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**Multimedia Editor** Dominik Tomaszewski  
**Consumer Tech Editor** Chris Martin  
**Senior Staff Writer** Ashleigh Allsopp  
**Technical Editor** Andrew Harrison  
**Associate Online Editor** David Price  
**Associate Editor** Karen Haslam  
**Associate Editor** Neil Bennett  
**Forum Editor** Peter Thomas  
**Editor-In-Chief** Matt Egan

jim\_martin@idg.co.uk  
marie\_brewis@idg.co.uk  
mandie\_johnson@idg.co.uk  
rob\_grant@idg.co.uk  
dominik\_tomaszewski@idg.co.uk  
chris\_martin@idg.co.uk  
ashleigh\_allsopp@idg.co.uk  
reviews@idg.co.uk  
david\_price@idg.co.uk  
karen\_haslam@idg.co.uk  
neil\_bennett@idg.co.uk  
moderator@idg.co.uk  
matt\_egan@idg.co.uk

## Contributors

Chris Bidmead, Michael Brown, Martyn Casserly, Peter Kernan, Alec Meer, Robin Morris, Mikael Ricknäs, Agam Shah, Andrew Shalat, Adam Shepherd, Lincoln Spector, Gavin Stoker, Derek Walter, Simon Williams

## Advertising

**Business Director** Helen Clifford-Jones  
**Account Director** Tom Drummond  
**Account Director** Jonathan Busse  
**Senior Account Manager** Edward Longmate  
**Senior Account Manager** Dave Lees  
**Account Manager** Julian Tozer

helen\_clifford-jones@idg.co.uk  
tom\_drummond@idg.co.uk  
jonathan\_busse@idg.co.uk  
edward\_longmate@idg.co.uk  
dave\_lees@idg.co.uk  
julian\_tozer@idg.co.uk

## Marketing

**Marketing Manager** Ash Patel  
**Head of Marketing Design** James Walker  
**Marketing Software Manager** Letitia Austin  
**Subscriptions Customer Services**

ash\_patel@idg.co.uk  
james\_walker@idg.co.uk  
letitia\_austin@idg.co.uk  
pcadvisor@subscription.co.uk

## Online

**Online Development Manager** Adrian Black  
**Web Developer** Victor Chong  
**Web Developer** Dominik Koscielak

webmaster@pcadvisor.co.uk  
Junior Developer John Copsey

## Accounts

**Financial Director** Chris Norman  
**Credit Controller** Dawnette Gordon  
**Management Accountant** Parit Shah

chris\_norman@idg.co.uk  
dawnette\_gordon@idg.co.uk  
parit\_shah@idg.co.uk

## Publishing

**Publishing Director** Simon Jary  
**Managing Director** Kit Gould

sj@idg.co.uk  
kit\_gould@idg.co.uk

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JIM  
MARTIN



# Windows gets personal

Microsoft's latest OS offers some interesting features

Welcome to another packed issue of *PC Advisor*. There's big news on Windows 10, as Microsoft has unveiled a host of new features which it says will make the new operating system the most personal version yet.

And that's important because the days of Windows being an operating system for managing your stuff on a single computer are long gone. Now, we want to email, browse the web, create documents, print attachments and a whole lot more from whichever device is to hand, be that a smartphone, tablet, laptop or a PC. The technology, as Microsoft's Terry Myerson put it, needs to get out of the way. We want to be able to put down one device and pick up another where we left off.

Windows 10 will enable exactly that thanks to features including universal apps, which sync everything from photo edits to lists of documents you've opened recently across all your Windows 10 devices, which will include smartphones and tablets.

Plus, with Cortana - Microsoft's 'personal' digital assistant - coming to the desktop, you'll be able to send emails, check directions and much, much more simply by talking to your PC.

A strange move is HoloLens. Clearly inspired by the variety of VR- and augmented reality headsets, the HoloLens is a pair of glasses which work with Windows 10 and let you do everything from playing 3D games and watching videos on virtual screens to checking a virtual shopping list on the fridge door. Not everyone is convinced by the idea, though: Chris has some fairly damning words to say about it on page 10.

But enough of the spoilers: turn to page 94 for the full story of Windows 10, where you'll also find out how you can download the preview version and try it out right now. Just make sure you don't install it on your main PC, as it's unfinished software.

Google has adopted a different approach for Chrome OS, which runs on Chromebooks. Instead of local storage and processing power, a Chromebook relies on an internet connection and powerful servers to get most things done. It means you can effectively buy a new laptop for under £200, and Chromebooks make great second PCs.

From page 100, you'll find our introduction to Chromebooks and guides on how to accomplish tasks when you can't just install a Windows application such as Skype or Photoshop.

If you have dead spots in your home where your router's Wi-Fi signal is too weak, you're not alone. The problem is all too common, but it's easily fixed with a powerline network adaptor or Wi-Fi extender. We explain these devices and their pros and cons on page 108.

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# "PC prices set to stay low in 2015," says Intel

Chipmaker's fourth-quarter earnings benefitted from a rebound in PC shipments



Capable, lightweight laptops are available these days for less than £150, and those prices are likely to stick around or even fall slightly this year, according to Intel.

PC shipments are expected stabilise in 2015, and average prices for desktops and laptops may decline a little, argued Brian Krzanich, Intel's CEO, during a recent conference call to discuss the company's earnings. Thin-and-light laptops are delivering more bang for the buck than in previous years, and well-built, fully functional Chrome OS and Windows laptops are available for \$200 or less, he added.

But innovations are also coming to PCs, and those may command a premium, he said. For example, HP's Sprout (pictured right) allows scanned 3D images to be manipulated on a digital canvas called the Touch Mat. It uses Intel's depth-sensing RealSense camera to capture the 3D images.

PC shipments should be flat or down only slightly in 2015, Krzanich said. They declined in 2014, but at a slower rate than in previous years. In 2013 shipments

declined by more than 10 percent. "It played out exactly as we forecast," he revealed.

Intel has benefited from the stabilisation. In January, it reported fourth-quarter revenue of \$14.7bn, up 6 percent from a year earlier and in line with analyst estimates. Net income was \$3.7bn, up 39 percent, while earnings were \$0.74 per share.

Revenue for the PC Client group, which sells chips for PCs and tablets, was \$8.9bn, was up 3 percent compared to the same quarter the previous year. The number of chips sold in laptops increased by 11 percent, though average prices for those chips decreased by 3 percent. Shipments of desktop chips declined 1 percent, though average prices stayed the same.

Last year wasn't the easiest for Intel, with chip delays hurting its revenue. After some manufacturing issues, it has released new chips based on the Broadwell microarchitecture, which are now shipping in some laptops. This processor will, however, have a shorter-than-expected life in laptops and may not even reach desktops.

Indeed, Intel is already promoting Broadwell's successor, Skylake, which will introduce wireless technologies that can replace cables for charging laptops and for connecting to monitors, printers and external storage. It is scheduled to be available in the second half this year.

Revenue for the Data Center Group, which sells server chips and components, was \$4.1bn, up a healthy 25 percent. An emerging category for Intel is the Internet of Things (IoT), and that group's revenue was \$591m, up 10 percent year over year. Intel sells low-power chips, real-time operating systems and security software for IoT installations such as smart cities.

Intel is projecting revenue for the current quarter to be \$13.7bn, plus or minus \$500m.



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# Microsoft reveals more about 'free' Windows 10

CHRIS  
MARTIN



Microsoft gives details of the consumer features on Windows 10 at recent briefing

Although Microsoft gave us plenty of new details on the upcoming operating system, possibly the biggest takeaway is that Windows 10 will be free. For the first year, at least, users of Windows 8.1, Windows Phone 8 and Windows 7 will be offered a free software upgrade to the new platform.

"This is more than a one-time upgrade: once a Windows device is upgraded to Windows 10, we will continue to keep it current for the supported lifetime of the device - at no cost. With Windows 10, the experience will evolve and get even better over time," said Microsoft in a blog post.

Windows 10 will run across a number of different devices, screen sizes and processors. That includes Xbox One and Windows Phone so it will be a simple case of one operating system no matter what the device.

Microsoft added: "Windows 10 is the first step to an era of more personal computing. This vision

framed our work on Windows 10, where we are moving Windows from its heritage of enabling a single device - the PC - to a world that is more mobile, natural and grounded in trust. We believe your experiences should be mobile - not just your devices."

We already knew that Windows 10 would herald the return of the traditional Start Menu, but we now have confirmation that Cortana will be baked into the OS. Other new features include Universal apps, Xbox streaming, new notifications, unified settings and a new browser codenamed 'Project Spartan'. You can find out more in our Windows 10 feature on page 94.

There is some bad news though, as Microsoft has confirmed that owners of the Surface RT won't get to upgrade to Windows 10. Instead, the firm is working on an update that will bring some of the functionality.



## Starbucks brings wireless charging to the UK

Starbucks introduces wireless charging for customers at selected UK stores

After a successful rollout in San Francisco, Starbucks has partnered with Powermat to bring wireless charging to the UK. The scheme is currently available at 10 of its central London coffee shops.

"We have always tried to anticipate our customers' needs and innovate with technology to provide even more convenience," said Ian Cranna, vice president of marketing at Starbucks. "Our partnership with Powermat demonstrates Starbucks response to an increasing need to stay connected while on the go."

The firm pointed to research by Mophie, which found 92 percent of Brits would feel stressed if their phone's battery ran out.

Although it's called wireless charging, customers will have to collect a 'ring' (pictured) from the till and connect it to their

device before placing it on the Powermat. These will be available to Apple users with a Lightning or older 30-pin device, and anything with a Micro-USB connector.

You can, of course, use a Powermat compatible device without the adaptor - the firm uses PMA, not the more popular Qi standard. There's no fee for borrowing the 'ring', though you can buy one from Starbucks for £10.

The first 10 central London stores are: Princes Street, Kingsway, Wardour

Street, Pentonville Road, Harewood Place, Berkeley Street, Great Portland Street, Moorgate, Fleet Street, and Euston Tower.





### Tesco broadband and home service sold to TalkTalk

Tesco has sold its Broadband and Homephone service to TalkTalk. For now it will continue to provide the service for its 75,000 broadband customers and 20,000 homephone subscribers. They will continue to earn Clubcard points until the service is transferred; at which point new offers will be open to them as TalkTalk customers. Even after the transfer their Tesco.net email service will continue to function as usual.

For now the price paid and service received will not change. In the next few months TalkTalk will contact customers to offer new services.

**MORE:** [tinyurl.com/Lao4cvw](http://tinyurl.com/Lao4cvw)



### WhatsApp now available via your web browser

Jan Koum, CEO and founder of WhatsApp, has announced that the instant messaging app is now available on the web via the Chrome browser. This means it's possible to simultaneously access your WhatsApp account on your phone, tablet, laptop or PC without a hack. Writing on his Facebook page, Koum said: "Our web client is simply an extension of your phone: the web browser mirrors conversations and messages from your mobile device - this means all of your messages still live on your phone".

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

## Three in talks to purchase O2

Three confirms discussions to create largest UK operator

Following BT's announcement (see below) it will acquire EE, the UK's largest network, it seems that more moves in the telecom industry are poised. Telefónica, which owns O2, has confirmed it has entered into an exclusivity agreement worth £10.25bn with Hutchison Whampoa, owner of Three. That's less than BT's £12.5bn buyout of EE, but the firm has more customers and a larger 4G infrastructure.

"This operation marks another step in Telefónica's transformation process, initiated by the Company to become a leading digital telco and accelerate sustainable long-term growth, while maintaining an attractive remuneration policy," a statement from the company said.

Despite EE having more customers, the Three/O2 merger will make it the biggest UK network with a market share of 41 percent "The agreement is a win-win for both companies, which were looking increasingly vulnerable as pure-play mobile operators in a market rapidly transitioning towards multi-play," said Kester Mann, principal analyst at CCS Insight.

The UK's mobile network market is being shaken up and this will signal the end of various ongoing deals such as Three sharing EE's network.

BT was initially eyeing up O2 as a potential deal in 2014, but EE then entered the frame so the firm had the pick of the two. EE might have been a better deal for Three since with an existing network sharing



deal in place, and the same with BT and O2, but it looks like that wasn't enough to swing it.

Hutchison Whampoa has a history with O2 though, as it purchased O2 Ireland back in 2013.

One of the big questions is what is happening to competition in the UK telecoms market. If this deal goes through, four out of five successful bidders in the 4G spectrum auction will have merged. Ofcom effectively guaranteed Three 4G spectrum in fear of reducing the number of operators.

There are a number of other operators such as Tesco Mobile, GiffGaff, Virgin Mobile and others, but they run virtual networks, so deals could well change with the acquisitions.

## BT seeks to buy EE in £12.5bn deal

Phone giant confirms talks to purchase UK's biggest mobile network

After much speculation, BT has confirmed that it is in negotiations with Deutsche Telekom and Orange with the aim of acquiring EE and its 24.5 million customers for a price of £12.5bn.

In a statement, BT said: "The proposed acquisition would enable BT to accelerate its existing mobility strategy whereby customers will benefit from innovative, seamless services that combine the power of fibre broadband, Wi-Fi and 4G. BT would own the UK's most advanced 4G network, giving it greater control in terms of future investment and product innovation."

EE customers are likely to experience more change as it's likely that BT will put an end to EE broadband and EE TV services since they are rivals to its own products - Infinity and YouView.

The move means BT can compete with Virgin Media as a 'quad-play' provider by offering broadband, mobile, landline and TV in one bundle.



Existing BT and EE customers are likely to be offered discounts and deals to take all four.

BT hasn't announced what it plans to do on the mobile side of things and it will be a difficult decision whether to ditch the EE brand which the company has spent a lot of money building, including the tie-in with Kevin Bacon. We wouldn't be surprised to see BT Mobile becoming the new name eventually, though.



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CHRIS MARTIN

# HoloLens is only good for two things: and they're not holograms

HoloLens may have impressed some, but I think Microsoft is mostly dreaming

**A**t its Windows 10 briefing, Microsoft announced various details about the upcoming operating system, but one thing we weren't expecting was that it will be the 'world's first holographic computing platform'. However, I think it's good for only two things.

This is somewhat at the conceptual stage, even though Microsoft said it's already started working with third parties to create applications. A set of APIs enable developers to create holographic experiences in the real world, according to the firm.

All of this might sound pretty cool, but I'm not so convinced by Microsoft's view of the future of its OS and computing.

Windows 10 being a holographic computing platform doesn't, unfortunately, mean that you can use the OS in a 3D way right in front of you regardless of what you're running it on. You will need the right hardware and that's why Microsoft introduced the HoloLens. The wearable gadget is the world's first untethered

holographic computer, has no wires and requires no connection to a PC.

The device looks rather swish, that is until you see someone wearing it. It's hardly small like Google Glass, so doesn't "blend technology with real life" as Microsoft claims. I haven't tried it on, but I don't think I need to, you can see how big and bulky it is. Microsoft doesn't seriously expect people to walk around their houses, offices or even out in public with this thing on does it?

One of the problems I have with HoloLens is the way Microsoft is banging on about holograms - it would have made a good drinking game during the second half of the two-hour presentation. The HoloLens lets you see three-dimensional objects projected into the world around you but, it's not as if anyone can see them, you need to be wearing it. When it comes down to it, this is simply augmented reality - a technology that has been around for a long time and is used in devices such as the Nintendo 3DS.

The other main problem I have with the HoloLens is who exactly is supposed to use it? Microsoft's videos have all sorts of ideas, but the only real consumer use I can see for the gadget is gaming. In this area there is loads of potential and is no doubt the future of the gaming industry - although Microsoft mentioned no possibility of using it with the Xbox One (how cool would that be?)

The question is whether someone else will come up with something better and cheaper than Microsoft. We don't know how much it will cost or when it will arrive and Microsoft probably doesn't either.

Aside from gaming, the main thing for which Microsoft is touting the HoloLens is product design, making it a gadget for that particular industry. Sure, designing a quad-copter sounds like fun, but how am I going to make it once I've done? I probably won't be able to afford to build one after buying the HoloLens anyway.

Oh, and I can't help but think the battery life is going to be absolutely dire. ☒



JIM MARTIN

# Android Auto and CarPlay

Competing systems only a stepping stone to a fully connected car

**A**s ever, CES was full of great new technology this year, with wearable tech almost drowning out the noise from the 4K TV brigade. However, there was something more interesting arriving in the cavernous halls of the Las Vegas Convention Center: car tech.

I say that not because I'm a car nut (I am), but because over the past few years car makers have turned their attention to technology in pursuit of selling new cars. In fact, Apple and Google are also getting in on the act with CarPlay and Android Auto.

However, having seen these systems in action, it's clear that there's still plenty of work to do. For a start, they're relatively limited in what they can do. CarPlay and Android Auto replicate only certain functions of your iPhone or Android Lollipop smartphone, and aren't really integrated with the car at all.

If I was being particularly harsh, I'd say that they're little more than glorified hands-free kits that use the bigger screen of the infotainment system. That's only slightly safer than looking at your phone's screen while driving.

It's a good start, but I'm sure we'll look back in a few years and see that CarPlay and Android Auto were stepping stones to a fully connected and intelligent car. Part of the

issue is that there's a disconnect between the car's systems and your smartphone's.

Some systems are already pretty sophisticated and let you use a touchscreen in place of physical buttons to turn on climate control, for example, switch between the various cameras mounted on the exterior and even monitor tyre pressures and other safety systems.

What's needed is a standard way to add your smartphone's capabilities without needing a different interface. You should be able to use natural language to do anything you like, from making a phone call, setting the air con to 17 degrees to finding the best recharging station for your electric car's battery or booking a hotel room as you drive.

## See into the future

Parrot offered a glimpse of the future at CES this year with its new infotainment system codenamed RNB6. It works with both CarPlay and Android Auto, and makes great strides to better car integration as well. It won't work with every car, but it will hook into the vehicle's 'network' and provide control over some functions, such as climate control, and also driver assistance including parking sensors and cameras. It's the first to include a dash cam, too, which

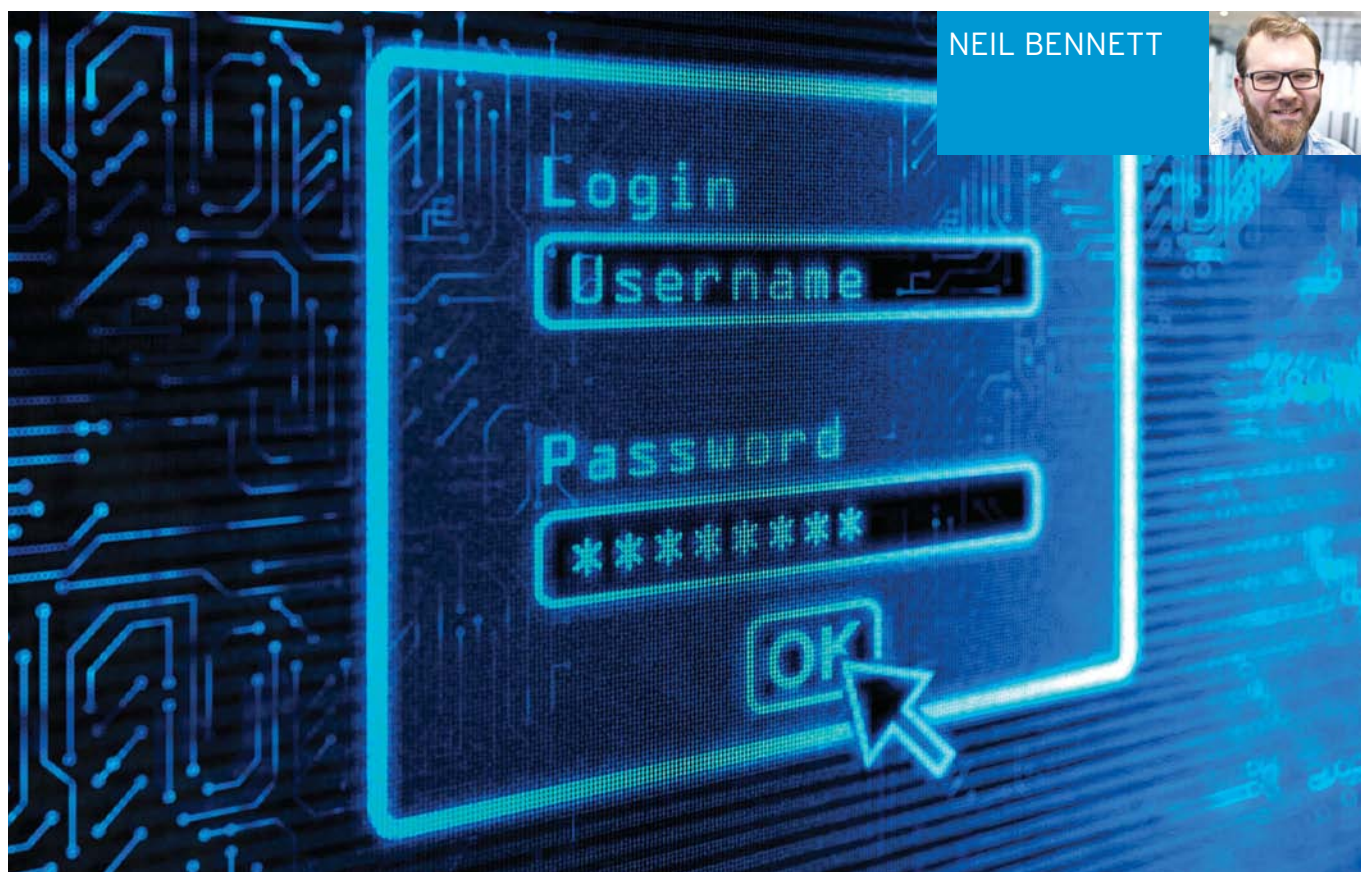
records as you drive so there's evidence in the event of an accident.

Even this isn't the definition of a fully connected car. There's loads of other technology on the horizon, including vehicle-to-vehicle and vehicle-to-infrastructure communication. If that sounds boring, it really isn't. It means that regardless of whether we end up with driverless cars or not, there will be new safety systems that could significantly reduce the number of collisions on the roads.

Humans are easily distracted, but if your car senses that you're about to drive through a red traffic light, it can automatically brake. This requires 'smart' traffic lights, but tests are already being done by Ford and others to make this a reality. Similarly, a vehicle-to-vehicle network could help ease congestion since all cars will be able to regulate their speeds and drive closer to each other without the risk of crashing. Current adaptive cruise-control systems are good, but they can't prevent those annoying stop-start traffic jams that we all hate.

It's bound to take years until standards in place and even longer until your car and the traffic lights on your high-street are actually using them, so CarPlay and Android Auto will undoubtedly become more popular in the meantime. 

NEIL BENNETT



# Keeping it simple

Why it can be okay to use weak passwords (sometimes)

**S**plashData's yearly list of the most popular passwords is back – and inevitably it's topped by 'password' and variations on the code an idiot would have on his luggage. It's a chance for techies to feel smug about using a truly random combination of numbers, letters and symbols – and for journalists to write the same old pieces gently chiding readers to use better passwords.

However, it can be good to use bad passwords – and if others think the same, then it could show that the premise of those articles and SplashData's press releases is a load of old 4c#fRTO.

This premise is that simple passwords – especially using obvious words such as 'password' and your children's names – are easy to hack. Therefore, you should always use more complex ones, using a long random barrage of characters. You should also use a different one for each site, in case one site is hacked and those responsible try to use your email and password on other sites.

Unless you have an eidetic memory, this is unrealistic. Instead, you let your browser remember all of your passwords except your bank (and hopefully any online

stores that have your card details) and you do one of three things. You use the same strong password (or a small selection of) for all sites, you keep a list of passwords somewhere handy or you have a few strong passwords for a small number of key sites and a few not-particularly-strong-but-easy-to-remember passwords for the rest.

The first approach leaves you vulnerable if hackers get a long list of email addresses and passwords from say, Adobe, and then use those to get into Amazon or your bank.

The second seems like the weakest, but is pretty secure. First, you need to ensure all of your passwords end in the same four numbers. Then write your list of passwords in a Google doc or Evernote or wherever, but without those four digits. And don't forget your Google or Evernote password. The downside, this requires writing them all down and who's got time to do that when there's Facebook, Twitter and the new series of *Sons of Anarchy* on Netflix to catch up on.

The third means you have strong passwords for the sites that matter – your bank, Facebook, Twitter, Amazon, et al – and you stick one of the simple ones in when you feel a strong one is unnecessary (or

that a password shouldn't be necessary at all): forums, mailing lists, online stores you probably won't order from again (so you're not gonna let them keep your card details).

One potential problem here is that occasionally you sign up for a site or service that seems unimportant, but later it becomes something you should be more careful about. Adobe's a prime example of this, where lots of designers signed up for an Adobe ID over many years for freebies or to use the company's forums – then later needed to use that account to pay for subscribing when Adobe changed its business model. So when the company was hacked, a lot of terrible password use was exposed.

If people are using this third approach, then perhaps they aren't as stupid as SplashData is making out. Maybe they're using those stupid passwords on a large number of immaterial sites, but using strong ones on the sites that matter – sites whose password engines won't let you use those weak ones anyway.

So maybe people aren't stupid. Or maybe they are. A regular reminder of the importance of passwords is good, but let's not take SplashData's data at face value. ☒



# Bright future for smartglasses

I'm finally excited about smartglasses and you should be, too

**W**hen I first saw the Google Glass, I didn't get it. Many people hate wearing glasses, so why would we want to wear huge, clunky glasses just to get information displayed in front of our eyes?

Then I tried it and I thought, "okay, I think I'm starting to get it". It's clever, it's useful for navigation and even for taking a quick photo, but is it worth all of the unwanted attention from passers by and the whopping price tag of £1,000 just to find a slightly speedier route without using my smartphone? Not really.

But my first experience of Google Glass did make me think that this could be the future. If adoption becomes widespread enough that wearing smartglasses doesn't make you feel silly, they could be far more useful than smartwatches. After all, smartwatches still offer very similar capabilities to smartphones, just in a more convenient place. Smartglasses, on the other hand, could change the way we view the world and the way we interact with it.

At CES 2015, I had the opportunity to try three different pairs of smartglasses: Toshiba Glass, Sony SmartEyeglass and Sony SmartEyeglass Attach.

I came away from the event feeling excited. One of the apps being shown off by Sony was a speech-translation app, which made me imagine what life would be like if everyone wore smartglasses.

Picture this: you go to a country where your knowledge of the language is minimal. Ordinarily, speaking to a local would involve strangely accented English and flamboyant gestures that probably make no sense at all. If you were both wearing smartglasses, you could speak to them in English, which would then be translated into their language for them to read on their smartglass's display. They can then speak back to you and you'd be able to read it in English. Cool, right?

Speech recognition is getting better by the day, so all it would take is for the technology to be built into smartglasses and for them to be adopted around the world, which is feasible when you consider the uptake of smartphones and tablets.

While you're on holiday, you might want to visit some of the coolest, quirkiest places, or the places that serve the best food. Instead of trying to find out where those places are using your smartphone or a guide book, you could launch an app on your smartglasses

that shows you where those places are as you look around. It would offer up a crowd-sourced star rating, so you'd immediately be able to spot where the five-star places are and head in that direction.

Perhaps one of those places is a museum, and that museum has a dedicated smartglasses app available to download for free. That app could act as your tour guide, displaying information directly beside artefacts or paintings, for example, pointing to specific areas of interest.

A vase that has a big chunk missing from it and has faded in colour could be brought back to life using virtual reality, for instance, or famous historical figures could appear in front of your eyes wearing the very outfit that's in the display case.

I think we're still a long way off from this, but the more I think about it, the more I think it's plausible. After all, there's going to come a time when smartphones aren't enough for us, and smartglasses could be the next big thing. We'll be looking back at 2015 thinking: "Remember when we had to get our smartphones out of our pocket and look down at them? Pfft, what fools - how did we manage?" 

# Let's get metaphysical

There's more to the collection of metadata than meets the eye

Naturally, computers are really good at data – collecting it, storing it, processing it. And by the same token they are also great at working with metadata. This is not the real content, but all the handy labelling attached to the data.

It's in computers' digital DNA to assign context to all that lovely data, which is how our files and directories have names with which we can find them. Along with file names comes time- and date stamps, to record the date of creation and modification.

Increasingly every file is tagged with even more data about the data, such as exposure settings and geographical location automatically embedded into all the photos we snap with our phones. The more accurately we can describe each document, spreadsheet, photo, song and video file, the easier it becomes to find, letting us scoop what's needed from swelling repositories of data that snowball with every season.

The subject of metadata has been raked over again in the wake of the Snowden revelations, making metadata another buzzword paraded through the news. Our governments routinely claim that they are unable to look into our data – the actual content of our emails and our telephone calls, for instance – since these are legally protected by laws and constitutions.

Let's ignore the facts now laid out before us which clearly show that GCHQ and NSA do indeed record the entire content of every single email and every fixed-line and mobile telephone call that we make today. And instead turn to the amazing utility of our metadata, which the surveillance agencies are more ready to publicly concede they're routinely tapping and archiving.

On the face of it, there may seem little harm in monitoring the data about the data, so long as the data content itself remains confidential. The problem is that even without knowing the content of communications, metadata creates a very telling story of who we are, with whom we communicate and what we might be saying. Given a suitable slice of metadata, an adversary can build a detailed picture of all aspects of our lives.

## Fin de siècle, fin de la vie privée

The British government passed the Regulation of Investigatory Powers Act in 2000 to legitimise the mass surveillance of communications in transit, ostensibly in the interests of national security. This was a landmark point. A significant part of the



newly legislated dragnet will include every British citizen's communications metadata.

But requests are routinely made through RIPA for reasons far removed from the act's original stated purpose of safeguarding us from terrorism, organised crime and paedophiles. There are now stories of local authorities hiding behind RIPA to direct surveillance at individuals suspected of mundane civil offences such as dog fouling.

More troubling is the use of metadata harvested for the government that has been exploited to undermine press freedom – notably to reveal journalists' confidential sources. The Metropolitan Police was caught bypassing necessary court orders when it requisitioned and sifted through the phone records of daily newspaper editors in two recent high-profile cases.

The policemen who were found guilty of falsifying evidence in the Plebgate case had secretly obtained phone records (metadata) with a RIPA request to uncover the embarrassing leak. And in the Chris Huhne speeding trial, a confidential source was exposed through the covert requisition of a newspaper editor's mobile phone records. In these cases, it was not the content of the calls that was turned against the journalists and their source, but simply the metadata records that showed the who, where and when of key phone calls.

In November I was invited to the Open Rights Group Convention at Kings College London, by sponsor AAISP. There I heard about the most disturbing application of metadata so far, for the targeted assassination of suspected militants

in Pakistan, Yemen and Somalia. The presentation was by Jennifer Gibson, a US human-rights lawyer working with Reprieve. She campaigns to raise awareness about unlawful CIA drone strikes, which also kill bystander civilians.

The truth is now unravelling, that drone strikes have been ordered on the basis of intelligence metadata that has condemned targets without trial.

In case there is any doubt about the power invested in metadata, and its usefulness to the surveillance authorities, we need only turn to the spokesmen for the spooks. Starting with former general counsel of the NSA Stewart Baker, who said 'metadata absolutely tells you everything about somebody's life. If you have enough metadata, you don't need content'.

But the last word goes to General Michael Hayden, former head of the NSA from 1999 to 2005, and director of the CIA from 2006 to 2009. Speaking at a symposium at John Hopkins University in April last year, Hayden concurred that you can learn all about someone from their metadata trail. He followed with the simple, chilling admission: 'We kill people based on metadata'.

Remember that when politicians such as Barack Obama assure you 'that's all we're collecting, just the metadata, so you shouldn't need to worry about it'. ☒

ANDREW  
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CHRIS MARTIN



# Race to produce world's thinnest phone is completely pointless

Instead of rushing to produce slimmer phones, manufacturers should be focusing on what's important

**I**t seems that smartphone makers won't give up on the race to produce the thinnest smartphone but it's all pointless really.

On page 42, we look at the Kazam Tornado 348 (pictured above and below). Although it's the thinnest smartphone we've ever reviewed and markets itself as the slimmest in the world, it's made me realise that this never-ending battle is pointless.

It wasn't so many years ago, or even months, when making a smartphone (or other devices) thinner was an achievement - they were brick-like. It was good to see something become slimmer, and therefore lighter too. However, we've gone beyond the point where it benefits the user.

Kazam's phone is just 5.15mm - or 5.3mm going by our callipers. Either way, it's an impressive feat, and there are other smartphones vying for the top spot, including the Oppo R5 and Vivo X5 Max.

A phone thinner than a Biro might sound impressive, but this is detrimental to the device. Although the Tornado 348 looks great, holding it in the hand is a strange experience. It's too thin to be ergonomic, so I found it difficult to hold and use comfortably. Since the device is so thin, it's extremely light; so much so that you can't feel it in your pocket, prompting that horrible panic that it's fallen out when it hasn't.

Ergonomics aside, there is another major problem with having a phone this thin:

there's no room inside for components. It's impressive that these firms can fit enough inside to make a working product, but there's one thing that inevitably suffers - battery life. This is because only a small battery will fit in the limited space.

If we have a breakthrough in battery technology, then this won't be so much of a problem. However, it seems that particular advancement, which we're all crossing our fingers for, is a little way off, so it's very much an issue right now.

Unergonomic smartphones with poor battery life are no good, unless playing phone Top Trumps down the pub is more important. So let's stop this race to nowhere and concentrate on what really matters. ☒



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# AMD pins its PC hopes on Carrizo chip



AMD has big hopes for its Carrizo chips, writes [Aqam Shah](#)

**S**tability in the PC market has been of benefit to a great many chip and computer companies, but not to Advanced Micro Devices.

The chip design company is now looking to its Carrizo chip, which will ship during the second quarter of this year, to shore up its position in the PC market, according to the company's CEO Lisa Su.

"Carrizo continues to gain momentum because it will deliver the largest ever generational leap in performance-per-watt for our mainstream processors," she said.

AMD's chips are mostly used in budget laptops and desktops, and the PC business remains the company's largest source of revenue. But weak shipments of desktop

and graphics processors hurt AMD's earnings during the fourth quarter of 2014.

The company reported revenue of \$1.24bn, down from \$1.59bn during the same quarter a year earlier. It posted a net loss of \$364m, compared with \$403m in Q4 2013.

Revenue for the computing and graphics segment, which deals in laptop and desktop chips, was \$662m, declining from \$888m in Q4 2013.

Carrizo, which is based on the Excavator CPU core, will probably do better than its predecessor chip, codenamed Kaveri, which was released at the wrong time, according to Dean McCarron, principal analyst at Mercury Research. "The PC market was entering a decline phase, and they introduced products as that was happening. That's less than ideal timing," McCarron said.

Over the past few years, AMD has been changing its business model, so its revenue mix relies less on mainstream laptop and desktop chips. It's trying to generate more revenue from graphics and custom chips, with some success. Its specialised chips are used in Microsoft's Xbox One and Sony's PlayStation 4 gaming consoles. But PCs remain an important market, and Carrizo is in a

better position than previous attempts to capture that market, Su said. "Overall, it's

300 million units. That's a big market," she said. "We can improve our execution, and there is a lot of focus to ensure our 2015 products are strong."

Worldwide PC shipments are still declining but are expected to stabilise over the next few years. AMD has been losing x86 market share to Intel, which is trying to rejuvenate the PC market with 3D cameras and hybrid laptop-tablets.

AMD hopes to put more Carrizo chips in laptops through a new design approach in which it will supply just one motherboard design for laptops of all sizes. AMD hopes the new approach will prove attractive to PC makers, who will be able to use a wide range of Carrizo chips while reducing the cost of designing a PC. PC makers have been slowly dropping AMD from laptops.

PCs may be back in focus for AMD as the market steadies, but that won't change the company's desire to generate revenue from other markets, McCarron said. With PCs becoming cheaper and shipments growing slower than they used to, AMD will have to focus its limited resources on markets that are growing faster.

"You can see the same thing at Intel. We're entering a stable replacement phase for PC," McCarron said. "We have this constant market that is not high-growth, but it's obviously significant with the unit volume behind it."



SONY PLAYSTATION 4



# Reading the smartphone runes at the CES show

**Mikael Ricknäs** reports from tech show International CES how smartphones look set to change – both inside and out

**I**nternational CES has never been a showcase for smartphones, but it always features announcements that highlight big trends for the next 12 months, and this year's was no exception.

Smartphone manufacturers are struggling to get people to upgrade because new models lack earth-shaking features. But upcoming devices will still offer significant improvements, including powerful processors, better screens and enhanced cameras, as seen at CES.

LG, for example, isn't giving up on the idea of curved smartphones, with its launch of the G Flex2, which is curved from top to bottom. Interestingly, LG has decreased the screen size from 6in to 5.5in, while at the same time boosting the resolution to 1080p.

I am still not a fan of the Flex2's curve, which is intended to make the smartphone more ergonomic and comfortable to use. On the other hand, Samsung's Galaxy Note Edge, with its curved side, is rather more useful: it lets users access and see more information and features alongside the main screen.

In fact, LG's display team showed a side-rounded screen as well, so this is a concept that seems to be catching on. The key is to come up with applications that make good use of the rounded edge, so



**LG G FLEX 2**

that whatever is displayed there is helpful rather than distracting.

Even though it wasn't a trend at CES, more high-end smartphones will get screens with a 2560x1440-pixel resolution (also known as QHD), like the ones already available with Google's Nexus 6 and LG's G3.

High-resolution screens are also trickling down to cheaper smartphones. The basic LTE-equipped ZenFone 2 costs \$199 (UK price TBC), but packs a 5.5in screen with a

**SAMSUNG GALAXY NOTE EDGE**



1080p screen, which is impressive. It also has a 13Mp camera on the back and a 5Mp version on the front. In general, buyers of sub-£200 phones without a contract will get more bang for their buck this year with better screens, cameras and LTE support.

The insides of the Flex 2 and the ZenFone 2 are also harbingers of what's to come this year. The Flex2 is powered by the 64-bit octa-core Snapdragon 810, which is Qualcomm's new flagship processor.

The chip will probably power many other high-end smartphones. It offers performance improvements across the board, including the ability to use faster memory and speedier LTE connections, along with extensive support for 4K video with the help of the Adreno 430 GPU.

Meanwhile, the ZenFone 2 can have up to 4GB of RAM, which should help improve multitasking performance. Vendors have been slow to increase the amount of RAM in their devices, but the ZenFone 2 may signal a change.

Asus is still very much a challenger in the smartphone market and needs something special to help it grab the interest of consumers. While it's doing that with hardware, fellow challenger Alcatel OneTouch is doing the same with software.

The company's new Pixi 3 family of smartphones is operating system-agnostic, running Android, Firefox OS or Windows Phone. The OS choice is made when buying the smartphone, as is the case with the HTC One M8, which comes with either Android or Windows Phone.

So what does all this mean for smartphone buyers? If you bought a new high-end smartphone last year, it might be worth skipping an upgrade this year. But if you have an older product or are in the market for a cheaper smartphone, this year's crop will look enticing. 

# Users could take Puzzlephones to pieces and reuse their modules for computer clusters

Circular Devices is already thinking beyond its Puzzlephone concept, as [Mikael Ricknäs](#) explains

**T**he promise of modular smartphones such as Google's Project Ara (see analysis on page 27) is that customers will be able to upgrade the components at will. Taking the concept a step further is Finnish company Circular Devices, which has come up with a way to reuse the discarded computing modules in old smartphones.

Circular Devices is working on its own modular smartphone idea, called Puzzlephone. It hopes to ship working Puzzlephone products before the end of the year even though it hasn't yet released a prototype device.

The idea behind the Puzzlephone and Project Ara is to increase the longevity of smartphones and reduce waste in the process. With its Puzzlecluster platform, Circular Devices is aiming to take the waste reduction even further.

Alejandro Santacreu, CEO at Circular Devices, said in a recent blog post: "It makes no sense to discard a perfectly working computer just because you have upgraded your smartphone. The



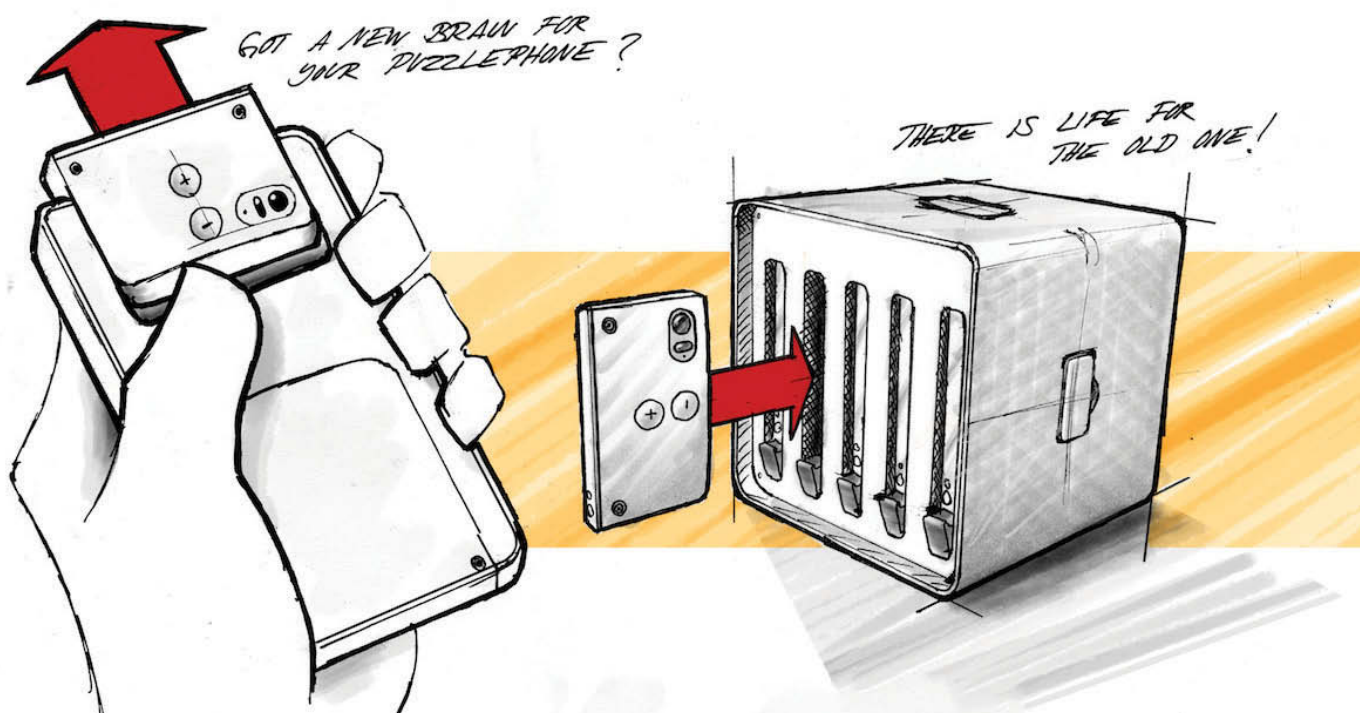
Puzzlecluster will extend the usable life of the Brain modules way beyond any other smartphone processor."

The Brain module includes the CPU, which will help power the clusters. The plan is also to reuse old battery modules for backup power. Drawings of the Puzzlecluster architecture show a chassis with slots for the reused modules, which can then be interconnected with others to create the cluster. Just one unit could also be used as a desktop computer.

Circular Devices didn't provide any details about when Puzzlecluster would start shipping or what software would be used to manage the hardware. But, assuming that the company is able to ship the first Puzzlephones some time this year, then the first CPU modules should be available for reuse probably by 2017. That leaves the company with plenty of time to turn its engineering drawings into a real, functioning product.

The goal is to deliver a product that's scalable enough to be used by home users, small and medium enterprises, public institutions and datacentres. Potential applications include rendering and data analytics, according to Circular Devices. If the cost is low enough, hobbyists and students could also use it to learn more about programming for parallel computing.

For anyone that wants to build a cheap cluster now, though, the Raspberry Pi single-board computer already offers a good alternative, and nVidia has published a helpful how-to for onbuilding Raspberry Pi clusters. ☒





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# HP plunges deeper into immersive tech with augmented reality and 3D printing in tablets

Company looking to provide interactive computing experience in its mobile products, says [Agam Shah](#)

**A**fter experimenting with augmented reality and 3D image manipulation in its recent products, PC maker Hewlett-Packard intends to bring them to tablets and laptops for a more interactive computing experience.

HP said its mobile devices will let users play with 3D images and then turn their visions into reality by outputting them in a 3D printer. It's a feature that already exists on HP's Sprout all-in-one desktop but will now make its way into a range of mobile products from HP in the future.

Also coming to HP's laptops and tablets will be features that bring augmented reality to real-world applications, said Ron Coughlin, senior vice president and general manager at HP's PC and printer division at a recent HP event.

"On immersive computing, you'll see us take it across segments, form factors and models," he declared.

HP wants to differentiate its products in the look-alike PC market, and Sprout provides a glimpse into what desktops could be like years from now. Sprout, which uses Intel's 3D RealSense depth-sensing camera, allows users to scan an object, then manipulate the resulting image on a specialised Touch Mat surface and ultimately print the resulting object on a 3D printer.

At the CES tech show, HP also showed its 23.6in ZVR 'virtual reality' monitor, which projects 3D images into thin air. Those images can be navigated, zoomed and manipulated using a stylus without touching the screen.

HP is adding a new spin to 3D technology with the Sprout PC and ZVR monitor, and the



products are closely tied to the company's emerging 3D printing strategy.

Coughlin said the company was providing the "on ramp" onto the 3D motorway via its Sprout all-in-one desktop and immersive computing, and the "off ramp" with its 3D printing vision.

Trickling down from the Sprout into tablets will be Workspace software, which allows users to share and manipulate 3D images. The Workspace software layer is built on top of Windows 8.1.

HP wants to bring immersive computing to a wide range of products, cutting across different price ranges. The ability to capture and modify 3D objects on PCs may be one of the drivers for growth in HP's 3D printing business, Coughlin said.

HP announced its first 3D printer late last year for release in 2016.

The company wants to remain on the technology offensive with new innovations as it prepares to split into two: HP, which will be in charge of PCs and printers; and Hewlett-Packard Enterprise, which will deal in enterprise software and hardware.

"If anything, we see ourselves being more aggressive," Coughlin said.

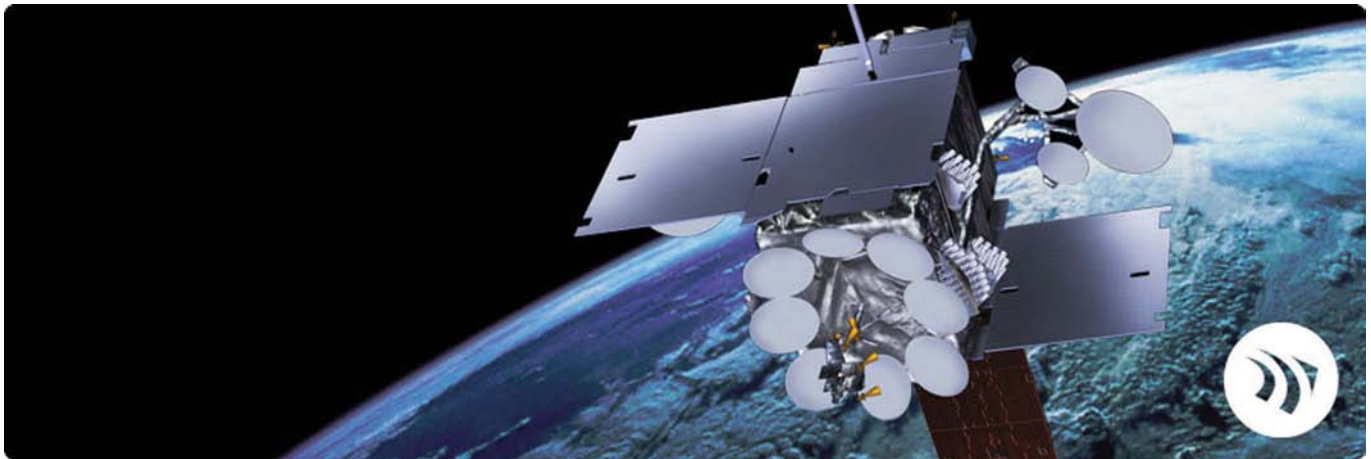
3D TVs and displays have been around for years, although the need for special glasses has hampered take-off. But continuing advances are giving new life to 3D in computers. Dell's Venue 8 7000 tablet, which also has Intel's 3D depth-sensing camera, can measure the distance between objects. Intel hopes its 3D cameras will also be able to identify objects and people's moods. ☒



HP ZVR



HP SPROUT



# Inmarsat goes into internet of things orbit

Developers will be able to take advantage of new high-speed satellites, reports [Mikael Ricknäs](#)

**I**nmarsat wants to see more applications taking advantage of its new high-speed satellites, and has pledged to make it easier for any developer to create them.

At its first ever developer conference, held in London in January, the UK company announced a more welcoming approach to developers. The push aims to make the necessary tools more easily available than before and help developers understand

how applications that use satellite communications need to be customised.

"This will benefit both application developers and our end users around the world," said Jonathan Sinnatt, director of corporate communications at Inmarsat.

The initiative isn't about developing the latest hot smartphone game, but creating business applications for the company's maritime, enterprise, aviation and government business lines.

Inmarsat is very keen on developers creating internet of things applications. "That's a key driver behind what we're doing now," Sinnatt said.

Applications could make use of sensors and other connected devices located in remote areas, on boats or on aeroplanes.

The applications will be able to do more things than before thanks to Inmarsat's new fleet of Global Xpress satellites. They will offer 50Mb/s+ download speeds and global coverage in the first half of this year. That's a big improvement over the 500Kb/s offered by its current fleet, according to Sinnatt.

"That means the potential of what the technology can be used for is vastly increased," he said.

To increase the capacity, the Global Xpress satellites use steerable beams that concentrate their power output. The drawback is that each beam also covers a smaller area. With the new satellites developers will also be able to take advantage of multicast transmission capabilities, which lower data costs by allowing for content to be delivered to multiple remote sites simultaneously.

Inmarsat is still working on the production APIs for Global Xpress. For now, there are two REST web interfaces, dubbed the Location and Network Access Device APIs, available in the company's testing environment.

To show how the APIs can be used, the company has published a native Android app on Github. The app shows how they simulate the location results by plotting a path across the North Atlantic Ocean.

In addition to mobile apps, developers will be able to build server-based and web-based applications that can be offered to Inmarsat users. 

**GX TERMINAL FOR SHIPS AND OFFSHORE PLATFORMS**



# Next-gen Atom discovered in HoloLens tank

Cherry Trail chip at heart of Microsoft's HoloLens holographic computer, reveals [Agam Shah](#)

**M**icrosoft's HoloLens holographic computer runs on an unreleased Intel Atom chip codenamed Cherry Trail, according to a source familiar with it.

Not yet commercially available, the HoloLens computer is an augmented reality headset that allows users to interact with 3D objects that show up as floating images, much like holographic projections. Users can wear the HoloLens and then build 3D objects, chat on Skype or even play 3D games.

Specific HoloLens hardware details have not been shared. At the recent Windows 10 event, Microsoft revealed only that it has a CPU, a graphics core and a holographic processing unit (HPU). The CPU and GPU are based on Cherry Trail, which will appear in tablets later this year, according to the source.

Cherry Trail is a successor to Intel's current set of tablet and low-end PC chips codenamed Bay Trail. Cherry Trail is smaller, has more features and is faster than Bay Trail. It can also fit within the curved contours of HoloLens. It is manufactured using Intel's 14-nanometer process.

The success of HoloLens depends on its ability to recognise gestures and hand movements. Intel is bringing some gesture recognition capabilities to Cherry Trail,



HOLOLENS

though it's unclear how the processing will be divided between the CPU, graphics core and holo-processor.

One challenge will be to keep it free of wires during use. For example, it may be possible for HoloLens to recharge wirelessly by being placed on a specific surface. Intel is bringing wireless charging features to Cherry Trail - tablets will also be able to recharge that way.

Cherry Trail devices will also be able to stream video wirelessly to larger screens through a technology called Wi-Di.

The mysterious part of HoloLens remains the HPU, which Microsoft described as a new type of processing unit.

According to Jim McGregor, principal analyst at Tirias Research, because HoloLens has to do so many calculations simultaneously to analyse and process information and pixels in 3D space, it could

be a vector or graphics processor that can recognise objects and handle the rendering and display of 3D images.

Alternatively, it could be an offshoot of Intel's Xeon Phi, which started off as a graphics processor - codenamed Larrabee - before morphing into a supercomputing chip designed to handle complex 3D imagery and math calculations. The Xeon Phi itself is too big to fit into HoloLens, but the holographic processor could be an Intel "micro-engine" adaptation of the chip, McGregor said.

It's also possible that Microsoft has developed its own HPU, although developing graphics and vector processors can take a great deal of time and money. Microsoft may have developed the HPU in the form of a digital signal processor (DSP), widely used in mobile devices to handle specific functions like language and image recognition, and worked with Intel so the DSPs were compatible with Cherry Trail.

HoloLens is the hardware for Windows Holographic, an augmented reality platform in Windows 10. Microsoft hasn't provided a availability date, but HoloLens will ship after Windows 10 becomes available later this year.

Neither Microsoft nor Intel immediately responded to requests for comment. [X](#)



# Universal Office apps take a major step forward with the release of Dropbox for Windows Phone

The two companies are competing and collaborating on PC, tablet and smartphone integration, says [Mikael Ricknäs](#)

**MICROSOFT IS ON THE MOVE WITH DROPBOX**



**D**ropbox has finally released an app for Microsoft's smartphones, hinting at a future when Windows smartphones, tablets and PCs will become more integrated.

It's little secret that Microsoft has struggled to compete with Apple and Android-based tablets and smartphones because of a lack of apps for its platform, but that has started to change, with the addition of Dropbox representing a particularly significant arrival.

It is also the latest piece of Dropbox's Microsoft puzzle, allowing users to save and access photos, docs and videos from any device that runs its apps for Windows Phone (8.0 or higher), Windows RT or Windows 8.1, or via a browser.

The mobile app is the latest product from the partnership Dropbox formed with Microsoft last September. The first step was to let users edit Office documents from the Dropbox apps for Android and iOS, and access files stored on Dropbox from the Office apps for those two operating systems.

More advanced features for accessing and editing content on any device at any time is a core tenet in Dropbox's and Microsoft's vision for the future.

Microsoft is hoping to attract more developers by delivering on its promise of letting them develop so-called universal apps that work on PCs, tablets and smartphones that run the upcoming Windows 10 operating system. If the same app runs across all devices, functionality across all of them will come automatically.

Microsoft has demonstrated some of the universal apps that will be integrated in Windows 10 when it is released by mid-year, including a new version of Outlook and a photo app that keeps images in sync across multiple devices. Microsoft has also showed how deleting a notification on a smartphone will make it disappear on a PC too, and vice versa.

The challenge for Microsoft will be to convince the likes of Dropbox that developing universal apps makes sense. So far, the company has kept quiet on who else will have apps ready for the release of Windows 10.

Dropbox isn't planning to rely solely on Microsoft to let its users access and edit Office documents. This week Dropbox also acquired Israeli company CloudOn, which will allow it to integrate features for editing Office documents from within its own apps.

For Microsoft, it's about building an ecosystem that's greater than the sum of its parts, while Dropbox has rightly realised that it needs to offer more than just file storage and sharing to remain relevant. 

# Lenovo anticipates boost from Windows 10

Agam Shah speaks to PC maker Lenovo, and finds a company excited about the new Windows

**A**s the release of Windows 10 draws closer, so excitement around Microsoft's latest version of its OS is growing among those waiting to bring the curtain down on Windows 8.

Lenovo, the world's largest PC maker, sees more customers wanting to upgrade to Windows 10, and is bullish about the OS, according to Peter Hortensius, chief technology officer at Lenovo, speaking at International CES in Las Vegas.

"I think customers are anxious to breathe some life into that product," Hortensius said. "We're obviously very bullish and hopeful on Windows 10."

Windows 10 will succeed the current Windows 8.1 operating system, which has been criticised for a touch-based tablet user interface very different from what had gone before in previous releases of Windows. Windows 10 will resolve many of the problems affecting Windows 8.1, which is a good OS but has its issues, Hortensius said.

As an example, he cited Windows 10's ability to boot straight to the desktop, something Windows 8 can't do (or at least it couldn't when Hortensius was speaking - a spring update for Windows 8.1 subsequently added the feature.) He applauded this as a commonsense approach that is bringing customer confidence back in the OS.

"The travails of Windows 8 are well documented," Hortensius said. "But it's still not an integrated experience."

The user interface change, multiple editions of the OS, and program compatibility issues didn't go down well with many. A lot of enterprise customers preferred to pass on Windows 8 altogether and are still upgrading PCs to the older Windows 7. Windows 10 will bring back many familiar Windows 7 features, which Microsoft hopes will please OS loyalists.

The new edition of the operating system removes the program incompatibility issues that have plagued Windows Phone and Windows 8 versions for Intel and ARM processors.

## Return of the Start menu

One big change in Windows 10 is the return of the Start menu, which was abandoned in Windows 8. Also, Windows 10 will scale from mobile to desktop devices, and apps will be compatible across all devices. Microsoft offers different versions of Windows for mobile phones, desktops and servers, and Windows 10 will unite those editions.

Analysts have said that Windows 10 could spur a round of PC upgrades in businesses, which could boost PC shipments. Lenovo's shipments have been growing even as rivals

like Dell and Hewlett-Packard have struggled in recent years with slowing laptop and desktop shipments.

Hortensius said that customers are responding well to the changes in Windows 10, and praised Microsoft for taking the right approach in developing the OS.

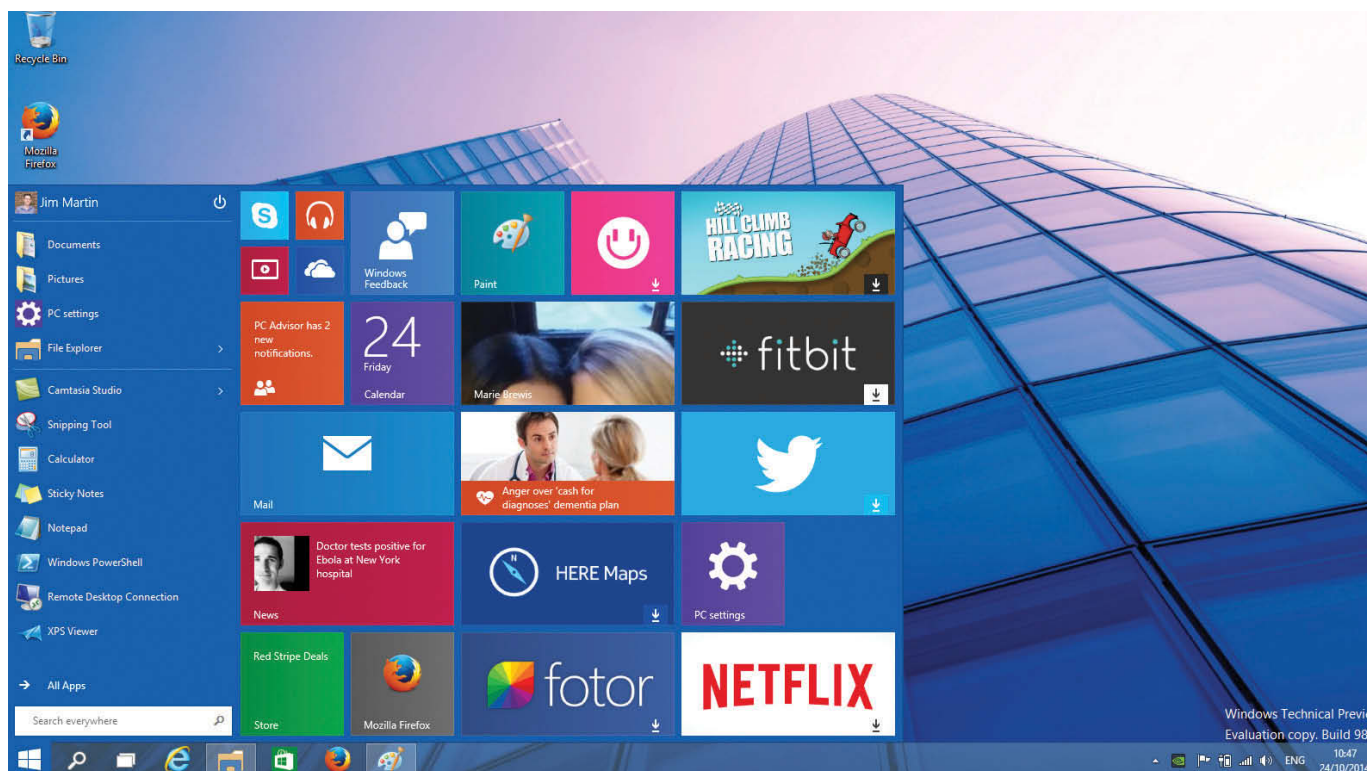
"We're very positive about where the product is going," he said.

A consistent user experience across all devices is important, and it has to be seamless, Hortensius said. A fully integrated and collaborative experience will help Microsoft's chances of putting Windows 10 in more devices, he added.

Depending on customer demand, Lenovo may consider the OS for a range of PCs, tablets and handsets. "It's up to Microsoft to make competitive offerings. If they do, we'll gladly use it," he said.

While Microsoft hasn't yet supplied a Windows 10 shipping date, the operating system upgrade is expected to be in PCs later this year. A beta version of Windows 10 is already available for download.

Hardware makers are currently preparing for the new OS. Lenovo and other PC makers will probably put Windows 10 in laptops and desktops later this year, while Intel and Advanced Micro Devices are already tuning their chips for the OS. ☒



# Google puts in hardware snap-on store for assemble-your-own Project Ara smartphone

Ara Module Marketplace store will sell hardware modules such as cameras, sensors and batteries that can be snapped onto its customisable Project Ara smartphone. [Agam Shah](#) explains how it will work

**A**s Google gets ready to ship its Lego-like Project Ara smartphone later this year, it wants to ensure relevant hardware is available for its release.

Recently Google shared details about a Project Ara store where users will be able to buy snap-on hardware blocks for the customisable smartphone. Google is relying on outside hardware developers to make Project Ara parts like antennas, cameras, sensors, screens and batteries, which will be sold through the store.

Google has taken its inspiration from the Lego toy bricks known to children all over the world. Google will accordingly sell a basic smartphone frame, and users can add or remove features by simply snapping on or swapping the hardware blocks on the frame.

Google wants the price of the basic smartphone frame to be as low as \$50. The snap-on modules that go on the frame would be sold separately.

With Project Ara, customers don't have to settle for features they don't want. If a wireless antenna or camera stops working, customers just have to change the relevant module instead of replacing the entire smartphone. Google also wants to make phones easy to upgrade.

Project Ara will start off as a pilot project, allowing Google to study how the device is used, and iron out kinks. Google has made three smartphone prototypes with different screen sizes.

## Crowdsourced

Ideas for Project Ara are being crowdsourced and rely heavily on external hardware developers to come up with new concepts for the smartphone's features. The company's store will be a one-stop-shop where customers can buy Ara modules and where hardware developers can sell their products. The recently released second version of Google's Module Developers Kit (MDK 0.2) carries further details about the store, module qualifications and payment disbursement.

Google said the Ara Module Marketplace store is analogous to the Google Play store, where apps, movies, music and e-books are sold. Consumers will be able to review



and rate modules, much as they can rate products in the Google Play store.

Developers will have to submit each Ara module to Google, which will verify whether it fits within the hardware specifications set out in the MDK. Hardware makers will also have to seek regulatory approval from countries where modules will be sold. Google hasn't said if it will assist in gaining regulatory approval. Many module developers are hobbyists, and bureaucracy could be a time-consuming and expensive process that could discourage some.

Google also said that developers will have modules shipped out through vendors preselected by Google. Google hasn't said whether it will help developers to get the parts manufactured, although the company said it is getting some parts 3D-printed through a deal with 3D Systems.

Revenue based on module sales will be "disbursed periodically at a set interval",

according to a document in the MDK. Google will also provide sales projection and planning tools.

Customisable smartphones have been tried before. Back in 2013, ZTE announced Eco-Mobius, which has not yet been released. In 2010, Israeli company Modu showed the Brewphone, to which keyboard, speaker and camera modules could be attached.

## Human response monitoring

Google has worked closely with hardware developers to conceptualise modules. Google itself has developed modules in which sensors can monitor human biometric signals.

"That includes galvanic skin response, sweat levels, your pupil dilation, gaze direction, and a variety of things that we can pick up non-invasively about you as you're interacting with the e-commerce system," explained Paul Eremenko, director of Project Ara at Google's advanced technology and projects group. "If you're stressed or impatient or bored with the experience, we could present a differently curated experience."

Another idea floated by Eremenko involves a secure module that stores private user information. The module can easily be swapped among Project Ara smartphones, and instantly customises the phone to a specific user.

There are also many technological innovations in Project Ara. The modules are based on electropermanent magnets, which can turn on and off without using any power. The modules eliminate wires and use inductive coupling for data transfers. A host of new data transfer protocols are being used in Project Ara. Google is working with Linaro to develop a custom version of Android that will support the new hardware and drivers. 

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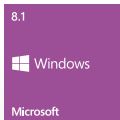


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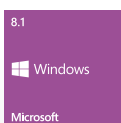


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- Intel® Pentium® G3258 overclocked to 4.4GHz
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- Windows 8.1
- 3 Year Premium Warranty

**£639** Inc VAT

The 3XS Performance GT is an affordably-priced gaming rig that includes a dual-core Intel Pentium G3258, which we overclock up to 4.4GHz for improved performance. Also included is a 2GB NVIDIA GeForce GTX 760 graphics card, 8GB of 2133MHz Corsair DDR3, a Z97 motherboard and 1TB hard disk.

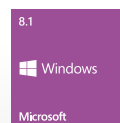


### Scan 3XS Gamer 20i Gaming PC

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- 8GB Corsair DDR3 2133MHz memory
- 4GB NVIDIA GeForce GTX 970 SC ACX
- 1TB Seagate HDD
- Windows 8.1
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**£1075** Inc VAT

The 3XS Gamer 20i is a super-fast gaming PC thanks to its combination of quad-core Intel Core i7 4790 CPU running at 3.6GHz with added Hyper-Threading plus a 4GB NVIDIA GeForce GTX 970 graphics card. These components are installed in an Asus Z97-K motherboard along with a 1TB hard disk.



### 3XS Graphite LG156 Gaming Laptop

- Intel® Core™ i5 4210M processor
- 8GB Corsair DDR3 1600MHz memory
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- Windows 8.1

**£855** Inc VAT

The LG156 is 15.6" mid-range gaming laptop that includes a NVIDIA GeForce GTX 860M graphics card. The LG156 has won multiple awards in the press for its performance and value for money. The LG156 is ready for next-day delivery and has a 2 Year Warranty.

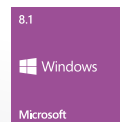


### 3XS Graphite LG1720 Gaming Laptop

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- 8GB Corsair DDR3 1600MHz memory
- 3GB NVIDIA GeForce GTX 970M
- 17.3in 1,920 x 1,080 screen
- 1TB SATA 6Gb/sec hard drive
- Windows 8.1

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The LG1720 is a 17.3" high-end gaming laptop that includes a choice of powerful NVIDIA GeForce GTX 970M or 980M graphics card, ensuring silky smooth frame rates in all games. The LG1720 is ready for next-day delivery and has a 2 Year Warranty.



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# 3XS SYSTEMS

# International CES®

CES 2015 is the biggest technology show on the calendar and here we've rounded up 10 of the best products we saw in Las Vegas this year



## « Razer Forge TV

### Micro-console/set-top box

The Razer Forge TV might look like an insignificant black box but is in-fact a media streamer and games console in one. The device runs on Android TV and comes with Google Cast support, too.

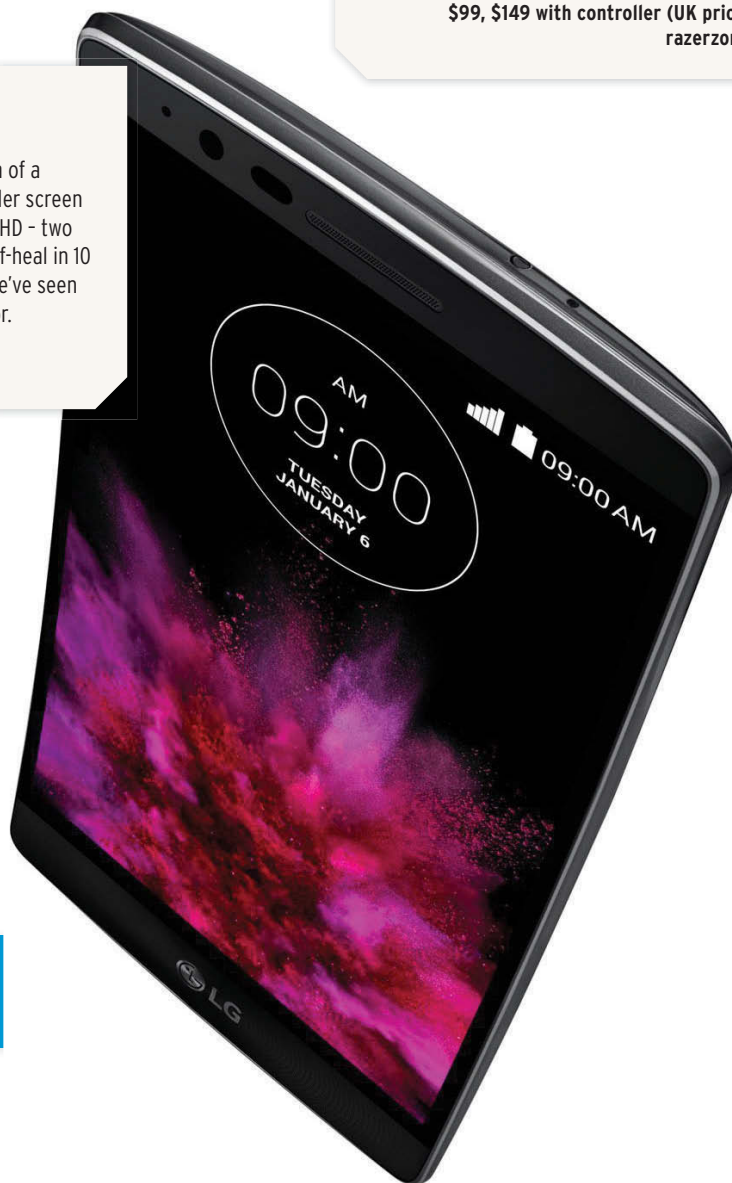
The controller for gaming is optional.  
\$99, \$149 with controller (UK price TBC)  
razerzone.com

## LG G Flex 2 »

### Smartphone

It seems LG hasn't given up on the idea of a curved screen. The G Flex 2 has a smaller screen at 5.5in and a higher resolution at Full HD - two much needed improvements. It can self-heal in 10 seconds and it's also the first phone we've seen with a 64-bit Snapdragon 810 processor.

£TBC  
lg.com/uk



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**smarter.am**

**>> Alcatel OneTouch Watch*****Smartwatch/activity tracker***

Wearable tech was big at CES 2015 this year and Alcatel's OneTouch Watch is a smartwatch and activity tracker in one. It will track your movements, provide notifications and has an optical heart rate sensor. It will be compatible with iOS and Android.

**\$150 (UK price TBC)**  
**alcatel.com**





### « Withings Activité Pop

#### Activity tracker

Withings wowed us with the Activité watch but it's a pricey piece of kit. The Activité Pop is more affordable with its silicone strap and PVD-coated case in a choice of colours. The analogue dials show the time and the progress to your daily goal but it can also track sleep.

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withings.com/uk

### Saygus V2 »

#### Smartphone

If you keep running out of storage on your smartphone then check out the Saygus V2. It can support up to 320GB thanks to dual microSD card slots plus 64GB of internal space. It also has a fingerprint scanner, IR blaster, wireless charging and a waterproof case.

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saygus.com



### « Sennheiser Momentum 2.0 Wireless

#### Headphones

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### « Garmin Vivoactive

#### Smartwatch/activity tracker

The Vivoactive is Garmin's take on the smartwatch and looks like the old Sony SmartWatch 2. It runs the firm's own software but can connect to iOS or Android. The Vivoactive is aimed at fitness fanatics with built-in GPS, but also provides features such as notifications and apps.

**Around £200**  
[garmin.com/uk](http://garmin.com/uk)

### Parrot RNB 6 »

#### In-car infotainment system

Car tech is getting bigger with the imminent arrival of Google's Android Auto and Apple CarPlay. Parrot's RNB 6 is ready for both despite running on Android 5.0 Lollipop and will arrive later this year. It features climate control, voice commands, parking assist, and loads more.

**£TBC**  
[parrot.com/uk](http://parrot.com/uk)



### « Dell XPS 13 (2015)

#### Laptop

The latest version of the XPS 13 from Dell claims to be the smallest 13in notebook PC. It weighs just over 1kg and starts at an affordable price tag. There's a touchscreen, SSD and a decent 15 hours of battery life on offer.

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





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\* Cost comparison: One year BT Retail contract: 10 ISDN30e channels + 100 DDI quota + CLIP = £218.00 per month. Spitfire: 10 SIP Trunks + 100 DDIs + CLIP + 1Mb additional Etherflow bandwidth on existing spitfire Ethernet = £74 per month (Etherflow = Metro Band 2A). Existing 2Mb leased line @ £45 per month compared with Spitfire 2Mb Ethernet leased line from £180.00 per month.



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**Specifications**

15.6in (1366x768) TN glossy touchscreen; 1.7GHz Intel Core i5-4210U dual-core processor; Windows 8.1; 8GB DDR3L RAM; 1TB (5400rpm) SATA HDD; Intel HD Graphics 4400; 2x USB 3.0, 1x USB 2.0; gigabit ethernet; 802.11b/g/n 1x1 MIMO; Bluetooth 4.0; HDMI; SD card reader; Kensington lock slot; 43Wh lithium-ion battery, non-removable; 383x252x23.8mm; 2.375kg

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



**LAPTOP**

## HP Envy 15 x360 15-u000na

HP is hedging its bets with this laptop, literally making it flexible enough to broaden its appeal. It's added folding tricks that let it fold back on itself, so where a normal laptop has a display that will hinge backward just beyond the vertical, the lid on the Envy 15 x360 goes all the way around, turning the notebook into a huge and heavyweight Windows tablet.

It's a 15.6in widescreen laptop, running a 1.7GHz Intel Core i5 dual-core processor. There's no additional graphics processor, instead relying on the quite versatile HD Graphics 4400 integrated graphics within the Intel chip. The version we tested includes 8GB of memory and a 1TB 2.5in hard disk for storage.

To use it more like a tablet, from the closed position, open the lid, lift it and keep rotating until the screen has folded right around to lie against the main deck again. Around half-way there, the keys and trackpad become disabled in order that any random presses on the keys are not registered. And the screen image also inverts, taking cues from an accelerometer that's now standard-issue in tablets since the iPad.

There's also an in-between stage, known as tent mode, where the laptop can be stood on a desk like an A-frame tent, and again operated like a touchscreen tablet.

Envy was once the name HP awarded to its premium consumer laptops, but for this model at least quality has slipped noticeably. While attempting to look more upmarket with metal construction, the case is constructed from plastic, apart from a thin 0.5mm aluminium veneer that forms the keyboard top plate.

But the main symptom of lowest-budget construction is saved for the touchscreen display, which is of particularly poor quality. A low-resolution 1366x768-pixel panel is not unusual for budget 15in Windows laptops, which renders on-screen type and graphics rather fuzzy. Nor is the high-gloss reflective finish unusual, where a shiny surface is a near necessity for a panel that encourages you to apply your greasy fingertips. But in contrast to high-quality tablets, there does not seem to be any attempt to use an oleophobic coating to resist marks,



nor does it have any form of anti-reflective coating.

Image quality of the twisted-nematic (TN) screen suffered badly. In our tests, it covered just 60 percent of the basic sRGB colour gamut, and so robs images of any colour realism. Contrast ratio was 80:1 at most brightness settings, explains the display's washed-out pallid complexion. And viewing angles were limited, such that anything more than a few degrees from face-on viewing resulted in the already weak picture becoming chroma inverted, with dark colours turning light and vice-versa.

For a laptop with tablet pretensions which demands viewing from various positions, this is a sorry state, making the screen particularly hard to read in many of its vaunted 360-degree combinations. When used as just a touchscreen laptop, the screen also suffered from wobbles when we tried to use the display as a touchscreen.

The keyboard fills the width of the top plate with its additional number keypad, and takes the usual centre-offset trackpad to compensate for having all the keys shifted to the left.

This HP TouchPad is less typical though, very large at 140x64mm, extended on both its sides with extra estate that is designed just to respond to custom finger gestures. Tap and drag down on the right side to 'display and select a charm', says the instructions, or the same gesture on the left to 'select an open app'. We couldn't get either of these functions to work at all, though.

With its recent Haswell-generation dual-core processor

and decent 8GB of memory, the x360's computing performance was more than satisfactory. Geekbench 3 scored it with 2552 and 4931 points for single- and multi-core modes. PCMark 7 reported an overall score of 2836, its result dragged back a little here by the use of a slower hard disk.

This slows down the computer in both subjective and benchmark terms when compared to today's SSD technology. We also noticed that to help reduce disk crashes caused when moving the laptop while it's spinning, the drive would lock up when it detected movement.

PCMark 8 meanwhile reported results of 2236 and 2707 points for its Home and Work units, again about typical for a laptop using a dual-core Intel chip and hard disk.

Some limited action with the latest Windows games may be possible providing you keep detail settings very low. Tomb Raider 2013 played with an average framerate of 30fps when set to the screen's native 1366x768 resolution and Low detail settings. This rose to 34fps at 1280x720 resolution. But raising detail to the Normal level saw framerates drop to 20- and 22fps respectively.

Battery life was okay, playing our standard looped video over Wi-Fi test for 5 hours, 20 minutes before the laptop shut down.

### Verdict

HP's application of the swivelling screen idea on a laptop works well enough, even if overall build quality doesn't give anything like a premium feel while you're handling its big and bendy frame. **✗ Andrew Harrison**

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 ■ [tinyurl.com/L2g2w2r](http://tinyurl.com/L2g2w2r)

**Specifications**

Windows 8.1 (64-bit); Intel Core i3-4012Y 1.5GHz dual-core; 60GB SSD + 500GB hard drive; 4GB LPDDR3 RAM; 11.6in - IPS LED backlight Touchscreen, (1920x1080); Intel HD Graphics 4200; 2Mp webcam; stereo speakers, microphone; 802.11a/b/g/n, Bluetooth 4.0; 3-cell lithium polymer; Micro-HDMI Headphone/microphone combo jack, Micro-USB 2.0; full-size USB (keyboard dock); microSDXC card reader; 11mm (tablet) 13.4mm (keyboard); 838g (tablet), 798g (keyboard)

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



**LAPTOP**

## Acer Aspire Switch 11

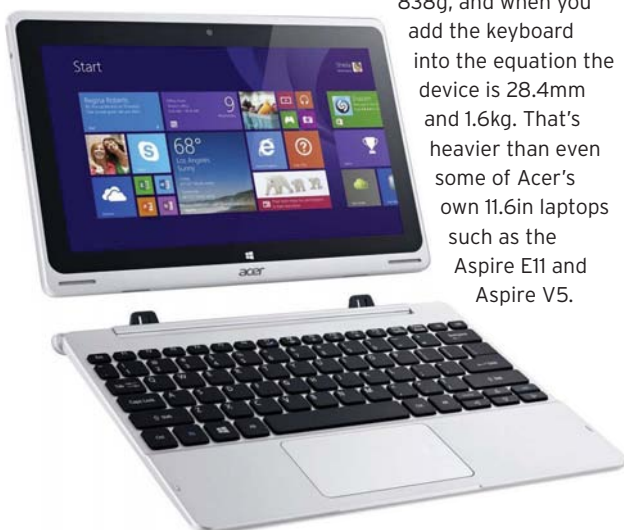
The hybrid market continues to plough on, attempting to fuse a laptop and a tablet into one device. Acer's Aspire Switch 11 is one of the latest to arrive, and comes with Windows 8.1 preinstalled. Prices start at £379, which is a lot more than the £289 Switch 10 ([tinyurl.com/L3njuqq](http://tinyurl.com/L3njuqq)). Our review model, the SW5-171, will set you back a more laptop-like price of £449.

The Switch 11 is, to put it simply, a larger version of the Switch 10 (Acer must have read our review suggesting a larger display). It has the same magnetic 'Snap Hinge' which means you can completely detach the tablet part from the keyboard dock. When clipped together the hinge means it can be folded shut like a regular laptop.

Tablet and laptop are the two obvious ways to use the device, but you can also use it in display and tent modes - the same as many convertibles on the market. The magnets are strong so hold well, though, it can be tricky to get the device snapped into place properly.

Unfortunately, the hinge doesn't go all the way around (like Lenovo's IdeaPad Yoga), so you have to remove the tablet and spin in 180 degrees for display mode. We also found that the device falls over backwards in laptop mode if you push the screen back far enough. It's a problem we saw with the Switch 10, so it's a shame to see it again.

Although the screen size is a mere 1.5in bigger, the device is a lot chunkier than its older brother. The tablet itself is 11mm thick and a hefty 838g, and when you add the keyboard into the equation the device is 28.4mm and 1.6kg. That's heavier than even some of Acer's own 11.6in laptops such as the Aspire E11 and Aspire V5.



It's heavy, but the tablet feels solid, well put together and has a nice brushed metal cover on the rear, which is more than can be said for the plastic keyboard. The dock does have a handy USB port on the right side, but we feel there is room for two.

We found the keyboard and trackpad on the Switch 11 to offer the same experience as its predecessor. That is to say it's nothing special.

### Hardware and performance

As we've mentioned, the Switch 11 has an 11.6in screen that gives you more room for manoeuvre compared to the Switch 10's 10.1in display. Acer offers the device in a couple of models, so you can choose from a bog standard 1366x768 resolution or a more exciting Full HD 1920x1080.

The latter is what our review sample came with, and is nice and crisp. Whatever resolution you opt for, the display is IPS and coated in Gorilla Glass so you get good viewing angles. It's also touchscreen, although Windows can be fiddly to use with touch, Acer sells an optional Active Pen stylus for £30.

If you opt for the Switch 11 with the lower resolution screen, you get the same Intel Atom processor found in the Switch 10 and an identical 2GB RAM. However, our Full HD model came with an Intel Core i3 (4012Y) 1.5GHz dual-core chip and double 4GB RAM.

That meant an extra 500 points in our PCMark 7 benchmark, with the Switch 11 scoring 2984, which is about what we expect from an affordable i3 device. We also saw an improvement on the graphics

side of things with results of 22fps and 11fps in Stalker: Call of Pripyat at 720p and 1080p respectively. It's an improvement, but this is by no means a device for proper gaming.

Moving on to battery life and the Switch 11 failed to impress with a dismal result of four hours, 24 minutes - almost two hours less than the Switch 10. We test by looping an HD quality film over Wi-Fi at a comfortable 120cd/m<sup>2</sup> screen brightness.

The cheaper model comes with 32GB of flash memory while our more expensive review unit has a 60GB SSD inside. The latter also has a 500GB optical hard drive, which we assume is inside the keyboard dock - hence why it weighs almost as much as the tablet. Acer doesn't mention this in any specifications, though. There was supposed to be an optional keyboard dock with a hard drive for the Switch 10, but it never materialised.

Beyond that full-size USB port on the dock, the tablet has 802.11a/b/g/n Wi-Fi, Bluetooth 4.0, a microSDXC card slot and a potentially handy micro-HDMI port. Last but not least, is a 2Mp front-facing webcam and front facing stereo speakers.

### Verdict

The Acer Aspire Switch 11 is a more attractive device than the Switch 10, with a larger screen and better specs. However, we're still not convinced by the chunky, top-heavy design and the device let itself down with poor battery life. It might be more affordable but there are much better hybrids out there. ☒ **Chris Martin**

**£799** inc VAT**Contact**■ [apple.com/uk](http://apple.com/uk)

Read more

■ [tinyurl.com/n9zwoxs](http://tinyurl.com/n9zwoxs)**Specifications**

2.8GHz dual-core Intel Core i5 (Turbo Boost up to 3.3GHz) with 3MB on-chip shared L3 cache; 1TB Fusion Drive, configurable to 2TB Fusion Drive or 256GB, 512GB or 1TB of flash storage (SSD); 8GB of 1600MHz LPDDR3 memory, configurable to 16GB; Intel Iris Graphics; 2x Thunderbolt; 4x USB 3.0; HDMI port; SDXC card slot; gigabit ethernet; audio in; headphone socket; IR receiver; 802.11a/g/b/n; Bluetooth 4; 36x197x197mm; 1.22kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



## DESKTOP COMPUTER

## Apple Mac mini (2.8GHz, 1TB Fusion Drive, late 2014)

Sure as death, taxes and data loss, there are some givens in this world. One of which is that next year's PC will be faster than last year's.

But there is an argument that for the majority of users the desktop PC has already reached 'fast enough' - in terms of processor speed at least, even if it's now apparent that flash storage makes a bigger perceived difference to how quick a personal computer can feel.

However, one thing we don't ordinarily expect is for a newly revised computer to appear that computes more slowly than the model that it replaces. Particularly when there's been not one but two long years between the now-obsolete and shiny new editions.

That's exactly what's happened with Apple's 2014 model of the Mac mini though. Today's Mac mini range is in many respects slower than the 2012 range it replaces.

With the entry-level model we reviewed in the previous issue ([tinyurl.com/kfajLj2](http://tinyurl.com/kfajLj2)) there was the distraction of finding the price slashed by one-fifth, from £499 to £399, to sweeten the deal. Inside this new starter model is effectively the same computer as a MacBook Air, albeit working much slower due to the little mini's reliance on a hard disk rather than solid-state flash storage.

That's fine for people working to the tightest budgets who don't require more computing power than is necessary for office duties and some modest creative work. But since the Mac mini launched in 2005, it has developed a cult following from delighted owners who have found the little chap capable of so much more.

The Mac mini has been pressed into service as a graphic designer's workstation, a home media centre for the family, and as a web server for hosting entire commercial websites.

It's been ably assisted in these latter kind of duties with the introduction of the Intel Core i5/7-Series processors - and in particular, the quad-core editions that first appeared inside the Mac mini in 2011. This was also the Mac mini range where Apple actively encouraged promoting the little



mini into front-line server action, issuing a slot-less server edition that packed two hard disks.

Now with the recent updates we find no more quad-core models are available. Standing at the top of the prêt à porter range is the 'best' Mac mini with 2.8GHz Intel Core i5. Given the intervening two years and the upward graph that is the progress of processor performance-per-clock, this model ought to crush the 2.6GHz-powered 'best' of 2012.

**Benchmarks**

In the new corner we have the current best of three off-the-shelf configurations of Mac mini for 2014, here with 2.8GHz Intel Core i5-4308U dual-core processor, Intel Iris Graphics 5100, 8GB 1600MHz memory firmly soldered in place, and a 1TB Fusion Drive.

In the old corner, we have one Apple Mac mini (late 2012) with 2.6GHz Intel Core i7-3720QM. This has been upgraded since new with a 512GB SSD and 16 GB of 1600MHz DDR3 memory from Crucial.

The first test is the cross-platform Geekbench 3, which measures raw processor and memory performance. The application feeds a computer a series of difficult sums to work upon, such as cryptographic routines, lossless file compression/decompression, ditto for JPEG and PNG graphics, and some Mandelbrot fractal crunching.

Today's best Mac mini scored 3363 points in single-core mode, and

7208 points in multi-core mode. And here, 'multi-core' means dual cores with Hyper Threading Technology, which can give the effect of a virtual quad-core chip when using many modern applications.

Yesterday's best Mac mini scored 3308 points single-core, and 12927 points multi-core. So today's Mac mini showed a 1.7 percent positive increase in point score when mono-tasked; and scored only 56 percent of the older model's speed with multi-threaded applications.

**Graphics tests**

We tested with two different versions of the venerable Cinebench test, v11.5 and v15. In Cinebench 11.5, the top 2014 Mac mini scored 1.38 points single-core, and 3.36 points multi-core, reporting a 2.44-times increase through running simultaneous threads.

The top Mac mini of 2012 scored 1.44 and 6.76 points respectively, with an indicated multi-thread speed-up of 4.7x. So here the later Mac had a 4 percent slower single-core speed, and had a little over one-third the latter's score running multi-core. In Cinebench R15, scores moved from 126 to 120 points, and from 549 down to 292 points. That represents a 5 percent single-core drop; and a 52 percent reduction in multi-core speed.

**Graphics performance**

In the two years between Ivy Bridge and Haswell generations of processors (2nd- and 4th-generation

Core chips), Intel has diverted more attention to the graphics engine that now resides in most of these chips. These graphics solutions now approach what was once only possible with dedicated discrete graphics from nVidia and AMD.

In 2012, the 2.6GHz Intel Core i7-3720QM had a graphics processing section known as Intel HD Graphics 4000, with a base clock frequency of 650MHz, and peak of 1250MHz.

Today's 2.8GHz Intel Core i5-4308U includes Intel Iris Graphics 5100 (not to be confused with Iris Pro though), with a lower base clock of 200MHz and maximum clock of 1200MHz. However the number of pipelines ('execution units') has increased from 16 to 40 in the later processor. Which of these graphics engines is more powerful may depend on the application, our results suggest.

From the Cinebench OpenGL test routines, the older Mac mini played the car animation sequence at 24.1- and 17.4fps, with Cinebench 11.5- and 15fps respectively. The newer Mac mini played the same tests at 28.4- and 25.5fps, vindicating the new graphics architecture with these results showing up to 47 percent faster framerates.

Turning to our standard Mac game tests of Batman: Arkham City and Tomb Raider 2013, however, we found the trend less certain. Where 2012 Mac averaged 42fps when played at (1280x720, Medium), the 2014 Mac fell to 34fps at the same settings.

For Tomb Raider 2013 (using Legacy OpenGL mode), we kept the same half-HD resolution and saw results of 34.8- and 23.9fps, for Low and Normal detail settings. These framerates were barely improved upon by the newer Mac mini, now up to 35.1- and 24.1fps.

Where later Intel chips have made breakthroughs is in reduced power consumption, a pivotal trend that is still improving for the sake of mobile battery-powered computers.

Idle power consumption has plummeted further in the latest revision, down from 10- to just 5W, although peak power consumption was found to have increased slightly from 45- to 50W.

## Ports and connectivity

As we mentioned, it's not all about processor speed, especially if you

don't intend running a web server or editing video.

The common bottlenecks that slow down your computer's speed come down to IO - data input/output - and here there is better news for 2014's Mac mini.

Wireless speed using Wi-Fi has potentially doubled, thanks to the implementation of 802.11ac in the current series. Where maximum data transfer with three-stream 11n would be up to around 300Mb/s, 11ac can currently deliver up to around 600Mb/s. Bluetooth 4.0 is unchanged since 2012, as is the collection of four USB 3.0 ports that made their debut that year. But now replacing the FireWire 800 port is a second Thunderbolt port, with both now uprated to Thunderbolt 2 specification.

The total available speed of Thunderbolt 2 should be no different to the original Thunderbolt, as its 20Gb/s specification equals the 2x 10Gb/s of the first iteration of Thunderbolt. But in real-world use there will be applications where a single higher speed channel can be put to better use than two half-speed links.

Besides Thunderbolt to connect a display or two, there's still an HDMI port available on the back panel. This makes it easy to hook up a Mac mini to Full-HD TVs and monitors, for example, although it's less suitable for the emerging ultra-high definition displays now available.

This port is now based on the HDMI 1.4 standard from 2009, and while it can output at resolutions up to 4094x2160 pixels, it is limited in refresh rate to just 24Hz. At the UHD resolution of 3840x2160, it should manage 30Hz, but this is still too low for practical use as a computer monitor, where refreshes slower than 50- or 60Hz typically show conspicuous trails to mouse cursors, for instance.

Storage drive performance has improved thanks to the upgrade to PCIe-attached flash drives. Like previous generation best off-the-shelf model, storage is based on a 1TB laptop-class hard disk, plus an additional solid-state drive of 128 GB capacity, these united to form a hybrid Fusion Drive. The difference now is the use of PCIe-attached flash, which means this section is now around twice as fast as it was with a Serial ATA-attached SSD.

Our sample of Mac mini was fitted with a 128GB Samsung PCIe flash drive, and in our tests the larger samples of the same drive can comfortably read and write at around 780MB/s

In other areas the spec remains the same - gigabit ethernet is still the current standard for wired networking, even if 10GbE is seriously overdue as a network connection outside of industry. The memory card slot supports SDXC cards, the current state of the art, while the audio sub-system seems to be the same as before too, with 3.5mm input and output jacks, and digital convertors that support up to 24-bit 96kHz digital audio.

## Memory

Finally, we must remind a prospective buyer of the change in memory upgrade policy. Where before Apple made RAM changes simplicity itself with a bottom twist-off hatch, it now locks you into one configuration for the lifetime of the product. The core RAM specification is very similar, clocked at 1600MHz, but is a new low-power (LP suffix) type, intractably soldered to the logic board.

As standard this model is fitted with 8GB memory, but if you anticipate pushing it into hard service, or just want to help safeguard its longevity, you may be advised to configure this at time of purchase to 16GB, for an additional £160. But this brings the Mac mini dangerously close to a four-figure £1,000 price, and it becomes harder to justify that when we know that this Mac mini has less than half the full-bore speed available from the older quad-core model.

You can now get a 2TB Fusion Drive for an extra £80 when you buy the £799 model, bringing the price to £879. Only the top of the range model has this option.

The 2012 Mac mini server version offered a 2TB hard drive, which made it a popular choice among those looking for a media server, so Apple's decision to offer this 2TB fusion drive is a reaction to this.

## Verdict

The adage about steps forward and backward comes to mind for the new Mac mini, and your needs will suggest how many this one's taken in each direction. ☒ **Andrew Harrison**

£300 inc VAT

Contact

■ [google.co.uk](http://google.co.uk)

Read more

■ [tinyurl.com/nq6k77y](http://tinyurl.com/nq6k77y)

Specifications

Android 5.0 Lollipop; 8.9in IPS LCD (2048x1536); nVidia Tegra K1 2.3GHz (64-bit); 2GB RAM; 16/32GB storage; 11ac dual-band Wi-Fi (2x2 MIMO); Bluetooth 4.1; NFC; GPS; optional 4G LTE; HTC BoomSound stereo speakers; 8Mp rear camera with LED flash; 1.6Mp front camera; 6700mAh battery; 154x8x228mm; 425g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



TABLET

# Google Nexus 9

A new Google tablet has been a long time coming and the Nexus 9 is finally here, and it's built by HTC.

At 8.9in, it's almost exactly half way between the 7.9in iPad mini and 9.7in iPad Air. More than that, it has a 4:3 aspect ratio, which deviates from the 16:9 form factor of previous Nexus tablets. The resolution might sound familiar too: 2048x1536 pixels equates to a decent 287ppi.

So the image is sharp, and the IPS panel means viewing angles are as good as an iPad's. Colours are ever so slightly muted, but contrast was good in our tests.

The Nexus 9 therefore sits between the two iPads in terms of size. It's marginally thicker than we'd expected at 8mm, but the tapered edges make it feel thinner. In terms of weight, it's light enough to hold comfortably in one hand, but probably not if you add a case. At 425g it's lighter than an iPad Air at 478g, but only just lighter than an Air 2.

The back has a soft feel, with the nexus logo inlaid just like on the Nexus 5. The back is where you've a choice of colours: black, white or sand. On the black model, the band around the edge is also black, while the white and sand models have a silver band.

The power button and volume rocker are on the right-hand side (in portrait mode), with a headphone port on top and Micro-USB on the bottom. A nice touch is front-facing stereo speakers - just as you'd expect from HTC, and they're surprisingly loud and clear. Obviously there's a lack of bass, but for catch-up TV and YouTube, they're excellent.

There's a new origami-style cover that has no hinge and is held in place by magnets. You fold two corners in, and then fold the cover back on itself to form a stand that is held to the back of the tablet by more magnets. We found the two positions gave reasonable angles for watching videos and table-top use, but there's no low angle for typing. For that, you're better off with the new magic keyboard, which is a folio-style case with a mechanical keyboard. We tried this out and the keys have very little travel, but they were just about big enough to

type on comfortably. Whether it's much better than the on-screen keyboard, Swype or voice input is debatable.

## Performance

A premium tablet needs a top-end processor and HTC has chosen the nVidia Tegra K1, a 64-bit chip shown to be running at 2.5GHz in Geekbench and backed by 2GB of RAM.

Internal storage is limited to 16- or 32GB. It's a real shame there's no 64GB option.

You do get 802.11ac Wi-Fi with 2x2 MIMO, Bluetooth 4.1 and NFC. There's also the option of a 4G LTE model for £459.

In Geekbench 3, the Nexus 9 scored 1904 for single-core, and 3352 for multi-core. That's similar to the iPad Air, but way short of the Air 2's score, especially in multi-core (it scored a massive 4523).

GFXbench is more interesting, and the Nexus 9 managed a respectable 22fps in the tough Manhattan test, and 48fps in T-Rex. Those are almost as good as the iPad Air 2, which managed 25fps and 52fps respectively.

In SunSpider 1.0.2, the Nexus 9 completed the tests in 955ms. While this is far slower than any of the latest iPads, it doesn't mean the Google tablet is slow at web browsing. Far from it. We loaded a few different websites and they were displayed just as fast as an iPad Air.

Battery life is better than we expected, playing a video on loop (at half brightness) for just over 11 hours. Using the included 1.5A charger, it takes roughly four hours to recharge from empty.

Obvious to the eagle-eyed, but much less obvious to anyone who isn't an Android enthusiast is the fact that the Nexus 9 ships with Google's latest mobile operating system, codenamed Lollipop. This is version 5.0 of Android, and it's as sweet as the name implies.

Lollipop is Google's tastiest release yet and is another reason why the Nexus 9 has the red mist for



the iPad. The new operating system feels responsive, intuitive and looks great. The flatter 'Material' design looks fresh and clean, and apps will likely follow suit.

Notifications have been made to look and work much more like they do on an iPad, appearing from the top-centre of the screen rather than having separate left- and right drop-downs as with KitKat. The multitasking view is now displayed as cards, which can be flicked away in either direction.

Yet again matching the iPad - on paper at least - the Nexus 9 has an 8Mp rear camera. It even gets an LED flash, and it records video at 1080p. The photos we've taken so far show the rear camera isn't as good as the iPad Air 2's. There's a fair amount of noise in low light, but colours are accurate.

Around the front is a 1.6Mp camera with an f/2.4 aperture just like the rear camera. This means it has a few more pixels than an iPad Air 2, but neither tablet is much good for top-quality selfies.

## Verdict

Overall, the Nexus 9 is a decent tablet but it's more expensive than we had expected. While the second-generation Nexus 7 remains an excellent 7in tablet, the Nexus 9 isn't the showstopper it could have been. Android fans will be impressed, but it's hard to recommend it over the first-gen iPad Air, which costs the same ☒ **Jim Martin**

**£319** inc VAT**Contact**■ [microsoft.com/uk](http://microsoft.com/uk)■ [Read more](#)■ [tinyurl.com/munwr2u](http://tinyurl.com/munwr2u)**Specifications**

1.2GHz Qualcomm Snapdragon 400 CPU; 1GB RAM; 16GB storage; microSD card slot; 5in IPS LCD capacitive touchscreen (294ppi); GPRS, EDGE, HSPA, LTE, dual-band Wi-Fi 802.11 a/b/g/n, Bluetooth 4.0, NFC, Micro-USB v2.0, FM radio, A-GPS, GLONASS, Accelerometer, gyro, proximity, compass; 139.4x70.7x8.5mm; 150g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**SMARTPHONE****Microsoft Lumia 830**

Available in orange, green, white, or black, the Lumia 830 is every inch the Nokia Windows Phone. Its colourful backside is a thin plastic detachable cover, which gives you access to the battery, SIM and microSD card slot. Unfortunately, because it is so thin, it feels cheap and plasticky when you are attempting to remove- and reattach it, and sometimes it doesn't click in perfectly. It's a dismal touch in an otherwise well-built device. The loudspeaker grill sits at the bottom of this panel.

Around the sides is a thick, metallic silver rim. On the right-hand side is volume rocker, on/off switch and a hardware camera button. At the top is a 3.5mm jack and the USB charging port. The silver look is okay, but we found it picked up a few marks after just a few days.

At 139.4x70.7x8.5mm, the Lumia 830 couldn't be described as small. It is chunky and thick, but not entirely in a bad way. It's relatively easy to use with one hand, and not uncomfortable to hold for lengthy periods. We weighed the Lumia 830 at 150g. There is no hardware home-, back- or search button, but permanent touchpoints beneath the display work well. The bezels around the display are pretty small, but the black glass front itself is surrounded by a thin silver strip, meaning that you get a lot of phone for a relatively small big-phone screen.

**Display**

The 5in IPS LCD capacitive touchscreen boasts 16m colours, and is made of Corning Gorilla Glass 3 for super toughness. With a resolution of 720x1280 pixels, the Lumia 830 has a 294ppi pixel density. While a QuadHD display would be nice, the Lumia 830's screen makes photos look good. It works well with the bright colours of Windows Phone 8.1, too.

Microsoft's smartphone has a Qualcomm Snapdragon 400 CPU. This now familiar quad-core chip is an ARM Cortex-A7, and runs at 1.2GHz. Onboard Adreno 305 graphics take care of the visuals. You get 1GB RAM. These specifications are fine, although they only match those of the much cheaper Lumia 630. In general,



we found performance to be okay without sparkling. At least that was the case for low-load actions. This is a mid-range handset at a mid-range price, after all.

In general things are responsive with no noticeable lag - as we have come to expect from Windows Phones. This wasn't born out by the SunSpider JavaScript browser test, however, which completed in an exceptionally poor average time of 2540ms. To put that into context, we got 1486ms from the Lumia 630. Don't expect zippy web browsing or general navigation under load.

Less disappointing are the connectivity options. The 830 is a GPRS, EDGE handset offering HSPA, and LTE. You get dual-band Wi-Fi 802.11 a/b/g/n, Bluetooth 4.0, and NFC. It charges and syncs via Micro-USB v2.0. It also has an FM radio, as well as an array of sensors including A-GPS, GLONASS, Accelerometer, gyro, proximity, and compass. And there is a microSD card.

The Lumia 830 comes with just one storage option: 16GB. On our test unit that left us with 10.8GB to play with out of 14GB available in total, which isn't enough for any serious smartphone user. Fortunately, there's a microSD slot, via which you can add up to 128GB.

**Cameras**

Windows Phones from the former Nokia label are expected to come with good cameras. In the case of the Lumia 830, it's PureView branded, which means it should be good. You get Carl Zeiss optics, optical image stabilisation, autofocus and LED flash, so things look good feature wise. Yet the main camera is a 10Mp 1/3.4in sensor that

captures up to 3520x2640 pixels, making it pretty low-rent for the PureView branding. Perhaps the image stabilisation and LED flash got it the branding. Around the front is a 0.9Mp selfie camera, that can grab 720p video.

In use we found the main camera did a good job on a well-lit scenes, with reasonable detail and colour balance. It struggles a little in low light, picking up a bit of noise. It's by no means a great camera, but it's acceptable. Certainly not bad for a mid-range smartphone.

The Lumia comes with a removable lithium-ion 2200mAh battery (BV-L4A), offering just over 7Wh. Over the course of a few days we found we could squeeze out up to 14 hours of heavy use from the device. It charges pretty quickly, too. And this handset offers Qi wireless charging straight out of the box.

The phone comes with Windows Phone 8.1 - the latest version of Microsoft's mobile operating system. If you haven't used Windows Phone before, don't be afraid - it is a simple-to-use and feature rich OS that's as secure and locked down as iOS. There are relatively few apps in the app store, but these days you can find most of the things you need for Windows Phone.

You get Cortana, too. Cortana is Microsoft's answer to Siri and the firm says it's the first 'true personal assistant on a phone'.

**Verdict**

There's nothing shockingly wrong with the Lumia 830, but better value can be found by dropping down to the Lumia 630, but if you want a 5in Windows phone this is a decent option. **✉ Matt Egan**

**£249** inc VAT**Contact**■ [kazam.mobi](http://kazam.mobi)

Read more

■ [tinyurl.com/mszf43c](http://tinyurl.com/mszf43c)**Specifications**

Android 4.4.2 KitKat; 4.8in AMOLED display (1280x720, 306ppi); Octa-core MediaTek MT6592 CPU; ARM Mali 450-MP4 GPU; 1GB RAM; 16GB internal storage; 8Mp rear camera, AF with LED Flash; 5Mp front camera; Video recording at up to 1080p; single-band Wi-Fi; 802.11b/g/n; Bluetooth 4.0; A-GPS; Micro-USB; Micro-SIM; 2050mAh battery; 68x140x5.3mm; 98g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



## SMARTPHONE

## Kazam Tornado 348



You might not have heard of Kazam, but the firm has produced the thinnest smartphone in the world. At just 5.15mm, the Tornado 348 is taking on the big guns of the smartphone world, including Apple, Samsung, Sony and Huawei. The device is thinner than the iPhone 6, Galaxy Alpha, Xperia Z Ultra and Ascend P6, which are 6.9-, 6.7-, 6.5- and 6.18mm respectively. Not only is thinner, but by a full millimetre which is an impressive achievement.

In the words of the UK-based firm, the handset is a “marvel of mobile engineering”, which employs an aluminium-magnesium alloy unibody and a Gorilla Glass screen. It has obvious similarities with the iPhone, but this is an attention-grabbing design in a good way.

Our white review sample is rather stylish, with a gold trim (it comes in black, too). Not only is it stunningly thin, it's as light as a feather at just 96g, too. We rarely see smartphones weigh in at under 100g and if you're looking for the thinnest and lightest smartphone around, then your search has come to an end.

Although low numbers in this area sound great they do have a down side – the phone is so thin it's not as ergonomic as others and is so light you don't realise it's in your pocket. The other thing to bear in mind is that because there is glass front and back, the Tornado 348 is a slippery customer.

Despite its slender profile, the phone feels pretty rigid and to avoid any fears, Kazam offers a free screen replacement service if you accidentally crack the display. It also has a two-year warranty, while a screen protector and silicone case are included in the box.

While it's thinness is the headline feature here what about the rest of the device? For starters, the 4.8in screen is small considering today's market – the vast majority

of Android smartphones are 5in or larger. This is no bad thing, though, and 4.5in is fine for most tasks and is easier to use one-handed compared to bigger phones. Kazam doesn't use on-screen buttons either, so there's more space for content on the display.

It's a shame to see a 720p resolution, though. We're not saying it looks bad, the AMOLED screen has good viewing angles, colours and brightness, but there are better options at the same price point.

Inside the svelte frame is a 1.7GHz octa-core MediaTek MT6592 processor and 1GB of RAM. It's not a massive amount and the device is by no means frustrating, but there is occasional lag.

There's just one model of the Tornado 348 and it comes with 16GB of internal storage. The firm has decided not to offer expandable storage which is a shame.

Another area in which the Kazam falls down is wireless – the phone is limited to single-band 802.11b/g/n Wi-Fi, Bluetooth 4.0 and GPS. There's no 4G LTE support, no NFC and no other extras such as wireless charging or an IR blaster.

Another letdown is the battery – at 2050mAh battery, it's about a third smaller in capacity than a typical smartphone offering. During our tests, we managed two days of use from the Tornado 348, but only with light usage so on average the device will last a single day.

Things pick up when it comes to photography as the Kazam has a pair of decent cameras. At the rear is an 8Mp sensor with autofocus and an LED flash. It offers HDR, panorama and various capture methods,

including smile shot.

Video can be shot in up to 1080p at 30fps. These days high resolution front-facing cameras on smartphones are the norm, and the Tornado has 5Mp with which to capture your mug shot for the world to see online. It doesn't offer HDR, but the quality is very good.

On the software front, the phone uses Android 4.4.2 KitKat. In general, the interface is largely stock meaning the firm hasn't messed around with the operating system. This is a good thing and we like the comprehensive settings section of the drop-down notification bar. We do have a few quibbles, though.

As we mentioned earlier, Kazam has opted for off-screen buttons instead of the now standard on-screen ones, and while they light up, they're not very bright at all. This is not unusual – Samsung, for example, has gone down this route. While this leaves more room on-screen, it makes the buttons slightly harder to reach. This means you have to long-press the menu button for recent apps and long-press the home button to access Google Now as you can't swipe up from the bottom. It's not the end of the world and is fine for an experienced user who can figure it out but not for a beginner.

Despite having KitKat, many things on the items have older icons. Although Photos and Hangouts are installed, the dated Gallery and Messaging apps are the default.

**Verdict**

If you're looking for the thinnest and lightest smartphone possible, then the Tornado 348 is for you. However, its design has a negative effect elsewhere and the phone falls down compared to rivals in terms of performance. **Chris Martin**

**£134** inc VAT**Contact**■ [umidigi.com](http://umidigi.com)

Read more

■ [tinyurl.com/Luwrrrt](http://tinyurl.com/Luwrrrt)**Specifications**

Android 4.4.2 KitKat (rooted); 5in full-HD (1920x1080, 441ppi)  
 Samsung Super AMOLED display with Corning Gorilla Glass 3; 2GHz MediaTek MTK6592 Turbo octa-core (8x Cortex A7) processor; 2GB RAM; 700MHz ARM Mali-450MP4 graphics; 16GB storage; dual-SIM or SIM plus microSD slot (up to 64GB); 802.11b/g/n Wi-Fi; Bluetooth 4.0; GPS; 13Mp rear camera; 8Mp front-facing camera; 3.5mm headphone jack; supplied with Zero case; 2780mAh lithium-polymer battery with quick-charge technology; 70.5x6.4x146mm; 145g

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆

**SMARTPHONE****UMI Zero**

UMI's Zero isn't officially available in the UK, but our sample was sent to us by Geekbuying.com, which is happy to ship to the UK. The only caveats to buying the UMI Zero from abroad is slightly longer delivery and that the supplied super-fast charger has a two-pin plug.

The usual selling price is \$463, which works out around £295, but right now the UMI Zero is on sale at \$203 - a staggeringly low £134. Note that you may incur extra charges from Customs, although we had no such problems. Geekbuying.com says it has plenty of stock available.

The UMI Zero is the world's thinnest dual-SIM smartphone, and at just 6.4mm it's slimmer than even the 6.9mm iPhone 6. Its front- and rear glass panels, minimal screen bezels and tall 146mm body remind us of Sony's Xperia line-up, giving it a premium look that also feels good in the hand.

This phone is extremely durable, with its glassware protected with Corning Gorilla Glass 3, and the single-piece chassis crafted from aircraft-grade aluminium-magnesium alloy. Nevertheless, the UMI Zero is supplied with a Z-shaped case that clips on to the rear. It's flimsy but light, and slightly raised at the front to protect the screen when placed face down on a flat surface.

As with the majority of Android phones there are three touchscreen buttons below the screen, here for Options, Home and Back (long-pressing the Home button brings up the recent apps menu). Unusually, the power button is found on the left side below the volume rocker, but it's ergonomically positioned for right-handed users. Meanwhile, on the right you'll find a SIM tray that will accept either two SIMs or one SIM and a microSD card. The 3.5mm headphone jack and Micro-USB charging port are also reversed, with the former at the bottom and latter at the top.

On the rear is a small speaker, while the 13Mp camera and dual-LED flash sit not in the middle but at the top-left corner - possibly a result of the Zero's ultra-slim design.

For the display, UMI uses one of Samsung's Super AMOLED panels. Super AMOLED is just like standard AMOLED, but thinner and more

energy efficient. AMOLED doesn't require a backlight and produces very good contrast, but can display oversaturated colours.

The display is 5in with a full-HD resolution of 1920x1080 pixels, equating to a high pixel density of 441ppi. Text is sharp, images are clear and video looks great.

UMI's Zero is an octa-core smartphone, running the 2GHz MediaTek MTK6592 Turbo processor with ARM Mali-450MP4 graphics and 2GB of RAM. In comparison to Samsung's Exynos 5410, which combines four ARM Cortex A-15s and four A7s and can only ever run four of its eight cores at once, this MediaTek chip has eight Cortex A8s that can run simultaneously.

Its significantly stronger multi-core over single-core performance in Geekbench 3 came as no surprise, with the UMI turning in 2489- and 445 points respectively.

At this price point, the storage and connectivity specs are reasonable. You won't get the latest 802.11ac Wi-Fi (maxing out at the more standard 802.11n), NFC or 4G connectivity, but there is Bluetooth 4.0 and GPS. If you're buying a phone from abroad, it's important to note the frequency bands on which it operates, and the UMI Zero runs on 2G and 3G bands GSM 850/900/1800/1900MHz and WCDMA 900/2100MHz.

Storage-wise there's 16GB built in, and if you're not interested in the phone's dual-SIM functionality you can insert a microSD card up to 64GB in capacity. Don't forget, you can also take advantage of Google's own and third-party cloud-storage services.

The UMI Zero is fitted with a 13Mp Sony IMX214 f/1.8 rear camera with a dual-LED flash and fast 0.3-second autofocus, plus an 8Mp front camera that's great for selfies and video chat. It supports several useful modes, including Multi angle view, Panorama and HDR. Missing is the ability to add filters and effects, but these can be applied using third-party apps in any case. Photos are a decent quality, certainly not to be argued with at this price.

Here's the one drawback for some users: the Umi Zero is sold



rooted, and is preinstalled with SuperSu from Chainfire (an app that allows for advanced access management of any apps that require root). This may well appeal to tinkerers, but for other users it prevents OTA updates. The UMI Zero runs Android 4.4.2 KitKat, however, which is a recent version of the OS.

It's a stock implementation of Android, and includes full access to Google Play. Unusually, apps such as YouTube and Play Music are not preinstalled - you'll need to download them from Google Play.

The UMI Zero is fitted with a high-capacity 2780mAh lithium-polymer battery, and supplied with a special charger (note the two-pin plug) that can charge the battery up to 51 percent in 14 minutes, or give you enough juice to talk for two-and-a-half hours in five minutes.

In common with other flagship phones, it has an Ultra power saving mode that switches off screen colours, background mobile data usage, Wi-Fi and Bluetooth. You can also schedule times for the phone to switch on and off each day, which will be useful if you want to use it as an alarm clock, but not receive irritating middle-of-the-night calls or waste battery life. With normal use UMI says you can expect 21 hours life.

**Verdict**

We're impressed with the UMI Zero. Ultra-thin, light, good-looking and tough, it packs some impressive hardware for the price. If you're happy to buy a rooted Chinese smartphone, then it's a great deal. ☒ **Marie Brewis**

£130 inc VAT

Contact

■ [sony.co.uk](http://sony.co.uk)

Read more

■ [tinyurl.com/Lhd7ppq](http://tinyurl.com/Lhd7ppq)

Specifications

The SmartBand Talk SWR30 and Lifelog Android app are optimised for devices running Android 4.4 and later; 1.4in black and white E ink display (296x128, 192dpi); waterproof to 1.5m (IP68 rated); Micro-USB; Bluetooth 3.0; 70mAh lithium-polymer battery; accelerometer; altimeter; 23.5x9.5mm; 24g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



WEARABLE TECH

## Sony SmartBand Talk

The SmartBand Talk is one of Sony's new entries into the wearable tech market. It's more of a fitness band hybrid than a fully fledged smartwatch, but it also allows you to make and take phone calls (hence the 'Talk' in its name). The £130 asking price is expensive for an activity tracker, but with the added smartwatch capabilities including hands-free calls and notifications, it's not bad value overall.

The device is available in black or white, and in M/L or S/M sizes. You can buy additional wrist straps separately if you'd prefer a more colourful option - Sony is currently offering an extra blue- or red wrist strap for free. More designs will be available in the coming months thanks to Sony's partnership with Proporta, which works with fashion houses such as Ted Baker and Roxy.

The SmartBand Talk is sleek and sophisticated compared to many other wearables out there. It's simple, feels comfortable (it only weighs 26g) and is high quality.

It's durable, too. The device has a full IP68 rating, which means it's fully dust- and waterproof (up to 1.5m continuously), so you can wear it without worrying about rain, and you can even use it in the shower.

The weak point is the strap, which didn't feel secure in testing. It fastens easily using two prongs that squeeze into holes along the wristband, but in use we found that the prongs occasionally popped out. On one occasion, the SmartBand Talk came completely loose and could easily have been lost.

The device has a 1.4in, black and white e-ink screen, which means low-power. This means it can stay on all constantly, so you can instantly check the time and how close you are to your daily steps goal.

The text is crisp and clear thanks to its 255ppi resolution, but there's no backlight so visibility in the dark is difficult if not impossible. E-ink does, however, mean that it's easy to see under bright lights.

The display isn't a touchscreen, though. You can tap it (forcefully) to show a notification, but aside from that you'll need to use the buttons on the side to switch between screens/apps and to turn the volume up or down.

As it's primarily a fitness device, the SmartBand Talk comes with a variety of integrated sensors that provide detailed exercise information. In addition to the usual accelerometer, it has an altimeter, which is something that lots of cheaper fitness trackers miss out on. It means that the SmartBand Talk can take into account variables such as hills and stairs, which makes the calorie data significantly more accurate.

In addition to the fitness features, you can make and accept calls thanks to its built-in speaker and microphone, which also supports HD Voice.

During testing, however, we found this feature to be hit and miss. Sometimes, we could tap to answer but the sound would come from the smartphone, which is less than ideal when said smartphone is hidden in a bag or tucked away in a pocket.

But when it did work, we found it to be surprisingly useful. It's not something we imagined we'd ever use, but while carrying out tasks such as housework, it was handy to be able to answer a call without having to stop what you're doing. Calls are clear and loud, so it's also possible to take calls while driving.

Even better is the ability to quickly see notifications on the SmartBand Talk. You can view whole text messages, Facebook notifications, which vibrates to alert you thanks to its haptic feedback capabilities.

You can't respond to those notifications from your SmartBand Talk, but we still found it useful to be able to check whether the notification was important before deciding whether or not to respond immediately or wait until later.

Inside the SmartBand Talk is an ARM Cortex-M4 32-bit processor and 2MB of internal flash memory. In terms of connectivity, there's NFC or Bluetooth 4.0 (Low energy).

It's worth noting that the SmartBand Talk works only



with Android devices, so iPhone owners and Windows Phone owners are out of luck. It isn't an Android Wear device like its Sony SmartWatch 3 sibling. Instead, it runs Android KitKat 4.4.

A SmartBand Talk app that lets you control the device's settings, but if you want to make the most of the fitness tracking capabilities you'll want to download Sony's Lifelog app. While this logs everything you do, much of what it records is completely unnecessary. So in addition to logging information such as number of steps taken, how long you slept for or time spent running, it also tracks how long you spent listening to music or playing games on your smartphone.

The SmartBand Talk has a lithium-polymer battery that has a charge time of less than an hour and charges via Micro-USB.

In our tests, the SmartBand Talk lasted up to five days between charges, which is impressive. The downside is that, during that hour of charging, the SmartBand Talk won't be tracking your activity.

### Verdict

The SmartBand Talk is a good fitness tracker that collects lots of useful data. The altimeter and automatic sleep tracking put it in the same league as some of its top competitors, and when you add the smartwatch capabilities into the mix you've got an excellent little gadget here. Ashleigh Allsopp

**£280** inc VAT**Contact**■ [samsung.com/uk](http://samsung.com/uk)■ [Read more](#)■ [tinyurl.com/pqecdw](http://tinyurl.com/pqecdw)**Specifications**

Android Wear; 1.63in Super AMOLED (320x320) display; IP67-certified dust and water resistant; accelerometer, gyroscope, heart rate sensor; 512MB of RAM and 4GB of non-user-replaceable internal storage; Qualcomm Snapdragon 400 running at 1.2GHz; Bluetooth 4.0 LE; requires Android 4.3 or later smartphone; 300mAh battery; 59g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**SMARTWATCH****Samsung Gear Live**

The Gear Live is Samsung's latest smartwatch, and is compatible with smartphones running Android 4.3 or later. Note: only phones, and not tablets. Pairing is a simple affair - you install Android Wear on your smartphone and it guides you through the rest of the process.

The most important aspect of any wearable is just how wearable it is. In our view, the Samsung Gear Live is perfectly comfortable enough. We wore it for several days without feeling discomfort. It's a chunky device, but very clean and simple to look at. A wide and curvaceous silver bezel wrapped around a square display that is black when not in use. It is solid, and feels robust. But we measured the Gear Live at 59g, and even for a smartwatch that is light.

What would be a watch's bezel is replaced by a discreet power/home button on the right-hand side of the display as you look at it. This is neatly tucked away flush with the body of the watch. Easy to find, but not visually- or physically irritating. (And not really required, given that you can wake the watch with a flick of the display.) Next to the power button is the microphone via which you can say 'Okay Google', and be just like the people in the ads. How you feel about this may dictate whether you will like the Gear Live.

Around the back of the watch face neither the charger nor the heartrate monitor will cause you any physical discomfort. We like the way you can easily swap out the thick black plastic watch straps. Those who wish to replace the relatively dull Samsung watch straps will be disappointed... and then pleased.

On the one hand, Samsung has very little to offer beyond the black plastic/silver clasp combo with which the Gear Live ships. On the other wrist: you can - in principle - use any 22mm watch strap.

The square watch face has a 1.63in Super AMOLED (320x320) display. That gives a pixel density of 278ppi, which is extremely good. It looks it, too. Bright, vivid, detailed. Our only issue with the display is what it does to the battery life - of which more later.

On the inside, the Samsung Gear Live comes with 512MB of RAM

and 4GB of non-user-replaceable internal storage. It has a Qualcomm Snapdragon 400 processor running at 1.2GHz. We were pleasantly surprised with how zippy was Android Wear running on this little beast. The Gear Live lacks nothing in terms of performance, if our user tests are anything to go by.

In terms of other specs there is no camera - fine by us - and the aforementioned heartrate monitor tucked around the back. Other sensors include gyro, compass and accelerometer. The Gear Live pairs via Bluetooth 4.0.

One thing we noted: when compared with a Jawbone UP24 ([tinyurl.com/qa5keed](http://tinyurl.com/qa5keed)), we found that the Gear Live measured far fewer steps for the same activity. On occasion as few as half as many. We've tested a lot of activity trackers, and found the UP24 the most accurate when compared to GPS. To an extent it really doesn't matter - activity tracking is about competing with your own scores, so as long as it is consistent all is fine.

Like any smartwatch the principle benefit of the Gear Live is the way it extends your smartphone. It shows alerts from apps installed on your Android smartphone, alerting you to incoming messages, news events, and diary items.

It's also a full-featured activity tracker. Water- and dustproof, the Gear Live tracks your activity and monitors your health, prompting you to do more. And it's a portable Google device: you are encouraged to 'Okay Google' as you go, and once you get over the awkwardness, it is kind of fun to be able to ask the big G semantic questions. You can, of course, 'Okay Google' to do things such as sending messages or taking notes, but we never found this more easy than liberating the old smartphone from a jacket pocket and typing on a touchscreen. This is a criticism of the smartwatch concept rather than the Gear Live.

There are Android Wear apps to install, although again the value



is really in extending apps on your smartphone. Google Maps is fun and useful on your wrist. The Android Wear software itself is colourful. Similar to Google Now and the Google Glass UI, it is Android made simple. As such it's reasonably intuitive although we found it occasionally irritating to have to think before we swiped upwards or sideways. Through gritted teeth we have to admit that the voice activation is actually really good.

We tested the Gear Live for a week or so, and in that time it gleaned an impressive amount of information about ourselves.

There is, however, one big black mark against the Gear Live - the 300mAh battery is simply too small and needed charging every day. We eked out a little more battery life by dimming the display, but then we found it difficult to read text off of the Gear Live under even strip lighting. Which negates the whole point of a smartwatch.

And charging is a faff. Not for the Gear Live the acceptable compromise of popping your smartwatch on to a bedside wireless charging cradle. It comes with an ugly and clunky, thin plastic claw that wraps around the Gear Live and charges via a spindly USB charger.

**Verdict**

The Gear Live is a decent smartwatch at a reasonable price. But, ultimately, we wouldn't buy one because we wouldn't want any smartwatch at this stage of their development. ☒ **Matt Egan**

**£150** inc VAT**Contact**■ [sony.co.uk](http://sony.co.uk)■ **Read more**■ [tinyurl.com/pj76w58](http://tinyurl.com/pj76w58)**Specifications**

Android Wear OS; 1.6in Transflective LCD touchscreen (320x320) display; 4GB internal storage (approx 2.6GB available); 512MB RAM; Quad-core ARM V7 1.2GHz processor; Bluetooth 4.0 LE; microphone; gyro, accelerometer, compass, ambient light sensor; GPS receiver; NFC; 420mAh battery; Micro-USB charging; IP68 dust and water resistant; core unit 45g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**SMARTWATCH****Sony SmartWatch 3**

It may not be as stylish as some circular smartwatches, but the SmartWatch 3 has a certain charm about it. There's no big Sony logo or anything to draw your eye away from the 1.6in square colour screen. The only button is to the right, but you'll rarely need it as the display lights up when you raise your arm or tap on the screen.

There's a choice of black or yellow straps (more will be available soon), and it's simple to pop out the display unit and swap straps. It's possible there will be third-party straps in future, but currently you're limited to the official pair which cost £20 each. Obviously, you get one in the box.

They're made from sturdy rubber and have an equally sturdy buckle mechanism like you'd find on a metal-strapped gents watch. It's easy to adjust the strap for size without cutting. On the down side, we found the rubber uncomfortable to wear when hot - sweat is trapped under it, so it's best to take it off regularly, and certainly at night.

Instead of wireless charging, Sony has opted for a standard Micro-USB port. That's great news in some ways as you can charge it practically anywhere; there's a good chance that any given office or home will have a Micro-USB cable and charger.

The USB port is covered by a captive rubber bung - the watch has an IP68 rating, so it's dust- and water resistant. We wouldn't advise swimming with it, but you'll be okay in the shower or going for a run in the rain.

We found the 420mAh battery lasted exactly two days, which is slightly disappointing given then unusual screen technology. Instead of AMOLED or IPS, Sony has opted for transflective, which means the display is still readable - given sufficient ambient light - without the backlight. It's the same technology used in many outdoor GPS devices.

You can choose whether or not to keep the screen on all the time. If you turn it off, you'll have to wake it up just to check the time, but if you leave it on permanently, you can merely glance at your wrist without having to tap or lift your arm.

Sony has also included an ambient light sensor, so the



brightness can be adjusted automatically, though, it doesn't appear to yield any extra battery life.

The 320x320 display has a few more pixels than the circular watches we've seen, but there's no real difference in the amount of information shown. The disadvantage of using a transflective display is that while colours look fine square-on, viewing angles are terrible by today's standards.

Storage remains the same as the Sony SmartWatch 2 ([tinyurl.com/Lcjhouh](http://tinyurl.com/Lcjhouh)) and rival Android Wear devices at 4GB eMMC flash memory. This can be used to store music, which can be played without a companion smartphone or tablet via Bluetooth (more on this below).

The SmartWatch 3 does have one ace up its sleeve, though: built-in GPS. With an onboard receiver, there's no need to take your smartphone with you on a run, hike or bike ride. The GPS records your route and feeds the data back to the Sony Lifelog app.

There's also NFC, a gyro, compass, accelerometer and Bluetooth. The latter isn't merely useful for connection to a smartphone for Android notifications: you can also pair the SmartWatch 3 with some headphones and listen to music stored on the watch (there's 2.6GB of usable storage) when you're exercising.

What it doesn't have is a heart rate monitor. If this is important, you should consider one of the new Fitbit trackers: the Charge HR or Surge. Also, it doesn't have altimeter to detect floors climbed, nor does it track your sleep.

You can install apps on Android Wear, though, that add functions and features, which could be even more useful. Right now the selection is rather thin on the ground, but it's sure to improve over time.

A recent update to Android Wear 5.0 has fixed some of the issues with this fledgling operating system, but it's still a work in progress. First-time users are likely to be surprised and frustrated by how much still needs to be done on the paired smartphone: you can preview messages but not reply, and ask for directions but be forced to use the phone to see a map, for example.

You can use 'Ok Google' for many things, such as web searches, sending texts and emails, setting timers and alarms and more. It's all a bit fiddly to set up and learn the specific commands, but once done it does work quite well.

**Verdict**

The SmartWatch 3's biggest strength is its built-in GPS. The transflective screen is a good idea, but in practice battery life is no better than other smartwatches with better screens. ☒ **Jim Martin**

**£99** inc VAT**Contact**■ [fitbit.com/uk](http://fitbit.com/uk)**Read more**■ [tinyurl.com/pfmq9kh](http://tinyurl.com/pfmq9kh)**Specifications**

Windows Vista and later;  
OS X 10.6 and later; OLED  
display; lithium-polymer  
battery; Bluetooth 4.0;  
water resistant to 1 ATM;  
tracks 7 days of detailed  
data; tracks daily total for  
past 30 days

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆

**ACTIVITY TRACKER****Fitbit Charge**

The Fitbit Charge is an activity tracker that displays a bunch of fitness stats right there on your wrist. Unlike some of its rivals, such as the Jawbone Up24 ([tinyurl.com/qa5keed](http://tinyurl.com/qa5keed)), Charge users don't have to look to their smartphone app to see how they are doing in reaching their fitness goals and targets.

The Fitbit Charge has an MEMS 3-axis accelerometer that measures motion patterns to determine your steps taken, distance travelled, active minutes, and calories burned. It also comes with an altimeter that measures floors climbed, to push you to climb those stairs instead of taking the lift, or to take the hilly route home rather than the flat. Every 10ft elevation you walk is counted as one flight of stairs.

From a design point of view, the first thing you'll notice as a difference to its predecessor (the Force, [tinyurl.com/pks7ohj](http://tinyurl.com/pks7ohj)) is its textured, flexible strap, made of a durable elastomer material similar to that used in many sports watches.

The tracker is available in four wristband colours: black, slate, burgundy and blue. There are also three wristband sizes: small, large and x-large. The strap itself is 2.11cm wide.

During our tests, the Charge lasted a full nine days. You can check the remaining battery life on the app, in the first Dashboard tab. You will also get an email when the device has about a day left of battery life remaining.

It's also water resistant up to 1 Atmosphere, which theoretically means it should be safe submerged to up to 10m. However, it is not waterproof, so is okay against accidental exposure to water, but not while swimming or in the shower.

The Charge doesn't boast the same level of multi-sports functions as the high-performance Fitbit Surge ([tinyurl.com/ndLs935](http://tinyurl.com/ndLs935)), but you can use it to log workouts and - via the app - see a monthly exercise plan.

You can also use it with Mobile Run to track run, walk and hike stats and map routes using your iPhone's GPS. Fitbit hopes to have this feature opened out to Android and Windows Phone users shortly. It's great for recording Average Pace and Split Paces.

It also offers music controls, so you can use it to select and shuffle songs on your iPhone. You can view runs from the past four weeks. You tap specific runs for an expanded view, where you can view steps, calories, and active minutes taken during your MobileRun.

Getting a good night's sleep is an important part of any overall fitness plan, and the Fitbit device will track not just how long you sleep, but the quality of that rest, too.

The Sleep monitoring has been improved with an automatic sleep-detection function. Previously you had to multi-tap (Fitbit Flex, [tinyurl.com/Lcfewyd](http://tinyurl.com/Lcfewyd)) or hold down a button (Fitbit Force) when you wanted the sleep tracking to commence. The Charge now does this for you by recognising the difference between the user being very still and properly asleep. We found this to work perfectly, which means you'll get sleep-pattern data more regularly than before. It's not a must-have upgrade feature but it's an added benefit.

You can also use the Charge to wake you up in the morning with its vibrating alarm that won't wake anyone else in the same room.

The calorie counter uses data to work out your calorie burning during the day, and also during the night - which is why Fitbit tells you you've burned some calories while you sleep.

The tracker and dashboard show an estimated number of calories burned based on your BMR (Basal Metabolic Rate), calculated using the height, weight, age, and gender information provided when you set up your Fitbit account.

When you haven't synced your device or logged any activities, Fitbit estimates how many calories you have burned if you got out of bed, got dressed, went to your day job, came home, or did nothing much more than walk to your car.

When you sync your tracker, Fitbit replaces your estimated



calorie burn with your tracker's data. If you manually log activities, the calories burned by doing those will be taken into account as well. So the more you wear your tracker, the more accurate your calorie burn data will be.

If your phone is nearby you can set the Fitbit Charge to show incoming call notifications using Caller ID. During testing, the process of setting this up was very hit and miss, working only on the third or fourth pairing attempt. Once successfully paired with your phone, you'll get a vibrating alert and the name or number of the caller will scroll across the Charge's display.

The full Fitbit experience requires a smartphone - iPhone, Android or Windows Phone - to view your day's and historical data on the excellent app. Further detail is available on the Fitbit Dashboard, viewable on your laptop, PC or Mac. While you can see daily stats on the Charge itself, you need to check on the app or dashboard for historical data.

As with all the Fitbits, Charge owners can compete against friends and colleagues on a leaderboard, as well as challenging them one-off exercise battles, and earn badges.

**Verdict**

The Fitbit Charge is a superb activity tracker wristband that replaces the troubled Fitbit Force and adds some great new features to reward Fitbit fans' patient waiting.  **Simon Jary**

**£49** inc VAT**Contact**■ [misfit.com](http://misfit.com)■ [Read more](#)■ [tinyurl.com/kfmjn5u](http://tinyurl.com/kfmjn5u)**Specifications**

Android 4.3 or later; iOS 6.1.3 or later; LED display; Bluetooth 4.1; 3-axis accelerometer; CR2032 coin cell battery; waterproof to 30m; 28.5x8x28.5mm; 6g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**ACTIVITY TRACKER****Misfit Flash**

Following on from the success of last year's Misfit Shine ([tinyurl.com/orcnhp6](http://tinyurl.com/orcnhp6)), the Flash has been launched as a more affordable version of the activity tracking fitness gadget at only £49.

If you're already familiar with the £99 Shine, you'll notice that the first area the company has changed to reduce the price is design. Instead of the sleek, smooth metal-effect finish of the Misfit Shine, the Flash is obviously made with plastic. That said, the matt plastic finish is much less likely to scratch than the Shine's anodized metal.

We're pleased to see that the Flash is waterproof, just like the Shine, so it can be worn in water to a depth of 96 feet. In addition to allowing the Flash to track swimming activity (which we'll talk about in more depth later), it also means it can be worn in the shower.

The device has a series of 12 LEDs around its face, which can be used to display the time as well as your daily progress. Misfit has made the LEDs easier to see than they are on the Shine, and they're easier to activate too. Unlike the Shine, the Flash is a physical button that you can press instead of furiously tapping like you often had to on the Shine.

The problem is that the Flash's wrist strap is useless. You slot the Flash in from the underneath, which is supposed to make it less likely to fall out. This is true until you come to pressing the button. Every time we pressed it, the Flash popped out of the wristband or twisted so that the clock face was in the wrong position. We soon got fed up and switched to using the alternative clip accessory that's included in the box or simply popping the Flash into a pocket.

The Misfit is easy to set up. Just pop open the Flash using the supplied tool, slot in the battery and snap it back together again. You should now see the small LED lights shining on the front of the device.

You'll need to have the Misfit app downloaded on your smartphone or tablet – the Flash connects via Bluetooth 4.0. Turn on Bluetooth on your device, launch the Misfit app and then follow the on-screen instructions.



The Flash tracks your activity levels (including steps and miles travelled) as well as sleep. Walking, jogging and running are the activities it tracks best, but it can offer some very basic tracking capabilities for other activities including swimming, cycling, basketball, tennis and soccer.

For tracking steps, the Flash seems to be fairly accurate, missing just a few steps here and there. Where you put the band on your body affects the accuracy – we'd advise against wearing it on your wrist if you spend your day typing, for example, even though the instructions suggest that's the best place to put it.

Its accuracy doesn't matter, though. Most people will find that it's simply useful for encouraging you to walk more often in order to reach daily goals – it certainly worked for this reviewer.

In addition to tracking walking, you can specify when you're about to one of the other activities as mentioned above. The Flash will track that activity from the moment you press Start until you press Done.

You should ensure that you've placed the Flash in the recommended position for each activity to get the best results. While swimming, for example, you should place it on your wrist, but when you're cycling, attaching it to your shoe is recommended.

The problem is that the activity tracking it does here is very basic. It can tell you how long you swam for, for example, and whether you were chilled out and swimming slowly (mild swimming) or really going for it in the pool (intense swimming). And that's about it. You'll get points for those activities, which will go towards your daily goal, but aside from that you'll get no analysis, and

no other information about activities such as how far you swam/cycled or how many strokes you took.

One reason for this is that the Flash lacks built-in GPS, but this does have its benefits. No GPS does, however, mean that it can track cycling in spin class or running on a treadmill in the gym, something other fitness trackers with GPS can get confused about.

The automatic sleep tracking is fantastic. We've tried several other fitness trackers that require you to let it know when you're off to sleep, and on many occasions we would forget to do so and wake up only to realise that our sleep hadn't been tracked at all. The Flash lets you know how many hours you slept for and how many times you stirred. The downside is that there's no analysis here, so the information doesn't mean much.

There's no calorie counting feature in the Misfit app: it'll tell you how many calories it estimates you've burned, but you can't add calories from meals and snacks.

The app does, however, offer the ability to connect with other apps and services including MyFitnessPal, for example, and you can enter your weight each day to keep track of your weight loss progress.

The final element to the Misfit Flash is the ability to connect with other Misfit-using friends to compare activity and encourage a bit of healthy competition. It's a definite added incentive, but chances are you might not know anyone else with a Misfit so you'll have to get them on board.

**Verdict**

While there are better options out there, the Misfit Flash has a decent set of features, and a simple and intuitive app.  **Ashleigh Allsopp**

**£78** inc VAT**Contact**■ [synology.com/en-uk](http://synology.com/en-uk)**Read more**■ [tinyurl.com/mneyvnk](http://tinyurl.com/mneyvnk)**Specifications**

1-bay NAS drive; Synology DSM 5.1 operating system; 800MHz Marvell ARMADA 370 88F6707 single-core (ARM); 256MB DDR3 RAM; mounting for 1x 3.5in SATA Revision 3 HDD; 1x gigabit ethernet; 2x USB 2.0; 1x 55mm cooling fan; 36W external power supply; 71x161x224mm

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**NAS DRIVE****Synology DS115j**

The DS115j is truly a budget model in terms of the key hardware components of processor and memory, but the build quality of this white plastic-cased drive is up to the brand's usual high standard.

As crucial, the drive's firmware - which we should really be calling an operating system for today's fully featured network storage computers - is the same versatile DSM 5.1 that is rolled out across the entire Synology line.

The DS115j follows earlier models like the DS114 and DS112, taking the same elegant chassis design. This is a two-part ABS plastic case in gloss white finish, with one half shell sliding forward to enable access to the inside. The construction means hot-swapping of its solitary hard disk is not an option, nor for that matter on any single-bay NAS drive that stores its OS on the storage disks.

The NAS drive supports one 3.5in SATA hard disk inside on a galvanised steel bracket; if you wish to use a 2.5in disk or SSD, you'll need to find an adaptor as there's no mounting holes or screws included.

There is one gigabit ethernet port, and two USB ports available at back, the latter only the slower v2.0 type. It's perhaps a symptom of a downsize in specification for marketing or cost reasons that only USB 2.0 ports are fitted here - the previous DS114 featured USB 3.0.

Peering closer at the specification, we can see other places Synology has pared back the components and performance. Replacing last season's 1.2GHz Marvell Armada 370 is the same processor but now underclocked to just 800MHz. And in place of the 512MB of system memory in the DS114, the DS115j has just 256MB.

The drive includes Synology's DSM 5.1 software, with free upgrades available for the lifetime of the product. We've detailed many of the software's manifold features before, such as standard file-sharing protocols (SMB, AFP, NFS, FTP). Additionally, there are many modules available to install through Synology's Package Center from the company's application repository.

Given the popularity of always-on storage units attached to people's home and business, security is



now a major concern. Among several new features added to DSM 5.1 since 5.0 is an automatic software update function, which will download updates to patch the latest vulnerabilities without any user intervention.

**Performance**

With its slower single-core ARM processor and limited amount of memory, we shouldn't expect particularly sprightly performance. But the DS115j is not terminally slow, and will be useful for anyone that doesn't mind a wait for certain file server operations to complete.

We set up the Synology DS115j with a 3TB Seagate Barracuda NAS disk. Tested first in Windows 7, we found that both ATTO Disk Benchmark and CrystalDiskMark were reporting respectable numbers for write operations - the everyday Achilles' heel of budget NAS drives with their underpowered processors.

And even more remarkable, both benchmark programs agreed exactly on the same maximum sequential write speed, returning 68MB/s as the file upload performance. Read speeds were similar: 102MB/s for ATTO and 94MB/s from CDM.

Small-file transfers were also not conspicuously poor, 16- and 12MB/s for 4kB files, read and write respectively, from ATTO.

The CDM test pegged figures lower in its more realistic 4kB random read/write test, reporting 2.7- and 4.4kB/s respectively. Set up with parallel threads, the DS115j became rather choked, though: in the 4kB QD=32 tests, 4kB random

reads actually fell to 2MB/s and writes barely changed at 5.2MB/s. That's likely symptomatic of the single disk being run by a slower single-core processor.

Performance with Macs running OS X ranged from usable to entirely desultory, depending on connection protocol. Best performance was seen when using Apple's own AFP network protocol, despite this being deprecated by Apple in favour of Microsoft's SMB since the update to OS X 10.9 Mavericks last year.

Maximum sequential speeds recorded by QuickBench were just under 100MB/s, averaging 96MB/s reads using files from 2- to 10MB size. Writes were slower, averaging here a still respectable 56MB/s.

Random read/writes of small files averaged 24- and 22MB/s, which are also decent figures.

But set up to connect using SMB2, which seems to be the default Windows protocol in DSM 5.1, large sequential file reads dropped to 59MB/s while sequential writes fell off a cliff to just 5.9MB/s. Small file random transfers at least held up to 21- and 11MB/s, averaged for reads and writes from 4- to 1024kB.

Power consumption was incredibly low. We measured just 14 W during peak operation. We recorded an idle state of 4W.

**Verdict**

The Synology DS115j will take on basic storage tasks, and still perform faster than some more expensive competition. **Andrew Harrison**

**£39** inc VAT**Contact**■ [uk.tp-link.com](http://uk.tp-link.com)■ [Read more](#)■ [tinyurl.com/mbv3cg7](http://tinyurl.com/mbv3cg7)**Specifications**

802.11b/g/n; 10/100Mb/s  
ethernet port; mains  
passthrough socket;  
2x antenna; supports  
WPS connection;  
110x66x75mm; 3W

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



## WIRELESS EXTENDER

## TP-Link TL-WA860RE

Everyone expects a good internet connection everywhere these days, so weak Wi-Fi signals, dead spots and slow connections must be banished. If you have a large house, or want wireless coverage right to the borders of your property, a Wi-Fi extender could be what you need. It's important to note that this isn't a powerline networking plug: the TL-WA860RE simply takes Wi-Fi signal from your router and re-broadcasts it. It uses the mains only for power – not a network connection.

What surprised us was how easy it was to install. You plug it in somewhere near your router where the signal is strong. Then it's a simple process of pressing your router's WPS button and the corresponding button on the WA860RE. Less than 30 seconds later the two devices had paired and the router's signal was being repeated.

If your router doesn't have WPS, you can use the well-written instructions to manually configure the adaptor with your Wi-Fi settings. Once programmed, you can relocate the adaptor to another socket further away from your router: not at the edge of its coverage but where the signal is still strong enough. An LED on the front tells you whether it's too close, too far or just right.

Thanks to a mains pass-through socket, you can plug the adaptor in anywhere, even if the mains socket is already in use. Just as useful is the wired ethernet port on the bottom, which you can use

to provide an internet connection to a games console, Blu-ray player, TV or other networking device that lacks Wi-Fi. If you have more than one such device, you can buy an inexpensive Ethernet hub and attach that to the TL-WA860RE instead to multiply the number of ports.

Two external, rotating antennas mean the TP-Link TL-WA860RE isn't the sleekest or most compact extender. However, you'll soon forgive this when it delivers a Wi-Fi signal to areas that were previously bereft of wireless internet.

## Performance

We plugged in the adaptor to a socket on the back wall of our test house, with the router some 10m away at the front. We then ran our usual file transfer test from a shed at the bottom of the garden, roughly 20m from the TL-WA860RE (30m from the router with a wall and two sets of doors in the way).

Using our Sony laptop's built-in 802.11n Wi-Fi (a basic 1x1, 150Mb/s radio on 2.4GHz) we saw good signal strength and, as far as the laptop was concerned, it was still connected to the BT Home Hub 5: there's no need to connect to a different network, nor enter a password.

Transferring the 977MB file took 11 minutes, 24 seconds, equating to 1.43MB/s (that's 11.44Mb/s). It's considerably longer than it took to move the file in the same room as the router. With the laptop roughly 3m away, it took only three minutes, nine seconds, which equates to 5.3MB/s or 42.3 if you prefer to work in megabits per second (Mb/s).

Chances are that you won't be copying large video files over long distances all that often, so it's arguably more relevant to talk about other tasks. With the TL-WA860RE

turned off, we couldn't even get a web page to load in the shed due to the very weak signal from the Home Hub 5, but with it turned on we were able to browse at a normal speed



and even watch HD YouTube videos without constant buffering.

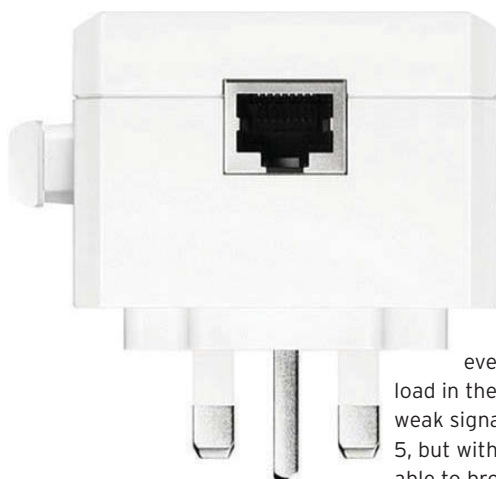
TP-Link also sent us the new RE200 Wi-Fi Extender for review. It's just as easy to set up as the WA860RE, but doesn't have a mains pass-through. The benefit of the RE200 is that it supports 802.11ac on 5GHz, which in theory means speeds of up to 450Mb/s. Adding the 300Mb/s you get with 802.11n on 2.4GHz, and you get 'AC750'.

We used the same Sony laptop in the same position to test the RE200 on 2.4GHz and found its signal was considerably weaker than the cheaper TL-WA860RE. In fact, we struggled to get a strong enough signal to perform our file-transfer test, but when we did, it took 13 minutes, 27 seconds to copy the 977MB file. That's 1.2MB/s.

We will test out the transfer speed over 802.11ac when we obtain a suitable USB dongle, but as anyone who's used 802.11ac will know, it delivers great speeds only at short distances, so we're not expecting it to go faster. Whether the poorer signal is due to the RE200's internal antennas or not we can't say, but since the TL-WA860RE is cheaper and has the handy pass-through socket, it's clearly the better buy.

## Verdict

For many people, powerline networking adaptors will provide even better range and speed, but the TL-WA860RE quickly and easily doubles your Wi-Fi coverage and is affordable, too. **Jim Martin**



**£90** inc VAT**Contact**■ [uk.tp-link.com](http://uk.tp-link.com)**Read more**■ [tinyurl.com/nk422wj](http://tinyurl.com/nk422wj)**Specifications**

500Mb/s Powerline  
adaptors TL-WPA4230P  
and TL-PA4020P;  
10/100 ethernet

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆

**POWERLINE ADAPTOR****TP-Link AV500**

The TP-Link AV500 Passthrough Powerline Wi-Fi Kit (TL-WPA4230P) features all the bells and whistles you could want from a non-gigabit Powerline setup.

While Devolo has surged ahead with its gigabit Powerline in the form of the Devolo dLan 1200+ adaptors ([tinyurl.com/pc8j8dh](http://tinyurl.com/pc8j8dh)), TP-Link is sticking with the less-speedy, but probably all you need, 500Mb/s systems. These are becoming an increasingly popular way of creating fast home networks for smart TVs, games consoles and Sky+ and Tivo boxes that all are enhanced with a wired Ethernet network connection.

Setting up a Powerline home network is easy. Simply plug one adaptor into the power socket near your internet router, and attach the adaptor and router with one of the supplied ethernet cables.

In the second room - where you need the fast connection that Wi-Fi just isn't going to deliver - plug the other adaptor into another wall socket near the devices that need to connect to a network. Then link these to the second adaptor by ethernet cables. Job done.

TP-Link's AV500 Passthrough Powerline Wi-Fi kit is a speedy Powerline system that can also add a wireless hotspot to that second room. This isn't just a boost of your existing Wi-Fi service (if you have one). It's a new hotspot, so it's like adding another wireless router in the second room. It avoids all the signal drop-off you get through distance, walls, and so on.

It also features an integrated passthrough power socket that



a less-than-real-world situation where

allows an additional device or power bar to be connected to the adaptor as though it were a normal wall socket - so in effect it doesn't use up a valuable power socket.

The TL-WPA4230P Kit is two separate adaptors that are boxed as a starter kit. The base unit, which you plug into your internet router, is the TL-PA4020P, with two ethernet ports. The second adaptor, which sits near your TV, Sky box and so on, is the TL-WPA4230P, with three ethernet ports and the Wi-Fi hotspot.

We like the number of ethernet ports as a rising number of home-entertainment systems are lost without an internet connection these days. Most Powerline adaptors feature just the one ethernet port.

The closest rival to the TP-Link AV500 Passthrough Powerline Wi-Fi kit is Devolo's dLan 500AV Wireless+ Starter Kit ([tinyurl.com/kc2r6j2](http://tinyurl.com/kc2r6j2)). This also has three ethernet ports on the second adaptor and a Wi-Fi function - although the base unit has just one, compared to the TP-Link's two.

**Speed tests**

Both the TP-Link and Devolo scored well on our real-world speed tests.

You can forget about manufacturers' claims of 500Mb/s speeds. It's much more like 70- to 100Mb/s. But don't worry as all the Powerline makers use these theoretical maximum speeds in their product names, and 60- to 100Mb/s should be well enough even for streaming HD TV and movies.

Our first speed test checks out how fast the Powerlines can run in

the two adaptors sit next to each other, but it's a decent benchmark to begin with. The TP-Link AV500 scored a near 100Mb/s score, which is respectable.

In our real-world test where the second adaptor is installed in a second room two floors away from the router and base unit. Here the TP-Link scored a modest but acceptable 65Mb/s.

Finally, we tested the signal strength of the new Wi-Fi hotspot. Here it managed 54Mb/s, which is good considering it's not much slower than the wired speed.

The Devolo 500AV scored almost identical scores.

(If you want the very fastest speeds then check out the £159 Devolo 1200+, which cruised at 126Mb/s, or its cheaper sibling the £99 Devolo 650 ([tinyurl.com/nc8muo3](http://tinyurl.com/nc8muo3)), which notched up 88Mb/s in the real-world test.)

The Devolo adaptors are a lot bigger than the TP-Link reviewed here, but work better in houses that have the power socket close to the floor or skirting boards as the ethernet ports are located at the top.

The TP-Link has its ports at the bottom, so isn't good for situations with low power sockets.

As the speeds are pretty similar this might be the only real deciding factor in choosing between the two systems - except for price, where the TP-Link is cheaper at £89 instead of £129.

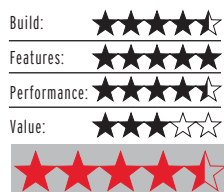
**Verdict**

The TP-Link AV500 Passthrough Powerline Wi-Fi kit is a nicely priced, and speedy set of fully featured Powerline adaptors. ☒ **Simon Jary**



**\$198 (£98)****Contact**■ [limefuel.com](http://limefuel.com)**Read more**■ [tinyurl.com/mwq6ud5](http://tinyurl.com/mwq6ud5)**Specifications**

24000mAh lithium-ion power bank; 4x 12W (2.4A) USB outputs; 1x 10W (2A) Micro-USB input; passthrough charging; auto-on/-off; two-in-one Micro-USB/Lightning cable included; LED flashlight; 79x24x155mm; 505g; 12-month warranty

**POWER BANK****LimeFuel Blast L240X Pro 24000mAh**

LimeFuel's Blast L240X Pro is a higher-capacity version of the L180X Pro ([tinyurl.com/owmgsq6](http://tinyurl.com/owmgsq6)). Like that power bank, it supports various high-end features such as passthrough fast-charging and auto-on/-off, but its increased capacity makes it a more useful travel companion on extended trips.

Indeed, with 24000mAh of power to hand, you can expect around 17000mAh to be available to your devices - that would give an iPhone 6 nine full charges with juice to spare. And its auto-on/-off functionality ensures nothing is wasted: to begin charging you simply plug in your phone or tablet, and when its battery is full the LimeFuel automatically shuts off the power.

This is the highest-capacity power bank we've reviewed at PC Advisor, offering an extra 1600mAh over the EC Tech YN-025 22400mAh ([tinyurl.com/LhgftLj](http://tinyurl.com/LhgftLj)) power bank. It's about the same size as that device, a fraction shorter but a little

fatter at 79x24x155mm, yet some 50g heavier at 505g.

The difference in price is more noticeable: while the EC Tech costs £29, the LimeFuel is available in the UK only via the company's website, where it costs \$149 - around £98 plus shipping. That's expensive compared to other power banks we've tested, but if you can afford it the LimeFuel ticks every box going.

It has plenty of other features in its favour, too. While the EC Tech is a reasonably basic power bank, with a no-frills red and black plastic chassis and 12W (2.4A), 10W (2A) and 5W (1A) USB outputs (upgraded since the time of our review), the LimeFuel has four, all rated at 12W (2.4A).

It's better-looking and feels better made, too, with a matt black smudge-resistant rubber finish and rounded edges that feel good in the hand. It never becomes warm in use, and attention to detail is strong. The Blast Pro comes with a two-in-one Micro-USB and Lightning slimline charging cable that will help you cut



down on clutter if you have assorted iOS and Android or Windows Phone devices to charge.

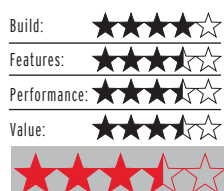
High-capacity power banks such as these can take forever to refill their own batteries. Both EC Tech and LimeFuel support 10W (2A) inputs, which means that given the right charger (not supplied) you can expect them to fill up in around 16 hours from empty.

**Verdict**

The LimeFuel Blast L240X Pro is an excellent power bank for taking on the road, with the highest capacity we've seen yet. **Marie Brewis**

**£22 inc VAT****Contact**■ [pny-europe.com](http://pny-europe.com)**Read more**■ [tinyurl.com/p7qemgo](http://tinyurl.com/p7qemgo)**Specifications**

3000mAh power bank; 1A (5W) Micro-USB input; built-in 1A (5W) Micro-USB output; four-LED capacity indicator; lithium-polymer battery; 58x85x13mm; 118g; 1-year warranty

**POWER BANK****PNY PowerPack M3000**

There's a lot to like about PNY's ultra-portable PowerPack M3000. It will fit virtually unnoticed into a pocket or bag, and its built-in Micro-USB cable removes the need to carry around a cable for charging your Android phone or tablet.

The M3000 is unsuitable for iPad and iPhone users (they will want to investigate the LM3000), but its built-in Micro-USB cable will be suitable for the vast majority of Android and Windows Phone smartphones and tablets.

The Micro-USB cable neatly slots into the side of the device, although we did find that after only a couple of uses it began to bulge out slightly at the side, having been bent backward to plug into our phone. It's a reasonably rigid cable, and doesn't feel as though it will be easy to break, but this also means you won't be able to place down the M3000 beside your phone or tablet. We found it was easiest to use the PNY PowerPack with it sitting underneath our smartphone. You

then just tap the button on the side to begin charging.

The device itself feels pretty tough, too, which is reassuring given that PNY doesn't supply a carry case. But built from strong black plastic with a green trim, this good-looking device needn't be hidden away. There's a one-year warranty, should you encounter any problems.

The M3000 is ultra-slim and light, at just 58x85x13mm and 118g. It's a perfect travelling companion that will also be ideal for daily use. That's great if your phone battery packs up for the day before you've even finished your lunch break.

PNY says you can expect up to two charges from its 3000mAh lithium-polymer battery. With most power banks offering around 70 percent efficiency (some power is lost through heat generated and voltage conversion), you should expect not much more than 2100mAh to be available to your devices. We can't think of any phones that would receive



two full charges with that amount of power to hand, but the PNY PowerPack should fill most smartphone batteries once.

This relatively low capacity, balanced with the power bank's 5W output (not too slow but not what we might consider fast charging), it's unlikely you'd use the PowerPack with a tablet. That doesn't mean you couldn't, of course.

**Verdict**

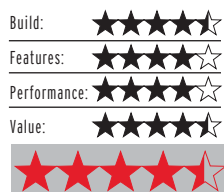
PNY's PowerPack M3000 has enough power to give your smartphone a full charge, and it's sufficiently small and light that you won't even notice it in a pocket or bag. **Marie Brewis**

**£14** inc VAT**Contact**

■ [ianker.com](http://ianker.com)  
 Read more  
 ■ [tinyurl.com/mbL2umq](http://tinyurl.com/mbL2umq)

**Specifications**

3200mAh power bank;  
 1A (5W) max output with  
 PowerIQ; 0.8A (4W)  
 Micro-USB input; carry  
 case; Micro-USB cable  
 92x23x23mm; 80g;  
 18-month warranty

**POWER BANK****Anker Astro Mini 3200mAh**

Anker's Astro Mini power bank is a bestseller at Amazon, and for good reason - it's easily portable, intelligent and good looking, too.

The power bank is available in five colours: black, blue, pink, silver and gold. We reviewed the blue model, a lipstick-style charger encased in anodised aluminium that both looks and feels good. At just 80g and 92mm long, it'll slip easily into a pocket, although a soft carry pouch is also supplied.

This rugged power bank is unlikely to come to any harm from bumps and scrapes on the road, but it's reassuring to see Anker offers an 18-month warranty.

The Astro Mini's closest rival is perhaps the Intocircuit PowerMini 3000 ([tinyurl.com/kwone54](http://tinyurl.com/kwone54)). That power bank is a few pounds cheaper, but there are several reasons why this Anker is the superior product.

First is its extremely high energy-efficiency. All portable chargers lose power through heat generated and voltage conversion

during charging, so the advertised capacity will never be available to your mobile device. However, while the cheapest power banks average 65- to 70 percent efficiency, and some of the better models around 80 percent, this Anker Astro Mini manages a superb 90 percent energy efficiency thanks to Samsung Grade A cells and premium chips.

This means that of the Anker's 3200mAh capacity, you can expect 2880mAh of usable power. That's enough to charge pretty much any smartphone once, some handsets possibly twice. While the Intocircuit is only 200mAh lower in capacity, its lower energy efficiency increases this gap.

The Anker also supports the company's PowerIQ technology, which intelligently identifies a connected device and adapts to its recharge rate. Perhaps more useful in Anker's larger-capacity power banks with higher-rated outputs (this Astro Mini has a maximum



output of 1A or 5W), it's an undeniably cool

feature that meant the

Anker was able to charge even our iPad mini, and iPads are notorious for being fussy about the devices from which they charge.

When it comes time to refill the power bank, the PowerMini 3000 gets the upper hand with a 5W input - not that you'll notice much difference when compared to the 4W of this device.

**Verdict**

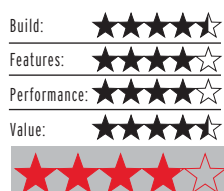
Anker's Astro Mini is an extremely useful power bank, both pocketable and pretty, and able to offer your smartphone a full charge away from the mains. At this price we can't fault it. **Marie Brewis**

**£18** inc VAT**Contact**

■ [inateck.com](http://inateck.com)  
 Read more  
 ■ [tinyurl.com/ogxmw62](http://tinyurl.com/ogxmw62)

**Specifications**

Bluetooth 3.0 Qwerty  
 keyboard; English UK  
 layout; 280mAh battery  
 lasts up to 100 days on  
 standby, 60 hours use,  
 charges in 2 hours;  
 282x135x4.3-18mm; 440g

**BLUETOOTH KEYBOARD****Inateck BK1003E**

Inateck's BK1003E ultra-slim Bluetooth keyboard oozes style, with a brushed steel underside and matte black plastic top. Full-size and well-spaced flat key tiles with rounded corners make typing easy, comfortable and quiet.

We recently reviewed Inateck's BK1002E keyboard ([tinyurl.com/pfjad3h](http://tinyurl.com/pfjad3h)), which is optimised for iPad and iPhone users with several dedicated hotkeys and a very Apple-esque design. It's a great keyboard, but this is something else altogether.

Not just better-looking and featuring an English UK rather than English US layout, the BK1003E from Inateck features a rechargeable battery that will last up to 60 hours in use, or 100 days in standby. A power-saving mode is triggered after 10 minutes of inactivity, and you simply press any key to resume operation. When the battery is depleted it will recharge over Micro-USB in just two hours. The BK1002E, by comparison, requires a pair of AA batteries.



As an Android user the Inateck BK1003E is better suited to this reviewer's needs than the BK1002E, but it is also perfectly serviceable for Windows and iPad owners. Simple to pair over Bluetooth, the Inateck enables you to control your Android tablet without ever needing to touch the screen.

The keyboard's top row features useful buttons that return you to the home screen, launch Google Now for search, select all, cut, copy and paste text, play, pause and skip music, turn up or down the volume and even take a screenshot. Meanwhile, you can use the arrow keys and Enter button to select an app, then Tab around menus within.

If you want to get some work done on the go, you'll find it significantly easier and faster with this Inateck than you would battling with Android's awkward copy-and-paste functions and slow finger-prodding touchscreen typing.

The BK1003E is perhaps not what you might consider a truly portable keyboard. Yet its wireless (Bluetooth 3.0) operation and ultra-slim design means you could throw it in a bag and take it on the road if required.

**Verdict**

The Inateck BK1003E has won us over, allowing more efficient use of our Android tablet as a work tool as well as for play. **Marie Brewis**

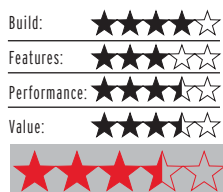
£39 inc VAT

Contact

■ [elgato.com/en](http://elgato.com/en)  
Read more  
■ [tinyurl.com/omnpe6k](http://tinyurl.com/omnpe6k)

Specifications

7W LED/430 lm; 3000K/  
warm white; E2 /E26/A21;  
110- to 240V; class A  
energy efficiency;  
7kWh/1000 hours energy  
consumption; 0- to 50°C/  
32- to 122°F operating  
temperature



SMART LED BULB

## Elgato Avea

You're probably accustomed to paying a few quid for a new light bulb, so you're jaw is likely to drop when you read that the Avea will set you back £39. This is, however, no ordinary bulb.

The Avea is an 7W LED bulb with a class A energy rating. It's a screw-fit bulb, so you'll need an E27/E26 lamp for starters and you'll also need an iPhone 4s or later, iPod touch (5th generation), iPad mini or iPad (3rd generation or later) with iOS 7.1 or later. There's no Android support, which is a big shame but support is coming soon we are told.

While it's a standalone bulb, you can control up to 10 with one device, so there's plenty of scope for expansion should you want to mood light many areas of your home.

Setting the Avea up is simple - screw it into the lamp in which you want to use it, switch on the power and connect to it via the free app. The device uses Bluetooth and you connect the bulb just as you would with any other Bluetooth accessory.

Importantly, Bluetooth Smart means there doesn't need to be a constant connection for the Avea to work, meaning it can be switched on and off with a physical switch and saves your device's battery.

As you might expect, you can select a colour from a large palette for the Avea and leave it alone. You can choose from green, yellow, orange, red, purple, blue and white and adjust the tone to your liking.

That's the basics but there are also a number of 'scenes' to choose from which slowly flow between preset colours. They have cheesy names such as 'magic hour', but they work nicely and you can group multiple bulbs so they are all doing the same thing.

The other mode is called 'wake-up light'. At a chosen time, the Avea will come to life to wake you up. This can be done with multiple bulbs as with the other modes and there's optional audio which will come from your device - either the app's built-in bird song or locally stored music.



Elgato's app works well but it is a little on the basic side. A key problem we encountered is that the bulb can't just be white - the bulb is simply off if the solid white mode tone slider is bang in the middle and it goes either orange or blue depending on which way you slide it.

Verdict

The Elgato Avea is a good and affordable buy if you want a single Smart LED bulb. Chris Martin

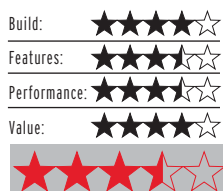
£80 inc VAT

Contact

■ [belkin.com/uk](http://belkin.com/uk)  
Read more  
■ [tinyurl.com/qxugv5q](http://tinyurl.com/qxugv5q)

Specifications

Kit includes 2x LED bulbs  
with E27 or bayonet fit;  
800 lumens; 3000K;  
2-year warranty (bulb life  
expectancy 23 years);  
compatible with Apple  
(iOS 6 and higher),  
Android (4.0 and higher),  
and Kindle Fire (Fire OS  
3.0 and higher)



LED SMART BULB KIT

## Belkin Wemo LED Lighting Starter Set

Just like smart thermostats, there's another race to replace dumb electrics in your home: smart light bulbs. Belkin is the latest manufacturer on the scene, following Philips and LIFX with their colourful bulbs.

The Wemo LED set, however, doesn't let you choose which colour you want your lighting. Instead, it's meant as a direct replacement for existing 60W incandescent bulbs, or the energy saving fluorescent equivalent.

The kit includes two bulbs: you can choose between bayonet or Edison Screw varieties. Each is rated at 800 lumens, which may not be as bright as your old-school incandescent but it's still impressive compared to many competing LED bulbs.

You also get a Wemo Link in the pack, which acts as a bridge between the bulbs and your Wi-Fi router. It's a small plug that you leave turned on in an area of your house with good Wi-Fi coverage.

Setup is simple using the free Wemo app, which is available for iOS, Android and Amazon Fire tablets. At least it should be simple. As with many wireless smart home products, you need to first switch Wi-Fi networks and connect directly to the Wemo Link in order to configure it to work on your home network. That went fine, but once connected it found our bulbs and proceeded to update their firmware.

After the promised 10-minute wait, the Wemo Link failed to find the bulbs and only by quitting the app and unplugging and re-plugging the Link was the system able to communicate properly and work.

Fortunately, that was the only hiccup and the easy-to-use app allowed us to set the bulbs to work exactly as we wanted. You can install them anywhere you like: in a ceiling fitting or a desktop lamp.

You create 'rules' for the lamps to work and these can be for them to turn on and off at sunset and sunrise, or at times you choose.



They can be named and controlled individually and you can even set a dimming period so the lamp fades in to your set brightness over a few minutes (or up to 30 minutes). You can also define a sleep period, so the bulb will turn off after a set time.

Verdict

The Wemo LED Lighting Starter Set is a good introduction to smart lighting. The app is easy to use, and the Link plug has Wi-Fi so doesn't need to be connected directly to your router. Jim Martin

**\$149 (£95)****Contact**■ [tronsmart.com](http://tronsmart.com)**Read more**■ [tinyurl.com/Lpjrtha](http://tinyurl.com/Lpjrtha)**Specifications**

2GHz Allwinner A80 (ARM big.Little Cortex A15/A7) octa-core processor; Android 4.4 KitKat; 2GB of DDR3 RAM; 16GB storage; 64-core PowerVR G6230 graphics; dual-band 802.11ac Wi-Fi; Bluetooth 4.0; gigabit ethernet; SATA; HDMI; 1x USB 3.0 OTG; 2x USB 2.0; SD; support for DLNA, Miracast and AirPlay; remote control; 164x164x27.5mm; 440g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

★★★★★

**ANDROID MEDIA PLAYER****Tronsmart Draco AW80**

Tronsmart's Draco AW80 in essence turns your existing television into an Android TV. Your TV then becomes a giant Android KitKat tablet, letting you browse the web, download apps, watch videos, catch up on your email and so on. The only difference is its lack of a touchscreen.

That's a big difference, though, and as we're sure you can imagine, navigating Android without touch takes a bit of getting used to. We tried to operate the Draco entirely with the supplied remote control. The remote does have a mouse mode, letting you move the cursor using the directional buttons and hit OK to select an option, but when trying to access the controls at the bottom of the screen and bypass the YouTube tutorial that appears on the first run of the app we eventually gave in and plugged in a USB mouse (a wireless mouse is preferable). If you'll be doing much typing or web browsing then a keyboard will also be required – operating Android's virtual keyboard with arrow keys on a remote or even using our USB mouse really is a pain.

Nevertheless, with Android installed you can turn any old television into the smartest set of all. You're not restricted to whichever catchup services and apps the manufacturer stipulates either – you can do anything you can do on an Android tablet. Even if your TV is that old and rubbish that it doesn't have an HDMI connection, Tronsmart supplies the necessary cable to hook it up via AV. (If you can use HDMI you'll get a better picture, mind.) Able to support 4K Ultra-HD, the Tronsmart's picture quality is limited only by that of your TV.

Tronsmart has preinstalled some apps to get you started, too. There's YouTube, Netflix, Plex and XBMC, for example, plus access to the full Google Play store so you can download whichever apps, movies and even some games that you like. Even Skype is preinstalled, although your TV probably doesn't have a webcam.

And the Tronsmart lets you connect additional devices, with three USB ports (one USB 3.0 and two USB 2.0), SPDIF and SD



card slots and a SATA connection. It also supports DLNA, Miracast and AirPlay.

**Design**

So, in theory, the idea is good. Great in fact. We really, really want an Android TV. (You could also have a Linux TV, since the Tronsmart supports that, too.)

In practice, the Tronsmart Draco AW80 is a slightly clunky solution. The box itself is reasonably well designed, 164x164x27.5mm, 440g, built from aluminium alloy with cooling vents and painted black. Less impressive is the external antenna, and if you don't have a wireless router you'll need to plug in a gigabit ethernet cable in addition to the power- and HDMI cables. And with mouse, keyboard and more also attached to the Draco, things can start to get a bit messy.

We can forgive all that, though, given this box's functionality. Plus its price – currently just \$149 (£95) from [Geekbuying.com](http://Geekbuying.com). [Geekbuying.com](http://Geekbuying.com) is not a UK retailer, but will happily ship to the UK and will include a suitable mains adaptor for your country of residence. However, there's a possibility you may incur extra charges at Customs; we didn't have this problem.

On paper the Draco's specs are pretty good. It lists a 2GHz octa-core Allwinner A80 (ARM big.Little Cortex A15/A7) processor, along with 2GB of DDR3 RAM and 64-core PowerVR G6230 graphics. Other highlights include 16GB of internal storage, the very latest dual-band 802.11ac wireless support, Bluetooth 4.0 and the aforementioned SATA,

HDMI and USB 3.0 OTG connections. As an Android device we ran the Tronsmart Draco AW80 through the same tests we use to benchmark Android phones and tablets.

Its SunSpider web browsing score was very good, and we recorded a super-low (for Android, in any case) 657ms. Multi-core performance in Geekbench 3 was also pretty good, with the Draco turning in 2579 points. In the single-core component it managed 799 points. Finally, we recorded graphics performance using GFXBench 3.0, in which the Tronsmart managed 9fps in Manhattan, and 22fps in T-Rex.

These are all strong results, if not as strong as those of some phones and tablets we've tested. So it's interesting that AnTuTu, a benchmark not in our usual portfolio, marks out the Draco AW80 as one of the fastest Android devices, with a score of 55106. Still, benchmarks are all to be taken with a pinch of salt, and in our real-life testing of the Tronsmart it seemed plenty fast to us.

We should probably note that the Tronsmart Draco AW80 is rooted, and is preinstalled with the SuperSU app, which offers advanced access management for apps that require root. The Tronsmart is still able to receive OTA updates, according to [Geekbuying.com](http://Geekbuying.com).

**Verdict**

Tronsmart's Draco AW80 is a great device, allowing you to turn any old TV into a super-smart Android PC. We're not entirely sold on its design, but its price and functionality has won us over. **Marie Brewis**

**£109** inc VAT**Contact**■ [vtech.co.uk](http://vtech.co.uk)■ [Read more](#)■ [tinyurl.com/kthzLq3](http://tinyurl.com/kthzLq3)**Specifications**

Android 4.2; 7in (1024x600) display; 8GB memory; up to 32GB microSD card; 2Mp camera; lithium-ion battery; 382x284x67mm; 1.4kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**KIDS TABLET****VTech InnoTab Max**

The VTech InnoTab Max is a tablet made specially for kids, with built-in 'child-safe' Wi-Fi, video camera and player, MP3 functions and a bunch of fun-, educational- and creative apps.

The device is well built, and available in the obligatory pink and blue. The cover protects the screen when not in use and also doubles up as a stand for a better viewing angle when watching videos or photo slide shows. Or you can remove the cover altogether if you prefer the more classic tablet look.

VTech believes the InnoTab tablets are suitable for ages three to nine. We think that children over the age of seven will find some of the supplied games a little simplistic or childish for their now sophisticated tastes. However, for children aged three to sox, kid-specific tablets such as the InnoTab and Leapfrog's LeapPad are great choices as a little person's first computer.

Children love to feel like this is their own device, rather than forever pleading to borrow mum or dad's phone or tablet.

The InnoTab Max is based on Android 4.2 but has an interface that's designed for kids. It's simple to use, and features a 7in touchscreen (1024x600 pixels) that can be operated by finger or the supplied stylus.

The fact it's powered by Google's OS means you can download more than 200 educator-endorsed Android games and not be limited to VTech's own 650 software titles. It still lacks the wealth of apps you get from a normal Android or iPad, and there are plenty of games that feature well-known kids movies and TV shows. Yes, there's a *Frozen* game (£4.99) and other Disney/Pixar-branded stuff.

It ships with 18 installed apps, two of which you have to download from the VTech Learning Lodge app store after registering. There wasn't a great deal of choice in which two free apps these would be, however.

The 2Mp camera is neat as it can rotate to take photos or video either front or back. Picture quality is not what we expect from a compact camera or smartphone, but it's just about acceptable enough for kids to play with. It would be nice if one day a kids' camera took decent photos.



The tablet has 8GB of internal storage to keep all those photos, videos, music and apps. We like the ability to expand this storage up to 32GB with a microSD card.

You can buy extra video content, such as Charlie and Lola, Pingu, Octonauts and some Disney shows, although these aren't cheap.

There's an e-reader with Story Dictionary, which can help children learn to read. We'd have preferred there to be more than one ebook included, although there are free books to download, too.

The built-in Wi-Fi means you can download games straight on to the tablet rather than having to hook up to a parent's PC, which has been a frustration with earlier kids tablets. It's also there for the InnoTab's web browser.

VTech claims that the browser is "kid safe", and there's a bunch of vetted websites for children to browse. This makes it much more of an internet experience than the LeapPad, which has a browser that is little more than a series of random videos for kids to watch.

While extremely limited we did find the LeapPad browser to live up to the kid-safe badge better than the InnoTab Max.

One of the pre-linked websites is the excellent HowStuffWork, which is full of fascinating facts that will entertain and educate children, but also features a section on Sexual Dysfunction. While there's nothing obscene or pornographic there parents might prefer not to have their young ones read about "How to fire up your sex life".

Clearly there are risks even on otherwise innocuous websites such as the above, and so it's great that parents can easily add or remove sites from each child's approved list using the web browser controls.

Sadly some beneficial, educational websites can't be added because they require JavaScript. For example, we couldn't get Mathletics website to work. This would have been a great addition to the InnoTab web browser.

One Wi-Fi feature we liked is Kid Connect, where children can send and receive text and voice messages, photos, stickers, and drawings to InnoTab-owning friends and family members who install the Kid Connect app on their iPhone or Android smartphones.

Kid Connect also features family group chat, multi-player games and Family Bulletin features. The Kid Connect mobile app lets you manage your child's contact list.

Security's pretty good as a parent has to approve each friend, and it's easy to use even for a four-year-old. Parental settings include time controls so you can limit the amount of time your child is allowed to play with the tablet. This is an excellent idea. Even with educational tablets such as the InnoTab parents should restrict the amount of time spent on such technology.

We also like that you can connect the InnoTab Max to your TV via a mini-HDMI to HDMI cable - also known as an HDMI type A to type C cable. You'll need to buy this separately, though.

The Max can play most cartridges designed for earlier InnoTab models. However, because of its larger screen, in order to play these older cartridges, you must first download updated versions to the tablet.

**Verdict**

The VTech InnoTab Max is best suited to children ages three to six, and includes some fun, creative games plus an excellent messaging feature that kids love. **Simon Jary**

**£329** inc VAT**Contact**■ [uk.creative.com](http://uk.creative.com)■ [Read more](#)■ [tinyurl.com/ogw74b8](http://tinyurl.com/ogw74b8)**Specifications**

24-bit/192kHz (24-bit /96kHz in surround mode); 600-ohm headphone amplifier 50 + 50W speaker amplifier; 3.5- and 6.35mm headphone outputs; 3.5mm microphone input; stereo RCA phono outputs; 3.5mm sub and rear speaker line outputs; Toslink optical digital input and output; Micro-USB 2.0 input; Dolby Digital 5.1 certified

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



## USB DAC AMP

## Creative Sound Blaster X7

The sound card is pretty much dead, but the high-end PC audio market is thriving. Most of the action is in USB DACs coupled with headphone amps, and Creative's new Sound Blaster X7 can fill that role. But this device can do much more, and its application isn't limited to personal computers. This Sound Blaster can also be used with gaming consoles, smartphones, tablets, DVD players, just about anything with an audio input or output.

The Sound Blaster X7 an affordable audio powerhouse with just two intertwined shortcomings: There's no HDMI in or out, so there's no support for high-resolution movie soundtracks on Blu-ray discs.

The SB X7 has an integrated Texas Instruments TPA3116D2 Class D digital amplifier that can drive a pair of either 4- or 8-ohm speakers. Flip a switch on the back panel to correspond to the speakers you're connecting to it. Gold-plated binding posts support bare-wire, spade, or banana-plug connections.

Creative rates the amp to deliver 38W per channel to 4-ohm speakers with the included 24V, 2.91A power supply. Upgrade to Creative's optional 24V, 6A power supply and you can drive 4-ohm speakers at up to 50W per channel. Using 8-ohm speakers? Creative rates the amp at 27W per channel with the stock amp, but it doesn't provide numbers for the optional PSU.

If you'd prefer to use self-powered speakers, you can bypass the internal amp and connect up to six powered speakers (front stereo, rear surrounds, a center channel, and a subwoofer) using its line-level outputs. You can also deploy passive stereo speakers and a powered subwoofer, because all of its inputs and outputs can be used simultaneously.

The unit also has a microphone array built into its front panel for gaming, VoIP calls, video conferencing, and speaker calibration. If you have your own favorite mic, a front-panel 1/8in connector can accommodate it.

If you'd like to customise the X7's sound, a door on the bottom of the box exposes socketed operational amps that you can replace. A Texas Instruments TPA6120A2



headphone amp can drive two sets of headphones that present up to 600 ohms of impedance (there's one 1/8in and one 1/4in headphone jack on its front panel).

### Connect almost anything

You can connect both analogue and digital audio sources using stereo RCA jacks and TOSLink optical inputs. There's a TOSLink output, too. The SB X7 has a Micro-USB connector for streaming digital audio from a Mac or PC, and a USB Type A receptacle that can host a tablet or smartphone if you want to stream audio from those devices.

If you prefer wireless streaming via Bluetooth, the SB X7 supports that, too, using your choice of the AptX or AAC codecs. The box can support two Bluetooth devices at once, and it supports NFC Bluetooth pairing. Just tap your device against the side of the cabinet.

Creative's SB-Axx1 audio processor forms the heart of the X7, which renders it suitable for PC gaming as well as critical-listening sessions. The SB-Axx1 is a DSP (digital signal processor) that's capable of voice processing, audio enhancement, audio effects, and decoding Dolby Digital soundtracks. The chip can decode audio bit streams with up to 24-bit resolution and at sampling rates up to 192kHz.

The SB X7's DAC is a high-end Burr-Brown PCM1794 that delivers an extremely high signal-to-noise ratio of 127dB. A Burr-Brown PCM4220 handles conversions from analog to digital for recording to a PC's hard drive from the onboard mic, mic input, or line-level inputs.

Like Creative's own audio processor, both of these parts support up to 24-bit resolution and sampling rates up to 192kHz.

### Audio effects

Creative has developed an entire suite of signal-processing software - SBX Pro Studio Technology - that runs on the SB-Axx1 chip. Some of these apps are designed with gaming in mind, while others are useful for just about any audio application. You can manage these effects using Windows software on your PC or an app for your Android or iOS device. Using a mobile device also gives you the ability to control the volume from across the room.

The music we care most about we either buy on CD and rip to FLAC, or we buy in HD form and download. As such, we prefer that audio playback gear processes that audio as little as possible. But we also purchase tunes from places such as Google Play, which sometimes arrive in the form of MP3 files, and listen to audio-streaming services.

Those tracks don't offer the highest fidelity, but Creative's Crystalizer software can effectively restore life to them. Other SBX Pro Studio effects let you add a pseudo-surround-sound effect and boost bass response, using sliders in the apps or Windows software to control the impact of each effect.

### Verdict

While we're not a big fan of the Sound Blaster X7's form factor, Creative has selected exactly the right components to stuff inside this little box. **Michael Brown**

£25 inc VAT

Contact

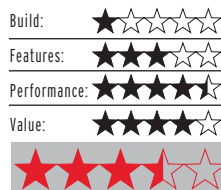
■ [puremayhemdesigns.com](http://puremayhemdesigns.com)

Read more

■ [tinyurl.com/nc2m53n](http://tinyurl.com/nc2m53n)

Specifications

40mm driver unit 320 impedance; 113dB ± dB sensitivity; 15Hz to 20KHz frequency response; 1.2m cable; 3.5mm plug; in-line microphone and answer button; 12-month warranty



## HEADPHONES

### Pure Mayhem Pure Flexi

Budget headphones can often perform just as well as much more expensive models. Sheffield-based design outfit Pure Mayhem has launched its first product, the Pure Flexi headphones.

They are far from the greatest build quality; they're simple and plasticky, but with a price tag of £25, it's to be expected. The design is a simple black plastic headband, with a yellow leather cushion at the top and earpads made from the same material, incorporating the Pure Mayhem monogram on the outsides.

Comfort-wise, they fit well, with protracted use offering no annoyances. You won't feel as if they're not there, but they equally don't clamp down too hard.

One of the key features of this pair of headphones is the adjustable nature of the earcups. Rather than the ratchet system traditionally used by most over-ear headphones, the Flexi's method is a sliding motion that can be used to put the cups in any position, including

detaching them altogether should the mood take you. However, convenient though this may be, the lack of defined settings will drive anyone with OCD tendencies to the point of distraction.

They're also not fantastic at cutting out ambient noise. There's no active noise-cancelling technology, and the seal over your ear isn't good enough to block out what's going on around you.

Audio quality is impressive considering the price – it isn't noticeably tinny, and the tonal balance is pretty good. The only thing we spotted was a slight tendency towards distortion on the low end, but it's so slight as to be barely worth mentioning. The treble- and mid-ranges are all bright, clear and punchy enough.

They don't have the depth of the Sennheiser HD 429s, which also have sharper treble. However, aside from that, there isn't nearly as much of a drop in quality from the more expensive brand as you'd expect.



The headphones have a 1.2m long cord that's a good size for mobile devices and personal stereos, although users wanting to plug them into a computer or hi-fi system may struggle. They come equipped with a standard 3.5mm jack, as well as a one-button remote and microphone for handsfree calling.

#### Verdict

These headphones have good sound quality, and although the plastic build leaves something to be desired, the more-than-reasonable price point absolutely balances this out. Adam Shepherd

£69 inc VAT

Contact

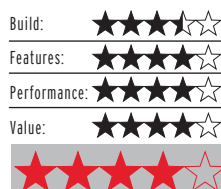
■ [akg.com](http://akg.com)

Read more

■ [tinyurl.com/nh2uf96](http://tinyurl.com/nh2uf96)

Specifications

17Hz to 20KHz frequency response; 100mW max input power; 120dB sensitivity; Bluetooth 3.0; smartphone control; 1.2m cable; 3.5mm plug; 150g



## BLUETOOTH HEADPHONES

### AKG Y45 BT

The AKG Y45 BT headphones are portable and wireless, and so make great headphones for commuters or others who wish to listen to music on the move.

Like our favourite portable Bluetooth headphones, the £180 Sennheiser MM 400-X ([tinyurl.com/q6pqshq](http://tinyurl.com/q6pqshq)), AKG's Y45 BTs can be folded down and come with a carry case. They are also supplied with a detachable cable for non-Bluetooth listening. If you want to listen to your favourite tracks wirelessly, then the battery life is around 10 hours. You charge the device with the supplied Micro-USB cable.

The AKG headphones have a number of controls on the right ear cup, where you'll find Play/Pause/Call Answer/Call End, Volume Up, Volume Down, and Power/Pairing buttons. There's also an integrated microphone, so you can switch to answering phone calls without taking the headphones off.

In our tests, we found the controls to be a bit fiddly and too

close together at first, and preferred the easier, bigger controls on the Sennheisers. Turning the AKGs off also took some getting used to.

But what about the most important feature of any set of headphones? Their audio quality. First off, we tested the Y45 BTs with the supplied cable. We found they have a warm balance, and slightly rolled-off upper treble. The mildly muffled effect nonetheless helps soften the grit of MP3 and AAC recordings.

The headphones have a mildly thumping upper bass, boosted to follow the fashion of other street headphones, such as Beats by Dr Dre.

They feature a strong midrange for voices, but not especially 'open' in character. There is limited stereo width even with binaural material. And the bass-forward voicing can colour the sound, making it a little opaque and jumbled.

Overall, the AKG Y45s favour rock and urban music, but are not so satisfying for classical and jazz.



Tested with Bluetooth there is noticeably increased white-noise hiss, especially when not covered up by any music. Busier music passages can sound dynamically compressed.

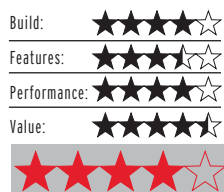
To the untrained ear, however, the audio quality is more than acceptable at this price, and give the more expensive Sennheisers a good run for the money.

#### Verdict

The AKG Y45 BT headphones are a great choice for portable Bluetooth listening. We marginally preferred the Sennheisers for the prize of Best Portable Bluetooth Headphones but the AKGs are nearly half the price, so worth considering. Simon Jary

**£32** inc VAT**Contact**■ [xmpow.com](http://xmpow.com)**Read more**■ [tinyurl.com/pvoq8nt](http://tinyurl.com/pvoq8nt)**Specifications**

Bluetooth Mode Headset/  
Handsfree/A2DP/AVRCP  
Bluetooth 4; 2.4GHz  
frequency range; up to 30  
feet range; up to 5 hours  
talktime; up to 200 hours  
standby time; 2 hours  
charging time; 18-month  
warranty; 11.4g



## BLUETOOTH HEADPHONES

**Mpow Petrel Bluetooth Headset**

If you hate headphone cables flapping around your head while you're out jogging or exercising, then a set of lightweight in-ear Bluetooth headphones might be the answer to your running prayers. We've tested a wide range of Bluetooth headphones, but only the Mpow Petrel Bluetooth Headset so far fit the needs of the frustrated runner.

These lightweight (11.4g) in-ear buds require no cable between them and your music player or phone, as they receive the music from the player via Bluetooth. To switch on Bluetooth just hold down one of the control buttons for a few seconds. There are Play, Pause and Stop controls integrated into the cord.

The buds are connected to each other by a cord, which you can adjust to your comfort.

Special ear hooks - three different sizes are shipped with the headphones - ensure that the earbuds don't fall out when you are exercising. These can seem a little

uncomfortable at first but you get used to them after a short while. Make sure you try all three different sizes included in the box.

There are indoor and outdoor stabilizers for you to choose as the most comfortable one for your exercise time.

The instruction manual isn't very helpful in showing you how to fit these. When we raised this with the company they promised to update the manual but for now all we can suggest is to look at the photos here and work it out for yourself! It's not difficult but better instructions wouldn't cost the company any more than the skimpy ones that ship with these headphones. Eartips come in small, medium, and large sizes.

Audio quality is much higher than we expected for a £32 set of Bluetooth headphones, and the headphones use the AptX codec for 'CD-quality' sound.

You charge the headphones using the supplied Micro USB cable. Mpow claims a five-hour battery life



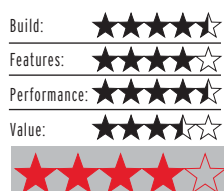
between charges. As they are so light and small this is an impressive feat. The headphones include a 45-day money-back guarantee and an 18-month warranty.

**Verdict**

Exercising without flapping cables is liberating, and it's hard to go back to wires once you've got used to the Mpow Petrel Bluetooth Headset. Sound quality is high, and these lightweight headphones will impress you as well as freeing you from those annoying cables as you run round the park.  **Andrew Shalat**

**£35** inc VAT**Contact**■ [energysistem.com](http://energysistem.com)**Read more**■ [tinyurl.com/o9L4dhe](http://tinyurl.com/o9L4dhe)**Specifications**

20Hz to 20KHz frequency  
response; 32-ohm  
impedance; Bluetooth 4.0;  
10m range; built-in  
microphone; -38db ± 3db  
microphone sensitivity;  
155g



## BLUETOOTH HEADPHONES

**Energy Headphones BT2 Bluetooth**

The Energy BT2 Bluetooth Headphones are a very affordable and good-looking set of closed, wireless headphones that fold up small to offer great portability.

Bluetooth headphones free you from tangling, troublesome cords and cables. Most cost the Earth but the Energy BT2 Bluetooth Headphones are priced at £35.

We were impressed with the level of design in these headphones. They look and feel great, and fold up into a coat-pocket sized form. At 155g they are light, although not as lightweight as our favourite (but much pricier) portable Bluetooth headphones, the Sennheiser MM 400-X ([tinyurl.com/q6ppqshq](http://tinyurl.com/q6ppqshq)).

You charge up the headphones using the supplied Micro-USB cable, so no need to worry about expensive and bulky batteries. The 200mAh lithium-ion battery will last 10 hours between charges, depending on how loud you run them of course.

They feature a control talk function and built-in microphone so

you can answer all your calls while listening to music.

And you can control your music with the Play, Pause, <<, >>, and Volume functions from the headphones without going through your phone or music player.

At just £35, the Energy Headphones BT2 headphones are about as cheap as you'll get a decent set of Bluetooth headphones, and so there are some things you don't get with these that you would with a more expensive set, such as the £180 Sennheiser MM 400-X portable Bluetooth headphones.

Audio quality isn't as impressive, as there's no apt-X audio codec that would push sound levels to 'CD quality'. We found audio quality to be a bit muddy, but is reasonable for headphones at this price. If you want top-quality audio and super portability then the Sennheisers deliver on both.

You don't get a cable, which might seem a strange comment in a Bluetooth headphone review,



but having one is handy if the headphones run out of battery or you fancy a higher sound quality when you don't mind being tethered by wires. And you don't get a carry bag or case, like you do with pricier sets, but they fold up well.

But for £35 the Energy Headphones BT2 is an affordable, attractive set of Bluetooth headphones that are nicely portable, and come with most of the functions you expect of a much more expensive set.

**Verdict**

The Energy Headphones BT2 Bluetooth are a very affordable, comfortable and good-looking set of foldable, portable wireless headphones. Audio quality is not as high as those priced near the £200 mark but at £35 these really are a bargain.  **Simon Jary**

£80 inc VAT

Contact

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

Read more

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

Specifications

2x 35mm long-throw full-range drivers with neodymium magnets; 70x30mm passive bass radiator; 2x 7.5W stereo Class D amplifier; 70Hz to 20kHz (-3 dB) specified frequency response; 3.5mm auxiliary analogue input; CSR8635 Bluetooth SoC; 8.14Wh (3.7V, 2200mAh) lithium-ion internal battery; Micro-USB 5V charging port; 161x82x32mm; 482g

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



BLUETOOTH SPEAKER

## Bayan Audio SoundBook GO

This is the third chapter in the story of the portable Bluetooth speaker, by Bayan Audio. Each carries the title of SoundBook, and the £150 original can now be seen as volume two in size and price terms, with a larger SoundBook X3 the second to be published – and the most weighty at £250. And now we have the pocket-sized budget edition, the SoundBook GO, priced at £80.

All three follow a similar plot, with a front protective flap that folds underneath the raked-back body, so that opening the speaker feels like opening a hardback book.

It's a neat design that provides some protection to the front perforated grille if you should travel with it; and despite the backward slope, the speaker will never fall over once it's sat on its own cover.

To help reduce price, various economies have been made in construction and features of the SoundBook GO, when compared to the first editions.

For one, there's no built-in FM radio for simple sit-and-play music. Build and materials quality have been reduced by now making the unit entirely from plastic, rather than with the premium-feeling aluminium body of the other two SoundBook speakers.

Also removed is the textual display, a dot-matrix effect that shines through the grille to show which source is selected. The nearly hi-fi codec AptX is also struck from the features list, leaving the default SBC, plus MP3 and AAC, as potential wireless compression systems for carrying your digital music through the air.

To charge the SoundBook GO, you plug it in to a USB 5V adaptor. Instead, you'll have to borrow one from another device, or plug into a computer's USB port to recharge.

On top of the SoundBook GO are just three buttons: an on/off button, with volume + and - keys either side. A row of 13 tiny white LEDs forms a visual bar to show volume setting.

Inside the SoundBook GO is a pair of 35mm full-range drivers just behind the black grille, and these provide most of the speaker's sound. In addition there is a passive bass radiator at the back, a weighted blob suspended in a rubber diaphragm.



The GO box itself is fully sealed and airtight to increase efficiency and bass response, although that bass radiator means there is still a decent sense of low-frequency sound to prop up the otherwise rather limited little drivers. And the sealed-box principle can also mean a better damped sound, which won't boom needlessly at certain bass resonant frequencies.

Powering the speaker drivers is a 7.5W stereo Class D chip amplifier. Bluetooth reception and decoding is undertaken by an integrated CSR8635 chip from Bluetooth specialist Cambridge Silicon Radio.

In use we found excellent wire-free reception, perhaps helped by an all-plastic chassis that doesn't screen Bluetooth's microwave radio as much as metal-enclosed cases. Played from an iPhone, we found we could maintain a link without audible dropouts over a 10m range through a plaster wall.

Besides the Bluetooth connection, you can plug in to a green-coded 3.5mm minijack socket on the back for improved sound.

The speaker is powered by an internal 8.14Wh lithium-ion battery, recharged through a Micro-USB port at the back. The surround of this port glows red when charging, and green when charged. Bayan Audio specifies up to nine hours of music playback when connected wirelessly.

The GO is available in a choice of four colour finishes for its plastic body – red, blue, white or black.

### Sound quality

The SoundBook GO is the smallest volume in the trilogy so far, uses cheaper materials, and has only two drivers against the X3 model's four. And yet we found the bottom-to-top overall sound quality of this

speaker was more listenable than its £250 flagship forebear.

There could in part be a psychological factor at play here. The GO is smaller, and one doesn't expect equal or better sound from smaller speakers. Its lower price also sets a lower expectation threshold for quality.

But all that said, we found the Bayan Audio SoundBook GO to be an incredibly well-rounded little speaker. Its tonal balance was spot on for general music listening, as well as for spoken voices and talk radio, giving clear vocal intelligibility across a range of volume settings.

When playing music it didn't suffer the all-too-common tizz and graininess of low-cost Class D amplification, instead keeping treble relatively calm and untiring to the ear. Tasked with complex mixes and challenging rhythms the SoundBook GO remained in control too, and while we can't expect to hear much in the way of true fundamentals, bass lines remained clear.

There was only a mild drag in pace in the bass. That's admirable where some passive bass radiators can leave you with a sense, in musical timing, of the beat being dragged backward somewhat.

### Verdict

Of the three SoundBooks we've opened to date, this is the first that we've found to really impress by its sound quality. Bayan Audio has really taken a leaf out of a good book on music here, making an affordable little speaker that bucks the trend for many of its Bluetooth breed by being a delight to listen to. And as with any such speaker though, for best results skip the Bluetooth link and just plug into the jack in the back.  **Andrew Harrison**

**£42** inc VAT**Contact**■ [kaspersky.co.uk](http://kaspersky.co.uk)■ [Read more](#)■ [tinyurl.com/kf6ywza](http://tinyurl.com/kf6ywza)**Specifications**

Windows XP SP3/Vista SP1/7/8/8.1 32/64-bit;  
800MHz CPU; 512MB (32-bit), 1GB (64-bit) memory;  
480MB drive space

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



## SECURITY SOFTWARE

# Kaspersky Total Security 2015

Kaspersky is one of the best-known internet security software providers. The 2015 version of its top-of-the-line product aims to protect not only PCs, but Macs, Android and iOS devices, too.

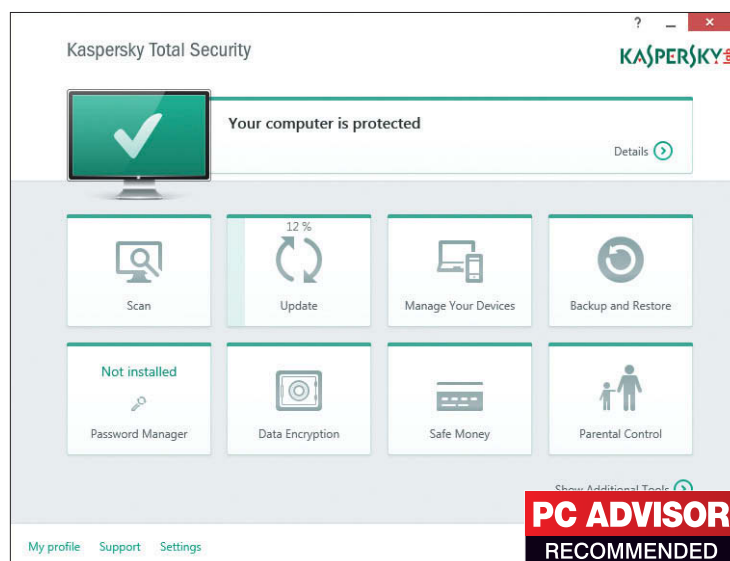
You can buy the product in one-, three- and five-device licences and mix and match the platform versions as you want. It's a shame Kaspersky hasn't gone the same route as McAfee and offered a one-off price for as many personally owned devices as you need.

Installation is straightforward and initial setup is pretty automatic, without the need to tweak too many settings for basic protection. The interface is clear cut, with each tile in the home window leading to status information and settings.

The suite comprises the obvious modules: antivirus, anti-spam, anti-phishing, firewall and parental control, and adds in useful extras, like online browser protection, including online banking security.

This includes Safe Money, which recently won an AV-Test innovation award. It protects banking details by combining site security checks with encrypted connections and a virtual keyboard. New features include webcam security, to stop intruders hacking into your device.

The backup module copies files to local, network or online storage,



though the package only includes the standard 2GB available free from Dropbox. Even with five devices covered, you have to buy any extra storage you need.

The software doesn't include a tune-up module, but does have a vulnerability scanner that checks for unprotected fragments of program code. There's also a tools page, which shows processor, memory, disk and network use in real-time.

Scanning a system isn't that quick. It took 1 hour, 54 minutes to scan 494,295 files from our 50GB test basket, giving a scan rate of 72.3 files/s. This lies towards

the lower end of the range of those IS products we've tested and is only slightly faster than 2013's Kaspersky PURE 3.0, which managed 68.7 files/s.

Repeating the test on the same file-set took 33 minutes to examine 174,608 files, so there's a fair degree of intelligence in not re-examining unchanged files. Again, not the best we've seen, though.

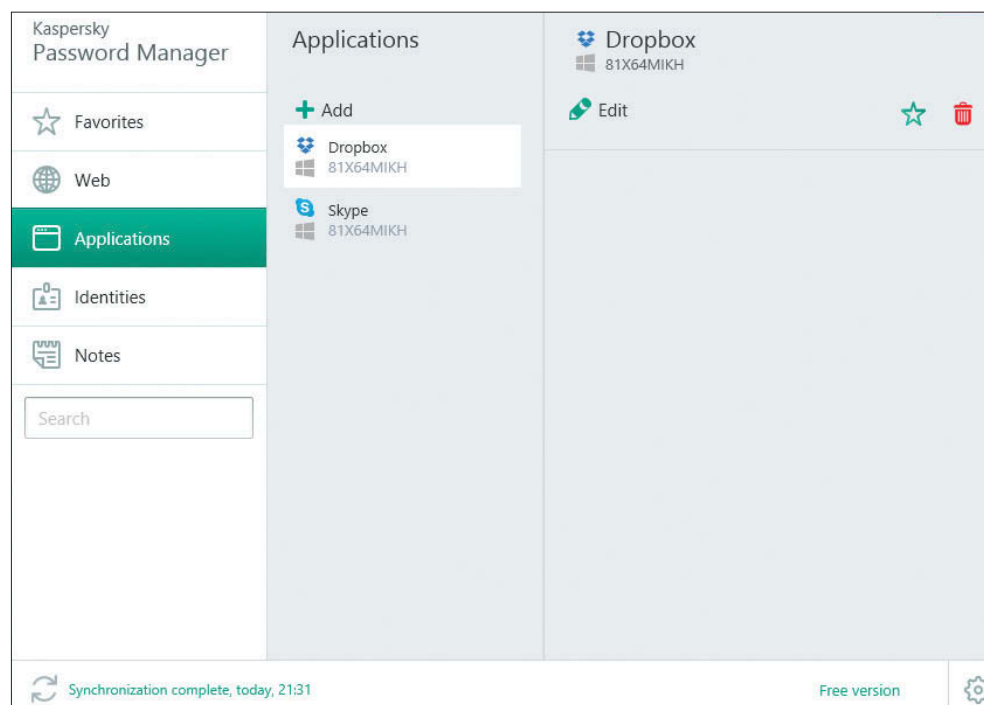
Our resource impact test measured an 8 percent increase in copy time when a Total Security system scan was running as a background task, which is good, and reflects AV-Test's (av-test.org) PC test results.

The Performance score, which measures the impact of the software on a wider range of tasks, such as visiting websites and downloading software, showed no slowdown at all for the Kaspersky software and was scored 6.0/6.0.

Finally, looking at both zero-day malware attacks and detection of widespread and new malware, the software was 100 percent accurate in spotting threats, gaining another 6.0/6.0. This gives the suite an exemplary overall score of 18.0/18.0.

## Verdict

A three-device, full protection IS suite for under £50 is good value and when that includes cover on all the major platforms, it should be flexible enough for most. Kaspersky Total Security 2015's technical strength can't be faulted either. **Simon Williams**



**£24** inc VAT**Contact**■ [ubisoft.com/en-GB](http://ubisoft.com/en-GB)

Read more

■ [tinyurl.com/o7e3ayb](http://tinyurl.com/o7e3ayb)**Specifications**

Xbox One; PlayStation 4, PlayStation 3, Xbox 360 and PC. PC system requirements: Windows 7 (SP1)/8/8.1 (64-bit only); 2.6GHz Intel Core i5-750 or 3.2GHz AMD Phenom II X4 955 processor; 4GB RAM; nVidia GeForce GTX 460 or AMD Radeon HD5850 (1GB VRAM) graphics; DirectX; broadband internet connection; 30GB drive space; DirectX-compatible sound card

**GAME**

## Far Cry 4

Far Cry 4 offers little to surprise anyone who played 2012's Far Cry 3, but frankly it doesn't need to. Refining a manic open-world shooter formula is more than enough, for the time being at least.

The setting moves from a tropical island to a despotic Himalayan kingdom, which means more diversity of environment. Icy mountain-tops, high-altitude shrines and verdant plateaus mix the aesthetic up nicely, but they also allow for a wider spread of wildlife. Which you will shoot or stab on sight, whether or not they've taken a pop at you first. This is probably not a game for vegetarians.

There is a main campaign, which tries very hard to introduce big characters and zingy lines, but often collapses into irritation for it. Far Cry 4 holds together an awful lot better when the storyline missions are put on the back burner in favour of ad-hoc chaos as you travel across its large map, looking for or inadvertently getting into trouble.

It's not a convincing living world, but rather a violent theme park wherein you can stumble into an armed convoy, a murderous honey badger or a heavily-defended fortress at any point and wind up having a micro-adventure.

To some degree, there's repetition - this is a playground for



guns, not a roleplaying game - but it hangs together because you'll tend to get diverted from whatever your objective was. A plume of smoke over there has to be investigated, a guy at the side of the road being attacked by a crazed eagle needs saving, or a gyrocopter on a cliff top must be flown. This is a game that rewards a low attention span, and it's so madcap about it that it rarely feels like a grind.

On the other hand, the 'real' game is about clearing endless icons off the map. At each, a new mini-game of sorts: seizing an enemy outpost, a race against time in a rickety car, hunting a rare animal, climbing to the top of a skyscraping observation tower. While none of these are boring (for the reasons mentioned in the previous paragraph) think about it too much and it's hard to overlook

the shallowness of it. Farmville style, you're hoovering up icons because you feel you've gotta catch 'em all rather than because you necessarily want to do the activity at each.

Between this and the sometimes screechy, ugly characterisation and dialogue, Far Cry 4 can come across as a dumb, nasty game. It knows it, too - characters in the game draw attention to it, mocking the unreality of the world and the reflexively brutal behaviour of the player. It doesn't get away with being meta, but it does get away with its shallowness because the shallowness is often a huge amount of fun - explosions, rampaging animals, hordes of reinforcements, dramatic car chases, all that good stuff. Better still, the entire campaign can be played co-operatively, so you can enjoy on-the-fly chaos with a chum.

It's also a decent stealth game if you want it to be. Pick up the right weapons or choose the right character upgrades and you can wipe out everyone in a fort without being seen. Again, this is nothing especially different from Far Cry 3, but there are far more opportunities to use it.

As a package, Far Cry 4 is great - far more opportunity for straight-up thrills than most of the comparatively stifling, self-regarding shooters of the last year. Individual elements - especially the main campaign - don't work so well or seem too vacuous on close inspection, but all put together, it's quite a party.

**Verdict**

Big, brash and chaotic, Far Cry 4 is perhaps not a huge step on from Far Cry 3, but it's more (much more) of a good thing. **Alec Meer**



**£45** inc VAT**Contact**■ [ubisoft.com/en-GB](http://ubisoft.com/en-GB)**Read more**■ [tinyurl.com/k3faye7](http://tinyurl.com/k3faye7)**Specifications**

PC; Xbox 360; Xbox

One; PlayStation 4

## GAME

# The Crew

The Crew is a massively multiplayer racer, which means it's best played online – it can't really be played offline. The undoubted highlight is Ubisoft's scaled-down map of the US, which offers a huge and varied open world to drive around with practically no restrictions.

The game promises a lot, calling itself a 'next-gen driving game', but while there are moments of brilliance and gratification, there are arguably too many failings to make The Crew great overall.

Confusion begins right from the start while you watch the gorgeous cutscene that introduces the game. You play the brother of a street racer murdered by a corrupt cop. Arrested for the crime yourself – and hell bent on revenge – you agree to be a CI (cooperating individual) for the FBI, posing as a street racer and working your way up the ranks of the 5-10 gang, which has factions all over the US.

The premise just about holds together: in the main, you must win races against the local 5-10s in order to rise through the ranks to get to the boss. Where the game falls down is in trying to do too much. Because it borrows from just about every other racer, it feels a bit like all of them, but not always in a good way.

In some races you have to escape from the cops or goons, Need for Speed-style, while in others you have to 'take down' opponents by ramming them. There are point-to-point as well as circuit races. The problem is that The Crew's AI, physics and game mechanics are all rather suspect.

The cops (and goons) have wildly overpowered cars, which are able to easily keep up no matter what you're driving. Then, you'll retry the escape only for them to somehow lose track of you when you're right in front of them, so there's no sense of achievement. It's similar in takedowns, in which it's virtually impossible to catch your enemy, but once you do, it can be ridiculously easy to disable them.

Some races are challenging because you have to win, but it's easier to do so by upgrading your car's performance or enlisting the help of up to three other players – your 'crew'. These can be friends,



or just random players who answer your request for a co-op race. If someone else can win, you reap the rewards, too. There's less of an incentive to help out players on a much lower level than you since you'll win parts that would make your car slower. You'll only get the cash alternative if you've already won the part before, but it's so minimal, it's not worth it.

Winning mission races earns you plenty of XP and some cash so you can upgrade your cars. You'll get a warning if the race will be 'hard' or impossible with your current car, so it's worth waiting until your car is better than the competition if you want an easier time. Mission races alone won't level your car (and you) up enough, so you'll have to grind through some of the 'race while you drive' events that appear on the road and involve various skills such as slalom, staying on the racing line and jumping the farthest distance.

However, you'll earn the most cash by entering public PvP races where you can race for yourself or your faction. Even if you come last, you'll be showered with XP and cash, but only by winning races and accruing points can you choose which event to race, and the type of car used.

PvP races are addictive and are one of the ways to earn enough cash to buy the most expensive cars in the game. If you prefer, you can buy credits from the Uplay store, along with a season pass that offers other benefits such as free cars.

The selection of cars on offer is pretty good but by no means extensive. The good news is that you can customise them to your

liking with decals, spoilers, alloys, body kits and even the colour of the interior leather stitching.

Even running the game on Ultra settings, the graphics look dated and grainy. It's partly saved by the varied landscape and convincing weather effects, but it certainly doesn't live up to its 'next-gen' branding – on the PC at least. It's good to find an in-car camera view although this can be a bit nauseating with the 'auto-look' mode where you look out of the side windows while cornering.

There are six types of cars: stock, street, performance, dirt, raid and circuit. You buy a 'fullstock' car and then it gets cloned into a new vehicle when you buy a street, perf, dirt, raid or circuit 'kit' for it, but not all cars support all kit types. You'll have to play for hours before even perf or raid are unlocked (Circuit doesn't unlock until level 40). You need to be in it for the long haul to get the most from The Crew.

Once you get the hang of it, all car types are fun to drive. Cars even sound good, but you have to wait until you get your first 'perf' car to hear the whistle and wastegate chatter of a turbo on, say, the Focus RS. Once again, though, it's jarring that effort has gone into such aural and visual details, including the 'working' boost gauges in cars, yet when you watch the pre-race cut scenes, front-wheel-drive cars spin their rear wheels and four-, five- or six-pot models gain V8 engines.

**Verdict**

The Crew may lack finesse because it tries to do too much, but there's just enough here to keep you coming back for more.  **Jim Martin**



£55 inc VAT

**Contact**■ [easports.com/uk](http://easports.com/uk)■ [Read more](#)■ [tinyurl.com/Lhv736h](http://tinyurl.com/Lhv736h)**Specifications**

PC; Xbox 360; Xbox

One; PlayStation 3;

PlayStation 4

## GAME

## FIFA 15

All sensible humans know that there are really only two footie SIMs worth playing. These are 'Pro Evo' (aka ISS) and the all-conquering FIFA. Traditionally FIFA was regarded as having the less realistic and -convincing game play, but as the name suggests it had the licences - the right to use the correct kits, player names and team names. It had the bling, but to Pro Evo belonged the glory. The suggestion was that FIFA was a football game for the soccer fans in the new 'football' countries such as Japan and the US, while Pro Evo was the more physically correct.

This hasn't been true for a while, and certainly FIFA 14 and the interim 2014 FIFA World Cup Brazil ([tinyurl.com/Lac8b35](http://tinyurl.com/Lac8b35)) offered realistic physics and game play. (I say this as a confirmed Pro Evo man.)

Not a huge amount has changed from those previous versions. The game plays quicker than FIFA 14, but it lacks the super speed of earlier versions of FIFA. Players are definitely quicker to start and stop, which rectifies a minor weakness of FIFA gameplay. And we love the way that physical confrontations have real crunch. There's detail, too, even in the most fearsome melee. The physical shape of both player and game feels more realistic than ever before. Timing a header is tough. Picking out a player with a cross or a long pass is tricky. Timing a tackle is mega-difficult, but unlike older versions of the game this includes putting in a horror tackle. On the harder settings FIFA is hard, just as it should be. It also has improved physics. Players look like athletes both in terms of their onfield performance and the animations that detail their reactions to goals and missed chances.

Tactically the game is improved. You can crowd the keeper during corners, and lump men into the box when taking attacking freekicks. You can set your team further up the pitch from goal kicks, or pull them all behind the ball to defend a lead.

We love the career mode option of playing as an individual player. Play up front and you have to make myriad runs, putting yourself in the right place at the wrong time multiple times before you are in



the right place at just the right time to put the ball in the net. Get it wrong and you are too tired to take advantage. Play on the wing and you will spend your time waiting for possession, trying to resist the temptation to break formation in order to get on the ball. And as part of the backline you are only a moment's lapsed concentration away from playing the opposition centre forward inside.

In short, it's like playing actual football. And that's great. FIFA really has come a long way from those earlier, arcade-like days.

### Bells and whistles

So the gameplay is what it means to be. And that means that FIFA 15 comes into its own. Because all of the other stuff is superb.

Whisper it, but the broadcast-style presentation - including the commentary - is good. Entertaining even. At no stage in a mammoth gameplay session did we want to switch it off. This is a first since the days we used to play early ISS/Pro Evo with the Japanese commentary on (great days). The camera work is great, too. It feels realistic without being intrusive. You get all the views without breaking the suspension of disbelief.

Within any of the career modes, you get useful matchday info live during your games. In fact, the career modes themselves are great. You can either develop as a player or a manager, and in both the level of detail and interactivity is close to a Football Manager-like SIM, with control over the gameplay.

The level of detail on players, grounds and kits is second to none. That FIFA-branding may bring with it the whiff of Qatari backhanders, but it does mean that you get the right squads in the right colours on the right stadia. If that sort of thing

matters to you, FIFA 15 will delight. The UK version is naturally weighted toward the English Premier League, and this may be irritating to fans of lower-league clubs. This reviewer is a Leeds fan, so is predisposed to being infuriated by such things. FIFA 15 is fine on this score.

Finally, for some reason we find the pre-match training sessions less irritating than we did with previous iterations. Perhaps they are quicker, or the gameplay is just a little better.

It's difficult for EA to keep selling FIFA over and over. But if there is one feature that may make FIFA 14 owners keen to upgrade, it's the improvements to the Ultimate Team feature.

You use the online market place to buy and sell Panini-style player cards. Get the right players, and you can create your dream team. There is an element of luck, just as there is in putting together a real-world team. Players of the same nationality will tend to play well together. And simply putting together a group of superstars will not suffice.

New to FIFA 15 is the feature of Concept Squads, in which you assemble teams of any players in order to practice and decide if you want to buy them. You can also loan world-class players.

### Verdict

If you don't own FIFA 14 or 2014 FIFA World Cup Brazil, and you do like to play football simulation games on console or PC, then you need to get FIFA 15. It's as good a soccer game as we've played. The question is whether the improvements from FIFA 14 are sufficient to make it a must-buy for owners of that game. We reckon you'd have to be a pretty committed FIFA player for that to be the case. But maybe you are...  **Matt Egan**



**£26** inc VAT**Contact**■ [firaxis.com](http://firaxis.com)

Read more

■ [tinyurl.com/o9rtar8](http://tinyurl.com/o9rtar8)**Specifications**

Windows Vista SP2/  
Windows 7: Intel Core 2  
Duo 1.8GHz or AMD Athlon  
X2 64 2GHz processor;  
2GB RAM; 256MB ATI  
HD3650 or better, 256MB  
nVidia 8800GT or better,  
or Intel HD 3000 or better  
integrated graphics; 8GB  
drive space; DirectX  
9.0c-compatible sound  
card; initial installation  
requires one-time  
Internet connection for  
Steam authentication;  
software installations  
required (included with  
the game) include Steam  
Client, Microsoft Visual  
C++2012 Runtime Libraries  
and Microsoft DirectX

**GAME**

## Civilization: Beyond Earth

The venerable historical strategy series moves beyond the final frontier. Well, kind of. Once past initial impressions, Sid Meier's Civilization: Beyond Earth's alien worlds turn out to be oddly Earthly, despite the presence of feral, giant Set in a possible future for humanity, you're in control of the first off-world colonists, trying to first survive, then flourish and eventually prove the superior of rival nations' settlers. Every turn means agonising about what to build, what to research and, if that's your chosen path, who to fight.

Strange technologies, creatures and minerals abound, but swiftly most reveal themselves to primarily be analogues of those in the still-fresh Civilization V. Initially, you're on a hostile world, presented with alien foes who can't easily be bested, and a vast array of strange new science to research. Unlike Civilization V ([tinyurl.com/kuracv4](http://tinyurl.com/kuracv4)), you're not discovering arrows or mining, but orbital platforms and alien-human hybridisation. There's a great deal of intricacy to Beyond Earth's research tree, and the attendant units and buildings you add to your nascent civilization.

Its new Tech Web is a fine addition to the Civilization formula, replacing the old branching but linear progression of new scientific discoveries with a freeform spread of techs you can pick and choose from as you please. This is far better suited to long-term strategies, and planning out what



sort of Civilization you want to be – warlike, technological, cultural – you want to be from the off.

What's missing is a certain zest – this is science fiction at its most buttoned down, either too fearful or unable to depart from the relatively sombre tone of the Civilization series. Every 'planet' your game is set on looks the same, there are only a handful of aliens, all of which cease to be much of a factor after the first couple of hours of a campaign, and a new quest system, designed to present moral dilemmas such as whether to welcome or eradicate a sub-species of augmented humans, is bitty and dry. There are little ideas everywhere, but they don't coalesce into a personality.

Moreover, it doesn't take long to fall into playing a game of Beyond

Earth in the same ways we played Civilization V.

Despite great hopes to the contrary, it's difficult to deny that Beyond Earth is Civ V with a new skin and some bells and whistles hung around the edges. Of course, Civilization V is a great strategy game, and a few years old now, but it still seems too much of a going concern for its follow-up to be quite so similar. While this means Beyond Earth is built on solid foundations, it doesn't exactly reach for the stars from there.

Of course, Civilization V was much improved by its two expansion packs – it too seemed on the dry side at first. That may well be the case for Beyond Earth in time, but as well as being something of a gamble it also means potentially waiting for up to two years for it to blossom.

Beyond Earth is by no means a failure, and it certainly retains the old 'just one more turn' Civ magic to some degree, but it pulls so many punches and seems so risk averse despite the move to a wilder setting. It is a game you can learn to love, as there's no small amount of carefulness deep beneath its rather plain surface, and coaxing that out in long campaigns at the highest difficult settings or in multiplayer will keep die-hard Civheads busy.

**Verdict**

Sid Meier's Civilization: Beyond Earth doesn't exactly live up to its subtitle, but it's a solid enough strategy game if you can shrug off how familiar it feels. **✗ Alec Meer**



£415 ex VAT  
£499 inc VAT

Contact

■ viewsoniceurope.com/uk  
Read more  
■ tinyurl.com/k83x8La

Specifications

Single-chip DLP projector  
0.72m minimum throw  
distance; 1280x800 native  
resolution; 1x HDMI; VGA/  
D-Sub; Composite; USB;  
SD; 800 ANSI lumens;  
120,000:1 contrast ratio;  
up to 30,000 hours  
claimed lamp life; 90W  
power consumption; 34dB  
(32dB eco mode) acoustic  
noise; Movie, Dynamic,  
ViewMatch, Brightest,  
PC display modes;  
175x51.5x138mm; 0.83kg;  
3-year warranty

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



PROJECTOR

## ViewSonic PLED-W800

California-based ViewSonic has specialised in display equipment since the late 1980s. Four years ago, it was one of the pioneers of a new line of miniature projectors using LED illumination, though, its remarkable PLED-W500 (tinyurl.com/7wp963u) disappeared from the market within a year. But now two next-generation products, the PLED-W800 and the PLED-W600 have reappeared to fill the gap.

The product names of these two very similar projectors are based on their ANSI ratings in lumens, and we tested out the brighter of the two. The PLED-W800's 800 lumens looks dim on paper, in comparison with the typical 2000+ claimed by comparable 'hot lamp' projectors, but LED illumination seems to work from a different rule book, and in practice delivers a much brighter screen than its specs suggest.

There's some real science behind this. LED dispenses with the spinning wheel of colour filters that a hot lamp DLP projector typically uses, instead firing three banks of primary colours in rapid succession, around 40 times faster than a wheel can spin, so that much more of the emitted light ends up on the screen. On top of this there's the Helmholtz-Kohlrausch effect that defines how saturated colours appear much brighter to the human eye than mechanical measurements would predict.

### Features

The net result is a small device capable of delivering an 80in screen from a distances of about 8ft, which is easily bright enough for a PowerPoint presentation in broad daylight. The native WXGA resolution delivers 800 lines of 1280 pixels per line, which neatly fits the 1280x720 'HD Ready' specification with a few lines to spare. That's not full HD, but the projector will accept 1080p HD, downscaling accordingly.

The W800, together with its power adaptor, mains lead and associated connection cables, easily fits into the A4-sized neoprene pouch provided. Like the W500, this projector is primarily aimed at presentations for the business



traveller. In this sort of use case, you won't even need a laptop, because the MHL (multimedia high-speed link) enabled HDMI connector lets you control the presentation from your smartphone.

If you want to dispense with the wiring, for another £49 you can add an optional PJ-WPD-200 wireless USB dongle, enabling a cable-free connection up to a distance of around 900ft.

In conjunction with client software provided with the dongle, you can run a presentation from a Mac or Windows machine, or directly from an Android or iOS smartphone. The Miracast protocol is also supported for direct screen mirroring. The W800 can also deliver a presentation from a memory stick or SD card.

It isn't easy to grasp from the limited documentation how to make the built-in Office Viewer work, but once you've got the hang of it setting up the projector for a presentation is a breeze. The software can handle simple PowerPoint (including PPTX) presentations; you use the cursor arrows on the remote control to move between slides. The Viewer can also display PDFs and DOCX files, too. While the projector's WVGA resolution isn't great for small fonts, there's a digital zoom on the remote control for homing in on detail.

We successfully tested direct from a USB stick JPEG, TIFF, BMP images. We also found that movies in AVI and MKV format played directly from a memory stick.

### Image quality

For movie viewing, you'll need to draw the curtains and switch the projector into Movie mode, which subdues the colours to a more natural tone. Alternatively, you

can use ViewSonic's proprietary ViewMatch mode, which adjusts the lamp's brightness to keep the colours accurately saturated. You won't be seeing the highest of hi-def, and we detected a tendency for the focus to drift after viewing for a while, but these shortcomings are no barrier to very acceptable movie enjoyment.

The projector has its own built in SonicMode dual integrated 2W speaker system, but the sound quality from such a small device is inevitably scratchy. You can, however, shut this off by plugging a stereo 3.5mm audio jack into the socket at the rear to extract the sound into headphones or an external hi-fi unit.

Netflix offerings, delivered into the PLED-W800 from a Roku Streaming Stick via a Yamaha RX-V6777 AV receiver produced eminently watchable home cinema quality on a 100in diagonal screen thrown across about 10ft onto a plain whitish wall. As part of the size/price compromise ViewSonic has dispensed with lens shift and optical zoom, so positioning the projector is critical. Helpfully there's a standard photography quarter-inch screw fitting in its base, making it easy to mount on a camera tripod. If the projector is tilted upwards or downwards with respect to the screen automatic keystoneing kicks in to straighten out the picture.

### Verdict

Aimed at the business travel and education markets, the PLED-W800 is a highly portable piece of kit that doubles as a convincing home entertainment projector. ViewSonic claims the LED illumination has an expected life of 30,000 hours, so with no expensive lamps to replace the RRP of £499 makes this an enticing option.  Chris Bidmead

**£641** ex VAT  
**£770** inc VAT

#### Contact

■ [seagate.com/gb/en/](http://seagate.com/gb/en/)  
Read more  
■ [tinyurl.com/ma4n8Le](http://tinyurl.com/ma4n8Le)

#### Specifications

4-bay NAS drive; 1.2GHz Marvell Armada single-core ARM processor; NAS OS 4.0.94; 512MB DDR3 RAM; 2x gigabit ethernet; 2x USB 3.0; 173x173x217mm

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



## NAS DRIVE

### Seagate NAS 4-Bay

A complete network storage solution and private cloud for power users – that's how Seagate ambitiously bills its latest 4-bay NAS drive.

The industrial design of this near-cubic black box is even sleeker than before, in all black finish with notably sharp corners and similarly square detailing. It's Windows 8 gone all noir, which we found here to make a not entirely unattractive overall impression. The light-sinking blackness is provided some relief by a line of brilliant white LEDs on the fascia, including four that flicker for individual disk activity.

Construction is all plastic – front, sides and back. This NAS box follows the usual approach of front-loaded hard disks, these mounted in individual caddies which are removed by pulling on small lever tabs at the top. Two gigabit ethernet ports are included at the back, as well as a single USB 3.0 port and large integral cooling fan of 120mm diameter. There's another USB 3.0 port at the front of the box. The second network port is more of a backup option though, since the unit is too underpowered to undertake any link aggregation of two gigabit lines to enhance performance.

Powering the Seagate NAS 4-Bay is a 1.2GHz ARM processor, a single-core Marvell ARMADA 370/XP. That may be a step up from the rather pedestrian 700MHz Cavium Econa CNS3420 dual-core ARM we found in its predecessor. Besides a higher aggregate clock, the Marvell has a slightly later ARMv7 architecture, against the Cavium's ARMv6. Memory is also expanded, from the Business NAS' paltry 256MB to a still rather limited 512MB DDR3 RAM.

This Seagate NAS 4-Bay is running a new version of the company's Linux operating system, now up to NAS OS 4.0. This offers a trendy Windows 8/iOS 7-style interface that's sparse-looking and with thin-weighted sans-serif typography and upper-case text.

Main options are listed textually down the left-hand side of the interface, and clicking a selection here brings up the relevant controls in the main pane on the right. Beside the usual SMB and AFP file services (both on by default) there are software servers for (S)FTP, UPnP/



DLNA and Time Machine, among others. Fine-grained control over some features is missing as far as we could tell; for example, limit on space available for Mac backups through Time Machine.

#### Performance

We tested the unit with four 4TB Seagate NAS SATA disks preloaded inside. Windows and OS X computers were used, and both SMB and AFP filing protocols. The NAS was tested with its default SimplyRAID configuration, which gives one-disk fault tolerance on a four-disk array, just the same as RAID 5.

Tested in Windows with the easy ATTO Disk Benchmark test, the software indicated read speeds up to around 110MB/s and write speeds to 55MB/s, which are good results although this test has the least correspondence with real-world performance. CrystalDiskMark showed a maximum sequential write speed figure of 52MB/s. The sequential read speed here was only 64MB/s, although this test in CDM should not be trusted when testing network storage.

Single-threaded 4kB random reads and writes were reported as 9.6- and 5.3MB/s respectively. Using the benchmark software's highest queue depth of 32, random read/write activity could reach 28- and 20MB/s respectively.

The slowness issue was most apparent when connecting to a Mac via AFP. And by default, we found that only the AFP service is broadcast over Bonjour, so that is the way that most Mac users will connect this drive. Best performance with 'large' (2- to 10MB) files tested in QuickBench showed average

speeds of 109MB/s reads but just 21MB/s writes. When tested with the 'extended' data set (20- to 100MB), which usually returns best possible results, write speeds rose slightly to 29MB/s; but read speeds tumbled to just 62MB/s when averaged.

Most troubling was the small-file transfer speeds. Whether using sequential or random-access tests, the Seagate NAS returned figures of 45MB/s for reads, and 2MB/s for writes (averaged with 4- to 1024kB files). Looking specifically at 4kB data, write speeds dawdled at just 0.06MB/s, or 60kB/s. In a potential real-world scenario of copying a large number of Word text documents to the drive, each sized at 32kB, the write speed was found to be only 0.5MB/s.

At that speed, assuming you wanted to fill the 12TB available space just with 32kB text files, with the drive working at its top speed, it would take over nine months to copy all your files across to it. That should give pregnant pause for thought. File writing performance using SMB in OS X was somewhat better for small file transfers. Here we recorded average reads at 25MB/s and writes 19MB/s.

#### Verdict

The Seagate NAS 4-Bay is a handy self-contained storage solution, with one of the world's few remaining disk manufacturers putting its disks into a working network-attached storage basket. Given the empty chassis' value at around £250, you can get more for your money by sourcing a NAS unit from a specialist like QNAP or Synology, and still keep the budget under £300 before you invest in disks. **Andrew Harrison**

# PORTABLE

We round up six of the best portable hard disks to see what the traditional technology has in store. **Andrew Harrison** puts them through their paces

Photography by Dominik Tomaszewski



**S**olid-state storage may be sexy, but if you're looking for huge capacity and tiny prices, then the classic hard disk remains unbeaten. Available capacities of portable drives with laptop-style disks inside now extends up to a whopping 2000GB, more commonly referred to as 2 terabytes (TB). Most portable USB drives are powered from the connected

computer, so you can use them on the move without the need to plug into the mains.

## Capacity

Even the smallest portable hard drive you'll likely find today will be 500GB in size, which is enough space to hold around 2000 CD albums in decent lossless FLAC format, or twice that number in lower quality MP3

# HARD DRIVES

or AAC format. Off-loading your music collection alone from a computer to a portable drive can be a godsend in freeing valuable space if your laptop has limited SSD storage, for example.

Another popular application of a portable hard drive is for keeping critical backups of your data held on a PC or laptop. You may be able to keep a perfect clone of your entire computer's internal drive, on standby and ready in the event that the computer is lost or its drive should malfunction. Alternatively, you may choose just to back up the most important files and documents from your user libraries, such as text documents, photos, films, music and stored email. Some portable drives include software that can help automate this process, keeping your selected directories in sync whenever you plug in the drive or by a daily schedule.

## Performance

Now that USB 2.0 has been banished from all self-respecting storage, we find USB 3.0 as the standard for connection, letting these portable drives perform as quickly as the little disks inside will allow.

This means that when transferring your music or video collection to or from your PC, you can expect around 100MB/s read speed (and typically the same for writing, since unlike flash storage technology the read and write speeds tend to be more symmetrical). Compare this with the older drives using USB 2.0, which would limit speeds to around 35MB/s, or only one-third the speed. So in real terms, your 100GB of media files would take close to an hour to transfer with USB 2.0, or under 20 minutes using USB 3.0.

If you're likely to be storing or backing up many small files, be aware that overall performance will plummet since hard disks

tend to choke on smaller files. So while large files may zip across at 100MB/s, the smallest will likely travel at less than 1MB/s, or one hundredth that speed.

## Protection

A rugged exterior will be handy if you want the freedom of being able to throw around the unplugged drive with less worry that it will damage the unit; and more importantly lose your data.

Look out for shock-resistance ratings such as the US military MIL-STD-810F 516.5 (Transit Drop Test). This means that it should withstand being dropped 26 times onto a hard floor, once on to each face, edge and corner, from a height of 1.22m.

The drive does not need to be switched on to pass - we don't believe any hard disk would survive that test - and nor does it require independent verification before a manufacturer can promote its product as 'milspec shock-resistant'. But the rating is an indication that the manufacturer has probably taken more care in nurturing the delicate disk inside.

## Extras

Besides the drive itself, you can expect to find more extras included with the product. A slip-on case or even just a simple cloth pouch can prove invaluable, letting you store the drive in the bottom of a laptop or handbag without it collecting scratches and dents - or in the case of metal-cased storage drives, of leaving scratches and dents on everything around it.

At least one USB cable will be included, and you may find additional Y-cables that allow you to piggyback more power from a neighbouring USB port. This is mandatory for some portable drives, which demand

more power than a single USB port can provide, for example.

## Value

For many users, a portable storage drive may be an unavoidable commodity, and price will be the deciding factor. We give a value rating based on how much each gigabyte of storage is costing you for each drive. Particularly with the largest 2TB drive, you can expect to find storage for under 5p per gigabyte now.

## Security

The larger the drive, the more you can store - and the more you stand to lose in the event of losing the drive or having it stolen. This is where it pays to lock down that drive.

There are two ways to ensure the data is unreadable by other users. You can scramble the contents through hardware encryption, such as the iStorage drive in this group. Or you can use a software application to encrypt either parts or all of the drive.

The hardware-encryption option is good for defeating keyloggers and other malware already installed on your PC, and this solution also tends to be platform agnostic, so works as well with Windows, Linux or Mac computers. The disadvantage is that the security is hard-coded into the drive, so that in the event of a vulnerability being discovered there's little chance of upgrading or fixing it.

Software encryption can be more flexible, but ensure that it works on your chosen computer platform. Ideally the software should be open-source to reduce the chance of it being compromised by deliberate back doors introduced by the developer. Unfortunately since the demise of TrueCrypt there is no cross-platform data encryption software that fits this requirement.

## iSTORAGE DISKASHUR PRO

**£269** inc VAT • [istorage-uk.com](http://istorage-uk.com)

If you use a portable drive for business, there's a very strong case to keep that data secure with a hardware-encryption drive. And with customer data at stake, there's a legal obligation to keep it confidential in the event of the drive being compromised.

The diskAshur Pro follows a line of similar drives sold in this country by iStorage Limited, which are rebranded and renamed drives designed by and made for Apricorn in the USA. This version is available in a new Pro version, gaining a FIPS 140-2 rating. This is thanks to the use of a validated cryptographic module; compare this with the older non-Pro version. It's listed only as FIPS PUB 197-validated, which means it uses AES encryption algorithm.

It looks almost identical to the standard non-Pro diskAshur, although there is one extra key on the clicky membrane number pad. This is a Shift key, like that on a Qwerty keyboard, which can be optionally used with the usual 0 to 9 numbers to create a much larger PIN code keyspace.

The unit is made from matt black plastic that has been treated with a rubber-like finish. The keypad requires some careful finger pressure to activate each key. Attached to the right side is a tethered USB cable with around 110mm of available length. If that's too short a USB 3.0 extension cable is included.

Inside is a 2.5in SATA disk; in our sample a 1TB disk from Toshiba. Other capacities include 500GB, 1.5- and 2TB. You can also specify the drive with a SSD between 128- and 512GB capacity.

When first set up, the diskAshur requires you to create your own PIN code of between seven and 16 numbers. Without the Shift key, our back-of-the-napkin calculations suggest there are around  $10^{16}$  PIN permutations; by raising the keyspace from 10

|             |       |
|-------------|-------|
| Build       | ★★★★☆ |
| Features    | ★★★★☆ |
| Performance | ★★★★☆ |
| Value       | ★★★★☆ |
| Overall     | ★★★★☆ |



to 20 buttons there could be more than 10 to 20 possible PINs. Or 10,000 times more numbers available.

Despite the added hardware encryption, the diskAshur Pro proved to be able to run at the same speed as rival unencrypted drives. Its 1TB Toshiba disk could read and write sequentially in Windows at around 115MB/s, while OS X benchmarks suggested speeds of around 103MB/s. Small 4kB files suffered the usual slowdown, here to 0.58- and 0.27MB/s for random reads and writes. The Mac test bed showed small file averages of 16.7MB/s random reads and 7MB/s random writes.

**VERDICT:** The diskAshur Pro is the most expensive drive here, but performs well and will keep out most intruders.

## LACIE MIRROR

**£230** inc VAT • [lacie.com/uk/](http://lacie.com/uk/)

French computer peripheral specialist LaCie is well-known for its stylish and unconventional products. Indeed, the company frequently commissions talented industrial designers to craft new products, which is the case here.

The Mirror is simply and aptly named, a portable storage drive that is covered on every facet with reflective mirrors. Designed by Pauline Deltour, a graduate of Paris design schools, the drive is available in just one version with a 1TB hard disk inside. But also included with the drive is a wooden desk stand that allows the Mirror to be showed off at a reclining angle when placed on the desk.

The construction looks simple, a plastic rectangular slab 13mm thick that has glass panels glued to its top, bottom and sides. The only relief from this symphony of reflectivity is a Micro-USB 3.0 port on one end, and some light printing along one edge with CE marks and product code.

The glass mirrors are fashioned from aluminosilicate Gorilla Glass, popularised by the iPhone and now used on almost every other smartphone and tablet screen. This affords it some scratch-resistance, so it's less likely to shatter if mishandled. Also in the box is a useful cloth carry bag, and even a polishing cloth. Unsurprisingly, the shiny finish is a positive magnet for your fingerprints.

The stand is made from a dense hardwood, Indonesian ebony, with a cutout to support the drive and a second groove where you could place a pen; or as likely an eyebrow pencil.

You must use LaCie's setup program to unlock the drive and format for your chosen PC platform. This was flaky when we tried in Windows 8, the program crashing every launch, so we used a

|             |       |
|-------------|-------|
| Build       | ★★★★☆ |
| Features    | ★★★★☆ |
| Performance | ★★★★☆ |
| Value       | ★★★★☆ |
| Overall     | ★★★★☆ |



Mac to set it up. Due to the glued-together construction we were unable to disassemble the drive, but it proved to have an averagely zippy notebook hard disk inside. In Windows 7 its top sequential speed was 110MB/s, while small random 4kB files transferred at 0.57MB/s for reads and 0.27MB/s writes.

Tested in OS X, we saw sequential speeds of 106MB/s. In the small-file test with 4kB to 1024kB data, it averaged 16.8MB/s for random reads and 8.18MB/s for random writes.

**VERDICT:** The LaCie Mirror performed perfectly well but be prepared to pay to peer through this looking glass - at £230 it is five times the price of more function-first models.

**SEAGATE SEVEN MM****£99** inc VAT • [seagate.com/gb/en](http://seagate.com/gb/en)

Since the rise of the SATA SSD we've seen internal notebook hard disks slim down to match, reducing from 9.5- to 7mm in thickness. Now Seagate has closed the gap again by introducing the Seven mm, a complete portable hard drive that is itself just 7mm thick.

While it's easy to find a 2.5in SATA disk of 7mm thickness, by the time it's slotted into an enclosure, the overall size tends to swell to around 11mm or more. It's not clear how Seagate has built this drive, but we'd guess it's a single-platter mechanism that expands the raw airtight disk case into becoming the entire drive case.

It's made from tough stainless steel with a basic, industrial matt finish. The sides are slimmed down as if the entire unit was stamped and sealed on the production line. In short, this is geek chic, a tough lump of metal with just a Micro-USB 3.0 port on one crimped edge.

Special mention goes to the cable, a 46mm-long USB 3.0 cable that has been finished with a nylon braid. Like that issued with stablemate LaCie, this woven fabric jacket lends a feel of quality to what is otherwise seemingly an afterthought thrown into the box.

With so little space to work with, Seagate could only build a hard disk with a single platter; most laptop disks use two or even three platters. The single-platter technology can sometimes undermine performance slightly, especially under multiple data access conditions that you might need on a computer boot drive.

In our tests with Windows 8.1, we saw maximum sequential write speeds at just 49MB/s, although with Windows 7 this was restored to a more typical figure of 101MB/s. That's still the slowest of the group, along with the 102MB/s sequential read speed. Tests in OS X also returned the lowest figures, of 98- and 95MB/s respectively for sequential reads and writes.

|             |       |
|-------------|-------|
| Build       | ★★★★☆ |
| Features    | ★★★★☆ |
| Performance | ★★★★☆ |
| Value       | ★★★★☆ |
| Overall     | ★★★★☆ |



Small files transfer performance reversed this trend with some of the best figures in the group. While 4kB random reads languished at around 0.5MB/s, typical for such disks, the 4kB random writes was around three times faster than most of the competition, if still only at 0.75MB/s. Nevertheless this bodes well for speeding up many daily tasks with small data files. In OS X, the Seven mm also worked better than most, averaging 15.3MB/s for random small-file reads and a class-leading 14.8MB/s for random writes.

**VERDICT:** At £99, or just under 20p per gigabyte, the Seagate Seven mm is currently priced rather expensively for its limited 500GB-only capacity. It does offer something quite different in industrial design though, and should be relatively robust, too.

**TOSHIBA CANVIO BASICS****£76** inc VAT • [toshiba.co.uk](http://toshiba.co.uk)

While many portable drive manufacturers try to differentiate their product through design or features, Toshiba looks to be content just to build the cheapest drive it can. That's not such a bad thing if you just want somewhere to keep your data rather than something to show off on your desk, providing no shortcuts have been made that could compromise performance or longevity.

Like fellow diskmakers Seagate and Western Digital, Toshiba has been able to shave some useful millimetres from the overall dimensions of this drive. Not in thickness as we saw with Seagate's Seven mm drive, but in length. Instead of adding a SATA-to-USB circuit board into the casework, Toshiba has engineered a raw disk with USB connectivity built right in. This has allowed it to build a complete portable hard drive that's just 111mm long. It's 21.4mm thickness, on the other hand, makes it the fattest of the group.

The case is made from basic black plastic, gloss on top, matt to the sides, that is snapped closed. There's the usual Micro-USB 3.0 port on one end, the company logo on top, and that's it. Lack of frills extends to the box contents, with no carry pouch to be found. That's a pity as our previously reviewed sample was covered in scratches across the top, potentially just from being carried loose in a bag.

Three storage capacities are available, 500GB, 1TB or the 2TB that we were loaned for testing. While we didn't look inside, the bench test numbers suggest that Toshiba may have installed a 2TB disk based on the Toshiba MQ01ABD100 disk also used by iStorage.

Sequential reads and writes in Windows came in at 117- and 114MB/s, and small-file transfers dropped to the 0.56- and 0.27MB/s figures we've seen with similar notebook-disk portable drives.

|             |       |
|-------------|-------|
| Build       | ★★★★☆ |
| Features    | ★★★★☆ |
| Performance | ★★★★☆ |
| Value       | ★★★★☆ |
| Overall     | ★★★★☆ |

**PC ADVISOR**  
RECOMMENDED

The Canvio Basics worked well with OS X, too, returning sequential results of 109MB/s reads and 106MB/s writes. Small-files averaged 16.7MB/s, a fairly typical result, but in the same write performance test with data sized from 4- to 1024kB, the Canvio Basics had the slowest overall speed of just 5.73MB/s.

**VERDICT:** The Toshiba Canvio Basics lives up to its name, a basic portable. However, there's also little sign of any compromise in its overall performance and usability, excepting a slower than usual small-file random write issue. Importantly for many potential users, it's one of the cheapest drives available at less than 4p per gigabyte, with seeming to compromise its build quality sufficient for its role.

## TRANSCEND STOREJET 25M3

**£83** inc VAT • [uk.transcend-info.com](http://uk.transcend-info.com)

Transcend's StoreJet 25M3 is a portable hard drive built to be more resistant to shock than most such products. It's aided by a tough rubberised jacket and internal damper frame. Available in three capacities: 500GB, 1- and 2TB. We tested the largest option.

This drive has a dark-grey silicone jacket that Transcend calls Iron Gray, with a bright green end cap and green trim line. An unusual addition to this drive is the One Touch Auto-Backup Button, a blue-ringed push button on the end cap that's designed to simplify the backing up of data to the drive. To work, it requires you first install the included Transcend Elite software, which can undertake various tasks such as on-demand and scheduled backups.

To use the One-Touch feature, after first installing the software on your PC you must create your own backup task; for example, to duplicate the contents of your Documents and Pictures libraries to a folder you've created on the drive. The next step is not clear, especially since there are no instructions included with the unit nor available to download. You must enable the One Touch Button feature on the task you created, by clicking a near-invisible circular grey icon under a column headed OTB. This symbol will then turn orange.

The 2.5in SATA hard disk inside the StoreJet proved to be quite the fast performer. In headline sequential speed tests of the near-empty disk, it could read and write at more than 135MB/s, which exceeds the 100- to 110MB/s we usually find with 5400rpm drives.

|             |       |
|-------------|-------|
| Build       | ★★★★☆ |
| Features    | ★★★★☆ |
| Performance | ★★★★☆ |
| Value       | ★★★★☆ |
| Overall     | ★★★★☆ |



Small-file transfer performance is also important, and here the it averaged 50MB/s reads and writes, testing with 512kB files. Tested with 4kB random IO, its speed dropped to around 0.5MB/s for reads and writes. The higher-than-average theme continued when tested in OS X, returning sequential speeds in excess of 130MB/s, random reads averaging almost 20MB/s and random writes of over 14MB/s.

**VERDICT:** At less than £85, the Transcend StoreJet 25M3 is great value for a decently resilient portable drive.

|                                  | <b>ISTORAGE</b><br><b>£269 inc VAT (£224 ex VAT)</b><br>★★★★★ | <b>LACIE</b><br><b>£230 inc VAT (£191 ex VAT)</b><br>★★★★★ | <b>SEAGATE</b><br><b>£99 inc VAT (£82 ex VAT)</b><br>★★★★★ |  |
|----------------------------------|---------------------------------------------------------------|------------------------------------------------------------|------------------------------------------------------------|--|
| Model name                       | <b>diskAshur Pro</b>                                          | <b>Mirror</b>                                              | <b>Seven mm</b>                                            |  |
| Product code                     | IS-DP3-256-1000F                                              | 9000574                                                    | STDZ500400                                                 |  |
| Capacity tested                  | 1TB                                                           | 1TB                                                        | 500GB                                                      |  |
| Capacities available             | 500GB, 1-, 1.5-, 2TB                                          | 1TB                                                        | 500GB                                                      |  |
| Drive inside                     | Toshiba MQ01ABD100                                            | Unknown                                                    | Seagate                                                    |  |
| Protective case                  | Yes                                                           | Yes                                                        | No                                                         |  |
| Cable                            | 110mm                                                         | 460mm                                                      | 460mm                                                      |  |
| Dimensions                       | 120x85x19.8mm                                                 | 128x80x13mm                                                | 123x82x7mm                                                 |  |
| Weight                           | N/A                                                           | 245g                                                       | 178g                                                       |  |
| Weight with cable                | 213g                                                          | 265g                                                       | 199g                                                       |  |
| Price per gigabyte               | 26.9p/GB                                                      | 23p/GB                                                     | 19.8p/GB                                                   |  |
| WINDOWS 7                        |                                                               |                                                            |                                                            |  |
| Sequential reads                 | 116                                                           | 110                                                        | 102                                                        |  |
| Sequential writes                | 114                                                           | 109                                                        | 101                                                        |  |
| Random reads (4kB QD32 )         | 0.58                                                          | 0.57                                                       | 0.51                                                       |  |
| Random writes (4kB QD32)         | 0.27                                                          | 0.27                                                       | 0.75                                                       |  |
| MAC OS X                         |                                                               |                                                            |                                                            |  |
| Sequential reads                 | 103                                                           | 106                                                        | 98                                                         |  |
| Sequential writes                | 102                                                           | 106                                                        | 95                                                         |  |
| Random reads (avg 4- to 1024kB)  | 16.7                                                          | 16.8                                                       | 15.3                                                       |  |
| Random writes (avg 4- to 1024kB) | 7.01                                                          | 8.18                                                       | 14.8                                                       |  |

**WESTERN DIGITAL MY PASSPORT ULTRA METAL****£91 inc VAT • wdc.com/en/**

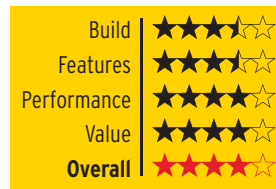
The My Passport Ultra Metal has a shiny metal top chassis, but also features a plastic bottom. This wouldn't be so bad if there were some rubber feet, but unfortunately the hard plastic bottom does mean the drive can all too easily slide around the desk.

The sides have a subdued satin sandblast finish, but the top catches the eye with its circular polish pattern. The centre of these subtle concentric circles coincides with the company WD logo and My Passport Ultra name, and faint chromatic patterns can be seen as you tilt the unit in the light.

Three colour options are available: a light natural silver; dark blue, almost black anodised; and a gold-effect finish that WD bills as its anniversary drive. Overall construction quality is below that of the company's Studio and Air drives, but price is also reasonably competitive at around £90 for the largest 2TB version, or 4.5p per gigabyte. The drive is available in either 1- or 2TB storage capacities.

Two software utilities are included with the drive – WD Drive Utilities, which provides SMART error status, adjustable sleep timer and drive erase. And WD Security, which allows you to add a password to protect the drive contents using its built-in 256-bit encryption engine.

Overall performance was just above the average of comparable drives featuring 1- or 2TB disks. In Windows large sequential reads and writes zipped by at 114/113MB/s, while small random



reads and writes fell to the usual crawl of around half and one-quarter of 1MB/s respectively. Tested in OS X, the benchmark test reported 110MB/s reads and 108MB/s writes, while the average of small random file transfers sized 4- to 1024kB was 16.1MB/s averaged reads and 8.1MB/s average writes.

**VERDICT:** The My Passport Ultra Metal offers good value as a solidly constructed portable drive. It has good software support and decent all-round performance for the category of portable disk.

| <b>TOSHIBA</b><br><b>£76 inc VAT (£63 ex VAT)</b><br><b>PC ADVISOR</b><br>RECOMMENDED |  | <b>TRANSCEND</b><br><b>£83 inc VAT (£69 ex VAT)</b><br><b>PC ADVISOR</b><br>BEST BUY |  | <b>WESTERN DIGITAL</b><br><b>£91 inc VAT (£75 ex VAT)</b><br><b>PC ADVISOR</b><br>RECOMMENDED |  |
|---------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------|--|-----------------------------------------------------------------------------------------------|--|
| <b>Canvio Basics</b>                                                                  |  | <b>StoreJet 25M3</b>                                                                 |  | <b>My Passport Ultra Metal</b>                                                                |  |
| HDTB320EK3AA                                                                          |  | TS2TSJ25M3                                                                           |  | WDBEZW0020BSL-EESN                                                                            |  |
| 2TB                                                                                   |  | 2TB                                                                                  |  | 2TB                                                                                           |  |
| 500GB, 1-, 2TB                                                                        |  | 500GB, 1-, 2TB                                                                       |  | 1-, 2TB                                                                                       |  |
| Toshiba                                                                               |  | Samsung Spinpoint M9T                                                                |  | Western Digital                                                                               |  |
| No                                                                                    |  | No                                                                                   |  | No                                                                                            |  |
| 450mm                                                                                 |  | 450mm                                                                                |  | 460 mm                                                                                        |  |
| 111x79x21.4mm                                                                         |  | 130x82x19mm                                                                          |  | 110x80x18.9mm                                                                                 |  |
| 207g                                                                                  |  | 234g                                                                                 |  | 241g                                                                                          |  |
| 229g                                                                                  |  | 266g                                                                                 |  | 263g                                                                                          |  |
| 3.8p/GB                                                                               |  | 4.15p/GB                                                                             |  | 4.55p/GB                                                                                      |  |
| 117                                                                                   |  | 138                                                                                  |  | 114                                                                                           |  |
| 114                                                                                   |  | 137                                                                                  |  | 113                                                                                           |  |
| 0.56                                                                                  |  | 0.55                                                                                 |  | 0.58                                                                                          |  |
| 0.27                                                                                  |  | 0.49                                                                                 |  | 0.28                                                                                          |  |
| 109                                                                                   |  | 133                                                                                  |  | 110                                                                                           |  |
| 106                                                                                   |  | 131                                                                                  |  | 108                                                                                           |  |
| 16.7                                                                                  |  | 19.9                                                                                 |  | 16.1                                                                                          |  |
| 5.73                                                                                  |  | 14.3                                                                                 |  | 8.07                                                                                          |  |



## Conclusion

From this group of six portable USB hard drives, all performed well in our tests and should present few problems in essential performance. Choosing between hard drives from this selection will be influenced more by your intended use, budget and sense of style.

Most original in concept, if not perhaps to everyone's taste, is the shiniest storage we've seen since LaCie's last outrageous design statement, the silver-plated Christofle Sphère mirror ball with its 1TB hard disk. The LaCie Mirror carries a hefty price premium so it will never be the value choice, but if you want to cheer up your desk as you reflect on your day, look into designer Pauline Deltour's specular creation.

Also at the top end of the price spread is the diskAshur Pro from iStorage UK. It includes a crypto module that's been signed off for US civilian contractor work, has an

expanded PIN keyspace thanks to an added Shift key, and also now includes a wear-resistant keypad. You're unlikely to keep out nation-state intelligence teams, but this FIPS 140-2 Level 2 design will deter the casual intruder, and has the great benefit of not being vulnerable to the usual keylogging malware found on Windows PCs.

Seagate is one of the world's three remaining disk manufacturers, a position that's allowed it to craft a thin portable drive solution in the Seagate Seven mm. The slim case limits capacity to 500GB, but that's still a decent capacity that can slip into a shirt pocket. In contrast to the glitzy LaCie Mirror, it has a more agricultural engineering style treatment, but if you want a tough-looking drive that will double as conversation piece the Seven mm is a one-off.

The remaining three drives are much more mainstream commodity products,

priced at a quarter the price of all the above at under 5 pence per gigabyte. The Toshiba Canvio Basic strolls through the value category, offering a perfectly workable portable drive with 2TB capacity for under £80. If you prefer the idea of a stronger case and little more sense of quality - not to mention useful cross-platform software extras - then the WD My Passport Ultra Metal will answer your needs while still keeping the price in the two- rather than three-digits price category.

Our Best Buy award goes to the Transcend StoreJet 25M3, which includes useful rubber armour against the battering of daily mobile use, while keeping overall price well within the sensible league. It doesn't hurt that, along with its Apple Mac-style StoreJet 100 counterpart, it's also the fastest single-disk portable hard drive we've seen by a decent margin.

## How we test

We independently lab test portable storage drives to gauge their data-transfer performance, using a variety of benchmark applications for Windows and OS X platforms. Drive partitions are normalised to FAT, if the drive isn't already set to exFAT format, which is the current best-practice choice for Win/OS X interoperability.

For this group test, we tested sequential read and write speeds with CrystalDiskMark 3.0, on both Windows 7 and Windows 8.1

computers (although given the near-identical results between these two operating systems from such disk-based drives, only the Windows 7 results have been reproduced).

For the Mac platform, we use Intech QuickBench for a comparable measure of large-file sequential speed testing. While this application lacks queue-depth, testing it can be useful to look at datarates for a sequence of random small files, sized between 4- and 1024kB. Many non-media

user files will fall into this size bracket, making this test a good guide to everyday file transfer speed.

Using the Windows CDM test, we can also look at parallel data streams to a queue depth of 32. While disk-based portable storage technology rarely show much difference than running the same test at QD=1, substantial improvements in performance can often be observed with faster USB 3.0 flash drives. ☒



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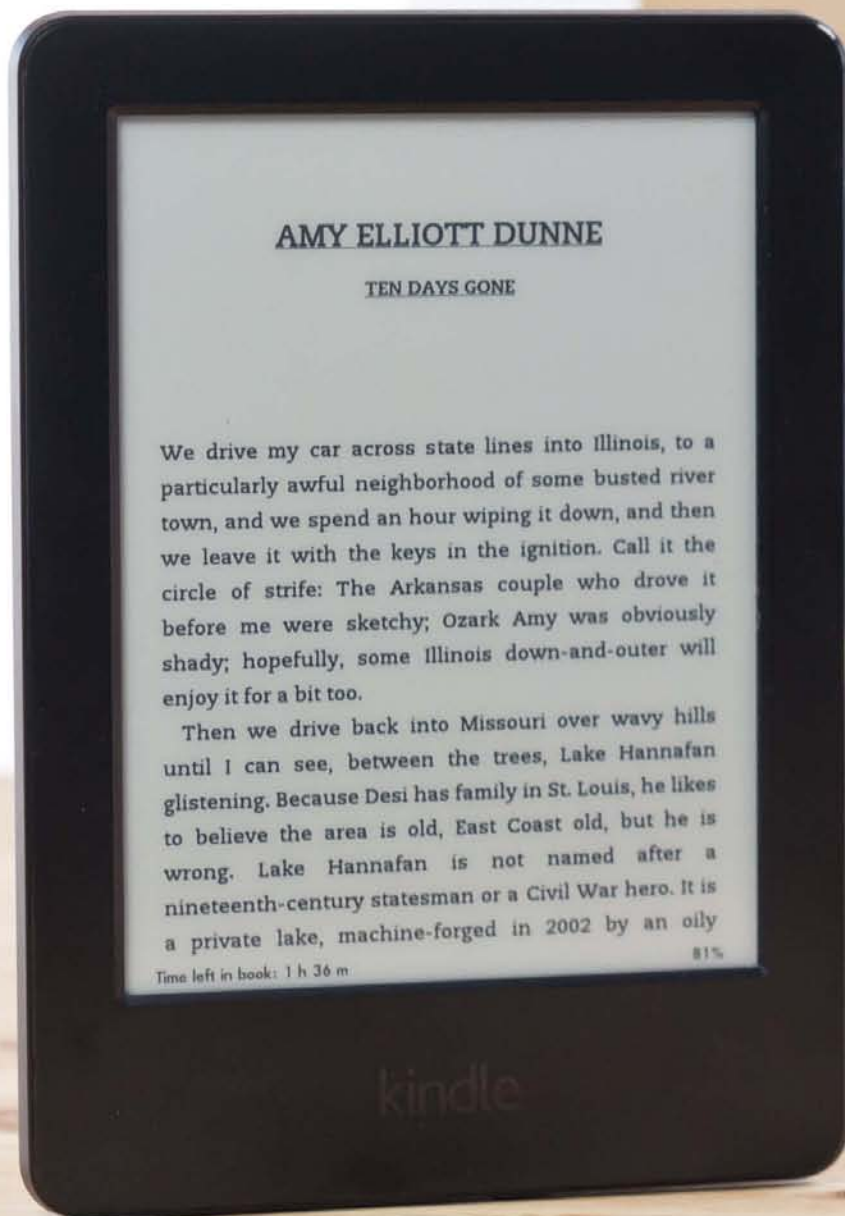
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# THE BEST e-readers YOU CAN BUY

With an e-reader, you'll never be stuck for something to read. **Jim Martin** reveals seven of the best

**Y**ou can read ebooks and magazines using apps on your smartphone or tablet, but there are plenty of reasons why investing in a dedicated e-reader is a good idea. Not only are they a lot cheaper, but they're simply a better tool for the task in hand. They can also be lighter than a book, yet store hundreds of books, so you can read your way through a fortnight-long holiday just by taking your e-reader along.

Most e-readers have a 6in E Ink screen. It looks much like paper and is easier on the eyes than the colour LCD screen of a phone or tablet. E Ink screens excel in bright sunlight, which can cause reflections on the glossy screens of other mobile devices. They are also an ideal size and weight to comfortably cradle for prolonged periods. Most modern e-readers have a touchscreen and weigh around 200g, so will happily slip into your bag or an oversized pocket for reading on the road.

Battery life is also much better on dedicated e-readers than phones and tablets, here measured in page turns rather than hours. So while your tablet could conk out halfway home, creating a genuine cliffhanger at the most inopportune point within your

novel, an e-reader could keep going for weeks or even months without needing a recharge.

Bear in mind, though, that e-readers with built-in backlights (technically they're frontlights, but we'll use the conventional term since everyone knows what it means) will last much less time between charges if you use the light all the time.

Content is an important consideration, as your device may be restricted to its manufacturer's own bookstore. For example, Kindle e-readers are limited to Amazon's admittedly very well-stocked online bookstore, while Kobo e-readers let you browse other stores.

A memory card can boost the storage capacity for ebooks and, if supported, music, video and other media. Be sure to check which file formats a device supports – not just media, but also whether it can handle ePub, PDF, TXT, RTF and other document file types.

Also consider connectivity. While your device will probably hold more than enough books to keep you occupied until you're next in range of a Wi-Fi hotspot, a cellular connection will allow you to download content on the move. It will also add to the device's price – by £60 in the case of the Kindle Voyage.

|             |       |
|-------------|-------|
| Build       | ★★★★☆ |
| Features    | ★★★★☆ |
| Performance | ★★★★☆ |
| Value       | ★★★★☆ |
| Overall     | ★★★★☆ |



## AMAZON KINDLE

**£59** inc VAT • [amazon.co.uk](http://amazon.co.uk)

Amazon's Kindle e-reader with a touchscreen would once have set you back £109. But now, the new seventh-generation device is basically the same as the older Kindle Touch but costs almost half that.

Other than being black rather than graphite in colour, and having similar bevelled rear edges to Amazon's current tablet range, the new Kindle is little different from the 2011 Touch. It has the same 4GB of memory, which is enough for thousands of books.

It has the same 6in screen with the same 800x600 resolution, equating to 167 pixels per inch. That's low by today's standards, but on a 16-level greyscale E Ink screen, it doesn't need to be much higher. Sure, characters are sharper on the 212ppi Paperwhite (and even crisper on the 300ppi Voyage), but it won't spoil a good read.

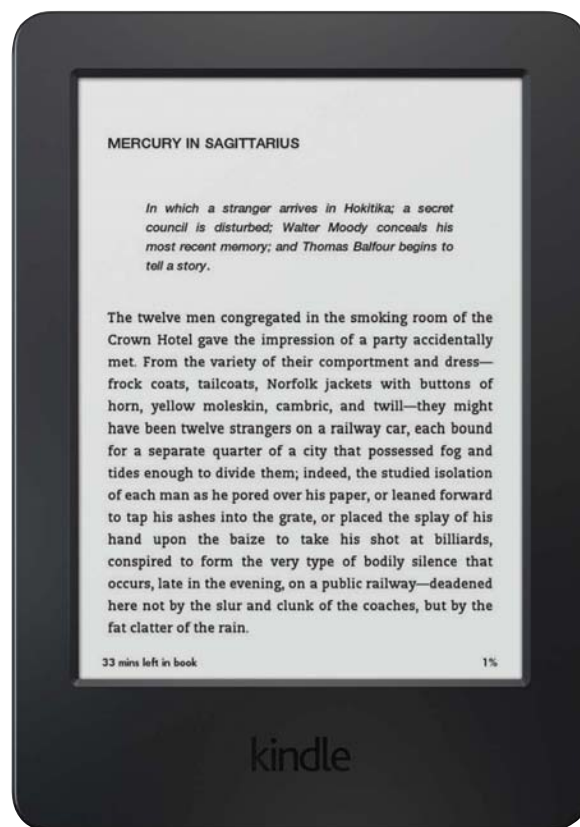
What's changed is that an even faster processor speeds up page turns. They're so fast now that you don't notice the page refreshing - it's a world away from early E Ink screens.

The touchscreen is as responsive as a modern tablet, and you can use gestures such as swiping to 'unlock' the Kindle (necessary to remove the lock-screen adverts unless you've paid the extra £10 to obliterate them) and scrolling through menus or web pages.

Anyone upgrading from a non-touchscreen Kindle will appreciate just how easy it is to type in search queries when looking for a new book in the Kindle store, searching the on-device library, typing in Wi-Fi passwords and making notes. You can tap away as fast as you like, and the Kindle will keep up.

It's a shame that Amazon hasn't managed to make the bezels at the sides any thinner to make it easier to hold the Kindle in one hand. Oddly, the new model is a few millimetres bigger in all dimensions than the old non-touchscreen model. And at 190g, it's also 20g heavier. It's still light enough to hold for long periods but it's disappointing nonetheless.

In terms of software, don't expect any difference from your current Kindle - if you've kept it up to date, that is. Amazon has been adding features regularly, and one particularly useful one is



FreeTime. You choose which books a child can read (there's no limit based on age rating), and they can earn badges when they hit their reading targets for one or more days. You can set the daily reading goal, such as 30 minutes, so the whole experience is customisable. FreeTime also blocks off the web browser and Wikipedia lookup, and stops them buying books from the store.

One recent addition is Kindle Unlimited, which costs £8 per month. It's like Netflix - you subscribe to get access to a vast catalogue of books while your subscription is active. Audiobooks are included as well as ebooks, but as this Kindle doesn't have a speaker or a headphone socket, you'll need another device to benefit.

The battery lasts for weeks if you read for short periods each day, making it much better than a tablet if you only want to read books, and charges in roughly four hours from a laptop or PC's USB port.

Amazon has designed new leather and PU cases, so you can add a splash of colour. There's the same garish yellow and magenta options as for the new Fire HD 6 and 7 tablets, plus red and purple (and black if you don't want colour). Both versions handily turn on the Kindle when you open them. The black leather will cost you a hefty £35, while the coloured PU versions are (a still hefty) £25.

## Verdict

Aside from the loss of the audio functions, you're getting a Kindle Touch for just £59. That's not bad, but don't forget there's no charger in the box. There's more competition these days, though, so if you want an e-reader with a lit screen - arguably the only important feature missing from the Kindle - you can buy the new Nook GlowLight for a few pounds more. And if you're willing to buy second-hand, eBay is full of Kindle Paperwhites, which sell for between £60 and £80. And don't forget that the new Fire HD 6 has the same reading features as the new Kindle, and costs only £20 more, so if you can live with reading on an LCD screen - which in effect means indoors - then the Fire is a great deal.

|             |       |
|-------------|-------|
| Build       | ★★★★☆ |
| Features    | ★★★★★ |
| Performance | ★★★★☆ |
| Value       | ★★★★☆ |
| Overall     | ★★★★☆ |



## AMAZON KINDLE PAPERWHITE

**£109** inc VAT • [amazon.co.uk](http://amazon.co.uk)

The Paperwhite has the same size 6in screen as most Kindles. However, the E Ink screen resolution has increased from 800x600 to 1024x768, giving it 62 percent more pixels than before.

This pixel density of 213ppi does make text crisper, but not to the degree that Amazon suggests. The main benefit is being able to read text more easily when using the smallest font sizes. Considering the Paperwhite costs the same as the Kindle Touch used to (it's no longer on sale), we're not complaining.

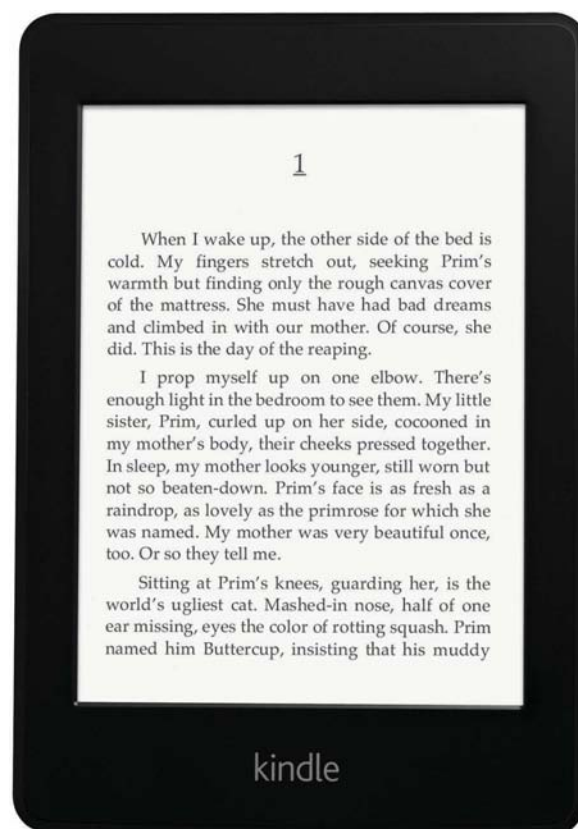
The big difference is that the Paperwhite has a built-in light: four low-power LEDs light the front of the screen. It's a feature e-bookworms have been wanting for a long time. Not only does it mean you can read in the dark, but it helps with the reading experience the rest of the time, too.

The Paperwhite's brightness can be adjusted on a scale from 0-24, so whether you're in the park in bright sunlight or in a dimly lit room you can get the screen looking perfect. In situations when you think the light is not necessary, it helps by giving the text a much whiter backdrop, making contrast better than any other Kindle. Some users complain that the light distribution is uneven across the screen but this wasn't an issue with our review sample - on the contrary, it was very even.

### Build and design

If you're upgrading from an older Kindle, you'll immediately notice the lack of buttons on the Paperwhite. There's just one: for power. Everything else is done via the touchscreen. You touch pretty much anywhere to go to the next page in a book, on the left to go back a page, or at the top to display the menu.

As it's basically the same size as the non-touchscreen Kindle, the Paperwhite should fit in cases designed for that model. The back of the device has a soft, rubbery feel and it is comfortable to hold in one hand. It weighs 213g, which is more than the 190g £59 Kindle (see opposite), although it still feels light.



The Paperwhite's interface and menus are largely unchanged from the Kindle Touch, with an extra menu item for the light. It's very easy to use, right down to browsing and buying from Amazon's vast catalogue, which also includes newspapers and magazines. Unlike some other stores, prices on Amazon are competitive, and there's no shortage of titles for under a pound, or even free.

### Whispersync

When reading a book, you can easily place a bookmark as well as make notes, or view notes you (or someone else) wrote previously. Amazon's Whispersync means you can pick up where you left off in any book on any device you're signed into - that includes the Kindle smartphone and tablet apps as well as your PC or laptop, or even another Kindle.

There's also a 3G version of the Paperwhite available for £169, so you can buy and download books even when out of Wi-Fi range. There's no contract for the cellular version - you can use it as much as you want for no additional cost.

Build quality is better than the Kindle Touch, and the Paperwhite looks more stylish in black, too.

You get 2GB of internal storage, 1.25GB of which is available to store books. You can also email documents (Word files, PDFs and others) to your unique @kindle.com email address. Unlike some e-readers, though, the Paperwhite has no slot for adding more memory, which is a bit disappointing.

### Verdict

Thanks to Amazon's unparalleled ebook library and ease of use, the Kindle Paperwhite is a fantastic e-reader to own. The screen is excellent - both the light and touch elements - and the whole device is well built. It's also light enough to comfortably hold in one hand. The Nook GlowLight is a good alternative if you think you need more storage, and it's a lot cheaper.

|             |       |
|-------------|-------|
| Build       | ★★★★★ |
| Features    | ★★★★★ |
| Performance | ★★★★★ |
| Value       | ★★★★★ |
| Overall     | ★★★★★ |



## AMAZON KINDLE VOYAGE

**£169** (Wi-Fi) inc VAT • [amazon.co.uk](http://amazon.co.uk)

Given that technology generally drops in price, launching an e-reader for £169 looks like a very bold move indeed. The Kindle Voyage looks especially expensive next to Amazon's own range of Fire tablets, which includes several models cheaper than the Voyage.

So why is Amazon charging £169 for the Voyage? Because it has the highest resolution display of any Kindle e-reader. Cramming 1440x1080 pixels into the same-as-ever 6in size delivers a pixel density of 300ppi.

Text is laser-sharp with none of the jaggedness of the screen you'll get for the £59 entry-level Kindle. It's noticeably sharper than the £109 Kindle Paperwhite's 1024x768 display.

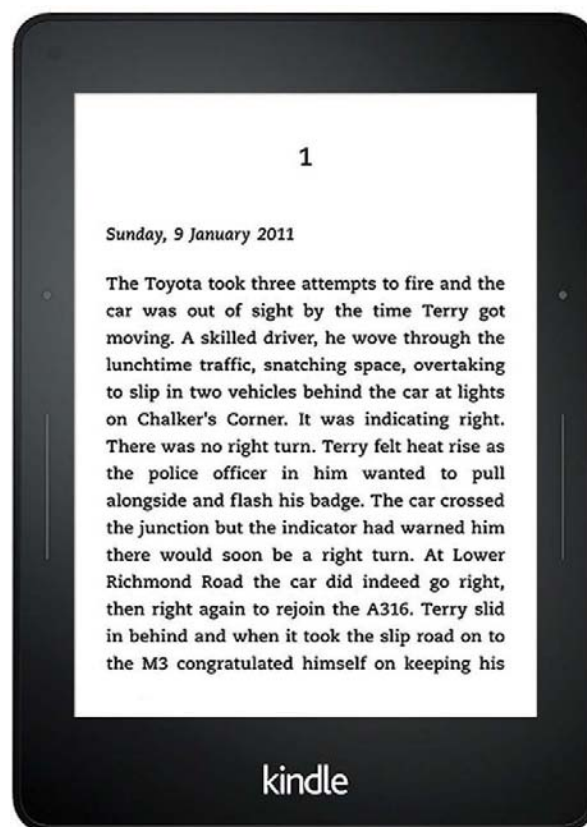
And make no mistake: the tablet-like, edge-to-edge glass is a game-changer for e-readers. Having dispensed with the thick, raised bezels of previous Kindles, the Voyage in your hand feels like a supremely lightweight – albeit monochrome – tablet.

The glass is also micro-etched, which cuts down on glare hugely. It's a little more reflective than a traditional E Ink screen, although not by much.

The backlight is simply brilliant. It's even and has enough adjustment to give you the perfect level indoors or outdoors. It even has an ambient light sensor allowing the backlight to be set automatically – a bugbear on the Paperwhite.

Another cunning feature is Night Light. This slowly reduces brightness as it gets dark, working in tandem with the auto brightness feature. Brightness changes so subtly you don't notice it – exactly what you want when you're engrossed in the latest book.

Another unique feature is touch-sensitive buttons either side of the screen. These replace the old page-turn buttons that have been absent from Kindles for a couple of years now. They make it possible to go to the next (or previous) page when you're holding the Voyage in one hand. You press the long line to go forwards and the dot to go back. You can set the sensitivity of the buttons as well as the level of haptic (touch) feedback, which lets you know you've



pressed them. Happily, you can set the feedback to a very small amount, so it's barely felt – yet another way to keep your attention focused on what you're reading.

The side bezels are thin and it's possible to accidentally press on the screen itself with your thumb and make the page turn. You can turn off PagePress, but not the ability to tap or swipe on the screen to turn pages.

When the Voyage is put side by side with a first-generation Kindle Paperwhite, it's easy to see that screen quality is a big step up, and not simply in terms of resolution and clarity. The backlight is much whiter and brighter at the same setting.

The processor also makes a big difference, with super-fast page turns and almost tablet-like responsiveness when navigating menus and typing search terms (or your Wi-Fi password) on the virtual keyboard. We tested the Wi-Fi model, but if you fork out £229, you'll get free-for-life 3G as well, so wherever there's connectivity you can spend more money in the Kindle bookstore.

Measuring 162x115x7.6mm the Voyage is a touch smaller than other 6in Kindles, and marginally lighter at 188g. There's 4GB of memory to store thousands of books.

We didn't have time to run out the Voyage's battery but Amazon claims up to six weeks if you read for 30 minutes a day, turn Wi-Fi off and set the backlight to level 10 (which is barely noticeable in daylight, but enough to read in pitch black).

## Verdict

The Kindle Voyage is without doubt one of the best e-readers money can buy. But is it worth buying? For most people, no. The extra resolution, sleek design and page-turn buttons are all nice-to-haves, not essentials. You'll get a better reading experience on a Voyage than a Paperwhite, but only just, and the price difference is simply too much to justify it. But if money is no object, you won't be disappointed.

|             |       |
|-------------|-------|
| Build       | ★★★★☆ |
| Features    | ★★★★☆ |
| Performance | ★★★★☆ |
| Value       | ★★★★☆ |
| Overall     | ★★★★☆ |



## BARNES & NOBLE NOOK GLOWLIGHT

**£62** inc VAT • [barnesandnoble.com](http://barnesandnoble.com)

If you want to read in the dark – in bed, say, without a lamp on – you’ll need to buy an e-reader with a back-light, like the GlowLight. At £89 it’s cheaper than Amazon’s equivalent, the Kindle Paperwhite, which costs £109 (although you can pick it up for the same price as the GlowLight at other retailers – Currys, for example).

Like the other Nook e-readers, the GlowLight is shaped like a pebble. The reasonably sized bezel around the edge of the screen makes it look a bit chunky, but you need the bezel to hold the device without touching the display. It’s easy to hold the GlowLight one-handed as long as you don’t have tiny hands. A rubber edging running around the entire device helps here and should cushion the device in accidental drops, too. It comes off easily – you can buy other colour bands to replace it.

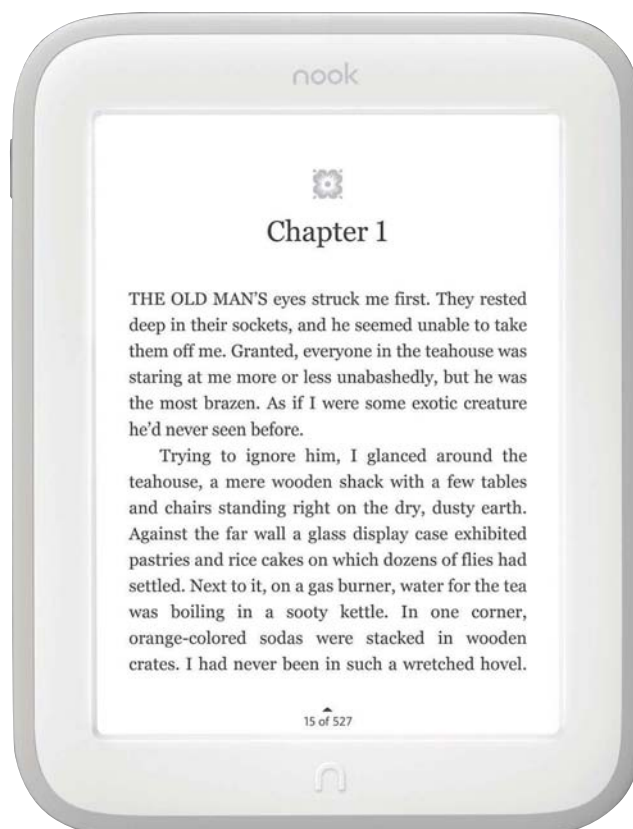
In the fight with the Paperwhite, the GlowLight has weight on its side. It’s Nook’s lightest e-reader to date at 175g, so it’s 31g lighter than its rival. It is a little thicker at 10.7mm compared to 9.1mm but that isn’t really noticeable.

Like most e-readers, the GlowLight has a 6in screen and it matches the Paperwhite in terms of resolution at 1024x758. The pixel density of 212ppi is nice and crisp – higher than most e-readers. The touch-sensitive screen lets you turn pages or navigate the interface.

You can easily switch the back-light on and off by holding down the small physical ‘n’ button below the screen. You can adjust the brightness too – at night, the minimum proved perfectly comfortable in use.

The GlowLight lights up evenly across the screen and although there is a slight shadow around the edge – mostly at the top – it doesn’t interfere with the reading experience. You can adjust the size of text to what you feel comfortable with.

The GlowLight has 4GB of internal storage. There’s 2.5GB available for content and 2GB reserved for Nook Store-specific content. The storage capacity is rated at 2,000 books, which should surely be enough keep most people going for a while.



You can browse the Nook Store on the GlowLight itself and buy books straight from it for download over Wi-Fi. There’s no 3G version available. As well as books from the store, the device supports ePub and PDF formats, and you can view JPEG, GIF, PNG and BMP files.

The store has three million titles to choose from and you can continue reading on other devices with the free Nook reading app available on iOS, Android and Windows 8. If anyone you know has a Nook or you can convince them to buy one, you can share content with LendMe, which allows you to borrow eligible titles for up to 14 days at no extra cost.

As with other Nook models, there’s a single-core 800MHz processor inside. As a result, the GlowLight isn’t the smoothest performer. You get that typical e-reader flicker when the display changes what’s being shown, which isn’t too bad when you’re reading but can be a bit disorientating when you’re browsing the store.

Page turns are fast, but the GlowLight struggles when initially loading a book, with some of the settings and when browsing the store. We often had to wait a few seconds for things to appear.

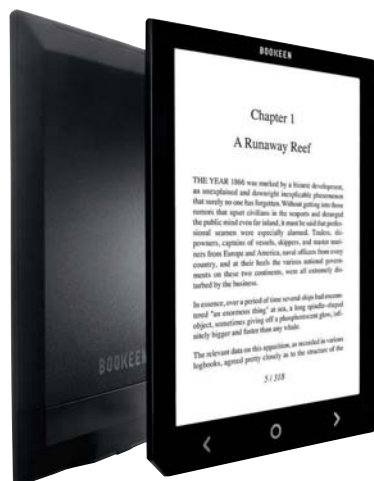
In terms of battery life, the GlowLight will last for eight weeks’ worth of reading according to Barnes & Noble. That’s with 30 minutes of reading a day, one page refresh a minute, default brightness or the light off and wireless also switched off.

After using the GlowLight for a couple of weeks – mostly with the light on minimum brightness and wireless on – we’ve used 40 percent of battery. This suggests a total battery life of five weeks under these conditions. It charges with Micro-USB, which is the same connector you’ll find on most smartphones and tablets.

### Verdict

The Nook GlowLight is a decent e-reader if you’re looking for one with a backlight. It’s lighter than the Kindle Paperwhite but its rival is currently available at the same price (although not from Amazon) with more features.

|             |       |
|-------------|-------|
| Build       | ★★★★☆ |
| Features    | ★★★★☆ |
| Performance | ★★★★☆ |
| Value       | ★★★☆☆ |
| Overall     | ★★★★☆ |



## BOOKEEN CYBOOK OCEAN

**£149** inc VAT • [bookeen.com](http://bookeen.com)

The Cybook Ocean e-reader comes with a recommended price of £149, and right now that is what you will pay, as we are yet to see it on sale anywhere outside of manufacturer Bookeen's own website (which expects you to complete your business in French), although Bookeen tells us it expects it to be in retail by the time you read this.

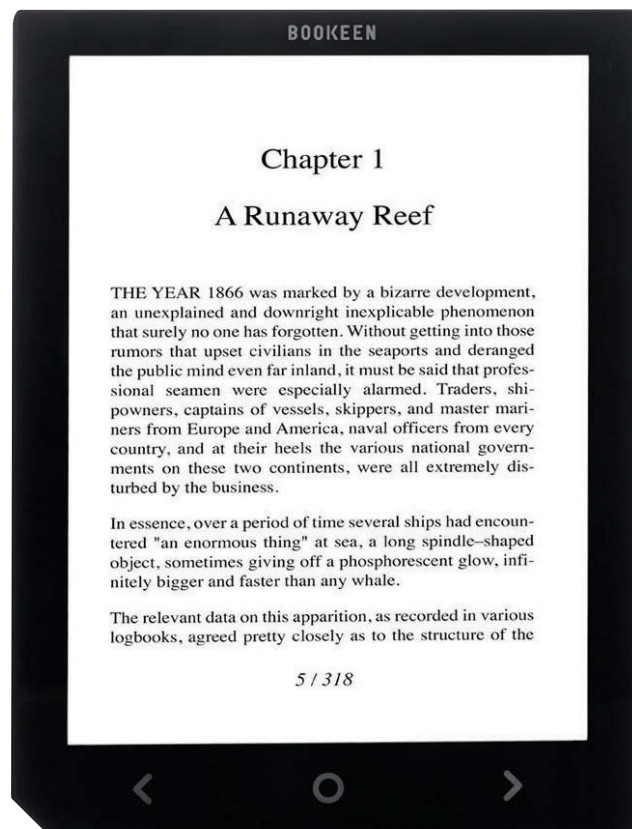
Given it offers a large backlit screen and wireless connectivity, the Ocean is probably best compared with the £169 Kindle Voyage. Yet it is a difficult to quantify what equates to good value in this space. Even a £59 Kindle offers access to Amazon's unrivalled bookstore, and a perfectly fine reading experience; the £109 Paperwhite does the same and adds a backlit screen. Still, you may crave the additional screen space enough to pay the extra for the Ocean.

The Ocean has a pretty big screen. It's an 8in, 1024x758 E Ink Pearl HD capacitive touchscreen display that's close to the size of a paperback book; if you have ever found other e-readers too small, then this is definitely the one for you. Clarity is decent, without being exceptional. The anti-glare works as well as you would expect for an E Ink display – that is, very well. Bookeen claims it is whiter and more homogenous than those of previous e-readers. Its FrontLight technology means you can read in the dark. And it does work well: a subtle rather than overpowering light that allows for comfortable, strain-free reading.

Inside the Ocean is a Cortex A8 TI OMAP3611 processor running at 800MHz and paired with 128MB RAM. In use, the Ocean was frustratingly slow and laggy. It's not like an e-reader has to be a power device, but it is annoying to have to wait when navigating from book to book, or book to story to book.

Battery life is rated at one month. We've had the Ocean for only a few weeks, so we can't confirm that, but after using it for a few days it still has seven-eighths of battery charge left.

At 7mm the Bookeen Cybook Ocean is thin for an 8in device (the full dimensions are 196x150x7mm). And at around 300g it is as light as you would need a big e-reader to be. There's no



problem holding it when reading lying flat in bed. The screen sits flush to the thin bezels.

The design itself is as interesting as can be for an e-reader. The Ocean is black and smooth, with squared-off edges and curvy sides. On the bottom bezel are the back, forward and home buttons. On the bottom is the Micro-USB connector, and a hardware on/off switch.

There is no SD port. You can install an SD card, but you'll have to peel off a rear panel, exposing portions of the motherboard, to do so. It's a long way from a slick consumer experience.

There were also a couple of little bubble-like blemishes on the bottom bezel after a couple of days of use. Nothing terminal, but an e-reader should be able to stand up to being carried around in a bag without getting marked. At least at this price it should.

To use the Ocean we had to set up an account – and that requires an understanding of French. An AdobeID account was also needed. Browsing the store also requires French – for the purchase of French-language books. Bookeen says you can purchase books by browsing other online stores, and then downloading books direct to the Ocean or to your PC and sideloading them. The company does intend to translate the store at some stage, but this is hardly the seamless customer experience of a Kindle, or even any modern smartphone or tablet.

It's a shame because the reading experience on the Ocean is pretty good. It's easier to use the buttons than the touchscreen to go back and forth, but the larger display does make for fewer page turns, the font is nice and the smart backlight is a joy to use.

## Verdict

It is impossible to recommend the Bookeen Cybook Ocean in its current form. Although it has a good, and large, screen in a well-built and lightweight frame, it is underpowered. More importantly, the French-language book store is of little use for UK customers. And at £150 it is just too expensive for such a device.

|             |       |
|-------------|-------|
| Build       | ★★★★★ |
| Features    | ★★★★★ |
| Performance | ★★★☆☆ |
| Value       | ★★★★★ |
| Overall     | ★★★★★ |



## KOBO AURA H20

**£140** inc VAT • [kobo.com](http://kobo.com)

The Aura H20 is the first e-reader capable of shrugging off sand and sea, and won't care even if you drop it while reading in a hot tub. It is also notable for a 6.8in screen, which is a lot bigger than all the 6in e-readers on the market, including Amazon's range. The bigger dimensions mean you have to pinch it between your thumb and fingers as it's a bit of a stretch to rest it on your palm with thumb on one side and fingers on the other.

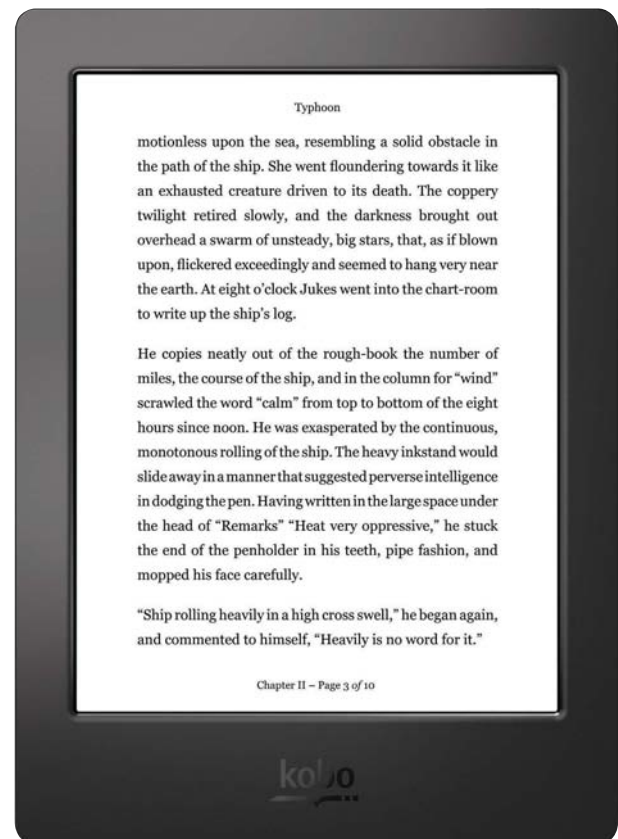
It has the same 1440x1080 resolution as the Aura HD and Amazon Voyage, so text is nice and sharp. From a normal reading distance the difference between this resolution and a 'non-HD' e-reader isn't as marked as you might expect, though.

The touchscreen handles all interactions, so there are no page turn buttons - just a power button on the top edge.

Hidden behind a waterproof flap at the bottom are a Micro-USB port, a microSD card slot and a reset pinhole. While the 4GB of internal memory should be more than enough, it's convenient to copy PDFs and other documents on to a card and pop it into the Aura H20 than to connect via USB. There's support for a wide range of file types with .doc the only obvious omission; however, it's easy to convert Word files to .rtf.

You tap on the right of the touchscreen to advance a page, the left to go back and the top or bottom to display the menu bars. You can change the font, size, line spacing and margins to make pages appear exactly how you like, and even choose the justification. You can select passages, highlight them, add notes or share them on Facebook. You can also search for those words or phrases on Google or Wikipedia. Tap the graph icon and you'll get stats such as the progress through the current chapter, time left before you get to the next chapter and a fun graph of the length of all the chapters in the book, plus an estimate of how long it will take to finish the book.

On the home screen a search bar lets you find books in your library, or search the Kobo store, which has a wide selection and prices similar to Amazon's. The home screen changes all the time.



The book you're currently reading is shown prominently, but there are other sections for recommendations based on what you're reading. Shortcuts appear when you use other features.

A handy feature is the ability to access articles saved to your Pocket account. Pocket lets you mark web pages to read offline, which can then be synced to the Aura H20. The makes the web browser, which is rather slow and frustrating is use, a bit redundant.

You can arrange your book library however you like, including collections. This could be useful if you have a lot of books and want to view them by author, genre or topic. You just enter a name for the collection and select which books go in it. And an Awards section gamifies reading - you earn badges for reading more.

The Aura H20 is talented, but not perfect. There's no auto brightness, for example, but our biggest complaint is the lack of processing power. Even compared to the £59 Kindle, it feels sluggish. Menus take longer to display and controls, such as the brightness slider, aren't always responsive.

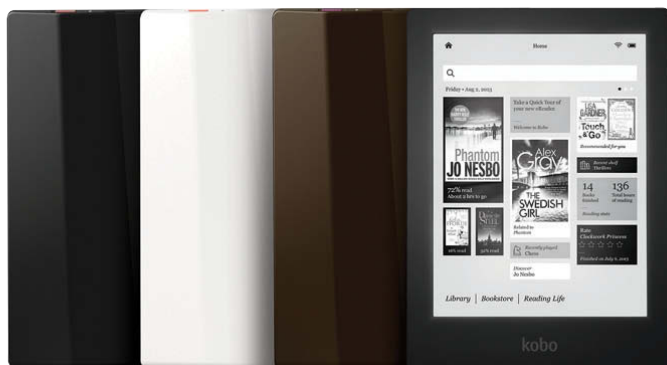
The screen is also slow to update. Page turns take noticeably longer than on the Voyage, and because it doesn't completely refresh on every page turn there's a faint 'ghost' image of the previous screen visible until it does refresh. Finally, the backlight isn't as even as it should be; it's not bad, but the bottom edge is a little darker than the rest of the screen.

## Verdict

The main reason to buy the Aura H20 is for its water resistance. And for that you pay a premium. In fact, many places sell it for £165. The best place to go is WH Smith, which stocks all Kobo e-readers.

For some people, this would be a price worth paying, but the H20's unresponsive interface is a big problem. Unless you need an e-reader that's waterproof and has an SD slot, you'll be much better off going for a Kindle Paperwhite, which is both cheaper and much more responsive.

|             |       |
|-------------|-------|
| Build       | ★★★★★ |
| Features    | ★★★★★ |
| Performance | ★★★★★ |
| Value       | ★★★★★ |
| Overall     | ★★★★★ |



## KOBO AURA HD

**£140** inc VAT • [kobo.com](http://kobo.com)

The Aura HD is an e-reader with an integrated front light and high-resolution screen. The Japanese company's ebook reader can pitch with confidence against the competing Amazon Kindle Paperwhite.

Shaken out of its brown card box, the Aura HD was initially a bit of a disappointment as it lacks the tactile quilted feel of Kobo's Touch e-reader. The back panel has four irregular plastic panels joined together at shallow concertina-like angles to help the device fit neatly in the hand.

There are three colours to choose from: Espresso, Ivory and Onyx. Just like the Kobo Touch, the Aura HD requires the installation of the Kobo desktop app, which is available for Windows and Mac OS X, on a computer before you first use it. This app also allows you to buy books and browse the Kobo Store through the Aura when it's connected.

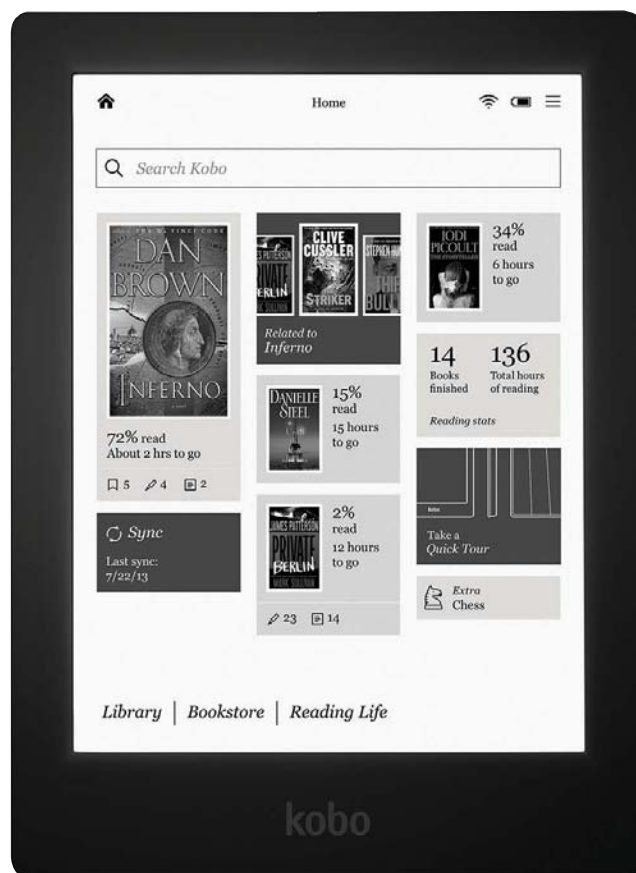
Navigation is still performed by means of the touchscreen, with simple single-touch dabs required to leaf through virtual pages.

At 240g, the Aura HD is heavier by 40g than Kindle's Paperwhite, but it still feels like it weighs virtually next to nothing in actual use. Small and light, it's pretty well a perfect fit for every handbag.

### Adding titles

Downloading books from the Kobo Store is not a problem. Uploading books from the computer – well, that was a bit more difficult and it's not easy to find much help on the website. Imported PDFs were not immediately recognised by the reader and were not visible within the app when the reader was connected to a computer. We had to restart the Kobo Aura HD a few times for our own imported books to appear.

The Aura HD takes a 6.8in E Ink screen, with a display resolution of 1440x1080 pixels. That gives it a decent Apple Retina-approaching resolution of 265dpi. It's high enough to make the characters in a typeface look really crisp and sharp. Even when viewed without



the light on, pictures on the screen looked like real photographs, rather than photos shown on a screen of an electronic device.

But the front reading light is a wonderful thing. Reading by day or night has never been easier, whether at night outside on a dark railway platform or in broad daylight. The screen is extremely responsive – sometimes almost too sensitive. Unfortunately multi-touch gestures, as found on the Kobo Touch, are gone.

Just like all other Kobo products, the Aura HD dispenses awards and statistics on your reading habits. All are shareable via Facebook, of course, and switchable.

A built-in dictionary is provided by Merriam-Webster's Collegiate, which gives useful basic definitions when required, but compared to the Kindle or iBooks dictionary it's not so informative.

The Aura HD includes 4GB of flash storage built in, which can be extended by 32GB by using a microSDHC card. The existing storage is more than plenty for ebooks, of course, which take up so little space compared to music and video files. There is no choice when it comes to wireless connections – the Aura is a Wi-Fi-only device.

The battery life was very good. With Wi-Fi and ComfortLight switched every time we used it, and an average 45 minutes reading every day, it lasted for 23 days.

Besides the efficient LED lighting, the battery is only exercised by screen refreshes, and over that time period it kept going for three-quarters of a 650-page biography.

### Verdict

Although it has a rather plasticky feel to it, just like the Amazon Kindle, the Kobo Aura HD still felt like a better-quality product than the Kindle – even with all the snags and problems that we experienced getting our own books on to it. In the end, though, the Aura HD is too expensive when a perfectly decent front-lit e-reader can be bought for half this price. ☒



# BEST DIGITAL CAMERAS

Gavin Stoker offers a shortlist of the eight most highly recommended digital cameras you can buy right now



|             |       |
|-------------|-------|
| Build       | ★★★★★ |
| Features    | ★★★★★ |
| Performance | ★★★★★ |
| Value       | ★★★★★ |
| Overall     | ★★★★★ |

BEST FOR SEMI-PROFESSIONALS

## CANON EOS 7D MARK II

**£1,600** (body only) inc VAT • [canon.co.uk](http://canon.co.uk)

This upgrade of the five-year-old 7D again offers itself up as an APS-C sensor workhorse. That large a gap between models is unheard of for digital cameras, which tells you how respected its predecessor was, as well as how much anticipation there is for a new model. Competitors in this price bracket include the Sony A77 Mark II, Nikon D7100 and Pentax K-3. The Mark II version arrives priced as a body-only deal, so there is no official boxed option complete with standard lens or lenses. That said, as more than 70 compatible lens choices are offered in the current Canon EF/EF-S line-up, no photographer will be compromised for creative choice.

At the core of the Mark II is a newly designed 20.2Mp APS-C CMOS sensor. The autofocus offers a whopping 65 cross-type AF points for pinpointing your subject no matter where it is in the frame; given that the older 7D was popular with fledgling filmmakers, the video ante has been further upped with Full HD capture at 60fps (720p). There's also a microphone input for more professional sound results via an optional external microphone, plus a headphone jack provided.

Showing its semi-professional mettle by offering a tough, weather-sealed magnesium alloy build and a 100 percent field of view optical viewfinder - so what you see at eye level is what you get in the resulting image - further improvements come in the form of dual-pixel AF, built-in GPS and compatibility with a Wi-Fi unit. Delivering a respectable 610 shots from a full charge is an LP6N battery. Suitable for both amateurs upping their game, or a pro looking for a second camera as backup, the EOS 7D Mark II is compatible with both SD and CompactFlash. This variety also enables video to be written to one card and stills to the other, if desired.

**VERDICT:** It appears Canon has taken the 'if it ain't broke don't fix it' approach with this model. In the EOS 7D Mark II, it has delivered another workhorse for those who don't need the next (larger file size) step up of a professional-grade full-frame sensor, and are happy with the bigger than average standard APS-C chip provided here.



|             |       |
|-------------|-------|
| Build       | ★★★★★ |
| Features    | ★★★★★ |
| Performance | ★★★★★ |
| Value       | ★★★★★ |
| Overall     | ★★★★★ |

BEST FOR ENTHUSIASTS

## FUJIFILM X-T1

**£1,0450** (body only) inc VAT • [fujifilm.co.uk](http://fujifilm.co.uk)

With an impressively high-resolution eye-level 2.36-million dot viewfinder, as well as the advantage of an effectively 16.3Mp APS-C sensor, the Fujifilm X-T1 may well tempt enthusiasts away from rival Olympus and Panasonic Micro Four Thirds systems, and possibly even existing Canon and Nikon owners looking for something more lightweight and manageable than a DSLR. At the same time, as with previous Fujifilm X models, the metal construction of the X-T1 feels solid. It's fast too when compared with its X series predecessors, with an official 0.08-second autofocus response. The X-T1 looks the part for any pro considering a smaller-format camera, being available in a standard black finish or the even more obviously retro-styled Graphite Silver version, announced at Photokina 2014.

We were sent the X-T1 with an XF 60mm f/2.4 prime lens. This fast/bright aperture combined with the fixed focal range allowed us to achieve pin-sharp subjects with attractively defocused backgrounds - in other words a DSLR-type effect, yet from a mirror-less alternative. At times it was tricky to tell the difference between the outputs of CSC and DSLR. So if you've previously weighed up any X-series cameras but were concerned that they didn't look sufficiently 'serious', the X-T1 may well prompt a rethink. An optional vertical battery grip costing £200 provides an opportunity to bulk up the camera further, if you want.

Even without that extra grip, the construction and operation indicate a camera that rises above its stature. There may be fewer compatible lenses for this system than from other well-established brands, but Fujifilm is gaining ground all the time. Plus, with the X-T1 increasingly taken up not just by enthusiasts but pros too, the lens line-up is expanding all the time.

**VERDICT:** If you're prepared to invest in yet another system, this is a sensible place to start. The Fujifilm X-T1 mounts a serious challenge in terms of image quality, challenging only the keenest of eyes to spot the difference between this and a physically larger DSLR.



|             |       |
|-------------|-------|
| Build       | ★★★★★ |
| Features    | ★★★★★ |
| Performance | ★★★★★ |
| Value       | ★★★★★ |
| Overall     | ★★★★★ |

BEST FOR  
AFFORDABILITY

## KODAK PIXPRO S-1

**£499** (for twin lens kit) inc VAT • [kodakcamera.jkilt.com](http://kodakcamera.jkilt.com)

Latest Kodak license holder JK Imaging invited photographers to regain that 'Kodak moment' via the brand's first-ever compact system camera (CSC). Metal-bodied and sleekly minimalist in a white gloss finish or regulation black, it's lightweight too, at under 300g body-only. So if you're weighing up the best camera for your travels or street photography it's a contender. Headline specifications include a 16Mp Four Thirds sensor – the same-format chip as found in Panasonic and Olympus system cameras. As this is Kodak's first attempt at a CSC, it comes with the advantage of a twin lens kit incorporating a 12- to 45mm zoom (24- to 80mm in 35mm terms), plus a 42.5- to 160mm (85- to 320mm), so you can cover all compositional bases, from ultra-wide angle to extreme telephoto (maximum zoom) out of the box. If you want to go further there's also the pipe-like 400mm f/6.7 fieldscope lens, which is available separately and ideal for wildlife watchers. Handily, the S-1 body offers built-in image stabilisation.

More consciously aimed at customers wanting to trade up from a smartphone rather than professionals, the S-1 lets you frame your shots with the aid of a 3in, 920K-dot LCD. This can be tilted too, which is a real advantage. Shooting selections are made via a familiar bottle top-style mode wheel on the top plate.

Better than most rivals at this price point is the S-1's 400+ shot battery life, and you can shoot uncompressed Raw files alongside JPEG for maximum image quality, as well as record Full HD video clips with stereo sound, and transfer shots via body-integral Wi-Fi. With all the specification boxes ticked, the good news continues in that photos retain sharp detail and rich colour, focusing automatically adjusts during video capture as well as for shooting stills, so imagery remains sharp even if switching subjects.

**VERDICT:** The Kodak name may no longer be the sexiest branding in the world of photography, but this is a solid performer with a reasonable kit price that augurs well for the future.



|             |       |
|-------------|-------|
| Build       | ★★★★★ |
| Features    | ★★★★★ |
| Performance | ★★★★★ |
| Value       | ★★★★★ |
| Overall     | ★★★★★ |

BEST FOR  
PROFESSIONALS

## NIKON D810

**£2,700** (body only) inc VAT • [nikon.co.uk](http://nikon.co.uk)

We don't all need massive image file sizes, but if you're looking for the highest resolution available from a full-frame 35mm camera to futureproof your pictures as much as possible, then the 36.3Mp D810 is worth considering.

With a dust and weather-sealed magnesium alloy body ensuring that the D810 looks and feels like a pro tool, this camera is all about providing photographers with detail. Indeed, Nikon has gone so far as to say that it delivers the best image quality in its history, offering not just the large pixel count, but also an extra degree of detail made possible by the omission of an optical low-pass filter – the sacrifice of this once standard feature is something of an industry trend. Also on board is a latest-generation Expeed 4 processor, which replaces its predecessor's Expeed 3.

Nikon has added a few more extras to this upgrade, including a new quieter shutter unit, a greater number of continuous shots (7fps in 15.3Mp DX crop mode; otherwise 5fps in FX mode), improved auto white balance, plus a 'clarity' option in the picture control settings that enable fine adjustments in 0.25 increments. Otherwise it offers the same 51-point AF system and Group Area AF feature as the flagship D4S.

On the outside the grip has been modified and now enables a firmer more comfortable hold, with an 'i' button giving easier menu access as well as offering a split-screen Live View mode. Incidentally, the 3.2in LCD screen provides an enormous 1229K-dot resolution, which is ideal when you're using it for composing stills or video especially. The latter has also been improved on this model. While you don't get 4K, there is a choice 50- or 60fps at Full HD resolution of 1920x1080 pixels and improved audio recording capabilities.

**VERDICT:** If you're already a pro Nikon user and want to add a new body to your kit bag, you now have a choice between the range-topping D4S for faster continuous shooting and the D810 for the highest resolution in the line-up.



|             |       |
|-------------|-------|
| Build       | ★★★★☆ |
| Features    | ★★★★☆ |
| Performance | ★★★★☆ |
| Value       | ★★★★☆ |
| Overall     | ★★★★☆ |

BEST FOR BEGINNERS

## OLYMPUS OM-D E-M10

**£700** (with 14-42mm lens) inc VAT • [olympus.co.uk](http://olympus.co.uk)

The OM-D E-M10 is currently the most affordable entry point into the OM-D camera series of classically styled, mini DSLR-shaped, mirrorless models based on the original Olympus OM brand from the 1960s and 1970s. Aimed at the travel and street photographer, this is the lightest and most compact of the OM-D family.

The smaller size of the E-M10 makes it a great option for anyone who wants near-professional-quality images, but don't want a bulky camera with it. That said, Olympus has kept the retro design that initially helped this series stand out from the crowd - until, that is, Fujifilm's X line-up pulled off a similar trick and arguably stole some of the OM-D's thunder.

While not an outright bargain at £700, the price still feels fair. Keeping proportions manageable, the camera comes with the latest-generation ultra-compact 14- to 42mm lens, a mechanical rather than manual zoom, which provides a focal range that is the equivalent of 28- to 84mm in 35mm film terms. The setup means that you can comfortably slot the camera body with its lens attached into a jacket pocket.

In terms of getting creative or shooting candidly, users are spoilt by both a high 1.4 million-dot resolution eye-level viewfinder, plus a tilting 3in touchscreen LCD just below. As with previous Olympus Pen models, the shutter can be fired just by tapping the screen. The supplied zoom comes into its own when shooting Full HD 1920x1080-pixel clips too: not only is it quiet in operation, its transitions are smooth and steady enough to avoid any unsightly jumps. Yes, there's a smaller 16Mp Four Thirds sensor than its rivals with an APS-C chip, but with its colour-rich, high contrast shots, the E-M10 punches above its weight.

**VERDICT:** The E-M10 is an affordable means of entry into Olympus's retro-styled, fully featured OM-D system. It borrows from its big-gun siblings (the more expensive E-M1 and E-M5), yet doesn't cut too many corners when it comes to handling and performance.



|             |       |
|-------------|-------|
| Build       | ★★★★☆ |
| Features    | ★★★★☆ |
| Performance | ★★★★☆ |
| Value       | ★★★★☆ |
| Overall     | ★★★★☆ |

BEST FOR VIDEO CAPTURE

## PANASONIC LUMIX DMC-GH4

**£1,300** inc VAT • [panasonic.co.uk](http://panasonic.co.uk)

Panasonic's flagship GH4 was the first compact system camera to market with 4K video capture; it has since been joined in the CSC club by Samsung's NX1 and Sony's A7S, which feature bigger core sensors than the Four Thirds chip at the heart of the GH4. It seems only fitting, as Panasonic has long pitched its models as 'hybrids', that this fast and accurate DSLR-alike CSC option appeals to those shooting both video and stills.

While you don't get body-integral anti-shake, the GH4 does offer a reassuringly weighty splash and dust-proof construction comprising an ultra-sharp 2.4-million dot eye-level viewfinder with self-activating eye sensor, plus compositional alternative of tilt and swivel 1036K-dot 3in screen just beneath. Also featured is an improved 16.05Mp Four Thirds-format CMOS sensor, Venus Engine processor and fast and accurate AF system. This makes it a direct competitor to the equally rugged and all-weather shooting Olympus OM-D E-M1, Samsung NX1 and Fujifilm X-T1. The traditional shooting mode dial features the usual full automatic settings, as well as digital effects options. There are eight of these including colour-boosting Expressive mode, plus three user-definable custom settings.

In terms of connectivity, the GH4 offers both Wi-Fi and NFC options. What's more, as 4K video needs both fast and high-capacity media cards, there is compatibility with the latest-generation Gold Series UHS-I SD cards, available up to 64GB. A battery life of 4500 shots is also respectable. In terms of lenses there's the ability to twin the GH4 with the massively useful 14- to 140mm Power Zoom out of the box, which provides a 35mm equivalent film range of double that - providing an all-encompassing 28- to 280mm reach. If you want this as well as the camera body, you're looking at around £1,750 in total at the time of writing.

**VERDICT:** Pitched by Panasonic as a 'hybrid' camera, the DMC-GH4 is a fast and accurate camera that offers 4K video capture, while its shooting options let you be as hands off or hands on as you want.



|             |       |
|-------------|-------|
| Build       | ★★★★★ |
| Features    | ★★★★★ |
| Performance | ★★★★★ |
| Value       | ★★★★★ |
| Overall     | ★★★★★ |

BEST FOR  
ENTHUSIASTS

## SAMSUNG NX1

**£1,300** (body only) inc VAT • [samsung.co.uk](http://samsung.co.uk)

This heavyweight contender from Samsung tops the company's line-up and introduces 4K video shooting to the NX range, along with enough manual control and resolution to possibly tempt conventional DSLR owners into moving across to the electronics giant.

It has a splash and dust-resistant magnesium alloy body, a 30.7Mp sensor (28.2Mp effective), a top-plate status display window, an eye-level viewfinder and a tilting AMOLED touchscreen on the back for deeper blacks and better contrast. Indeed, the only attributes the range-topping NX1 is missing to put it up there with the best DSLRs on the market is an internal mirror mechanism and a full-frame sensor. Instead, the camera has a back-illuminated APS-C sensor, although that is still pretty tops.

Although the number of compatible lenses may not be on a par with the 60+ volume of Canon or Nikon's optics for their DSLR ranges, Samsung launched more at September's biennial Photokina. These include a 50- to 150mm premium lens that offers a f/2.8 fixed aperture, four ED elements and hypershield coating along with a six-axis gyro sensor for detecting camera shake, and which minimises its effect by the equivalent of 4.5 stops. There is also a 300mm f/2.8 in development plus a vertical grip now available.

While some will gripe that the chunky build (it measures 138.5x102.3x65.8mm) means it won't fit in a pocket, others will be reassured by the larger size.

For £1,300, the NX1 needs to be quick and responsive and here the camera offers up to 70 continuous shots at 15fps plus an AF with 205 phase-detection points. Adaptive noise reduction enables crisp results at higher ISOs, which stretch to the maximum expandable ISO 51200 setting.

**VERDICT:** The NX1 is the clearest signal yet that Samsung is looking not only to compete with Panasonic and Olympus in the top-end CSC arena, but to also attract those who would previously have opted for a camera from Canon or Nikon.



|             |       |
|-------------|-------|
| Build       | ★★★★★ |
| Features    | ★★★★★ |
| Performance | ★★★★★ |
| Value       | ★★★★★ |
| Overall     | ★★★★★ |

BEST FOR BIG  
SENSOR,  
SMALLISH BODY

## SONY A7 MARK II

**£1,500** (body only) inc VAT • [sony.co.uk](http://sony.co.uk)

Battling against the likes of the Fujifilm X-T1, the Olympus OM-D E-M1 and the Samsung NX1, the newest model in Sony's A7 Alpha series trumps most comers by incorporating a full CMOS frame sensor (equivalent to a frame of 35mm film) in a relatively compact camera body. The bigger the chip, the better the images, theoretically at least, which is part of the reason why the A7 series, with its largest possible chip in a relatively compact body, has proved so popular.

The A7 is now at the Mark II stage, and is the one and only full-frame camera with optical five-axis image stabilisation, providing the equivalent of 4.5 stops. Autofocus response is 30 percent faster than the previous generation, while startup is 40 percent quicker, too. Coming from an electronics manufacturer, the A7 Mark II's inclusion of both NFC and Wi-Fi connectivity options comes as no surprise, and it's compatible with Sony's existing E-mount lens family, too.

Outwardly suggesting semi-pro status, the Mark II version still resembles a miniaturised DSLR, with the Raw, JPEG and Full HD video-shooting 24.3Mp model also offering a redesigned body. Delivering 3:2 aspect-ratio still pictures, the shutter release button has been placed more forward on the grip and a different type of front control wheel added.

The eye-level shot comes courtesy of 2.36-million dot resolution 0.5in OLED electronic viewfinder (EVF) with 100 percent field of view. Also impressing is wide AF area coverage thanks to a 117-point phase detection AF sensor working in combination with 25-point contrast detection AF to ensure both speed of operation and accuracy along with it. The A7 Mark II has a battery life good for an average-sounding 350 shots.

**VERDICT:** This high-end full-frame compact is faster overall compared with its predecessor. Coupled with the redesigned body, customisable function and settings, it ensures the A7 Mark II provides anyone considering making the leap from a DSLR to a slightly smaller size with a good point to jump aboard Sony's system.



The Fujifilm X-T1 mounts a serious challenge in terms of image quality, challenging only the keenest of eyes to spot the difference between this and a physically larger DSLR

|                             | <b>CANON</b><br><b>£1,600 inc VAT</b><br><b>(body only)</b><br> | <b>FUJIFILM</b><br><b>£1,050 inc VAT</b><br><b>(body only)</b><br> | <b>KODAK</b><br><b>£499 inc VAT</b><br><b>(for twin lens kit)</b><br> | <b>NIKON</b><br><b>£2,700 inc VAT</b><br><b>(body only)</b><br> |
|-----------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------|
| Model                       | <b>EOS 7D Mark II</b>                                           | <b>X-T1</b>                                                        | <b>Pixpro S-1</b>                                                     | <b>D810</b>                                                     |
| Sensor                      | 20.9Mp APS-C CMOS (22.4x15mm)                                   | 16.7Mp APS-C X-Trans CMOS II (23.6x15.6mm)                         | 16.83Mp Four Thirds CMOS (17.3x13mm)                                  | 37.09Mp full-frame CMOS (35.9x24mm)                             |
| Lens mount                  | Canon EF, EF-S                                                  | Fujifilm X                                                         | Micro Four Thirds                                                     | Nikon FX                                                        |
| Screen                      | 3in fixed LCD (1040K dot)                                       | 3in tilting LCD (1040K dot)                                        | 3in tilting LCD (920K dot)                                            | 3.2in LCD (1229K dot)                                           |
| Video                       | 1920x1080 pixels at 50fps                                       | 1920x1080 pixels at 60fps                                          | 1920x1080 pixels at 30fps                                             | 1920x1080 pixels at 60fps                                       |
| Continuous shooting         | 10fps maximum                                                   | 8fps maximum                                                       | 5fps maximum                                                          | 7fps maximum                                                    |
| Number of compatible lenses | 70+                                                             | 16                                                                 | 3                                                                     | 60+                                                             |
| Weight                      | 910g (body only)                                                | 390g (body only)                                                   | 290g (body only)                                                      | 880g (body only)                                                |

|                             | <b>OLYMPUS</b><br><b>£700 inc VAT</b><br><b>(with 14- to 42mm lens)</b><br> | <b>PANASONIC</b><br><b>£1,300 inc VAT</b><br> | <b>SAMSUNG</b><br><b>£1,300 inc VAT</b><br><b>(body only)</b><br> | <b>SONY</b><br><b>£1,500 inc VAT</b><br><b>(body only)</b><br> |
|-----------------------------|-----------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------|
| Model                       | <b>OM-D E-M10</b>                                                           | <b>Lumix DMC-GH4</b>                          | <b>NX1</b>                                                        | <b>A7 Mark II</b>                                              |
| Sensor                      | 17.2Mp 4/3in CMOS sensor (17.3x13mm)                                        | 17.2Mp 4/3in CMOS sensor (17.3x13mm)          | 30.7Mp BSI APS-C CMOS (23.5x15.7mm)                               | 24.3Mp full-frame Exmor CMOS (35.8x23.9mm)                     |
| Lens mount                  | Micro Four Thirds                                                           | Micro Four Thirds                             | Samsung NX                                                        | Sony E                                                         |
| Screen                      | 3in tilting LCD (1037K dot)                                                 | 3in tilting LCD (1036K dot)                   | 3in angle-adjustable AMOLED touchpanel display                    | 3in LCD (1,228,800 dot)                                        |
| Video                       | 1920x1080 pixels at 30fps                                                   | 3840x2160 pixels at 29.97fps                  | 3840x2160 pixels at 30fps                                         | 1920x1080 pixels at 60fps                                      |
| Continuous shooting         | 8fps maximum                                                                | 12fps maximum                                 | 15fps maximum                                                     | 5fps maximum                                                   |
| Number of compatible lenses | 17                                                                          | 16                                            | 12                                                                | 22                                                             |
| Weight                      | 350g (excluding accessories)                                                | 480g (body only)                              | 550g (body only)                                                  | 556g (body only)                                               |



# What is Apple's HomeKit

Apple hopes its HomeKit will simplify controlling the smart home. **Martyn Casserly** reports

**I**t was back in June 2014 when Apple announced its Smart Home platform 'HomeKit', and we're still waiting for the first fruits of this potentially groundbreaking home automation system to appear. Rumours have begun to surface recently, though, that manufacturers are gearing up to release various products in early 2015 that will utilise HomeKit. So the curtains could soon be drawn back on the digitally enhanced home of the future. Before long you may be controlling various elements of your house remotely from the comfort of your iPhone 7.

## What is a Smart Home?

The idea of an intelligent home has been around for decades. Back in the 1950s visitors to Disneyland could tour a conceptual 'Home of the Future' in all its plastic-infused splendour. But whereas that dwelling centred on disappearing shelves and storing irradiated food (well, it was the fifties), there

was, of course, a complete lack of electronic interfaces for the modern household.

Until recently Smart Homes were something we might have aspired to if and when we became wealthy. It was all about tricking out our homes with elaborate, voice controlled computers, automated mood lighting, and self-closing curtains.

These days more and more people have smart devices in their home that can be controlled via smartphones. From thermostats that are intelligent enough to know what temperature it should be, based on your usual needs, to security systems that send alerts to your iPhone along with images of potential burglars.

These devices and apps are going to become a big deal over the next few years, and Apple's HomeKit system looks set to be a significant player. One reason why home automation devices are becoming more widely available is the rapidly falling prices of the technology, which means its becoming

easier and cheaper to equip objects with sensors and microchips. In a few years from now your bin might tell the council when it is full, and the tyres on your average car will let you know they need inflating.

## Home Automation

Home automation could benefit from Apple's track record of taking a technology and making it user-friendly and mainstream. At the moment those with smart gadgets in their home likely have a number of separate apps on their phones and computers for controlling them. Apple would integrate everything into one solution and tie all of it together with one app that runs on iPhones, iPads, Apple TV and Macs.

Privacy and security are also both huge factors when dealing with homes. Apple recently announced new rules to its potential HomeKit partners, stating that any sort of information gathering for advertising or data mining would be strictly forbidden. Even the

The HomeKit **ACCESSORY SIMULATOR** will be used by developers to design their integrated systems

devices themselves must include Wi-Fi and Bluetooth chips from specific manufacturers, presumably so that Apple can monitor the kind of products being created for its HomeKit customers.

Another reason why the company is well placed in this market is that the 'early adopter' types with money to spend are likely to already own its devices. It's also a concept that hits home for Apple. The California giant has been there before, when it pioneered the idea of a home hub. Back in a 2001 keynote address at the Macworld conference, Apple CEO Steve Jobs introduced the vision of a home hub with the Mac serving as the household's central controller of entertainment and productivity. This could be the natural evolution of that concept. Then there's the fact that Apple has already made moves to integrate iOS with automotive information and entertainment systems in CarPlay, so why not do the same thing in the home.

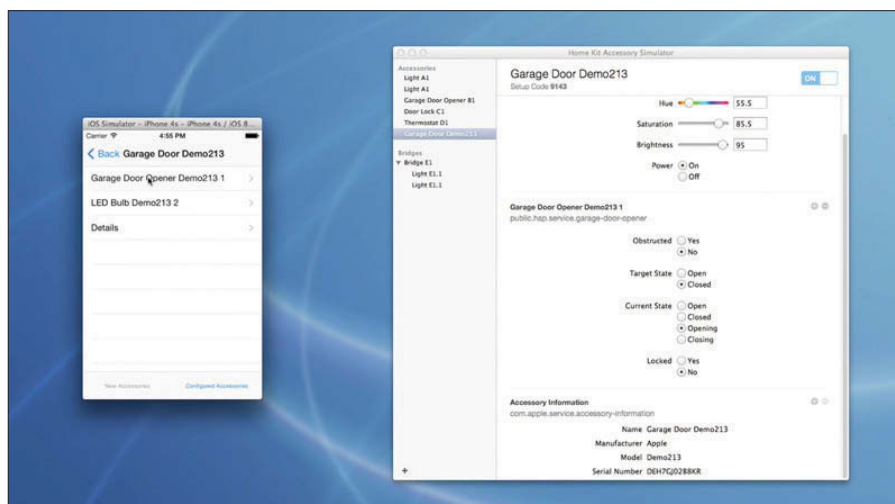
## When will devices be available?

While Apple has yet to officially launch the HomeKit platform, things seem to be gathering pace. In a recent Forbes interview it was confirmed that Broadcom, one of the three companies allowed to distribute HomeKit compatible microchips, has begun shipping the initial batches to device manufacturers. "Everyone's getting ready," revealed Brian Bedrosian, senior director of embedded wireless in the mobile and wireless group at Broadcom. "Expect to see new product launches in the next cycle of product releases."

These chips will feature the HomeKit firmware, giving manufacturers a chance to test and finesse their devices before release to the public. In fact, Elgato has already announced HomeKit-compatible home automation devices, with its new Eve range. These upcoming products will include sensors that measure energy and water consumption, room temperatures, air quality, and humidity.

Further evidence that HomeKit is about to become a reality was revealed at the Made for iPhone/iPad (MFi) Summit in Shenzhen, China in November 2014 when Apple confirmed to the attending accessory manufacturers that it would now accept plans for HomeKit-related products. This is something usually done in the latter stages

You'll be able to use **HOMEKIT** to control your home's temperature, turn on lights, and open and close doors



of a product development cycle, and would be a strong indicator that Apple is finalising its plans for rolling out the platform.

So with the Wi-Fi and Bluetooth chips already in the hands of device makers, and Apple now ready to approve their creations, it seems our waiting may finally be over.

## Compatible devices

As far as we know, Apple isn't about to launch its own smart home gadgets but will allow third parties to make HomeKit compatible products if they sign up to its MFi programme. This means that, as long as your lights or alarms are made by an Apple-approved device maker, you will be able to use its system to control them. Apple will then sell these products in its High Street stores. In fact a quick perusal of the online store reveals that there are already several automated home items available that will presumably be upgraded to HomeKit once the system is officially launched.

These products could include Philips' popular Hue series of light bulbs, which can change colour and have their brightness controlled via the existing iOS app. Then there's the Kevo automated door lock that can be opened by having your iPhone in

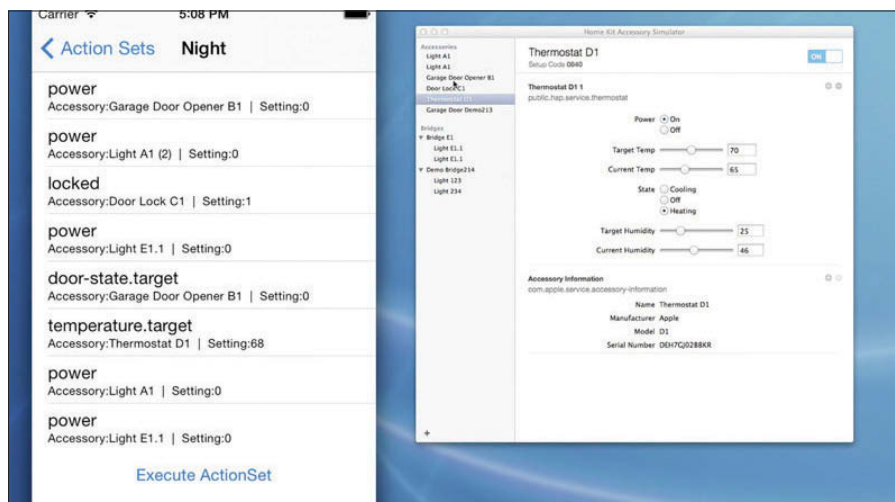
close proximity. Nest's learning thermostat has been a big success already, and lends itself nicely to the automated nature of HomeKit. Other possibilities include baby monitors, garage doors, media systems and whatever bright ideas developers come up with in the coming months.

## Apple's partners

Apple has already announced partnerships with a number of manufacturers leading the way in home automation. These include Philips, Withings, Netatmo, Kwikset, and several others, many of whom already sell products in the Apple store.

## How it will work

At WWDC 2014, Apple's senior vice-president of software engineering Craig Federighi explained that "there are a lot of great home automation devices coming on the market these days, and they have companion apps - things like lights and door locks, webcams, garage doors, and thermostats. But, you know, each of them have their own application, and they end up defining their own network protocol, their own security mechanisms. Well, we thought we could bring some rationality to this space."



HomeKit, then, is a common network protocol that these devices can employ, so the user need only open one app to control them all. This could be a generic setting for the whole home, say changing the thermostat to a certain temperature, or individual room settings, which might be as simple as turning off the lights in the bedroom. There's also a feature that allows you to create zones, so in one command you could lock all of the doors on the ground floor. With this kind of control over a home there are obviously security concerns, which Apple addressed when it confirmed that HomeKit would include secure pairing, so only a specific iPhone could open your door or issue other commands.

### How HomeKit will work with Siri

Siri seems firmly integrated with HomeKit, allowing users to use simple commands to complete regular tasks. At WWDC, Craig Federighi used the example of how the zone system could be mixed with Siri to achieve impressive results.

"With HomeKit you can group devices and changes into scenes," he explained, "and then with Siri integration you can say something like 'Get ready for bed' and be assured that your garage door is closed, your door is locked, the thermostat is lowered, and your lights are dimmed. That's HomeKit."



### HomeKit's advantages

Simplicity. Home automation is meant to make life easier, but if you have to juggle 10 different apps to get something done, then the chances are you'll be quicker if you just nip around the house do it manually. It will also bring a uniformity to the interface, so the user will know how it works straightaway, rather than having to learn a new layout each time they buy a device.

### Google Nearby

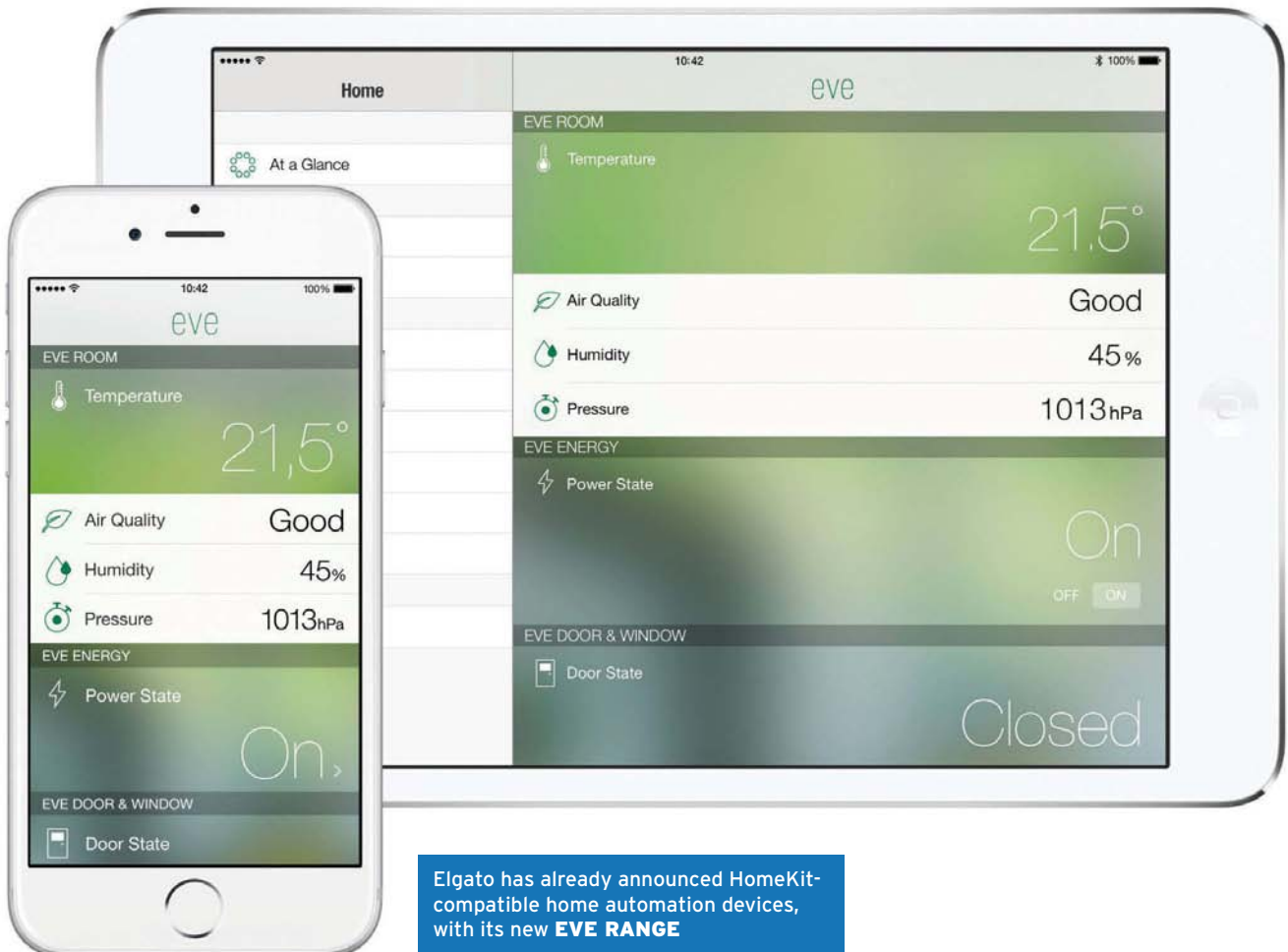
Apple won't have the playing field all to itself in home automation, as Google has already made significant investments in this area. At the start of 2014, the search giant bought

The **NEST THERMOSTAT** would work well with the HomeKit system

Nest for around \$3.2bn. This company, headed up by Tony Fadell, who famously came up with the initial design for the iPod and led the development of the iPhone, has garnered much praise for its thermostat, which can be controlled via your smartphone.

Rumours have also been circulating about Google Nearby, a service that allows devices to communicate with each other based on proximity. While the potential for this is still unknown, we've already seen the Android feature that unlocks a Chromebook if it detects your phone nearby. This could possibly be extended to work with doors, lights, or even media systems so you can arrive home to your favourite music already playing.

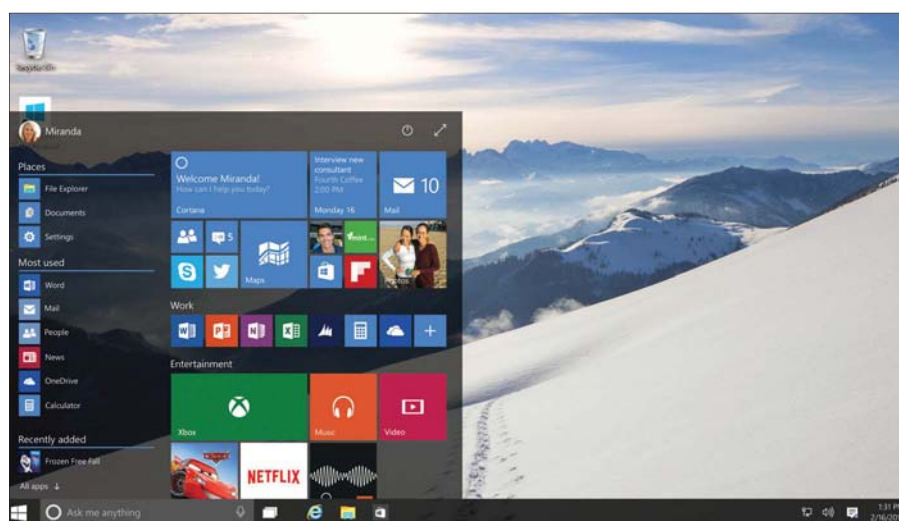
How it will match up to HomeKit is still unclear, as neither system has been fully released, but Google has been aggressive in its expansion into the areas of wearables, TV, and in-car systems recently, so it would seem likely that a fully fledged home automation platform will appear before too long. Then it will come down to which manufacturing partnerships the two companies can forge, with exclusives being all important. 



Elgato has already announced HomeKit-compatible home automation devices, with its new **EVE RANGE**

# WINDOWS 10: THE COMPLETE GUIDE... SO FAR

Microsoft has a lot riding on Windows 10, so it's making some radical changes in order to keep the operating system relevant in today's mobile-focused world. Here's everything you need to know about it



## One platform, multiple devices

Critical to Windows 10's success is the fact that it will run on PCs, laptops, tablets, smartphones and the Xbox one. With a few exceptions, it means the same apps will be available on all compatible devices; for example, smartphones running Windows 10 will have built-in Office and Outlook.

Obviously, the interface will be tailored so that it works on the vastly different screen sizes, though, as Microsoft demonstrated at the launch event in Redmond on 21 January, it's the same underlying code running on smartphones and PCs.

The tech giant calls these Universal Apps, and they'll sync with each other, so any changes you make on one device are reflected on another. They will work with smartphones, small tablets and computers, delivering everything you need for productivity. A family of apps will be built into all Windows 10 devices, bringing continuity as you move from device to device. Full Word, Excel and PowerPoint will be included on phones - complete with the familiar Office Ribbon. A recent documents list will be available to all Windows 10 devices.

Many apps will get a big overhaul for Windows 10, not just Office and Outlook. The Photos app, for example, has been

**F**ollowing on from the Technical Preview of Windows 10 last year, Microsoft has unveiled a host of new features and demonstrated how it will work on all kinds of devices, including smartphones, tablets and even the Xbox One.

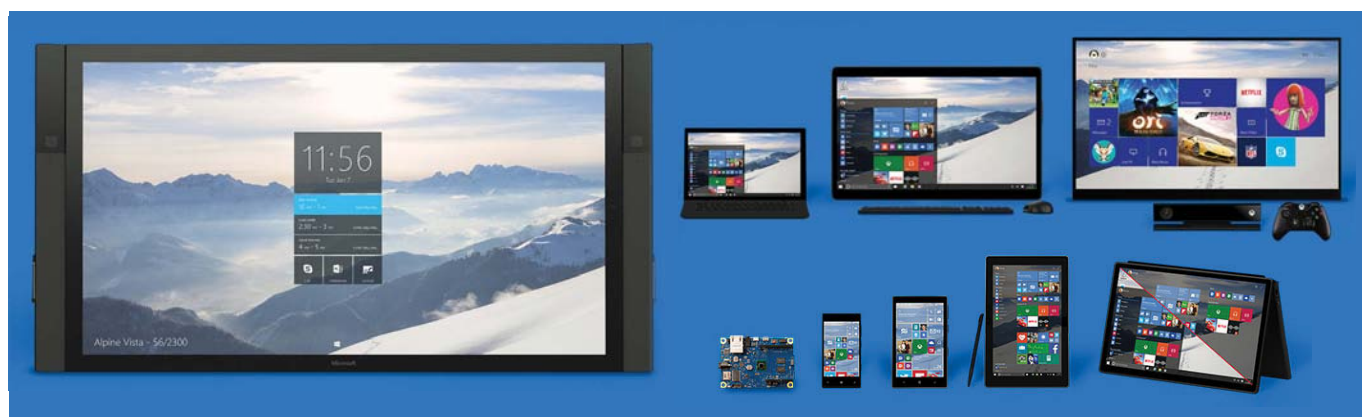
## A free upgrade

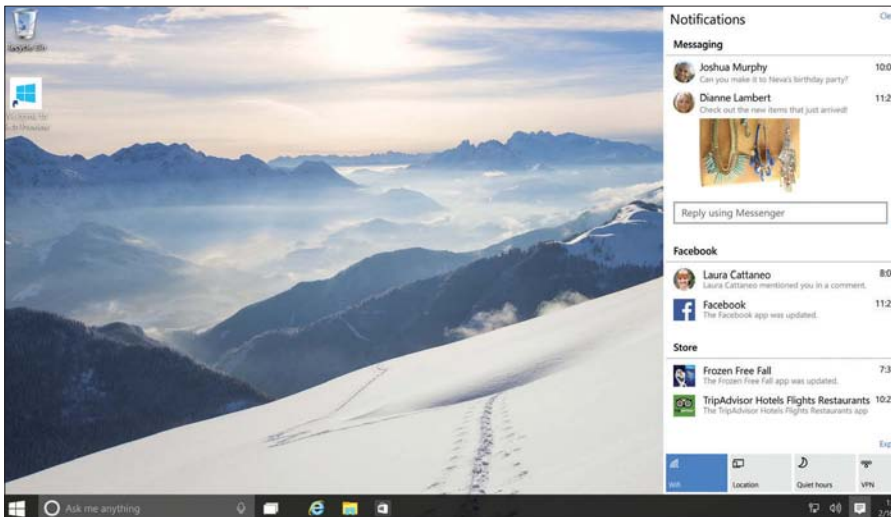
Before we delve into that, though, there's one other important detail: price. For the first year, Windows 10 will be a free upgrade for anyone running Windows 8 (or 8.1) and

you can even upgrade for nothing if your computer has Windows 7.

Similarly, most people with a smartphone running Windows Phone 8 (or 8.1) will be able to update to Windows 10 - not Windows Phone 10, note - for free.

This is a win-win situation, since we'll all be able to benefit from the new features without opening our wallets and Microsoft will quickly gain a large user base to woo developers into creating apps for the new operating system.





## ACTION CENTER ▲

improved so that you'll now see the same photo stream across your Windows 10 devices. And like Google Auto Awesome, photos will be automatically enhanced (if you allow it) and duplicates removed with the best version of similar photos kept.

## Action Center and settings

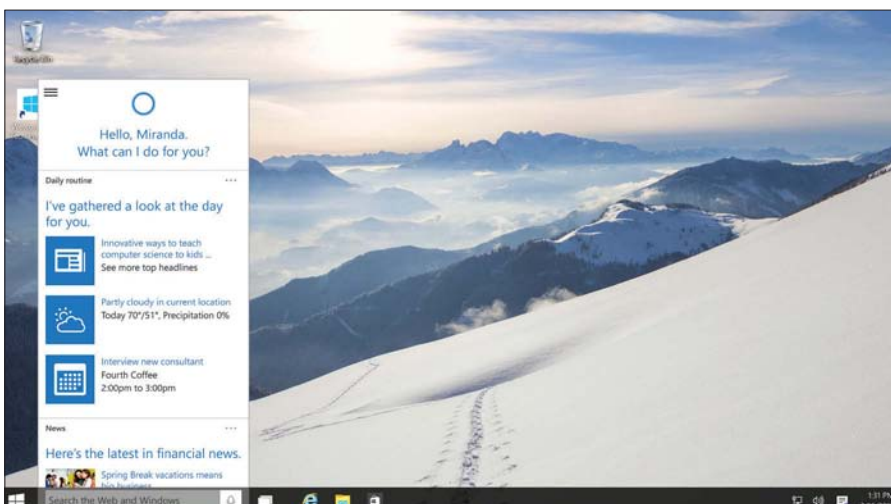
Windows Phone's Action Center will be coming to desktop in Windows 10. It will offer notifications, quick actions and more, similar to the Notification Centre in OS X Yosemite for Mac users.

Settings have also been streamlined and implemented as a universal app, removing the confusion of having both a Control Panel and Settings menu.

## Cortana

One of the most anticipated new features was Cortana, which will come to the PC and tablet

## CORTANA ▼

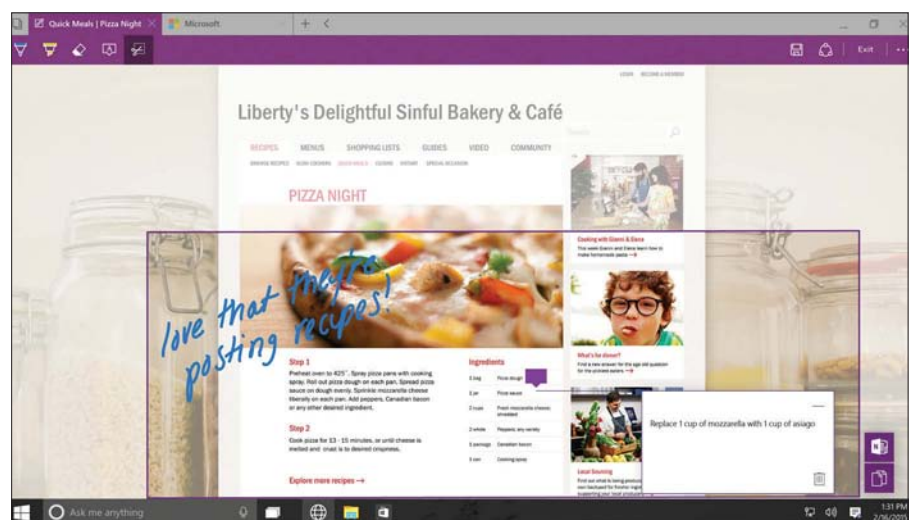


you and your interests. For example, you could ask the personal assistant to send an email to your wife and then dictate it without leaving the application you're using. Cortana knows who you're related to (if you tell her), so she can send the email without asking for further details.

Similarly, with access to your emails and calendars, Cortana can be aware of important events and let you know if you need to leave early due to heavy traffic, for example.

## Project Spartan (bye, bye Internet Explorer)

A new web browser will ship with Windows 10, currently codenamed Project Spartan. This has a new rendering engine, which according to Microsoft, is "compatible with



for the first time with Windows 10 thanks to the new way that Microsoft has merged the OS for mobile and desktop into one.

Microsoft has pipped Apple to the post here, bringing system-wide voice control to the PC. You can also type to interact with Cortana if you prefer.

One of the big benefits of having Cortana on all your devices is 'her' knowledge of

## PROJECT SPARTAN ▲

today's web". It has a new look and feel, and it has three significant features that will make you more productive on the web.

First is the ability to mark up articles on the web with comments and annotations before you share them, either through touch or with a keyboard.

Second, Spartan improves reading on the web. The reading mode supports PDFs natively and can be personalised, and includes a reading list that shows up on all your Windows 10 devices. This content is then available to read offline, so it won't matter if you're on a plane with no internet connection.

Finally, Spartan brings Cortana to the browser and will pop up information and suggestions as you browse the web. When you search, Cortana can display information (similar to Google's widgets) at the top. If you search for flight status and Cortana knows a particular flight number from an email or your calendar, 'she' can show whether the flight is on time or delayed.

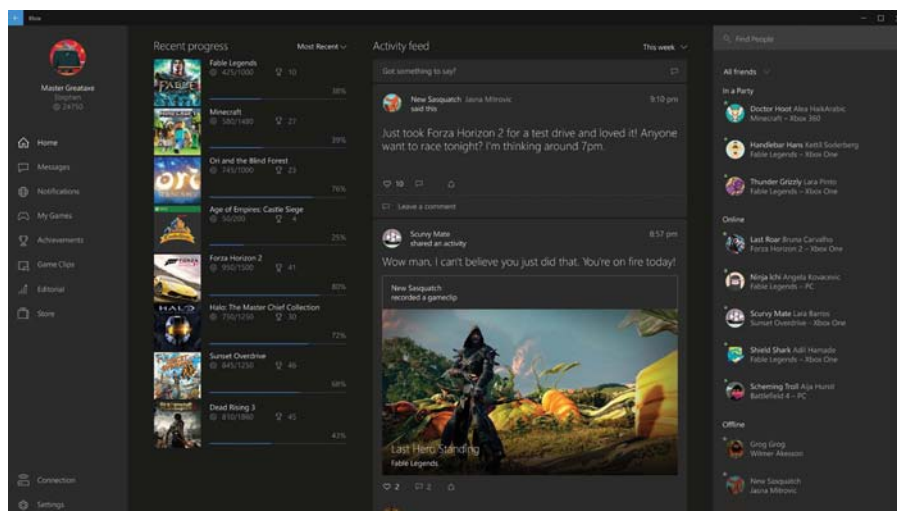


## Xbox

Microsoft got Xbox all wrong in Windows 8. Instead of an app for those owners who also have a Windows PC, the Xbox apps in Windows 8 were almost adverts to persuade people who didn't already have one to go and buy the console. The music, videos and games apps within Windows 8 made the mistake of putting paid-for store content before your own stuff, but that won't happen in Windows 10.

Thankfully, Microsoft is bringing Xbox Live to the desktop. Players will also be able to play Xbox One games on their PC by streaming them directly from their console to their Windows 10 tablet or PC within their home. That means you don't need a powerful device to play Xbox One games, and it's handy if someone else wants to watch the TV your console is connected to.

Better still, Windows 10 gamers will be able to play against people on their Xbox



## GAME DVR ▲

One in multiplayer games: it's the same platform, remember.

## Continuum

One of the hurdles for the design team is hybrid, or 2-in-1 devices, which can be a tablet or a laptop. In laptop mode, you need an interface that is optimised for keyboard and mouse, but as a tablet you want to control everything via the touchscreen.

Microsoft's answer is Continuum, which automatically switches modes when you disconnect the keyboard from a Surface tablet. (If the keyboard is part of the device, we're assuming there will be a button or a way to detect when you fold the keyboard underneath the screen to use it as a tablet.)

For example, if you have several windows open that don't fill the entire screen, they'll automatically switch to full-screen mode and possibly even change to a touch-friendly UI when you go to tablet mode.



## CONTINUUM ▲

## Smartphones and tablets

For devices with 8in screens or smaller there will be a 'mobile' version of Windows

**WINDOWS 10 ON MOBILE** ▶

Left to right:  
Start screen;  
Photos; Action  
Center



10. On a smartphone, the Start screen is very similar to Windows Phone 8 with live tiles and the ability to rearrange and resize tiles as you like.

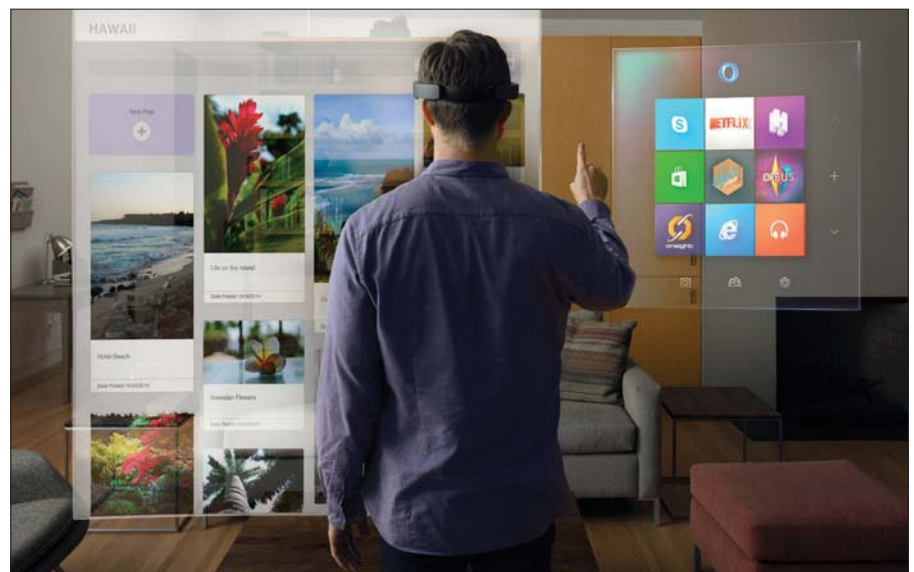
When you swipe in from the right you'll see the app tray (just as you do now), but you'll find recently installed apps at the top of the list.

The Action Center also has some new features and is now synced with the PC version. You can expand action buttons and dismiss single items shown as notifications.

The Word Flow keyboard has been improved in Windows 10, letting you pull it over to the right and do shape writing with one hand, and you can use voice input to reply to messages by tapping the microphone button. The speech system is sophisticated enough to recognise names of contacts, hashtags and insert punctuation.

Other improvements to messaging include support for IP-based messaging services and Skype. If you're sending an SMS and both parties use Skype, Windows 10 will automatically flip to the application so you can have a real-time conversation, whether that's continuing to use IM, or switching to a voice or video call.

As we've already said, smartphones will have Office built in and thanks to hardware

**HOLOLENS** ▲

acceleration, you'll be able to give proper presentations from your phone.

New versions of Outlook Mail and Outlook Calendar will also be found on phones, tablets and PCs. The full Word engine will be built into the email app so you can format text just as you would in a document. Swipe gestures - as already exist in Apple Mail and Gmail - let you flag or delete messages.



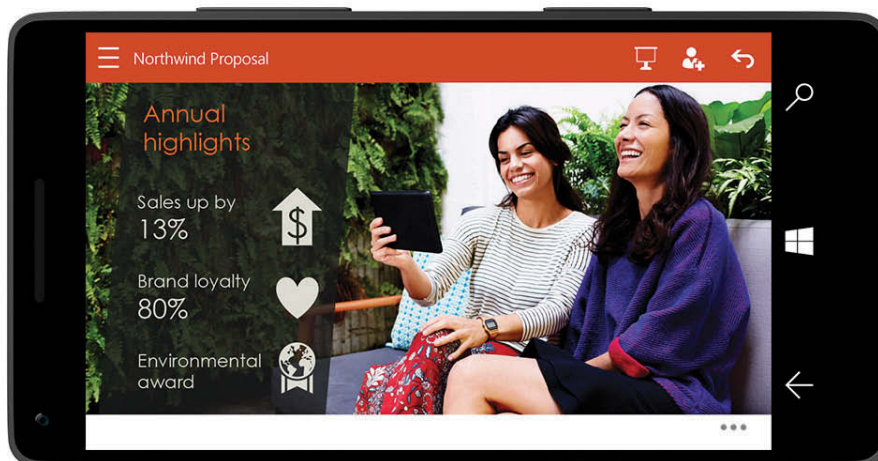
You're not cut off from the real world since the wireless glasses are transparent. It's an interesting concept with a lot of potential, and we're eager to see how it develops.

**When's it available?**

The great thing is that Microsoft wants as many people as possible to help shape Windows 10. This means that you can sign up to the Windows Insider Program and download the preview version of Windows 10 to test out, all for free.

Simply head to [preview.windows.com](http://preview.windows.com) and click on the link to sign up. You can then follow our step-by-step tutorial at [tinyurl.com/k79obn8](http://tinyurl.com/k79obn8) to install it.

The preview version of Windows 10 for smartphones may or may not be available by the time you read this, but everyone on the Insider Program will get an alert by email when it's ready to download and install on your Windows Phone. ☑

**POWERPOINT** ▼



# Back to the Future Part II

**PC Advisor staff** look at what the classic movie got right and wrong about tech in 2015

**I**t's 2015, a year that has special status for many movie fans: it's the year to which Doc and Marty travel in *Back To The Future Part II*. To be precise, they travel to 21 October 2015, which means there are just over eight months until we should all have flying cars and wear two ties to the office.

To give credit where it's due, although it doesn't have the defining classic status of the original, *BTTF 2*'s writers had a surprisingly accurate vision of 2015's gadgets. We may not ever see the Hoverboard become a reality (and certainly not by 21 October), but the film gets a heck of a lot right, and makes one major oversight.

Here, we look back over our favourite gadgets from *Back To The Future Part II* to see if current tech can match 1989's dreams.

## The internet

Okay, so let's deal with the biggest failing first. Even when the film was written in the late 1980s, the writers completely failed to predict the internet. Instead, there's still a heavy reliance on paper in the film's version of 2015. Throughout the futuristic sections of the movie, fax machines churn out paper – in one instance to tell Marty he's fired, and there's a reference to the latest innovation of 'dust-repellant' paper. **Chris Martin**

## Smart Glasses

*BTTF 2* got one thing pretty much bang on with its representation of wearable technology. Not only did Doc Brown have his stylish aluminium shades, but Marty had some radical specs looking something like a chunky Google Glass prototype.

And other firms have been quick to announce their smart glasses (Samsung, Epson, Sony and Toshiba to name but four) and thankfully they're a little more refined than the ones Marty was sporting in the film. Virtual reality is also gaining traction again thanks to devices such as the Oculus Rift (and even Google Cardboard). **Chris Martin**

## Hoverboards

A cross between a skateboard and a hovercraft, hoverboards were the kids' version of the flying cars in *BTTF 2*. There's no hope at all that Mattel or anyone else will release a working hoverboard in 2015, but it's possible they could be a reality at some point in the not-too-distant future.

Various theories about how the producers made hoverboards work for the film were bandied about, including hidden magnets. The reality, however, is much more mundane. The actors were suspended on wires that were removed in post-production, and the hoverboards stuck to their feet.

Real hoverboards would have to use a quantum superconductor for levitation, but with the limitation of sticking to a predefined path instead of being able to travel anywhere. Quite whether the techniques used in the video below can be translated to support the weight of a human remains to be seen. **Jim Martin**

## Drones (The automatic dog-walker)

In a classic caper, the automatic dog-walker that appeared in *BTTF 2* distracted Marty McFly for long enough to allow Biff to steal the DeLorean and travel back to 1955. It consisted of a drone attached to the dog's collar by a lead. That drone could presumably be programmed to follow a particular route.

While they're not being used for dog walking, civilian and commercial drones are indeed becoming a common sight. It's yet another remarkably prescient prediction from the *BTTF 2* writers.

Amazon is considering using drones to deliver parcels to your door as part of its Amazon Prime Air project. Drones are also being used for filming and surveillance purposes. In the film, a drone is sent by the *USA Today* to take photos for the paper.

Returning to dog walking, an enormous robot called Luna that was unveiled by RoboDynamics in 2011 could be the answer



SMART GLASSES

to automatic dog-walking. The robot can also help with various tasks around the home, including walking your dog. RoboDynamics expects that there will be a robot in every home by 2021. **Ashleigh Allsopp**

## Skype

Video-conferencing is one technology we saw in *BTTF 2* that is already part of every day life. In one famous scene we watch Marty's colleague Douglas Needles convince him to get in on a work related scam, but unfortunately the call is being snooped on by his boss, who then fires him. Having ended the video call Marty's boss sends a fax to confirm he has been fired, not so high tech.

It's slightly disconcerting to see all the information about Needles flash up on the screen: age, 47; birthday, 6 August 1968; address, wife... It's as if his GCHQ file has just been opened up, and just like today, we wonder if the GCHQ and other government agencies are listening in on our calls like Marty's boss was.

Now we are actually in the future, video-conferencing isn't only used for bad though. A friend of mine got a job recently after being interviewed over Skype. The first time he met his new employer was on the first day in the new job.

Today video-conferencing is a popular way for businesses to communicate with colleagues and clients who are based around the world. It saves money in travel costs, and also stops our carbon footprints from getting too big. It's not clear where Marty's boss Ito Fujitsu was based, but perhaps we can presume that he was in Japan and Marty does indeed work remotely. **Karen Haslam**

## Salesforce

The scene with Marty's boss snooping on him reminded me that many organisations keep detailed records of their employees, customers, rivals and more using HR systems and 'customer-relationship management' software such as online service Salesforce. For business reasons (apparently), we even volunteer information through LinkedIn.

As for bosses snooping on their employees calls, that's a reality for city

traders and the like - even on their mobile phones. Tech companies such as Cognia offer tech that enables financial firms to record their employees' calls and messages - with their permission (though granting permission is usually part of their terms of employment) - to avoid insider trading and commercial espionage. **Neil Bennett**

## Biometrics

In *BTTF 2*'s imagined 2015, fingerprint scanning is commonplace, used for home security and electronic payment. Most people unlock the door to their home by pressing their thumb against a scanner; charity muggers carry around portable versions of the thumb pad to solicit instant donations, which are subtracted from online accounts on the basis of biometric IDs.

We're not there yet, but fingerprint scanning is widespread in our timeline too. Apple famously gave the iPhone 5s a fingerprint scanner for one-touch login - analysts expect the company to expand this component's capabilities in future - but they've been around for a lot longer than that. We've seen them built into laptops since 2004, and we've even seen them on portable storage drives.

And maybe biometrics are finally becoming practical. On the home security front, heavy-duty fingerprint-scanning padlocks are available, although they remain

rare; the need for batteries makes us wonder how much the old faithful padlock really needed to be improved. At least you don't need to worry about losing the key.

At any rate, let's hope one aspect of the thumb pad in *BTTF 2* doesn't appear in our own society: the practice of 'stealing' other people's thumbs in order to access their money and property. Thumbs down to that. **David Price**

## Time travel?

I loved the first *Back To The Future*. I went to see it in the first week of 1985 with the 12 Morley Cub Scouts - and yes, watching in 1985 a film set in 1984 and 1954 is a kind of time travel. In the intervening 30/60 years time travel has not become a reality - but I could have told you that in 1984, 1954 or any other time in-between then and now.

Time travel as depicted in *Back To The Future 1, 2, 3* or any future reboot is the one bit of tech that we will never see. Ever. We'd know about it if time travel was invented at any point in the history of our civilisation (or those that came and went before and after). If time travel exists at any point in history it exists in all points of history, so unless Doc Brown is hiding his invention over in the States we're forever out of luck on that score. Which is a shame, because I think I'd rather suit Marty's body warmer. **Matt Egan** ☒



THE INTERNET



HOVERBOARD



## Get more from your new Chromebook



Setting up a new Chromebook is much easier than setting up a PC. They don't require major updates or antivirus software. You start simply by signing in with your Google Account (or creating that account, if you don't already have one).

That said, Chromebooks have some unique quirks, such as limited offline capabilities. Derek Walter reveals everything you need to know to set up your new Chromebook the right way, starting with the tools that let you replace the Windows software that just won't work on a Google laptop

### Survive offline

Yes, Chromebooks are primarily conduits to the web. But aside from very specific computing demands, such as high-end gaming or video- and image-editing, the gap between what a Chromebook can or can't do is quickly closing. There are a slew of superb, powerful web apps available that can already replace most people's basic desktop software.

Two such examples are Adobe, which is building a Chrome-friendly version of Photoshop, while Microsoft is bringing Skype to the web (and native webRTC-based voice and video chats

are already here). The absolutely free Office Online works with traditional Office documents and offers enough features for mainstream users. And recent initiatives by Humble Bundle and Mozilla hint that a brighter future for web-based gaming.

The other typical knock on Chromebooks is that they're not as useful offline. While that's still true to some degree, Google and numerous third-party developers have been working hard to enable offline capabilities in their web apps. The Chrome Web Store, which is the digital storefront for Chrome software, even features a section dedicated to offline apps.

## Prepare for offline use

Beyond offline Chrome apps, numerous native Chromebook offerings and features can be configured for use away from the web. Google's Gmail Offline, for example, lets you – you guessed it – work with Gmail while offline. Download the app from the Chrome Web Store, then fire it up from the Chrome OS app launcher. You'll then be asked if you want to save your messages offline. (If you're signed in to multiple Google accounts, toggle the email address at the bottom to select where to save your email data.) Once enabled, Gmail Offline lets you reply and compose new messages, which are cached and then fired off to the recipient once you're back online.

Heavy Google Drive users should head to the settings page (click the wrench icon at the top right) inside Drive to enable offline storage. It will then sync all your docs, sheets, slides and drawings to your Chromebook. Just like Gmail, it syncs back your changes to the Drive server once you're reconnected. Be mindful of the limited storage space found in most Chromebooks, however; the files stashed in your Google Drive could easily exceed your Chromebook's capacity.

## Set up your Chromebook for printing

Printing from a Chromebook is the most complicated process you'll encounter. You're in luck if your printer is Google Cloud Print ready (Google has an official list at [tinyurl.com/q7up367](http://tinyurl.com/q7up367)). If so, all you have to do is enable Cloud Print on your Chromebook.

To see whether your Chromebook recognizes your printer, simply open the Chrome Settings menu (click the icon that looks like three horizontal bars) at the top-right corner of the browser

window, select Settings, click Show Advanced Settings, and then scroll down to Google Cloud Print. Under 'New Devices' you should see the name of your printer, assuming it's properly connected to your network.

If your printer doesn't show up in the list, it may not be Google-Cloud-Print ready, or it could just be having some other connection issue). You may have to dig out that instruction manual or head to the printer's specific help page. Google also has a support site that may point you in the right direction.

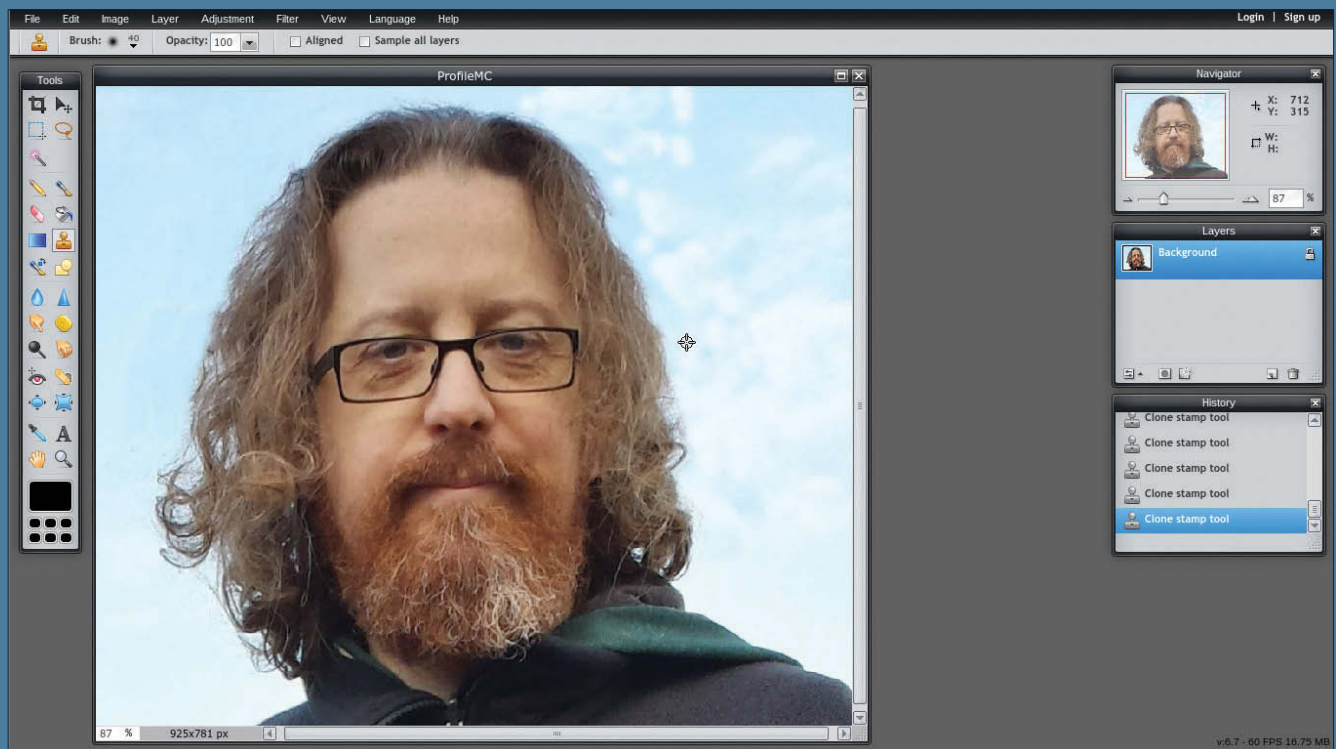
If your printer isn't Cloud-Print-enabled, the only way to print stuff from your Chromebook is to connect your printer to a Mac or Windows PC, install Cloud Print on that as well as your Chromebook, and then follow the steps we mentioned earlier to tie it all your Google account.

The workaround works well enough, but if you plan to print a lot from your Chromebook, you'll want to spring for a Cloud-Print-enabled printer. Another advantage of Google Cloud Print is that once it's configured, you can print from any device that can sign into your Google Account.

## Chromebook power

With those basics under your belt, you're ready to start. The beauty of Chromebooks is that after the initial setup, most people will never need to worry about those beefier settings and options – or any other kind of maintenance or management, for that matter. ☒





# Edit your photos on a Chromebook



Editing digital photos once required powerful PCs with expensive software. Photoshop has become the suite of choice for professionals and consumers alike, so much so that now people use it as a

verb: "did you Photoshop that?" Could it be then that it's possible to run something as demanding as Photoshop on the humble Chromebook? Martyn Casserly shows how to use Photoshop on a Chromebook, and reveals the best alternatives

## Project Photoshop Streaming

Up until recently Photoshop was very much the preserve of PCs and Macs. It came as a surprise then when Adobe announced that it was experimenting with an online version that Chromebooks could use. Project Photoshop Streaming hosts the application on Adobe's servers, meaning that the majority of the processing is done in the cloud rather than on the Chromebook itself, which would admittedly struggle with the demands. Of course anyone using the service would need a fast and stable internet connection, as there would be a lot of information travelling back and forth between the Chromebook and the site. Initial reports have been very encouraging though, saying that the

solution works surprisingly well and could pave the way for more server-side applications.

Sadly Project Photoshop Streaming is a very restricted service at the moment, only available to existing Creative Cloud customers based in North America who work in education. With the technology now in place though, it will hopefully only be a matter of time before Adobe opens it up to a much wider audience. Until then there are other options available on the Chromebook that can accomplish a good deal of the Photoshop duties and cost a lot less.

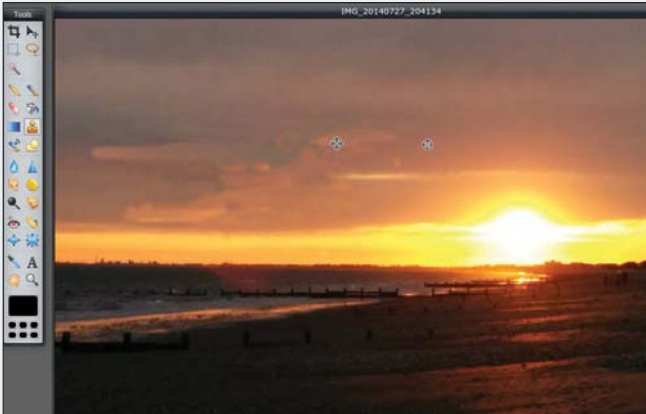
## Pixlr Editor

One of the most popular image editors on Chrome OS is Pixlr Editor. To download it click on the square grid icon in the bottom left of your screen, then select the shopping bag icon that represents the Web Store. Once the store is launched search for Pixlr Editor and then click on the blue button marked '+ FREE' to add it to your Chromebook. When you load up the app you'll notice that the interface is very similar to Photoshop. The left-hand column is where the tools reside, including the ability to crop an image, Clone parts of a picture when you want to magically remove people or objects, and more everyday functions such as red-eye removal.

## Using the Clone tool to remove objects

A common task that Photoshop excels at is removing unwanted artifacts, or people, from images. The easiest way to do this is with the Clone Stamp tool, which is the yellow stamp icon in the Tools



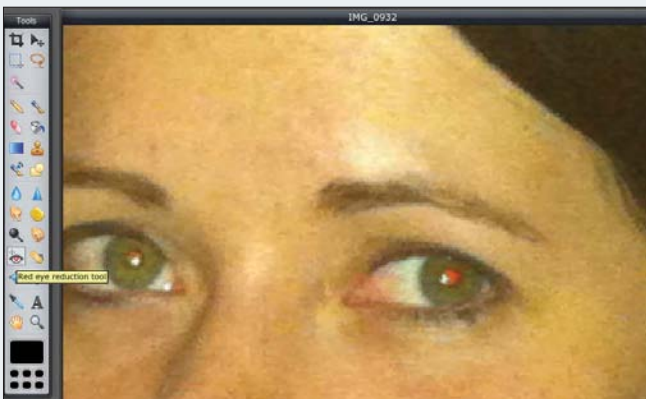


panel that also resembles someone's head and shoulders. Click on this and then when you move to the main image you'll see you now have a circle as your pointer. A clone tool works, as the name suggests, by copying one part of the image over another. It's can be something of a blunt instrument, but if you take your time you can achieve impressive results.

To use the clone you'll need to pick a part of the image that you want to copy, press Ctrl+click, which selects the area, then move the mouse to the bit you want to replace click and hold, then gently move the mouse through the image. If you make any mistakes just hit Ctrl+Z to undo your last edit. One thing to know is that the point you pick to copy actually moves as you paint it over the affected area. This is to make the image look more natural, but it takes a little getting used to.

### Removing red-eye

Another quick fix that's very handy is removing red-eye from pictures. This is actually very simple to do, thanks to the red-eye reduction tool in Pixlr. Once you've loaded up the image you want to fix, go to the Tools panel and click on the eye icon.

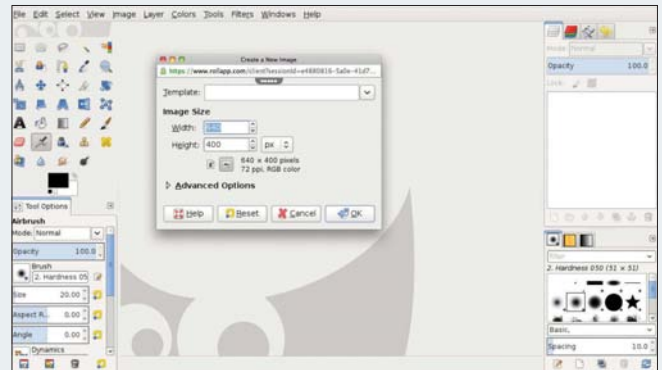


Now, on the left of the screen are three panels, the top one is called the Navigator and it displays a small version of the main image. This allows you to focus on any part of the image by moving the little red square over it, and then zoom in and out using the slider. To fix red-eye, enlarge the affected area until it takes up most of the screen, then place the pointer over the eye in the main image. Now just click on the red parts and Pixlr will darken them. Again, if you make a mistake Ctrl+Z will come to the rescue.

There are many more functions available in Pixlr, including making an image or logo from scratch, and it really is a very impressive free tool for the Chromebook. A quick search on YouTube reveals a plethora of tutorials for many of its other graphical capabilities, and you can also access the app via the normal Chrome browser on your PC or Mac.

### GIMP

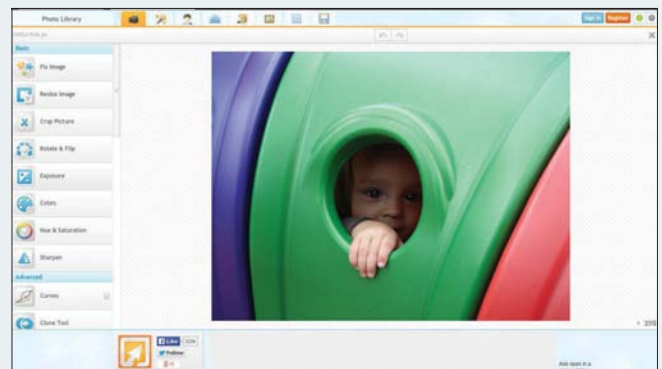
GIMP has long been one of the most popular Photoshop alternatives on PCs and Macs. Much like Pixlr, the interface is heavily based on Photoshop, with an impressive amount of tools



and functions. Now Chromebooks can enjoy GIMP for free, thanks to this web adaptation to the classic application. You will need to create an account to have access to any of the useful features, but once you're set up this is a useful tool for your photo collection.

### iPiccy

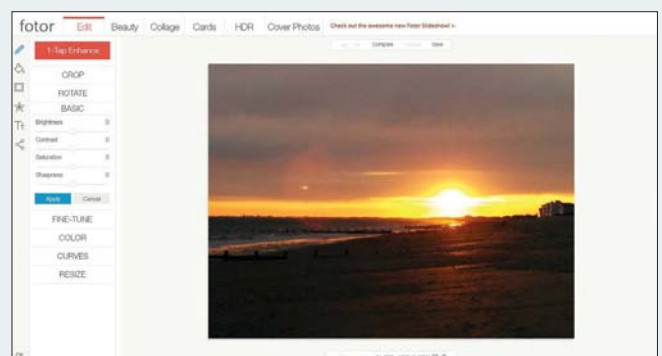
If you want a simple editor for photos, iPiccy is a great free app. The layout is bright and friendly, with big buttons bearing their functions so you can't get lost. It's powerful too, being able to

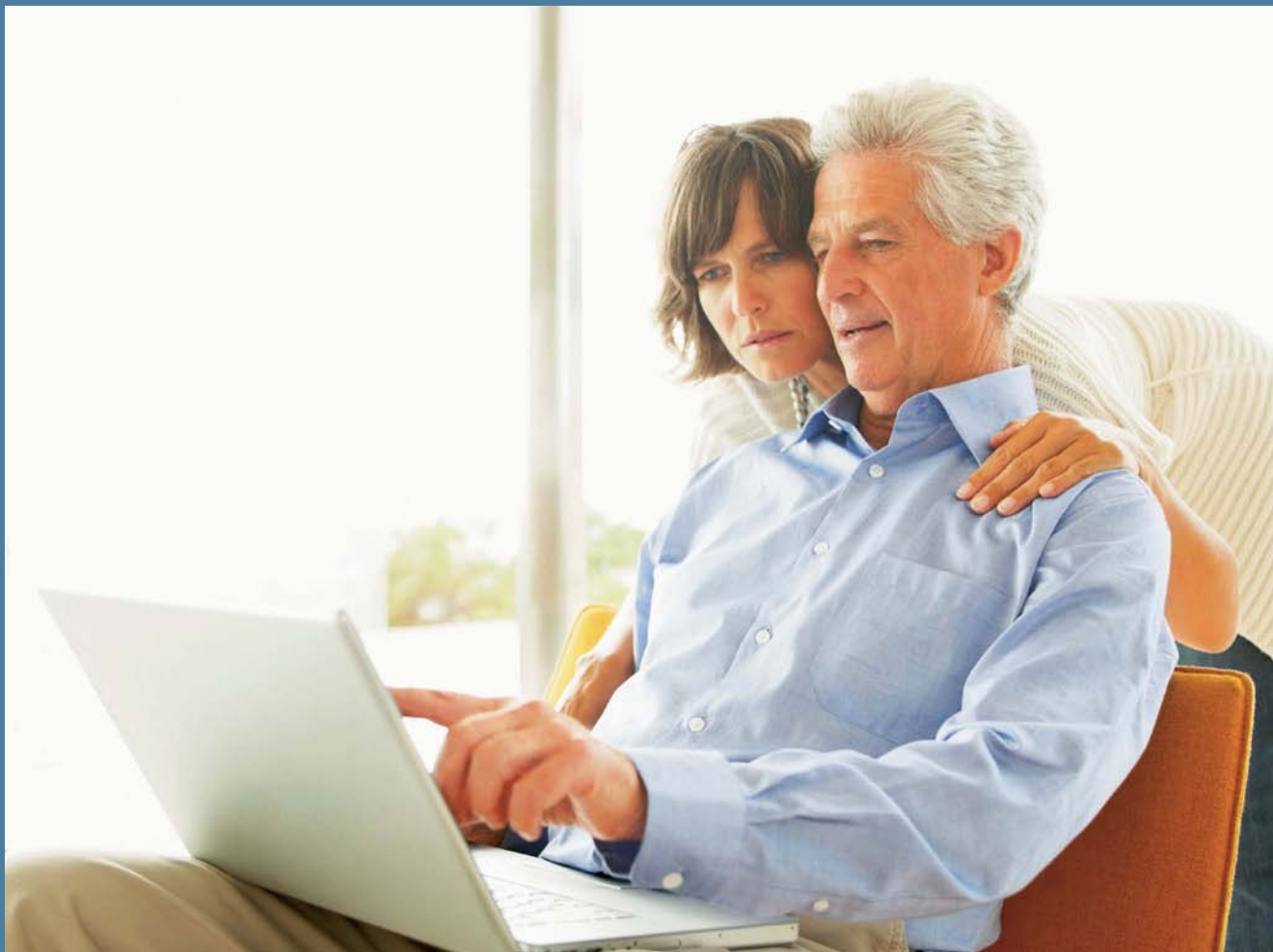


resize, rotate, and even remove parts of an image via a cloning tool. It also has easy to use settings for adjusting colours and exposure, plus various Instagram-style filter effects.

### Fotor Photo Editor

Fotor is focused far more on making cards and collages than the deep editing features of Photoshop. It still has many of the standard tools you'd expect, and also Instagram-style filters are in abundance. There is even a blog on the site that covers various creative ideas, such as how to take chic fashion photos. ☒





## Use Hangouts to call friends on a Chromebook



Chromebooks are great, inexpensive devices that can be used for a wide variety of PC related tasks. From the basics of email and web browsing, up to photo editing and gaming, you'll find plenty of apps that can make these versatile machines

incredibly useful. As pretty much every Chromebook comes equipped with a built-in webcam they are also excellent for making video calls to friends and family around the world. Using Skype to achieve this is something of a challenge though, but an excellent alternative is available. Martyn Casserly reports

### Installing the Skype app

A very common question we're asked is how can you use Skype on a Chromebook? To which the answer is, basically, you can't. Sort of. Technically it is indeed possible to get Skype up and running on the Google powered device, but it certainly isn't for the faint of heart. So in most cases we would advise against trying it and instead opt for Google's own Hangouts service which acts in almost exactly the same way. If you're determined to stick with the Microsoft empire, or your family simply can't bear to move themselves from Skype, then with a little effort you can make it work.

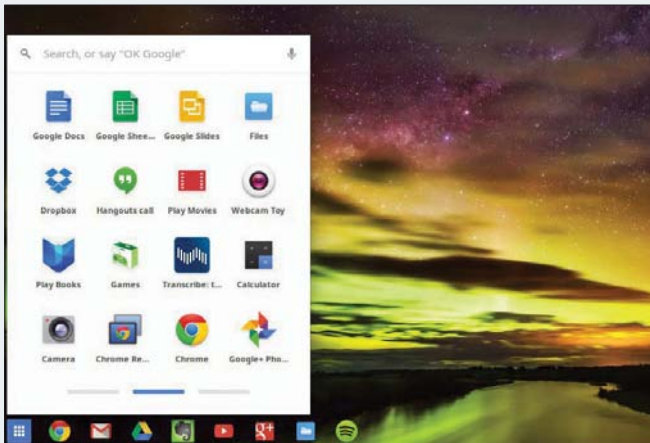
Google has recently been experimenting with ways to run Android apps on Chromebooks, via a specially created runtime. So far there are only four officially supported apps - Vine, Evernote, Duolingo, and Sight words - but the eventual plan is for a lot more, which will hopefully include Skype. Installing any of these apps on your Chromebook will also include the runtime in order to work. Then if you can find the relevant APK for Skype you'll

need to package it so that it will run on Chrome OS. As we said, it's not for everybody. There are several instructional videos on YouTube showing you how to achieve this, so search for 'run android apps on chrome' and you'll be able to try it out.

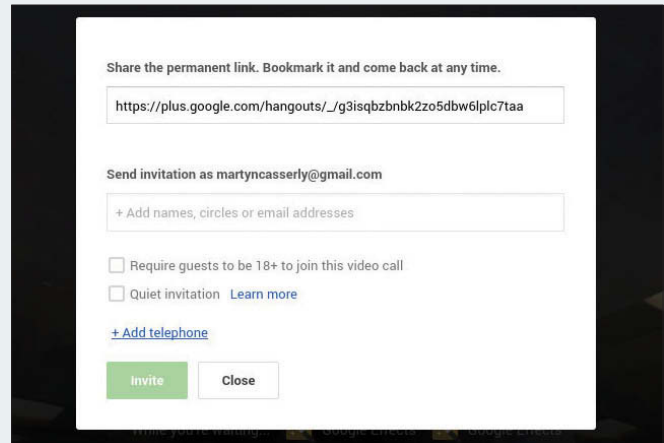
### Using Google Hangouts

The easiest, and we'd suggest best, alternative to using Skype on a Chromebook is Google's own Hangouts app. This video messaging service offers many of the same capabilities - including group chats, instant messaging - and if you use it on an Android phone you can also make voice calls to iPhones, iPads, Chromebooks, and of course Android devices that also have the app installed.

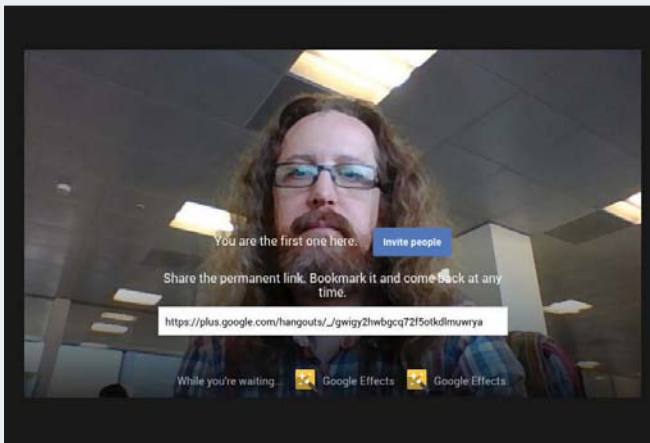
As you have a Chromebook, it stands to reason that you also have a Google account, otherwise you couldn't have logged in to the device. Hangouts uses your existing account as your ID and is very simple to use. Just follow these steps and you'll be chatting with friends in no time.

**START**

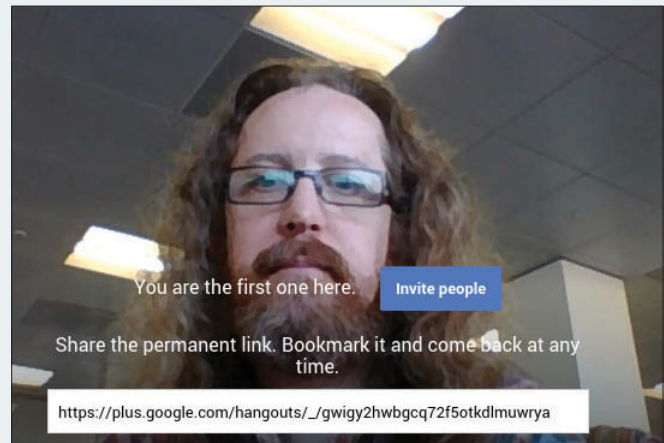
To launch the app, go to the bottom left-hand corner of the screen and click on the dotted, square icon to open the app tray. Here you'll find the green speech bubble icon for Hangouts. Click this to launch the app.

**2**

You'll be presented with a pop-up box asking you a few questions about permanent links, people to invite, and a few other small details. For now we'll ignore this, so click Close and you'll be taken to the main Google Hangouts screen.

**3**

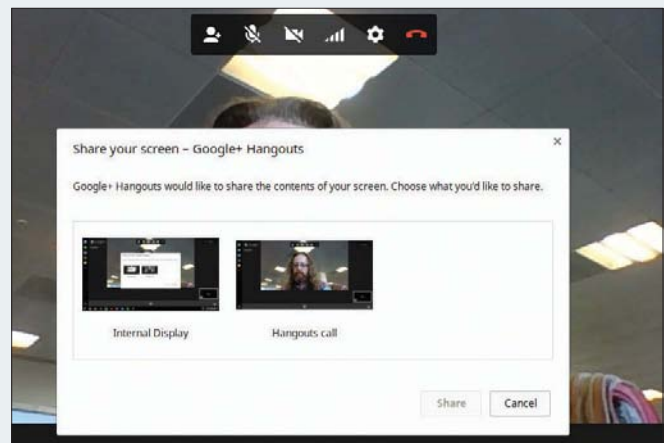
The webcam on your Chromebook is now active and you should see a real-time video of yourself in the centre of the screen. If you move your mouse pointer more options should appear from the left and the top of the screen.

**4**

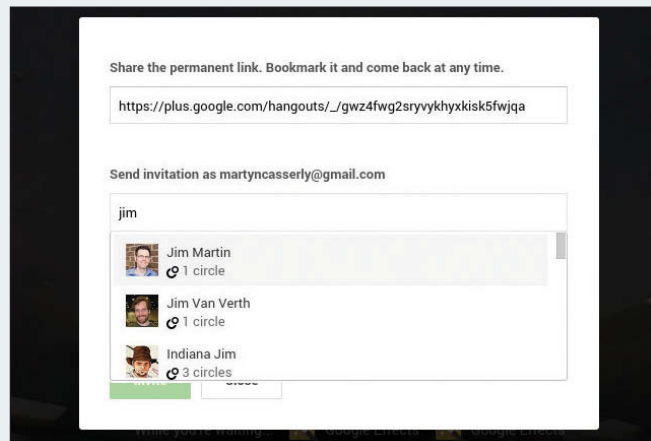
Across the top, you'll see the standard video calling icons. Here you can invite people, mute the mic, turn the camera off, adjust bandwidth use (which in essence lowers video quality if your connection is weak), general settings, and leave the call.

**5**

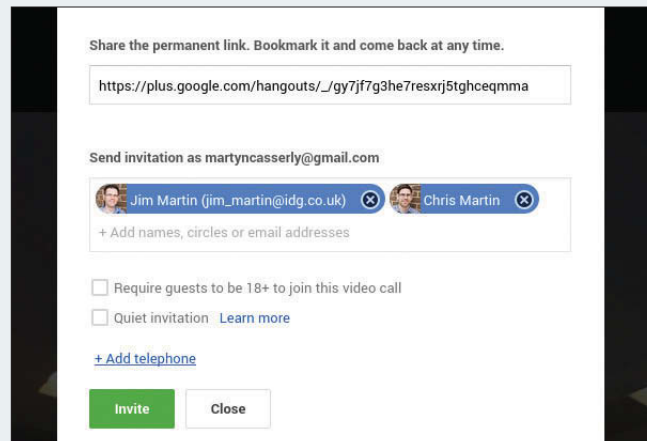
The left-hand column has different options some of which are somewhat playful. Draw allows you to doodle all over your friends - something we know the kids will love - and Google effects can insert various backgrounds, including a deserted beach.

**6**

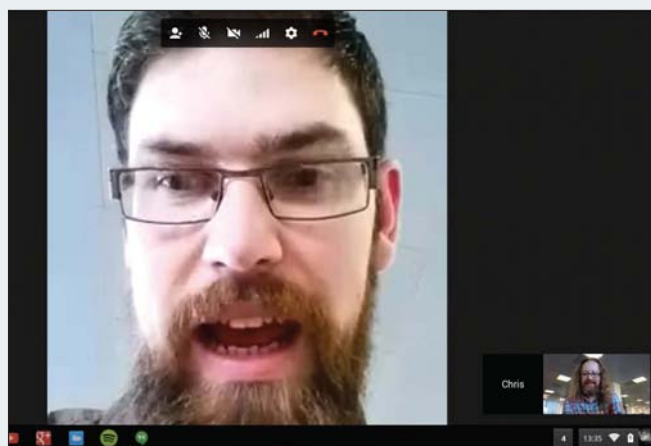
Other options are more useful, with the Chat icon launching an IM window; Capture taking a screenshot; and Screenshare which allows you to display your desktop with anyone else on the call - great for sorting out any technical issues.



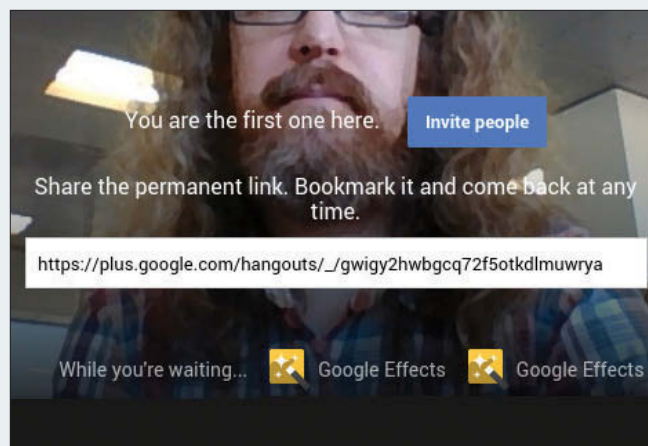
**7** The main point of Hangouts is to contact people. To start a call, go up the Invite People icon where you'll see the box that open when you first launched the app. Type someone's name into the box marked 'Send invitation' and your contact list will appear.



**8** Once you've added everyone you want on the call - you can have up to nine friends at once - then click on the green Invite button to start the Hangout. You'll return to the video screen and others will join as and when they accept the invitation.

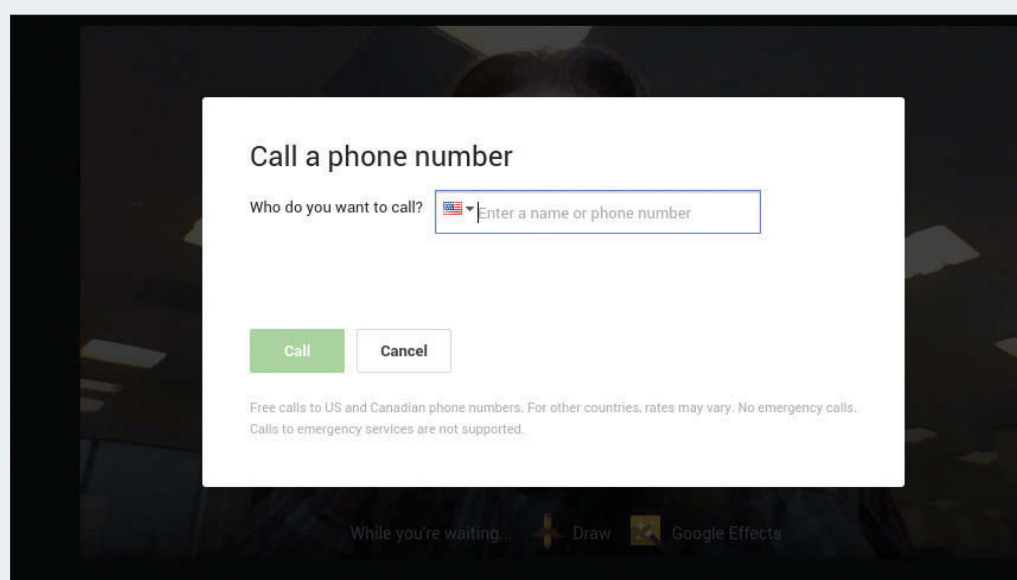


**9** Remember that other people don't need a Chromebook to take part in a Google Hangout, as the service works on phones and tablets that have the app installed. They'll still need an internet connection, of course, preferably using Wi-Fi.



**10** If you want to set up a regular Hangout, say for a weekly team meeting, then you can use the permanent link feature offered at the start. Just bookmark the link, share it with your colleagues, and you can return the call whenever you want.

**11** You can also make use of the Skype-style ability of making calls to landlines and mobile phones at low rates. Click on the Add Telephone option in the invite box and you can call the US and Canada usually for free, plus the rest of the world for a small fee. ☒

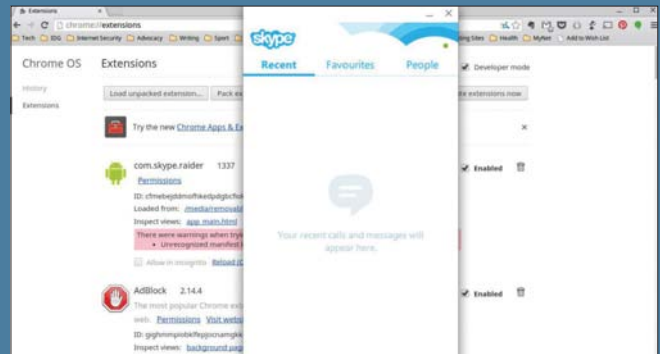


# Use Android apps on a Chromebook



Chromebooks are excellent devices that offer great value and a surprising amount of capability. This can be increased by the addition of Android apps, many of which can run on Chromebooks, albeit with a little help. Google recently announced the App Runtime for Chrome (Beta), which allows developers to adapt their Android apps to Chrome OS.

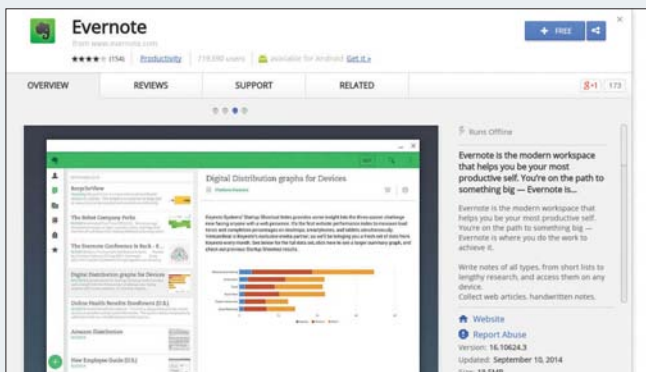
So far four official apps have been released using this runtime – Evernote, Duolingo, Vine, and Sight Words – but with some effort it's possible to get a lot more. Be warned, though, performance can be very patchy, and during our experiments we encountered several issues that induced furious head scratching. But if you fancy a spot of gentle



hacking, we'll show you what you need to make this work, and how to do it. Martyn Casserly reports

## Downloading Google's app Runtime for Chrome

While you might expect a trip to some developer site in order to find the Runtime app, it's a lot simpler than that. To install it on your Chromebook all you need to do is download any of the four apps mentioned above (Evernote, Duolingo, Vine or Sight Words) and the Runtime app is automatically included in the package. So head to the Web Store on your Chromebook, search for Evernote, then click to install it. Notice that there are more than one version of Evernote listed. Ignore the one entitled Evernote Web, as this is just a shortcut to the online version.



## Downloading an app APK

To install an Android app on your Chromebook you're first going to need the APK, which is the basic equivalent of an EXE file on Windows or a DMG on OS X. You'll need to do this on a Windows or OS X machine, as Chromebooks can't run the repacking software we'll be using in the next step. Google the app you want, making sure to include APK in the search. Be careful when going to the listed sites as many of them have big Download Now buttons that are often for the adverts next to them rather than the file itself. Take your time, make sure you check that you're clicking on what you actually want, then you'll be able to download the APK instead of some dodgy browser plug-in.

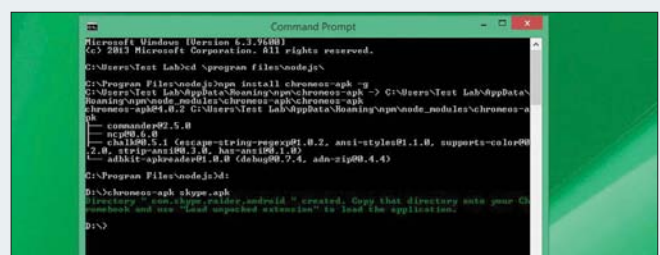
## Converting the APK

Now you have the APK, you'll need to repackage it for Chrome OS. This might sound somewhat intimidating but it's only a couple of lines of code. We will need another piece of free software though, which can be found at nodejs.org. Visit the site, go to the downloads page, then choose the version of Node-JS that works

on your system. Before you launch it remember to note the name of the APK file, and in which folder it currently resides, as we'll need to navigate to it manually. Load up nodejs and then enter the following command: **npm install chromeos-apk -g**.

If you get an error message saying "npm should be run outside of the node repl, in your normal shell", then close the windows, open up the normal terminal window by searching for Command Prompt, then enter the following: **cd \program files\nodejs\**, then run the original command again.

Now you'll need to change to the directory that the APK file is in. For ease we've used a USB drive. Check Windows Explorer for the correct path then navigate to that one, like this: **d:** (which changes our current place to the USB drive). Next, enter the following command: **chromeos-apk [enter the file name for your app].apk**. You should have seen some green writing appear below the command telling you that a directory was created. This means the APK is ready.



Make sure that the new APK is on your USB stick, then plug it into your Chromebook. With a browser windows open go to the settings option (the three lines in the top-right corner), then select More tools > Extensions. Tick the box in the top-right corner marked Developer mode, and another button bearing the legend 'Load unpacked extensions' will appear. Click that.

You should see a pink warning appear under the name of your new Extension. This is fine and can be ignored. If you have any other error messages, and we have several throughout the process of writing this guide, then we suggest you Google the message and you will find plenty of solutions already online.

Finally, hit the launch option under the pink message, then watch your Android app load up on a Chromebook. It must be said that some work better than others, and Skype was flaky on our HP 11in Chromebook, but if you want to dabble, then there are plenty of apps that will be perfectly happy on your little laptop. ☑



# Improve the wireless signal in your house



If the Wi-Fi in your house is flaky, you might consider a Wi-Fi range extender to push your signal that extra bit further. Or you can add Powerline adaptors that use your home's electrical wiring to create a speedy home network with added new Wi-Fi hotspots.

All of us know a house's weak or dead Wi-Fi spots, and it's frustrating when these are where you need a strong Wi-Fi signal most. These are most often caused by distance from the wireless router, thick stone walls, and interference. Simon Jary reveals the tips, tricks and gadgets that will help improve your wireless signal

## 1. Update your wireless router

If your house suffers from weak Wi-Fi, we first recommend that you think about upgrading your wireless router.

The oldest-to-newest Wi-Fi standards are: 802.11b, 802.11g, 802.11n, and 802.11ac. If you have an older wireless 'b' or 'g' router, you should consider replacing it with a newer wireless 'n' or 'ac' device that offers longer ranges and faster connection speeds. Why not be cheeky and ask your ISP to send you an updated wireless router? If you've been a customer for a while, it should help you out, but watch out if it asks you to sign up for a longer term, unless you're happy with its service.

Though newer routers may not significantly increase the range of your wireless network, you should at least get better speeds at longer distances.

You won't get the maximum range and performance from the newer wireless router unless your computers, smartphone or tablets also use the same Wi-Fi standard. An old laptop is unlikely to boast 'ac' or 'n' Wi-Fi. Check the specs to see which wireless standard it is using.

Rather than buy a new laptop or desktop PC or Mac, you can buy a wireless adaptor - from just £25 - that plugs into a USB port. You can also add a new wireless adaptor inside a desktop PC's case or via a PC Card slot; but good luck trying that with a Mac.

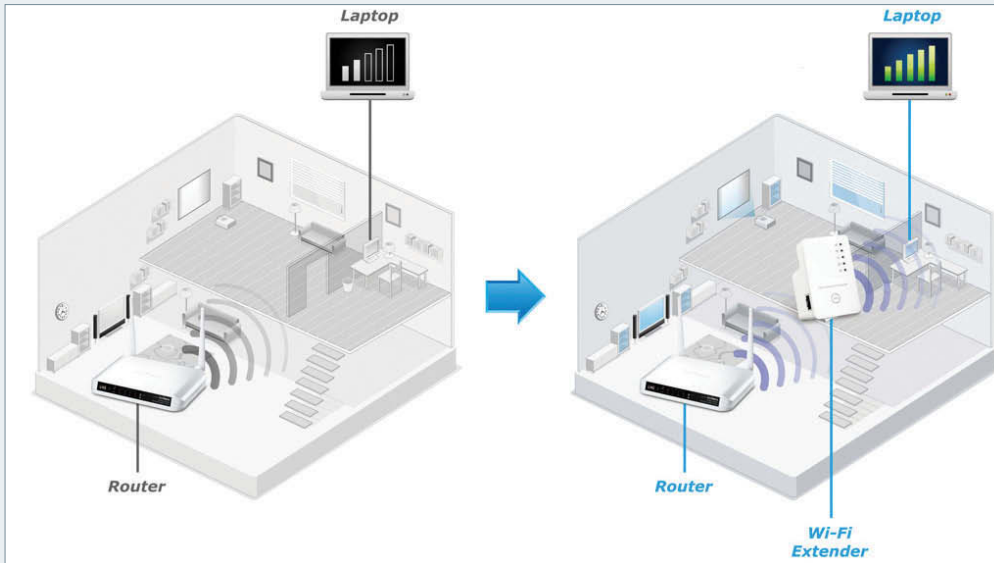
What about your smartphone's wireless? Apple's iPhone 6 and Samsung Galaxy S4 and S5, for example, are equipped up to 802.11ac (and backwards compatible with the older standards), while the iPhone 4 and 5, Galaxy S, S2 and S3 are compatible up to 802.11n.

## 2. Create a new Powerline home network

We also recommend considering Powerline adaptors that create a fast home network using the electrical wiring in your house. This means you can take your internet around your house without losing much performance. Creating a Powerline home network is as easy as plugging in an adaptor to a power socket.

Simply plug one adaptor into a socket near your router and connect it to the router using an ethernet cable (usually supplied with the adaptor). Then plug the second adaptor into a power socket in a faraway room. You can then attach this to your smart TV, Sky+ box, games console, laptop, and so on, via another ethernet cable. This means that you can do without Wi-Fi for more demanding tasks such as streaming HD TV shows or moves from catch-up TV services such as BBC iPlayer, 4oD and Sky.

Powerline adaptors act as if they're directly plugged into your router - even if they're on the other side of the house. You need at least two adaptors, and the best way to buy these are as part of a starter kit.



just going to get your head spinning.

Wi-Fi can work over one of two spectrum bands: 2.4- or 5GHz. The trade-offs between 2.4GHz and 5GHz have to do with interference, range, and speed. Manufacturers claim that 2.4GHz routers or extenders can reach up to 300Mb/s speeds, while 5GHz devices have a theoretical maximum of 450Mb/s. Dual-band devices are therefore sometimes rated as 750Mb/s. Remember that these claimed speeds are theoretical maximums, and you won't be getting anywhere near these speeds, but you can achieve perfectly

The best Powerline adaptors can also create a new Wi-Fi hotspot right there in the second (or third or fourth) room. These create not merely boosted signals - like you get with a Wi-Fi extender - but close-to-fully performing new Wi-Fi hotspots. They cost more but are more versatile and provide faster speeds than mere extenders.

### 3. Wi-Fi extenders

A new wireless router or Powerline Adaptor set with built-in wireless are best but can cost more than a simple Wi-Fi Extender. The best Powerlines, with wireless functionality, we tested cost from around £50 to £150. Wi-Fi extenders such as TP-Link's TL-WA860RE (read our review on page 50) costs less.

Wi-Fi extenders catch a wireless signal and then rebroadcast it, helping to strengthen the signal from a router on a different floor of a house or on the opposite side of a building. It should be noted that they can also drag down your network's performance. A repeater uses half its internal antennas to receive a wireless signal and the other half to transmit a new signal - in effect halving the potential speed of the device's network connection. This shouldn't be that noticeable for light web browsing, email, and so on, but can be felt when streaming video or moving files around the network. That's why we prefer Powerline for the more demanding tasks.

Wi-Fi extenders share the bandwidth with the router. Wi-Fi speeds are slower because it's sharing the data between the router and the extender, whereas the Powerline simply acts as a single device (not sharing the bandwidth) and so you get better speeds.

The Wi-Fi extender needs to be placed in a central location, not too far away from the main router. If you put the repeater at the far edge of your main network hoping to strengthen the signal you will reduce the speed of your connection to the rest of the network and to the internet. Remember that the extender is just boosting the signal. If it's placed in a weak Wi-Fi spot, then it will merely push around that weak signal. Place it in an area with better Wi-Fi and the signal it pushes out will be stronger, too.

The ideal location for a range extender is half way between your main router and the intended wireless devices - in an open corridor or spacious room rather than a crowded space. It should be away from interfering devices such as cordless phones, Bluetooth gadgets and microwave ovens.

### 4. Bands on the run: 2.4- or 5GHz wireless

We need to explain the difference between Wi-Fi bands. We'll try to keep this as technically simple as possible, but skip if this stuff is

acceptable wireless performance using such devices.

Each band has its limitations, though. 2.4GHz devices face a battle for the available space, and so cause interference between each other. The 2.4GHz band is also divided into overlapping channels. The more overlap, the greater the interference among networks located closely together.

Switching to 5GHz alleviates the channel problem because so many more channels are available - and without any overlap - in the 5GHz band. But 2.4GHz does have one big advantage over 5GHz: range. The shorter wavelengths used in the 5GHz band cannot penetrate as well through seemingly solid objects like walls, ceilings, desks, and, yes, people.

The more interference, the less speed and range; the greater range you want, the less speed you can have; the greater speed you want, the more you have to mitigate interference and work closer to an access point.

A dual-band (2.4- and 5GHz) Wi-Fi extender should offer the best of both worlds. The same goes for Powerline adaptors. The latest Devolo dLAN 1200+ Wi-Fi Starter Kit, for example, uses 'ac' and 2.4- and 5GHz bands. ☒





# Make email less of a chore with Gmail



Gmail is one of the best email services around and not just because it's free. Okay, so you're in effect letting Google scrape yet more data together about you, but for many the trade-off is worth it.

However, most people barely scratch the surface of Gmail's powerful features, many of which include being able to find the email you want quickly and easily. There are other filtering and sorting tools,

along with optional features that can save even more time and, occasionally, face. Gmail is always being updated and now, by default, it will warn you if you've mentioned an attachment in the text but failed to actually attach a file.

Here Jim Martin reveals six Gmail tips to manage your email better. (Note that we're primarily dealing with the web interface here, but some tips also apply to the Android and iOS apps.)

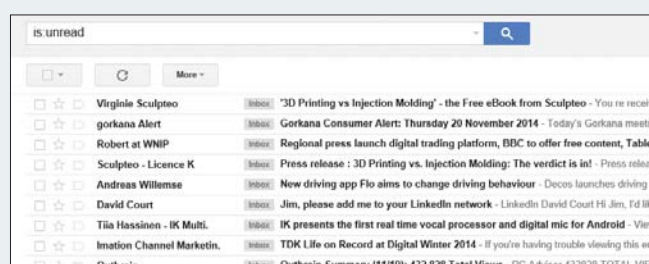
## 1. Learn to search your inbox properly

Google is the king of search and this means Gmail has immense power when it comes to finding emails. But if you're only entering simple phrases into the search box, you're not even using half of the available power. Here are some ways to use the search box more productively:

**From:jim.martin@outlook.com** Lists all emails from this address

**Is:unread** Lists all the emails you've yet to open

**Has:attachment** Displays only emails with attachments



**In:sent Cyprus** Shows all emails containing the word 'cyprus' but only in your sent folder

You can even combine them so you could type **From:jim.martin@outlook.com has:attachment** to find attachments from a certain person.

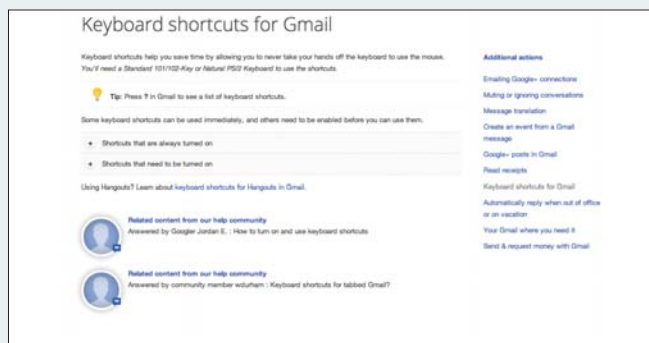
## 2. Use shortcuts

Do you use the mouse for everything? If so, you're wasting more time than you realise. Gmail is full of shortcuts such as these:

When reading a conversation, press **n** and **p** to move between emails in that thread. You'll see the cursor moving up and down the left-hand side and you can press enter to open a message or expand messages which are shown as a collapsed view in the middle. In the Compose window you can use the following:

**Ctrl + Enter** sends an email

**Ctrl + Shift + C** takes you to the CC field (even if it's hidden), so you can add recipients



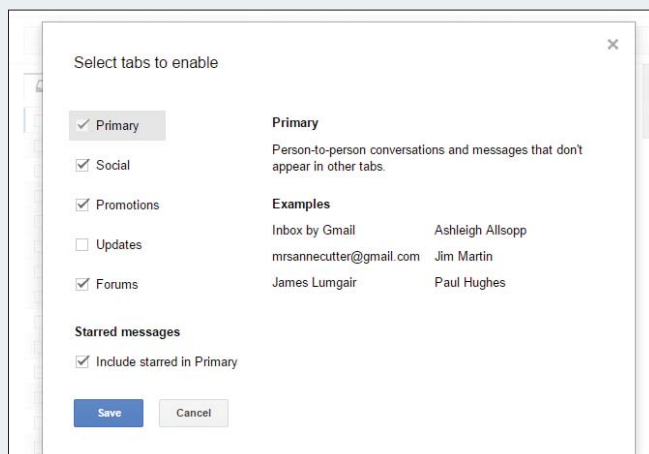
You can enable extra shortcuts if these tickle your fancy by clicking the gear icon, going to settings and then going to the Keyboard shortcuts section. Shortcuts include:

- C** Compose a new message
  - D** Compose a message in a new tab
  - /** Puts the cursor in the search box
  - S** Marks the message or conversation as special (the star icon)
  - +** Marks as important (if you use Priority inbox)
- A full list can be found at [tinyurl.com/nqpczgz](http://tinyurl.com/nqpczgz).

## 3. Use tabs

A feature added last year is multiple inbox tabs. By default these are Primary, Social, Promotions and Forums.

Gmail automatically filters emails into these tabs so you can ignore stuff that's less important and focus on what is. The automatic filtering is excellent and rarely gets it wrong, so emails from friends, family or important services arrive in your Primary inbox where you're most likely to see them.



Messages and alerts from social channels including Facebook and Twitter go into Social, while newsletters, offers and other promotional emails filter into Promotions.

A small **+** at the right-hand side allows you to create more tabs, and you can customise all the tabs in the settings.

## 4. Quick action buttons

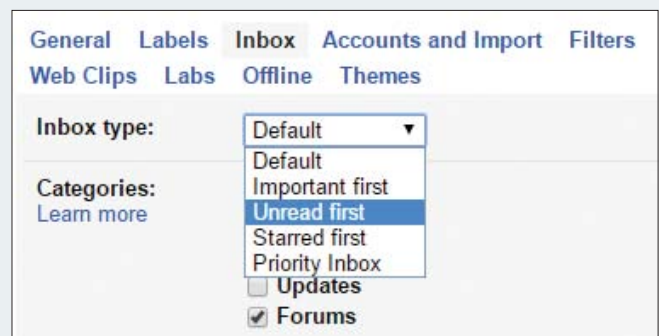
More recently, Google added quick action buttons, which you might not have even noticed. These let you do things without having to open the email and click a link. For example, you can check the details or progress of an online order by clicking the View Order or Track Package button.



Other actions include rating a restaurant you visited, or modifying a booking.

## 5. Arrange email your way

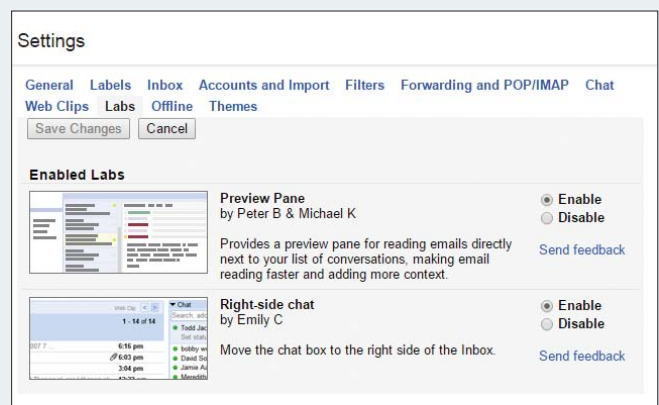
By default email is shown in chronological order, so the most recent is at the top of the list. You might prefer another order, though. If you click on the cog icon, then Settings, then click on the Inbox link, there's a drop-down menu with options for Important First, Unread



First, Starred First or Priority Inbox. You can try any of these to see if you like it – if not, change it back to Default.

## 6. Get a preview pane

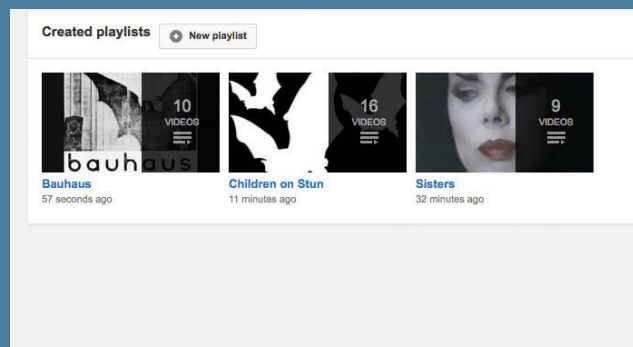
If you're an Outlook or Thunderbird fan, switching to the standard Gmail web interface can be unsettling. Fortunately there's a way to get a preview pane as you can in Gmail on an iPad alongside the list of emails. To do it, click the cog icon, then Settings and click on Labs at the top. Search for Preview Pane, and click the 'Enabled' radio button, and then the Save Changes button. Gmail will reload and you'll see a new icon at the top to the left of the cog icon. Click it to choose where your preview pane appears. ☒



# Create a new playlist on YouTube



YouTube is fast becoming an invaluable resource for music fans. While Spotify, Deezer and Xbox music battle it out for dominance in the streaming market, YouTube has become such a popular music site that Google has started a subscription service that allows you to watch YouTube videos without ads and even offline. The YouTube Music Key is available for £9.99, but if you just want to stick to the free version of YouTube you can easily create playlists for your favourite songs with little interruption. Martyn Casserly shows how



## Adding a playlist

First, go to youtube.com and log in. If you don't have an account, you'll need to create one. However, since the site is owned by Google, you can use your Gmail details to sign in. Once you've logged in, look in the left-hand column. Halfway down the page is the Playlists section, click on the red Playlists heading and you'll be taken directly to your lists.

To create a new one click on the '+ New playlist' button that sits above Liked videos and you'll be asked to give it a name.

## Searching for songs

Now you have a new, but empty, playlist. But not for long. On the right-hand side of the screen is the Add videos button. Click this and you'll be presented with a search screen where you can locate the songs that are soon to populate your list. There are three types available, the default of which is Video search (shown below). This one is simply a YouTube search, like the one you would usually use to find videos on the site. The other two allow you to search for a video not on YouTube by using its URL (although we couldn't find any sites that would allow this function to work), or if you already have YouTube videos you've created you can select from those. For now we'll stick to the first option and search on YouTube.

Video search

URL

Your YouTube videos

Type your search in the box above to find videos.

Enter the name of a song or artist you want and you should see a list of search results appear. In the image accompanying each video, you'll see the arrow icon that represents Play. This means you can sample the song before you add it to the list: great if you're unsure whether it's the right song or not. When you're happy, add the video by highlighting it, then clicking on the Add video button. Repeat the process until you have a decent amount of videos.

## Editing the playlist

When you've assembled your list, you can fine-tune it via a few different tools. If you hover your pointer over any of the songs, you'll see options appear in the left and right corners. The three dots of the left allow you to move the song up and down the list, so you can place it where you feel it fits best, while the right-hand options feature an 'X' that deletes the song from your list, or the More drop-down menu.

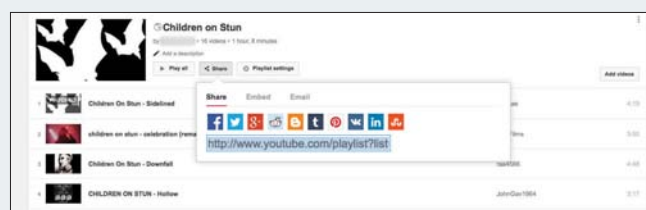


The More menu has a number of options for quickly editing the song. The first couple will move it to either first or last in the queue, while the others allow you to add notes (which might be handy if you're sharing this playlist with friends and have a story or memory you want to commemorate), or setting that particular song as the thumbnail, which in essence means that it will appear as the artwork for your playlist.

## Sharing the playlist

You've worked hard in your labours to create this musical montage, so why not share it. There are a few different ways to do this. At the top of your Playlist, next to the artwork, are three buttons: Play All (self-explanatory), Share and Playlist Settings. Inside the latter you'll see menus for Privacy. If your Playlist is set to Private, then it will still appear in searches but people won't be able to access it. Conversely, Public means anyone can use it. If you don't want it to appear in YouTube search results at all then choose the Unlisted option. If you're happy for people to share your list by putting it on their blogs or websites, then you'll need to tick the allow embedding option.

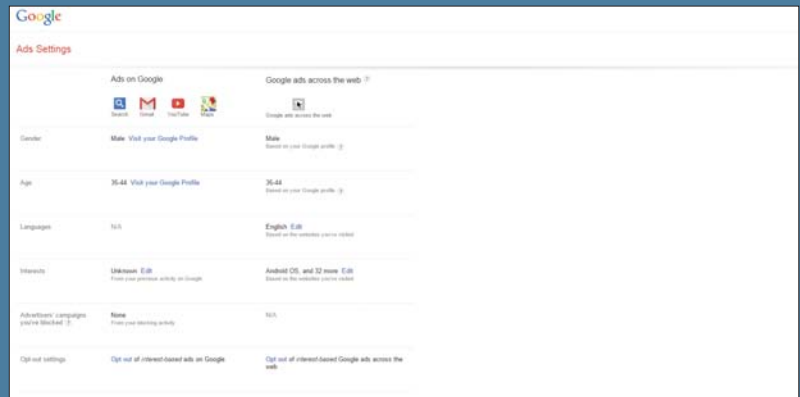
To share your creation with the world, or just a few close friends, go back to the Playlist page and click the Share button (Note that if you've set your list as Private the Share option will no longer appear). In the Share settings are the three tabs: Share, Embed and Email. The first of these gives you a short URL that you can copy and paste, or just click one of the icons to post the link directly on the corresponding social media site. Embed gives you an HTML code which creates a player for pasting into a blog or website, while Email allows you to send the list directly to friends and family. So select your method of munificence and that's it, you're all done. ☑



# Check what data Google has about you



Matt Egan shows you how to find just how much data Google holds on you and what you can do about it



## Google account

In order for Google to put a name to you, you have to have a Google account. Without one, Google may well have anonymous data about you as a cookie on a laptop- or smartphone browser, but it is impossible to know what that is (just as it is impossible for Google to know who you are). So all of the processes I am about to explain rely on you being logged in to your Google Account. I bet you have one, too. Ever logged in to an Android phone or tablet, used Gmail or used YouTube as a registered user?

The email and password you use for those things (or Google Calendar, Google+, Google Docs, and so on) is your Google Account. You may – as I do – have several. In which case you will need to repeat all of what follows for each account. Amuse yourself by spotting the differences between each account. First, let's check the Basics.

## Search history and account basics

Google used to be only a search engine. Remember that? Almost certainly you still use Google Search, a lot. And Google collects a lot of data about the searches you make, as it says a lot about you. Sign in and head over to [tinyurl.com/ybntgmn](http://tinyurl.com/ybntgmn) and view the search history that Google holds about you. It's quite freaky to see what Google knows you searched for. You can also see your YouTube search history at [tinyurl.com/hvy555w](http://tinyurl.com/hvy555w).

More prosaic but also critical basic information can be found in your account details. Sign in and head to [tinyurl.com/p48nabL](http://tinyurl.com/p48nabL) to see the basic data you gave to Google. Go to [tinyurl.com/oumo6rb](http://tinyurl.com/oumo6rb) and you can see records of an array of Google tools, and your activity with them. We'll click into a couple of these further along, but suffice to say that this is an important dashboard for finding out what Google knows about you.

## What Google thinks it knows about you

This is where it gets interesting. And also where you find the ability to opt-in and -out of interest-based advertising. The principle reason Google tracks all this data about you is so that it can more successfully target you with advertising, in order to pay for the free services you access. Depending on your viewpoint (or demographic) this is either a sinister menace or a cool way of getting free stuff.

But it is interesting to find out just what Google thinks it knows about you, and how it uses that to target ads your way. Sign in and head to [tinyurl.com/panzLx5](http://tinyurl.com/panzLx5). You will see what Google considers to be your gender and age, as well as your interests. Prior to Google+ this used to be great fun (when I was in my early 30s Google

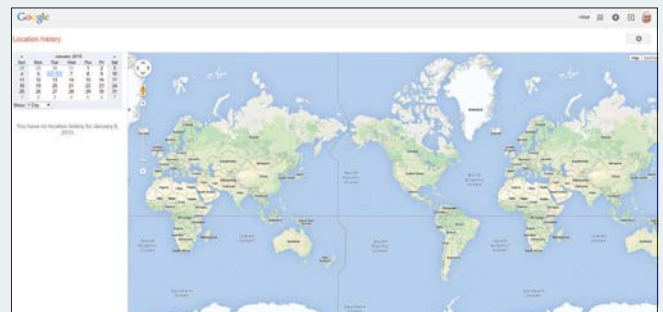
thought I was a woman in their 60s). But now if you use Google+ – and you tell the truth – you will find the basic data is largely correct. It is the interests that are – well – interesting.

When I used this with my work email account Google thought I was some sort of tech maniac. Which makes sense. But on my personal Gmail account my interests are naturally more broad. This matters because within this page you have the option to opt out of interest-based advertising. These are adverts targeted at you because Google thinks you will be interested in their content. Personally I am happy to remain in – mainly because it amuses me that all the adverts I see at work are for tech.

If you are less happy, as well as opting out of interest-targeted ads, you can also opt out of allowing website owners to track you via Google Analytics. Simply head over to the Google Analytics opt out page: [tinyurl.com/bq6be7b](http://tinyurl.com/bq6be7b).

## Where Google thinks you have been

One of the options available from the Google Settings Dashboard outlined above, is the ability to find out where Google thinks you have been. You can head there directly at [tinyurl.com/mhhkavf](http://tinyurl.com/mhhkavf). Interesting to me here is that despite me using an Android phone into which both my Google Accounts are synced, Google has no location data on me. My phone by default doesn't share that data.



## What devices, apps and services have access to your Google data

In many ways this is the most important test of all. One of the benefits of Android is that it lets you know what permissions are required by each app you install on Android. But you encounter myriad Google apps and services on multiple devices. This page: [tinyurl.com/ph9c9zq](http://tinyurl.com/ph9c9zq) lists the devices and services, and what access they have. Click on a listed device and you can see further details and the opportunity to revoke, on the right-hand side. ☒



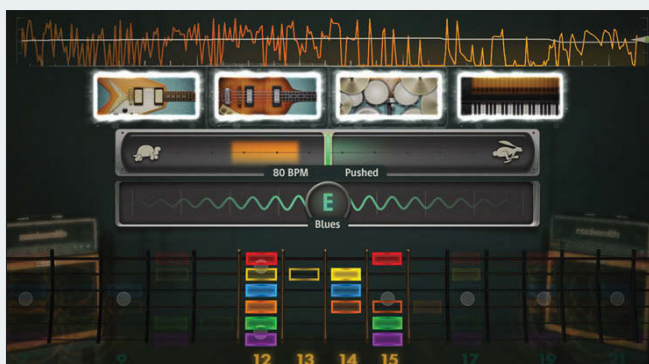
## Use technology to help learn the guitar



In a bygone age prospective guitar heroes began their long journey to six-stringed stardom by sitting next to a record player and jamming along to their favourite tracks. After hours of careful listening they might decipher the deft notes played by their idols, but it was a laborious method of trial and error, often resulting in calloused fingers and the threat of physical assault from parents who could no longer take repeated playings of *All Along the Watchtower*.

These days, thanks to technology, this process can be streamlined to a point where the guesswork is removed and even the tones you need are only a click away. Some may decry this demystification as somehow bypassing the need to 'pay your dues', but we've little doubt that if these tools existed when Hendrix, Clapton or Slash started out, they'd have been all over them.

Martyn Casserly reveals the apps that will help you on your way to becoming a guitar hero



### Rocksmith

£59, including cable

Guitar Hero was a ridiculously successful video game, in which the player used a tiny, plastic, toy guitar shaped controller to play along to famous songs. The more accurately they pressed the coloured buttons in time to the music, the higher the score. Of course this posed the question, why not just spend that time learning to actually play an instrument? Well, now with Rocksmith you can.

The setup is simple; plug your guitar into the included Rocksmith Guitar cable, then plug the other end into your Xbox, PlayStation, PC or Mac. Now when you play notes on your guitar the game will be able to hear them in real time. The game itself comes with 50 included songs, covering bands as diverse as The Kinks, Rolling Stones, Arctic Monkeys and Iron Maiden. Each song can be played as either rhythm, lead, or bass guitar, and follows

the same basic structure of Guitar Hero, in that you see the finger positions and strings coming towards you on a 3D timeline while the track plays. Just put your fingers in the right place at the right time, pick the string, and you're awarded a point. Difficulty settings allow you to learn songs in a simplified form, that automatically builds in complexity as you improve. The game also monitors your performance so that you know which sections you need to work on, and features a Riff Repeater that can loop any section you're struggling with. If you have more than one Rocksmith guitar cable you can also play with other guitar wielding friends, making those twin lead parts in Iron Maiden songs really come to life.

Learning guitar can be a lonely and frustrating experience at times, but Rocksmith definitely brings a sense of achievement and that vital ingredient of fun that could keep you going when your fingers and neighbours are urging you to quit.

### Boss JS-10

£250

Boss is one of the most respected names in the guitar industry, with its range of pedals gracing the feet of pretty much every great player in the past 40 years. The Japanese legend has used this pedigree and experience to design an all in one unit that acts as an amp, pedal collection, and practice tool for the budding guitarist.

The JS-10 is small enough to sit on a desktop, but packs a wide range of tones and jam tracks that make practicing your licks a joy rather than a chore. Just plug a guitar into the device, choose a track, and away you go. Simple, easy, fun. You can also attach the JS-10 to your PC or Mac via USB, and transfer songs from your



music library, or insert a USB thumbdrive to the back of the unit and access songs directly. A built-in phrase trainer allows you to slow tracks down without altering the pitch, so you can learn potentially tricky parts, and you can also lower the volume of the recorded guitar parts,

enabling you to replace them with your own efforts. Rumours are that Boss is about to discontinue the JS-10, so you may well find stocks being sold at knockdown prices, if so you could pick yourself up a real bargain.

## YouTube

### Free

While guitar tutors up and down the land will weep gently into their pillows at night, cash strapped guitarists can rejoice that a really rather laughable amount of free lessons are now available on YouTube. Channels such as JustinGuitar have dedicated playlists for beginners that can teach you the very basics, such as tuning your guitar and the first few chords, with intermediate and then style specific playlists waiting for you when you improve. Justin Sandercoe proves an engaging and constantly encouraging tutor, boasting an impressive range of playing skills, all of which he happily imparts to the viewer in an easily accessible style.

A quick search on the general YouTube site for any song you are trying to learn will usually return several video lessons from a variety of sources, although the quality of these can vary from professional down to some young chap in his bedroom who barely has a grasp on the song himself. Many of the better channels are really providing samples for their full courses, which are subscription based and found on their own dedicated websites. One of the best ones we've discovered so far is TrueFire, which offers an incredible 22,000 videos on its site (7,500 of which are free), alongside backing tracks, and forums where you can talk to tutors. There is a 30-day free trial available, and subscriptions options are either £10 or £16 per month for extended services.

## Guitar Interfaces

### Varies

There are many fantastic apps and software suites available to improve your playing, but if you can't plug your guitar into them in the first place then they become something of a nonstarter. Thankfully there are now a plethora of guitar interfaces built specifically for this purpose. IKMultimedia is perhaps the most prolific company in this area with its iRig range of interfaces now available for more than just Macs and iOS devices.

The iRig HD-A (£65) is a 24-bit audio interface that works with both Android devices and PCs. This pocket-sized unit has inputs for normal guitar jack leads, and though its high quality A/D converters, outputs signals to your computer via a USB cable. Lightweight, no batteries required, and the results are excellent. If iOS is your preferred platform, the iRig HD (£65) is a good choice.

## Riffstation

### £16

Once you've got the basic skills of chords and finger positions under control, most guitarists will start to take a trip to the dusty end of the fretboard in order to try out some lead work. This can be quite a daunting task at first, especially if you're trying to emulate your heroes, as the likes of Joe Satriani don't slow down much



when their eight bars of glory hove into view. Fear not though, as the wonders of digital sorcery are at your command thanks to the wonder that is Riffstation. This PC and OS X software analyses the tracks you select from your music library and allows you to slow sections down without affecting the pitch.

This means you can practice the song in the original key but at a much more sedate pace, then increase the tempo as your fingers get used to the various licks. Another feature allows you to isolate the solo, then either listen to it closely and work out any flicks, or phrases that are disguised in the mix, or remove it completely so you can play the part instead. The software also works out the chords for each song, and gives you the ability to transpose it into a different key, which is great if you have a preferred place to play on the fretboard, or a singer whose voice is naturally higher or lower than the original artist. A 30-day free trial of the software is available on the website, but we think that once you've tried it out, the £16 asking price will seem a paltry amount.

## Ultimate Guitar Tabs

### Varies for each platform

When you've mastered a few chords, the next logical step is to learn a few of your favourite songs. This, of course, involves working out the various chords, something which isn't always as easy as it sounds. Ultimate Guitar Tabs is a great way to build up a repertoire quickly as it serves as a repository for thousands of chord sheets for all sorts of music. The bulk of tabs available are user created, meaning that a few can be somewhat questionable in their accuracy, but for the vast majority of songs we were able to find good, usable versions with little effort.

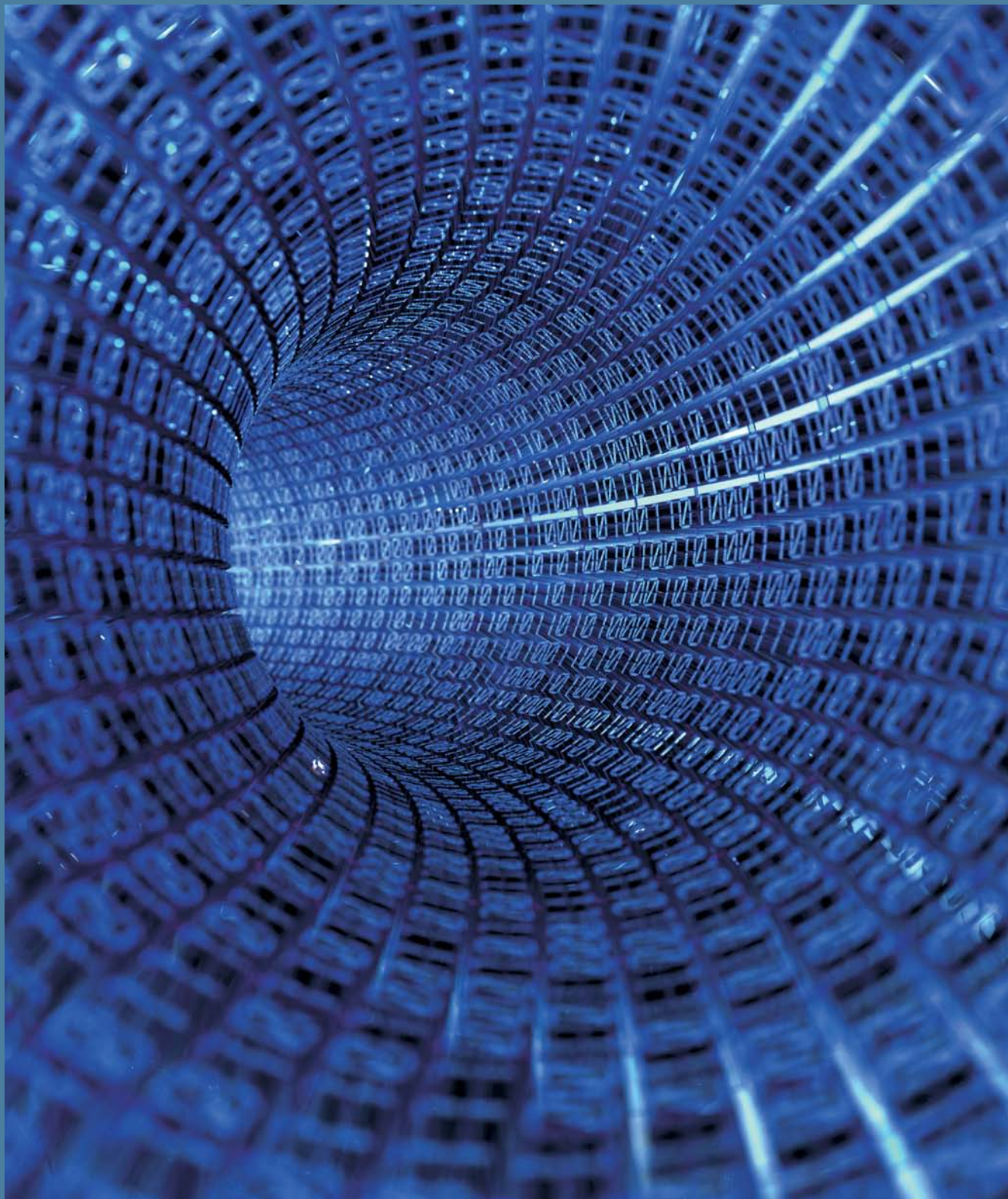
The website is a free, and hugely useful resource, but if you're willing to invest a few pounds, then the mobile offerings are particularly handy if you want to bring your music with you. Versions are available for the iPad, iPhone, Android, and even Windows Phone 7. These feature offline modes for your favourite tabs, with a standout function being the ability to transpose any of the songs into different keys simply by pressing the up or down button on the tab. It sounds a bit basic, but this could well be the most useful addition to your musical arsenal, certainly for the least amount of money. ☒

```

Take Me to the River--Al Green, et al
intro:      E7      Asus4  A(repeat vamp to verse 1)

E7              Asus4  A
verse 1:I don't know why I love you like I do
E7              Asus4  A
After all the changes you been putting me through
E7              Asus4  A
You took my money and my cigarettes
E7              Asus4  A
Now I ain't seen hide nor hair of you yet

C              G      D      A  A7
chorus: I wanna know, won't you tell me, I'd love to say...
E7              Asus4  A
Take me to the river, wash me down
E7  E7+5      Asus4  A  E
Take me to the water,      put my feet on the ground
  
```



## Turn out the lights and access the Dark Web



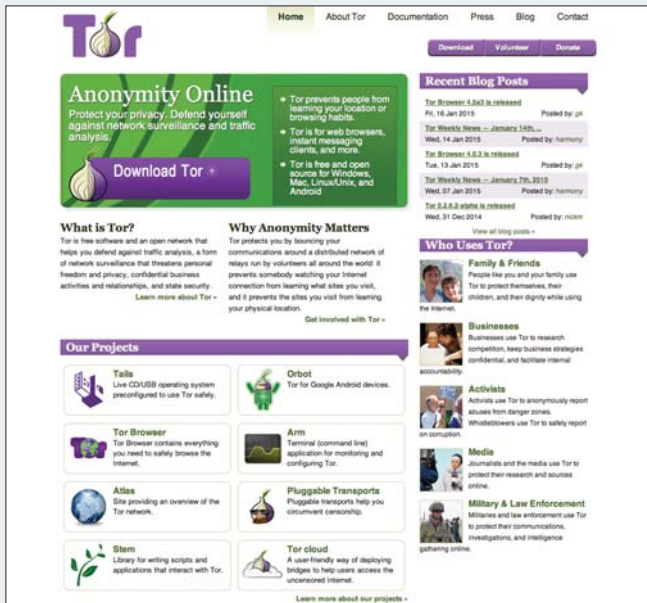
Matt Egan reveals everything you need to know about the hidden internet.

He examines what it is, your various options and how to access the Dark Web

## What is the Dark Web?

The Dark Web is a term that refers specifically to a collection of websites that are publicly visible, but hide the IP addresses of the servers that run them. Thus they can be visited by any web user, but it is very difficult to work out who is behind the sites. And you cannot find these sites using search engines.

Almost all sites on the so-called Dark Web hide their identity using the Tor encryption tool. You may know Tor for its end-user-hiding properties. You can use Tor to hide your identity, and spoof your location. When a website is run through Tor, it has much the same effect.



Indeed, it multiplies the effect. To visit a site on the Dark Web that is using Tor encryption, the web user needs to be using Tor. Just as the end user's IP is bounced through several layers of encryption to appear to be at another IP address on the Tor network, so is that of the website. So there are several layers of magnitude more secrecy than the already secret act of using Tor to visit a website on the open internet - for both parties.

Not all Dark Web sites use Tor. Some use similar services such as I2P - indeed the all new Silk Road Reloaded uses this service. But the principle remains the same. The visitor has to use the same encryption tool as the site and - crucially - know where to find the site, in order to type in the URL and visit.

Infamous examples of Dark Web sites include the Silk Road and its offspring. The Silk Road was a website for the buying and selling of recreational drugs. But there are legitimate uses for the Dark Web. People operating within closed, totalitarian societies can use the Dark Web to communicate with the outside world. And given recent revelations about US- and UK government snooping on web use, you may feel it is sensible to take your communication on to the Dark Web. (I'll stick to Facebook because I like the attention.)

## Dark Web or Deep Web?

Although all of these terms tend to be used interchangeably, they don't refer to exactly the same thing. An element of nuance is required. The 'Deep Web' refers to all web pages that search engines cannot find. Thus the 'Deep Web' includes the 'Dark Web', but also includes all user databases, webmail pages, registration-required web forums, and pages behind paywalls. There are huge numbers of such pages, and most exist for mundane reasons.

We have a staging version of all of our websites that is blocked from being indexed by search engines, so we can check stories

before we set them live. Thus for every page publicly available on our website, there is another on the Deep Web. The content management system into which I typed this article is on the Deep Web. So that is another page for every page that is on the live site. Meanwhile our work intranet is hidden from search engines, and requires a password. It has been live for nearly 20 years, so there are plenty of pages there.

Use an online bank account? The password-protected bits are on the Deep Web. And when you consider how many pages just one Gmail account will create, you understand the sheer size of the Deep Web.

This scale is why newspapers and mainstream news outlets regularly trot out scare stories about '90 percent of the internet' consisting of the Dark Web. They are confusing the generally dodgy Dark Web with the much bigger and generally more benign Deep Web. They are mixing up the act of deliberately hiding things, with that of necessarily keeping pages away from search engines for reasons of security or user experience.

## Wait, what about the 'Dark Internet'?

Confusingly, 'Dark Internet' is also a term sometimes used to describe further examples of networks, databases or even websites that cannot be reached over the internet. In this case either for technical reasons, or because the properties contain niche information that few people will want, or in some cases because the data is private.

A basic rule of thumb is that the phrases 'Dark Web' or 'Deep Web' are typically used by tabloid newspapers to refer to dangerous secret online worlds, the 'Dark Internet' is a boring place where scientists store raw data for research. The Deep Web is a catch-all term for all web pages that are not indexed for search, the others refer to specific things.

## How to access the Dark Web

Technically, this is not a difficult process. You simply need to install and use Tor. Go to [torproject.org](http://torproject.org) and download the Tor Browser Bundle, which contains all the required tools. Run the downloaded file, choose an extraction location, then open the folder and click Start Tor Browser. That's it. The Vidalia Control Panel will automatically handle the randomised network setup and, when Tor is ready, the browser will open; just close it again to disconnect from the network.

Depending on what you intend to do on the Dark Web, some users recommend placing tape over your laptop's webcam to prevent prying eyes watching you. A tinfoil hat is also an option.

The difficult thing is knowing where to look. There, reader, we leave you to your own devices and wish you good luck and safe surfing. Aggregation sites such as Reddit offer lists of links, as do several Wikis, including [thehiddenwiki.org](http://thehiddenwiki.org). Dark Web sites do go down from time to time, due to their dark nature. But if you want good customer service, stay out of the dark. ☒





## Take precautions when using a public network



If Windows knows it's accessing a public network, it will hide your laptop from other computers and devices. That provides significant, but not perfect, protection. So you have to make sure Windows knows you're on a public network, and you need to take

additional precautions. When Windows logs on to a Wi-Fi network that it doesn't recognise, it will ask you how it should handle security. And if for some reason it doesn't ask, you can manually make it bring up the question itself. How it does this depends on your version of Windows. Lincoln Spector reports

### Windows 7

When you log on to a new network, Windows 7 brings up a large dialog box where you can declare whether it's a Home, Work or Public network. If the dialog box doesn't come up, or you're not sure you gave the right answer, you should confirm that Windows knows it's a public network. Go to the Start menu's Search field, type network and select Network and Sharing Center. Once there, you'll see the name of the network, and below that, the network type. The type is a link. Click that link, and you'll get to the same dialog box that was supposed to come up automatically.

### Windows 8

When you log on to a new network, a panel will appear on the right side of the screen, asking if you want to find 'PCs, devices, and content on this network'. If it's a public network, select No.

If you want to make sure the setting is correct, go to the Search charm, type network, and select Network connection settings. Select your network. If the Find devices and content switch is turned off, Windows knows it's a public network. If that switch is on, turn it off.

### Other precautions

That should be enough, but it's wise to take extra precautions:

- Make sure you're logging on to the right network
- Never do anything financial on a public network
- If you keep sensitive files in an encrypted container, don't open it when you're on a public network
- Use a good firewall and antivirus program, and use different passwords for each site

That should keep you acceptably safe. ☒



# Open your router's ports and play games



Port forwarding is a frustrating, arcane process that modern man shouldn't have to bother himself with. Thankfully that's largely the case these days. Most companies set up servers so that the gadgets in your home connect to the internet using the 'normal' paths and allow you to remotely

access them with little more than an email address, password and ID code.

Plus, the advent of UPnP - Universal Plug and Play - should have put an end to manual port forwarding but unfortunately there are still scenarios when you'll need to delve into your router's settings and do it manually. Jim Martin explains how to forward ports

## Backgrounder

Your router is the gateway between any devices with Wi-Fi or a wired network connection and the internet. It's a little like a postal system, ensuring that data coming in and going out is directed to the appropriate place.

Ports are a bit like numbered doors - they can be open or shut to data. Most traffic uses a few universally agreed doors (80, for example), but certain applications or devices are awkward and need to use other ports which are closed by default. The process of opening those doors to allow data to pass is called port forwarding.

## How to set up port forwarding

1. In a web browser, type your router's IP address number into the address bar, and press Enter. If you don't know it, see [tinyurl.com/p69pvzo](http://tinyurl.com/p69pvzo) for instructions on finding it.
2. Enter your username and password when your router's web page appears. The default username and password should be in the manual, on a sticker on router itself, or written down somewhere if you changed them from their defaults. You can use Google to find the defaults for most routers. If you don't remember what you changed them to, or can't find the defaults, you'll need to reset your router using the pin-hole reset button.
3. To forward ports, look for a tab or menu called applications, port forwarding, port triggering, NAT, advances or something similar.
4. Although the interface will vary from router to router, you'll need to enter the same information. The application should tell you, but if it doesn't work, try Googling to see which settings you need. You may be able to select the program from a list, but if your game or application isn't there, create a new entry (name it)

> Advanced Setup > NAT Setup > Open Ports Setup > Edit Open Ports Setup

Index No. 1

☒ Enable Open Ports

Comment SMTP

Local Computer 192 . 168 . 1 . 2 Choose PC

|    | Protocol | Start Port | End Port |    | Protocol | Start Port | End Port |
|----|----------|------------|----------|----|----------|------------|----------|
| 1. | TCP      | 25         | 25       | 6. |          | 0          |          |

and enter the port number you want to open, or enter a range of ports to open. If you aren't sure what port(s) you need to open for an application, consult this Port Forward list. Some common ports are 25565 (Minecraft), 6881-6887 (BitTorrent clients), and 3724 (World of Warcraft).

5. Choose the protocol (TCP, UDP, or both).

| Port Redirection Table |              |          |             |             |              |                                     |
|------------------------|--------------|----------|-------------|-------------|--------------|-------------------------------------|
| Index                  | Service Name | Protocol | Public Port | Private IP  | Private Port | Active                              |
| 1                      | SMTP         | TCP      | 25          | 192.168.0.2 | 25           | <input checked="" type="checkbox"/> |
| 2                      |              |          | 0           |             | 0            | <input type="checkbox"/>            |
| 3                      |              |          | 0           |             | 0            | <input type="checkbox"/>            |

6. Now choose which device on the network the rule should apply to. Your router might let you choose it from a list, or you may have to do it by IP address. Regardless of the method, you will probably need to assign a static IP address to that computer or other piece of networking kit. Save all your changes.
7. If there's the option, make sure the rule is enabled. There may be a check box next to each rule, and it may be disabled by default.
8. Use the online checker [tinyurl.com/ykscneo](http://tinyurl.com/ykscneo) to find out if your port forwarding has been successful. ☒



ONLINE  
REGISTRATION  
REQUIRED

# Panda Antivirus Pro 2015

FULL PROGRAM (SIX MONTHS OF UPDATES) AVAILABLE ONLY ON THE DISC+

## Installation details

Go to My Computer, right-click the DVD icon and open the disc. Select Files 237\Panda Antivirus Pro 2015 and open the install file.

**Online registration required:** Follow the instructions within the program by 15 April 2015.

## System requirements

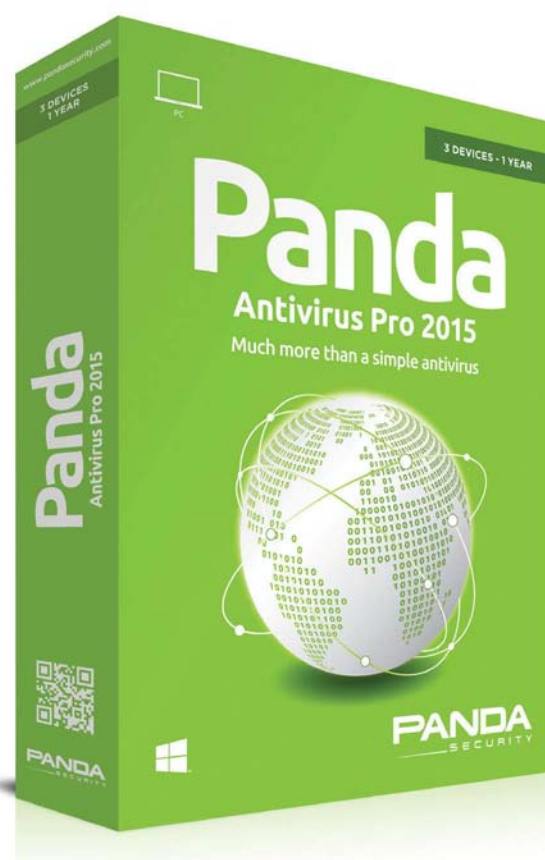
Windows XP/Vista/7/8;  
128MB RAM (1GB recommended);  
265MB drive space

Panda Antivirus Pro 2015 comes with a brand-new look and feel that reinvents the concept of antivirus protection with new architecture.

The new architecture, based on Panda's Cloud, provides a greatly improved experience - faster, simpler, more regular updates, all transparent to the user. New antivirus- and heuristic engines with the power and performance of the Cloud Intelligence protect your PC when online, and advance offline technologies for when you are not connected.

## Features

- Antivirus and antispyware
- Panda USB vaccine
- Virtual keyboard
- Safe browsing
- Application control
- Multimedia/gaming mode
- Rescue kit
- Firewall
- Wi-Fi monitor



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# Ashampoo Burning Studio 2015

FULL PROGRAM AVAILABLE ONLY ON THE DISC+

ONLINE  
REGISTRATION  
REQUIRED

## Installation details

Go to My Computer. Right-click the disc icon and open the disc. Select Files237\Ashampoo Burning Studio 2015 and open the install file.

## Online registration

**required:** Follow the instructions within the program by 15 April 2015.

## System requirements

Windows XP/Vista/7/8;  
Single-core 1GHz, dual-core 1.8GHz processor;  
230MB drive space

With Ashampoo Burning Studio 2015, you are well equipped for all burning tasks whether they involve movies, music or simply files. Create backups or data discs, rip music and create audio CDs or simply archive your movies to Blu-ray discs. The highly improved usability and sleek design make Ashampoo Burning Studio 2015 the ideal choice for all burning-related tasks.

## What's new

- Disc spanning to automatically split huge amounts of data across several discs
- Added support for CUE+MP3, CUE+Flac and CUE+Wav
- Rip to FLAC and OGG
- Backups from smartphones and tablets (such as iPad and Android devices) at the click of a button

## Features

- Create data discs with optional autostart feature
- Burn data to CDs, DVDs and Blu-ray discs
- Update existing discs (multi-session)
- Backup files across several CDs, DVDs or Blu-ray discs
- Create audio CDs and MP3/WMA discs
- Rip audio CDs to multiple formats
- Create HD and Full HD video discs
- Duplicate CDs, DVDs and Blu-ray discs
- Create and burn disc images
- Erase rewritable discs
- Create modified copies
- Design and print covers and booklets



ONLINE  
REGISTRATION  
REQUIRED

# Magix Music Maker Silver

FULL PROGRAM (60 DAYS) AVAILABLE ONLY ON THE DISC+

## Installation details

Go to My Computer, right-click the DVD icon, and open the disc. Select Files 237\MAGIX Fastcut and open the install file.

## Online registration

**required:** Follow the instructions within the program by 15 April 2015.

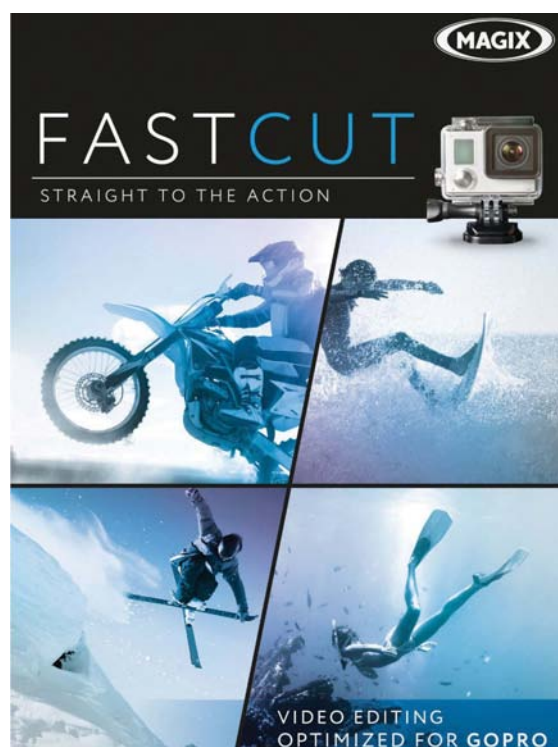
## System requirements

Windows XP/Vista/7/8;  
2GB RAM; 7.5GB drive  
space; 2GHz processor;  
1024x768 resolution

Anyone can use Fastcut's editing templates and extensive features, designed specifically for editing action cam footage, to make action-packed movies in no time at all. The program allows you to manually edit your videos or have them automatically composed for you. For automatic editing, Fastcut offers a wide range of thematic templates with fitting songs, cuts and transitions. This way, you can quickly and automatically piece together all your recordings to fit the beat of the music. Additional effects such as vintage look, tracking shots and slow-motion effects can be added individually.

## Features

- Designed to work with all standard action camcorders
- Start the program and you're ready to go
- Automatic video-editing mode with special action templates
- Switch modes for custom editing
- Animated transitions and templates
- Spectacular music suitable for different video lengths
- Proxy video editing optimised for Edit 4K and HD action cam videos
- Automatic image enhancements such as image stabilization
- Filter for removing wind noise
- Present videos on TV, mobile devices or online



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Place disc in drive. Open the file 'Click here to begin.pdf' for extra information.

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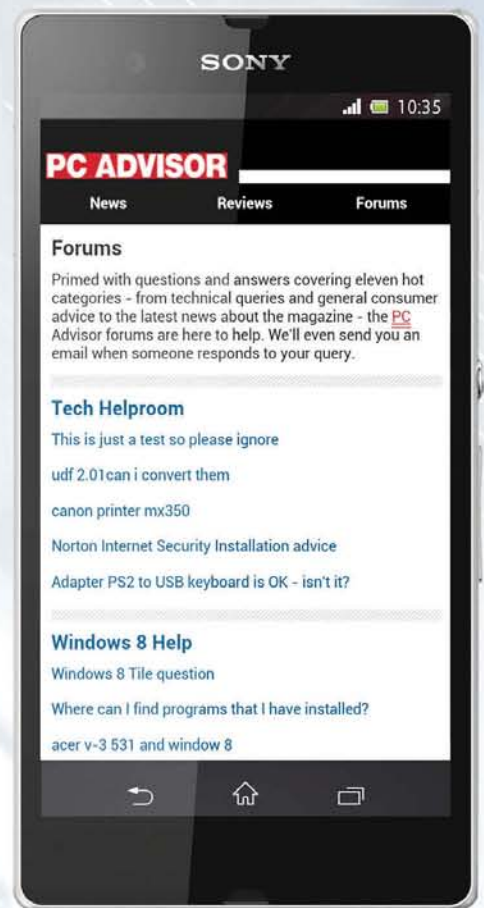
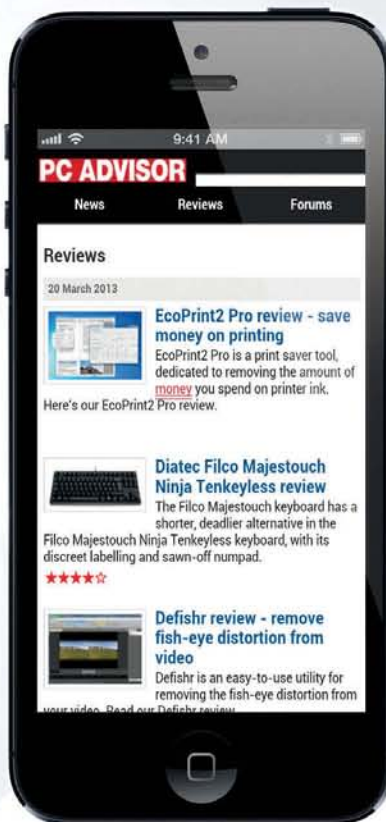
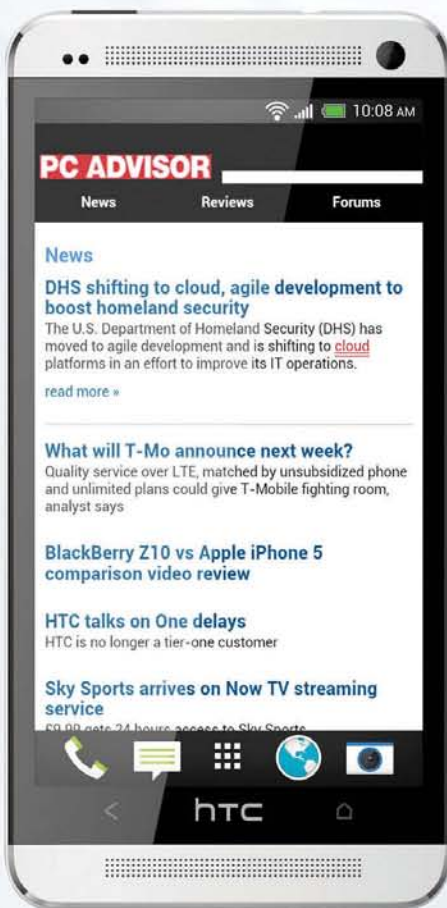
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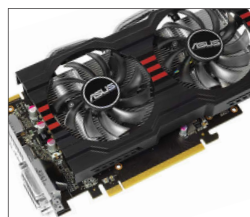
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Projectors



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Flat-panel displays

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|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----------------------------|----------------------------|-----------------------------|
|                       | 1                                                                                                                                                                                                                                                                                                                                                                                                                             | 2                                                | 3                          | 4                          | 5                           |
|                       | Apple MacBook Pro 13in Retina                                                                                                                                                                                                                                                                                                                                                                                                 | Apple MacBook Air 13in                           | HP Spectre 13-3010ea       | Toshiba Kira-101           | MSI GS60 2PE Ghost Pro      |
| Price                 | £1,399 inc VAT                                                                                                                                                                                                                                                                                                                                                                                                                | £849 inc VAT                                     | £999 inc VAT               | £1299 inc VAT              | £1,317 inc VAT              |
| Website               | Apple.com/uk                                                                                                                                                                                                                                                                                                                                                                                                                  | Apple.com/uk                                     | Hp.com/uk                  | Toshiba.co.uk              | Uk.msi.com                  |
| Launch date           | July 14                                                                                                                                                                                                                                                                                                                                                                                                                       | Apr 14                                           | Sep 14                     | Aug 14                     | Oct 14                      |
| Build rating          | ★★★★★                                                                                                                                                                                                                                                                                                                                                                                                                         | ★★★★★                                            | ★★★★★                      | ★★★★★                      | ★★★★★                       |
| Features rating       | ★★★★★                                                                                                                                                                                                                                                                                                                                                                                                                         | ★★★★★                                            | ★★★★★                      | ★★★★★                      | ★★★★★                       |
| Performance rating    | ★★★★★                                                                                                                                                                                                                                                                                                                                                                                                                         | ★★★★★                                            | ★★★★★                      | ★★★★★                      | ★★★★★                       |
| Value rating          | ★★★★★                                                                                                                                                                                                                                                                                                                                                                                                                         | ★★★★★                                            | ★★★★★                      | ★★★★★                      | ★★★★★                       |
| Overall rating        | ★★★★★                                                                                                                                                                                                                                                                                                                                                                                                                         | ★★★★★                                            | ★★★★★                      | ★★★★★                      | ★★★★★                       |
| Processor             | 2.8GHz Intel Core i5                                                                                                                                                                                                                                                                                                                                                                                                          | 1.4GHz Intel Core i5                             | 1.6GHz Intel Core i5-4200U | 1.8GHz Intel Core i7-4500U | 2.4GHz Intel Core i7-4700HQ |
| RAM                   | 8GB DDR3L                                                                                                                                                                                                                                                                                                                                                                                                                     | 4GB DDR3L                                        | 8GB DDR3                   | 8GB DDR3                   | 8GB DDR3                    |
| Storage               | 512GB SSD                                                                                                                                                                                                                                                                                                                                                                                                                     | 128GB SSD                                        | 256GB SSD                  | 256GB SSD                  | 2x 128GB SSD, 1TB HDD       |
| Screen size           | 13.3in glossy (anti-glare)                                                                                                                                                                                                                                                                                                                                                                                                    | 13.3in glossy (anti-glare)                       | 13.3in glossy              | 13.3in glossy              | 15.6in matt                 |
| Screen resolution     | 2560x1600                                                                                                                                                                                                                                                                                                                                                                                                                     | 1440x900                                         | 1920x1080                  | 2560x1440                  | 1920x1080                   |
| Graphics              | Intel Iris Graphics                                                                                                                                                                                                                                                                                                                                                                                                           | Intel HD Graphics 5000                           | Intel HD Graphics 4400     | Intel HD Graphics 4400     | nVidia GeForce GTX 870M     |
| Video memory          | N/A                                                                                                                                                                                                                                                                                                                                                                                                                           | N/A                                              | N/A                        | N/A                        | 3GB                         |
| Wireless              | 802.11a/b/g/n/ac                                                                                                                                                                                                                                                                                                                                                                                                              | 802.11a/b/g/n/ac                                 | 802.11a/b/g/n/ac           | 802.11b/g/n/ac             | 802.11a/b/g/n/ac            |
| Ethernet              | Optional                                                                                                                                                                                                                                                                                                                                                                                                                      | Optional                                         | None                       | None                       | None (mini)                 |
| Bluetooth             | ✓                                                                                                                                                                                                                                                                                                                                                                                                                             | ✓                                                | ✓                          | ✓                          | ✓                           |
| USB                   | 2x USB 3.0                                                                                                                                                                                                                                                                                                                                                                                                                    | 2x USB 3.0                                       | 2x USB 3.0                 | 3x USB 3.0                 | 3x USB 3.0                  |
| FireWire              | x                                                                                                                                                                                                                                                                                                                                                                                                                             | x                                                | x                          | x                          | x                           |
| Thunderbolt           | 2x                                                                                                                                                                                                                                                                                                                                                                                                                            | ✓                                                | x                          | x                          | x                           |
| DisplayPort           | x                                                                                                                                                                                                                                                                                                                                                                                                                             | ✓                                                | ✓                          | x                          | ✓ (mini)                    |
| HDMI                  | ✓                                                                                                                                                                                                                                                                                                                                                                                                                             | x                                                | ✓                          | ✓                          | ✓                           |
| DVI                   | x                                                                                                                                                                                                                                                                                                                                                                                                                             | x                                                | x                          | x                          | x                           |
| VGA                   | x                                                                                                                                                                                                                                                                                                                                                                                                                             | 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                | FaceTime HD webcam                                                                                                                                                                                                                                                                                                                                                                                                            | HD webcam, multitouch trackpad, backlit keyboard | 1080p webcam               | 720p webcam                | 720p webcam                 |
| Operating system      | Mac OS X 10.10 Yosemite                                                                                                                                                                                                                                                                                                                                                                                                       | Mac OS X 10.10 Yosemite                          | Windows 8.1 64-bit         | Windows 8.1 Pro 64-bit     | Windows 8.1 64-bit          |
| Bundled software      | iLife 11                                                                                                                                                                                                                                                                                                                                                                                                                      | iLife 11                                         | None                       | None                       | None                        |
| Fear (Max detail)     | Not tested                                                                                                                                                                                                                                                                                                                                                                                                                    | Not tested                                       | 31fps in Stalker (720p)    | 17fps (1080p)              | 45fps Batman: Arkham City   |
| Battery               | 71.8Wh lithium-polymer                                                                                                                                                                                                                                                                                                                                                                                                        | 54Wh lithium-polymer                             | 51Wh lithium-ion           | 52Wh lithium-polymer       | 52Wh lithium-polymer        |
| Battery life          | 9 hrs 55 mins                                                                                                                                                                                                                                                                                                                                                                                                                 | 12 hrs 57 mins                                   | 7 hrs 30 mins              | 7 hrs 10 mins              | 1 hr 59 mins                |
| PC Mark 7 score       | Not tested                                                                                                                                                                                                                                                                                                                                                                                                                    | 4602                                             | 5006                       | 5100                       | 5655                        |
| Dimensions            | 314x219x18mm                                                                                                                                                                                                                                                                                                                                                                                                                  | 325x227x4-17.5mm                                 | 324x220x15mm               | 316x207x19.8mm             | 390x266x19mm                |
| Weight                | 1.57kg                                                                                                                                                                                                                                                                                                                                                                                                                        | 1.35kg                                           | 1.52kg                     | 1.26kg                     | 1.9kg                       |
| Warranty              | 1 year return-to-base                                                                                                                                                                                                                                                                                                                                                                                                         | 1-year return-to-base                            | 2 year return-to-base      | 2-year onsite              | 2-year onsite               |
| FULL REVIEW           | TINYURL.COM/PNTUMPW                                                                                                                                                                                                                                                                                                                                                                                                           | TINYURL.COM/KNXWZ3                               | TINYURL.COM/N4CJQL9        | TINYURL.COM/QHP9F9T        | TINYURL.COM/JVJBU39         |

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|                      | PC ADVISOR RECOMMENDED     |                            |                          |                         |                        |
|                      | Lenovo IdeaPad Z50-70      | Dell Chromebook 11         | Acer Aspire V13          | HP 255 G3               | Lenovo B50-30          |
| Price                | £385 inc VAT               | £239 inc VAT               | £420 inc VAT             | £220 inc VAT            | £200 inc VAT           |
| Website              | Lenovo.com/uk              | Dell.co.uk                 | Acer.co.uk               | Hp.com/uk               | Lenovo.com/uk          |
| Launch date          | Jan 15                     | Dec 14                     | Jan 15                   | Jan 15                  | Jan 15                 |
| Build rating         | ★★★★★                      | ★★★★★                      | ★★★★★                    | ★★★★★                   | ★★★★★                  |
| Features rating      | ★★★★★                      | ★★★★★                      | ★★★★★                    | ★★★★★                   | ★★★★★                  |
| Performance rating   | ★★★★★                      | ★★★★★                      | ★★★★★                    | ★★★★★                   | ★★★★★                  |
| Value rating         | ★★★★★                      | ★★★★★                      | ★★★★★                    | ★★★★★                   | ★★★★★                  |
| Overall rating       | ★★★★★                      | ★★★★★                      | ★★★★★                    | ★★★★★                   | ★★★★★                  |
| Processor            | 1.7GHz Intel Core i3-4010U | 1.4GHz Intel Celeron 2955U | 2GHz Intel Core i3-4158U | 1.5GHz AMD A4-5000 (4C) | 2.16GHz Intel Celeron  |
| RAM                  | 4GB DDR3                   | 4GB DDR3                   | 4GB DDR3                 | 4GB DDR3                | 4GB DDR3               |
| Storage              | 1TB HDD                    | 16GB SSD                   | 500GB HDD with 8GB flash | 500GB HDD               | 500GB HDD              |
| Screen size          | 15.6in gloss               | 11.6in glossy              | 13.3in matt              | 15.6in matt             | 15.6in matt            |
| Screen resolution    | 1920x1080                  | 1366x768                   | 1366x768                 | 1366x768                | 1366x768               |
| Graphics             | nVidia GeForce 820M        | Intel HD Graphics          | Intel Iris Graphics 5100 | AMD Radeon 8330         | Intel HD Graphics      |
| Video memory         | 2GB                        | N/A                        | N/A                      | N/A                     | N/A                    |
| Wireless             | 802.11b/g/n                | 802.11a/b/g/n              | 802.11a/b/g/n            | 802.11b/g/n             | 802.11b/g/n            |
| Ethernet             | Gigabit                    | Gigabit                    | Gigabit                  | Gigabit                 | Gigabit                |
| Bluetooth            | ✓                          | ✓                          | ✓                        | ✓                       | ✓                      |
| USB                  | 1x USB 3.0, 2x USB 2.0     | 2x USB 3.0                 | 1x USB 3.0, 1x USB 2.0   | 1x USB 3.0, 2x 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                  | ✓                          | x                          | x                        | ✓                       | ✓                      |
| eSATA                | x                          | x                          | x                        | x                       | x                      |
| Media card slot      | ✓                          | ✓                          | ✓                        | ✓                       | ✓                      |
| Audio                | Headphone minijack         | Headphone minijack         | Headphone minijack       | Headphone minijack      | Headphone minijack     |
| Optical drive        | DVD Writer                 | None                       | None                     | DVD Writer              | DVD Writer             |
| Extras               | None                       | Webcam                     | None                     | None                    | None                   |
| Operating system     | Windows 8.1                | Google Chrome OS           | Windows 8.1              | Windows 8.1             | Windows 8.1            |
| Bundled software     | None                       | None                       | None                     | None                    | None                   |
| Battery              | 41Wh Lithium-ion           | Lithium                    | 48Wh Lithium-ion         | 32Wh Lithium-ion        | 32Wh Lithium-ion       |
| Battery life         | 4 hrs 58 mins              | 7 hrs 17 mins              | 6 hrs 35 mins            | 3 hrs 58 mins           | 4 hrs 51 mins          |
| PC Mark 8 Home score | 1959                       | N/A                        | 2358 (3396 Work)         | 1646 (2266 Work)        | N/A                    |
| Batman (Low/High)    | 33/29fps                   | N/A                        | 29/24fps                 | 23/20fps                | N/A/8fps               |
| Dimensions           | 382x265x27.5mm             | 295x201x24mm               | 327x227x20.6mm           | 377x257x26.5mm          | 380x260x26.5-32.5mm    |
| Weight               | 2.4kg                      | 1.3kg                      | 1.5kg                    | 2.1kg                   | 2.2kg                  |
| Warranty             | 1-year return-to-base      | 1-year depot               | 1-year return-to-base?   | 1-year return-to-base   | 1-year return-to-base  |
| FULL REVIEW          | TINYURL.COM/NJNNKWQ        | TINYURL.COM/M3D3QJ4        | TINYURL.COM/MF4SHUZ      | TINYURL.COM/NBUL2NO     | TINYURL.COM/OQ94SKB    |

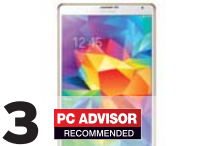
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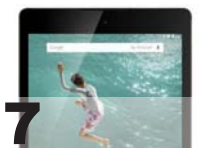
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|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------------------|----------------------------|----------------------------|
|                      | Scan 3XS Graphite LG156                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Dell Inspiron 17-7737    | Chillblast Defiant 2 Mini   | HP Pavilion TouchSmart 15  | Chillblast Helium          |
| Price                | £899 inc VAT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | £800 inc VAT             | £899 inc VAT                | £530 inc VAT               | £899 inc VAT               |
| Website              | 3xs.scan.co.uk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Dell.co.uk               | Chillblast.com              | Hp.com/uk                  | Chillblast.com             |
| Launch date          | Jul 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Jul 14                   | Jul 14                      | May 14                     | Jul 14                     |
| Build rating         | ★★★★★                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ★★★★★                    | ★★★★★                       | ★★★★★                      | ★★★★★                      |
| Features rating      | ★★★★★                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ★★★★★                    | ★★★★★                       | ★★★★★                      | ★★★★★                      |
| Performance rating   | ★★★★★                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ★★★★★                    | ★★★★★                       | ★★★★★                      | ★★★★★                      |
| Value rating         | ★★★★★                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ★★★★★                    | ★★★★★                       | ★★★★★                      | ★★★★★                      |
| Overall rating       | ★★★★★                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ★★★★★                    | ★★★★★                       | ★★★★★                      | ★★★★★                      |
| Processor            | 2.5GHz Intel Core i7-4710MQ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2GHz Intel Core i7-4510U | 2.5GHz Intel Core i7-4710MQ | 1.6GHz Intel Core i5-4200U | 1.8GHz Intel Core i7-4500U |
| RAM                  | 8GB DDR3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 16GB DDR3                | 8GB DDR3                    | 8GB DDR3                   | 16GB DDR3                  |
| Storage              | 1TB SSHD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 500GB HDD + 8GB NAND     | 1TB SSHD                    | 750GB HDD                  | 500GB HDD + 120GB SSD      |
| Screen size          | 15.6in matt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 17.3in glossy            | 13.3in non-reflective       | 15.6in glossy touchscreen  | 14in                       |
| Screen resolution    | 1920x1080                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1920x1080                | 1920x1080                   | 1366x768                   | 1600x900                   |
| Graphics             | GTX 860M/Intel HD 4600                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | GT 750M/Intel HD 4400    | GTX 860M/Intel HD 4600      | GT 740M/Intel HD 4400      | Intel HD Graphics 4400     |
| Video memory         | 2GB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2GB                      | 2GB                         | N/A                        | N/A                        |
| Wireless             | 802.11a/b/g/n/ac                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 802.11a/b/g/n            | 802.11a/b/g/n               | 802.11b/g/n                | 802.11b/g/n                |
| Ethernet             | Gigabit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Gigabit                  | Gigabit                     | 10/100                     | Gigabit                    |
| Bluetooth            | ✓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ✓                        | ✓                           | ✓                          | ✓                          |
| USB                  | 3x USB 3.0, 1x USB 2.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 4x USB 3.0               | 2x USB 3.0                  | 2x USB 3.0, 1x USB 2.0     | 2x USB 3.0                 |
| FireWire             | x                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | x                        | x                           | x                          | x                          |
| Thunderbolt          | x                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | x                        | x                           | x                          | x                          |
| DisplayPort          | x                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | x                        | x                           | x                          | x                          |
| HDMI                 | ✓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ✓                        | ✓                           | ✓                          | ✓                          |
| DVI                  | x                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | x                        | x                           | x                          | x                          |
| VGA                  | ✓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ✓                        | ✓                           | ✓                          | ✓                          |
| eSATA                | ✓ (shared USB 3.0)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 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                         | 8x DVD ± RW                | N/A                        |
| Extras               | 1080p webcam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 720p webcam              | 1080p webcam                | Webcam                     | 720p webcam                |
| Operating system     | Windows 8.1 64-bit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Windows 8.1 64-bit       | Windows 8.1 64-bit          | Windows 8 64-bit           | Windows 8.1 64-bit         |
| Bundled software     | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | None                     | None                        | None                       | None                       |
| Stalker (720p/1080p) | 178/102fps                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 104/63fps                | 180/100fps                  | 60fps (720)                | 29fps (720p)               |
| Battery              | 77Wh lithium-ion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 58Wh lithium-ion         | 62.2Wh lithium-ion          | 41Wh lithium-ion           | 44.6Wh lithium-ion         |
| Battery life         | 4 hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 5 hrs                    | 5 hrs 33 mins               | 5 hrs 45 mins              | 5 hrs 20 mins              |
| PCMark 7 score       | 4846                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 4260                     | 4456                        | 2860                       | 5100                       |
| Dimensions           | 374x250x43mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 412x269x28mm             | 330x227x32mm                | 386x258x25mm               | 337x236x21mm               |
| Weight               | 2.7kg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3.3kg                    | 2.1kg                       | 2.6kg                      | 2.1kg                      |
| Warranty             | 2-year return-to-base                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1-year NBD               | 2-year collect-and-return   | 1-year return-to-base      | 1-year return-to-base      |
| FULL REVIEW          | TINYURL.COM/MYTG9X5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | TINYURL.COM/N6828JG      | TINYURL.COM/NNDFZRR         | TINYURL.COM/L2JAXH7        | TINYURL.COM/P7U28WQ        |

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|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|                      | Aorus X7 v2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Aorus X3 Plus               | MSI GE70 2PE Apache Pro     | Schenker XMG P304           | Dell XPS 15                 |
| Price                | £1,729 inc VAT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | £1,549 inc VAT              | £1,126 inc VAT              | £1,100 inc VAT              | £1,449 inc VAT              |
| Website              | Aorus.com                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Aorus.com                   | UK.msi.com                  | Mysn.co.uk                  | Dell.co.uk                  |
| Launch date          | Sep 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Nov 14                      | Sep 14                      | Jul 14                      | Sep 14                      |
| Build rating         | ★★★★☆                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ★★★★☆                       | ★★★★☆                       | ★★★★☆                       | ★★★★☆                       |
| Features rating      | ★★★★☆                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ★★★★☆                       | ★★★★☆                       | ★★★★☆                       | ★★★★☆                       |
| Performance rating   | ★★★★☆                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ★★★★☆                       | ★★★★☆                       | ★★★★☆                       | ★★★★☆                       |
| Value rating         | ★★★★☆                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ★★★★☆                       | ★★★★☆                       | ★★★★☆                       | ★★★★☆                       |
| Overall rating       | ★★★★☆                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ★★★★☆                       | ★★★★☆                       | ★★★★☆                       | ★★★★☆                       |
| Processor            | 2.4GHz Intel Core i7-4860HQ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2.4GHz Intel Core i7-4860HQ | 2.5GHz Intel Core i7-4710HQ | 2.2GHz Intel Core i7-4702MQ | 2.3GHz Intel Core i7-4712HQ |
| RAM                  | 16GB DDR3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 16GB DDR3                   | 16GB DDR3                   | 8GB DDR3                    | 16GB DDR3                   |
| Storage              | 1TB HDD, 3x 128GB SSD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2x 128GB SSD                | 1TB HDD, 2x 128GB SSD       | 250GB SSD                   | 512GB SSD                   |
| Screen size          | 17.3in matt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 14in matt                   | 17.3in matt                 | 13.3in matt                 | 15.6in gloss                |
| Screen resolution    | 1920x1080                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 3200x1800                   | 1920x1080                   | 1920x1080                   | 3200x1800                   |
| Graphics             | 2x nVidia GeForce GTX 860M                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | nVidia GeForce GTX 870M     | nVidia GeForce GTX 860M     | nVidia GeForce GTX 860M     | nVidia GeForce GT 750M      |
| Video memory         | 8GB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6GB                         | 2GB                         | 2GB                         | 2GB                         |
| Wireless             | 802.11a/b/g/n/ac                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 802.11a/b/g/n/ac            | 802.11b/g/n/ac              | 802.11b/g/n/ac              | 802.11b/g/n/ac              |
| Ethernet             | Gigabit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Gigabit                     | Gigabit                     | Gigabit                     | *                           |
| Bluetooth            | ✓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ✓                           | ✓                           | ✓                           | ✓                           |
| USB                  | 3x USB 3.0, 2x USB 2.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2x USB 3.0, 1x USB 2.0      | 2x USB 3.0, 2x USB 2.0      | 3x USB 3.0, 1x USB 2.0      | 3x USB 3.0, 1x USB 2.0      |
| 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                         | None                        | N/A                         |
| Extras               | HD webcam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | HD webcam                   | HD webcam                   | 720p webcam                 | 720p webcam                 |
| Operating system     | Windows 8.1 64-bit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Windows 8.1 64bit           | Windows 8.1 64-bit          | Windows 8.1 64-bit          | Windows 8.1 64-bit          |
| Bundled software     | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | None                        | None                        | None                        | None                        |
| Stalker (720p/1080p) | 189/157fps in Tomb Raider                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 60.9/38.3fps in Tomb Raider | 120fps in Batman (1080p)    | 115fps (1080p)              | 68fps (1080)                |
| Battery              | 74.7Wh lithium-polymer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 73.26Wh lithium-polymer     | 49Wh lithium-ion            | 62Wh lithium-ion            | 91Wh lithium-ion            |
| Battery life         | 1 hr 48 mins                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1 hr 48 mins                | 2 hrs                       | 5 hrs 5 mins                | 5 hrs                       |
| PCMark7 score        | 6304                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6627                        | 6241                        | 5500                        | 5833                        |
| Dimensions           | 425x303x24.5mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 330x263.5x22.9mm            | 418x269x39mm                | 374x250x37mm                | 372x254x18mm                |
| Weight               | 3.24kg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1.8kg                       | 3kg                         | 2kg                         | 2kg                         |
| Warranty             | 2-year return-to-base                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2-year return-to-base       | 2-year return-to-base       | 2-year collect-and-return   | 1-year next day in-home     |
| FULL REVIEW          | TINYURL.COM/KLUXLGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | TINYURL.COM/LS86960         | TINYURL.COM/PU5L5GK         | TINYURL.COM/Q4JWVSM         | TINYURL.COM/N9GRT4U         |

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| Tablets                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                         |  |  |  |  |  |
|                         | 1 Google Nexus 7 (2013)                                                           | 2 Apple iPad Air 2                                                                | 3 Samsung Galaxy Tab S 8.4                                                         | 4 Sony Xperia Z3 Tablet                                                             | 5 Apple iPad mini 2                                                                 |
| Price                   | £199 inc VAT                                                                      | £399 inc VAT                                                                      | £319 inc VAT                                                                       | £300 inc VAT                                                                        | £239 inc VAT                                                                        |
| Website                 | Play.google.com                                                                   | Apple.com/uk                                                                      | Samsung.com/uk                                                                     | Sony.co.uk                                                                          | Apple.com/uk                                                                        |
| Launch date             | Jul 13                                                                            | Oct 14                                                                            | Aug 14                                                                             | Jan 15                                                                              | Oct 13                                                                              |
| Overall rating          | ★★★★★                                                                             | ★★★★★                                                                             | ★★★★★                                                                              | ★★★★★                                                                               | ★★★★★                                                                               |
| Platform                | Android 4.3 Jelly Bean                                                            | Apple iOS 8.1                                                                     | Android 4.4.2 KitKat                                                               | Android 4.4.4 KitKat                                                                | Apple iOS 8.1                                                                       |
| Screen size/resolution  | 7in/1280x800                                                                      | 9.7in/2048x1536                                                                   | 8.4in/2560x1600                                                                    | 8in/1920x1200                                                                       | 7.9in/2048x1536                                                                     |
| Storage/media card slot | 16GB/none                                                                         | 16GB/none                                                                         | 16GB/32GB                                                                          | 16GB/32GB                                                                           | 16GB/none                                                                           |
| Connectivity            | 802.11b/g/n, Bluetooth 4                                                          | 802.11a/b/g/n/ac, Bluetooth 4                                                     | 802.11a/b/g/n/ac, Bluetooth 4                                                      | 802.11a/b/g/n/ac, Bluetooth 4                                                       | 802.11a/b/g/n, Bluetooth 4                                                          |
| Processor               | 1.5GHz Snapdragon S4 Pro                                                          | Apple A8X                                                                         | Exynos 5                                                                           | 2.5GHz Snapdragon 801                                                               | Apple A7                                                                            |
| RAM                     | 2GB                                                                               | 1GB                                                                               | 3GB                                                                                | 3GB                                                                                 | 3GB                                                                                 |
| Claimed battery life    | 9 hrs                                                                             | 10 hrs                                                                            | 12 hrs                                                                             | Not specified                                                                       | Not specified                                                                       |
| Cameras (front/rear)    | 1.2/5Mp                                                                           | 1.28Mp                                                                            | 2.1/8Mp                                                                            | 2.2/8Mp                                                                             | 1.2/8.5Mp                                                                           |
| Dimensions              | 114x200x8.7mm                                                                     | 240x169.5x6.1mm                                                                   | 126x213x6.6mm                                                                      | 123x213x6.4mm                                                                       | 200x134.7x7.5mm                                                                     |
| Weight                  | 299g                                                                              | 437g                                                                              | 294g                                                                               | 270g                                                                                | 331g                                                                                |
| Warranty                | 1 year                                                                            | 1 year                                                                            | 1 year                                                                             | 1 year                                                                              | 1 year                                                                              |
| FULL REVIEW             | TINYURL.COM/QYUDY5C                                                               | TINYURL.COM/QEYQXYM                                                               | TINYURL.COM/KL6G9FJ                                                                | TINYURL.COM/NJ6VHEO                                                                 | TINYURL.COM/MZDXBGQ                                                                 |

| Tablets                 |                                                                                     |                                                                                     |                                                                                      |                                                                                       |                                                                                       |
|-------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                         |  |  |  |  |  |
|                         | 6 Apple iPad Air                                                                    | 7 Google Nexus 9                                                                    | 8 Samsung Galaxy Tab S 10.5                                                          | 9 Sony Xperia Z2 Tablet                                                               | Tesco Hudl 2                                                                          |
| Price                   | £319 inc VAT                                                                        | £300 inc VAT                                                                        | £399 inc VAT                                                                         | £399 inc VAT                                                                          | £132 inc VAT                                                                          |
| Website                 | Apple.com/uk                                                                        | Play.google.com                                                                     | Samsung.com/uk                                                                       | Sony.co.uk                                                                            | Tesco.com                                                                             |
| Launch date             | Oct 13                                                                              | Nov 14                                                                              | Aug 14                                                                               | Apr 14                                                                                | Oct 14                                                                                |
| Overall rating          | ★★★★★                                                                               | ★★★★★                                                                               | ★★★★★                                                                                | ★★★★★                                                                                 | ★★★★★                                                                                 |
| Platform                | Apple iOS 8.1                                                                       | Android 5.0 Lollipop                                                                | Android 4.4.2 KitKat                                                                 | Android 4.4.2 KitKat                                                                  | Android 4.4 KitKat                                                                    |
| Screen size/resolution  | 9.7in/2048x1536                                                                     | 8.9in/2048x1536                                                                     | 10.5in/2560x1600                                                                     | 10.1in/1920x1200                                                                      | 8.3in/1920x1200                                                                       |
| Storage/media card slot | 16GB/none                                                                           | 16GB/32GB                                                                           | 16GB/32GB                                                                            | 16GB/none                                                                             | 16GB/microSD                                                                          |
| Connectivity            | 802.11a/b/g/n, Bluetooth 4                                                          | 802.11b/g/n/ac, Bluetooth 4.1                                                       | 802.11b/g/n/ac, Bluetooth 4                                                          | 802.11b/g/n/ac, Bluetooth 4                                                           | 802.11a/b/g/n, Bluetooth 4                                                            |
| Processor               | Apple A7                                                                            | 2.3GHz nVidia Tegra K1                                                              | Exynos 5420                                                                          | 2.3GHz Snapdragon 801                                                                 | 1.8GHz Intel Atom                                                                     |
| RAM                     | 1GB                                                                                 | 2GB                                                                                 | 3GB                                                                                  | 3GB                                                                                   | 2GB                                                                                   |
| Claimed battery life    | 10 hrs                                                                              | Not specified                                                                       | Not specified                                                                        | Not specified                                                                         | 8 hrs                                                                                 |
| Cameras (front/rear)    | 1.2/5Mp                                                                             | 1.6/8Mp                                                                             | 2.1/8Mp                                                                              | 2.2/8.1Mp                                                                             | 1.2/5Mp                                                                               |
| Dimensions              | 169x240x7.5mm                                                                       | 228x153x7.95mm                                                                      | 247x177x6.6mm                                                                        | 266x172x6.4mm                                                                         | 128x224x9mm                                                                           |
| Weight                  | 469g                                                                                | 425g                                                                                | 465g                                                                                 | 439g                                                                                  | 401g                                                                                  |
| Warranty                | 1 year                                                                              | 1 year                                                                              | 1 year                                                                               | 1 year                                                                                | 1 year                                                                                |
| FULL REVIEW             | TINYURL.COM/LSB84EE                                                                 | TINYURL.COM/NQ6K77Y                                                                 | TINYURL.COM/OESDFZQ                                                                  | TINYURL.COM/M8BZZUN                                                                   | TINYURL.COM/NE5W9U9                                                                   |

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| Smartphones             | 1                           | 2                           | 3                           | 4                        | 5                         |
|-------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------|---------------------------|
|                         | LG G3                       | Sony Xperia Z3 Compact      | LG G2                       | HTC One (M8)             | Samsung Galaxy Note 4     |
| Price                   | £499 inc VAT                | £365 inc VAT                | £279 inc VAT                | £550 inc VAT             | £599 inc VAT              |
| Website                 | Lg.com/uk                   | Sonymobile.com              | Lg.com/uk                   | Htc.com/uk               | Samsung.com/uk            |
| Launch date             | Jun 14                      | Nov 14                      | Sep 13                      | Apr 14                   | Nov 14                    |
| Overall rating          | ★★★★★                       | ★★★★★                       | ★★★★★                       | ★★★★★                    | ★★★★★                     |
| Platform                | Android 4.4.2 KitKat        | Android 4.4 KitKat          | Android 4.2 Jelly Bean      | Android 4.4 KitKat       | Android 4.4.4 KitKat      |
| Processor               | 2.5GHz Snapdragon 801       | 2.5GHz Qualcomm             | 2.26GHz Snapdragon 800      | 2.3GHz Snapdragon 801    | 2.7GHz Qualcomm           |
| Storage/media card slot | 16GB/none                   | 16GB/microSD                | 16GB/none                   | 16GB/microSD             | 32GB/none                 |
| Screen size/resolution  | 5.2in/1440x2560             | 4.6in/1280x720              | 5.2in/1920x1080             | 5in/1920x1080            | 5.7in/2560x1440           |
| Screen type             | Capacitive multitouch       | Capacitive multitouch       | Capacitive multitouch       | Capacitive multitouch    | Capacitive multitouch     |
| Connectivity            | 4G, HSPA+, Bluetooth, Wi-Fi | 4G, HSPA+, Bluetooth, Wi-Fi | 4G, HSPA+, Bluetooth, Wi-Fi | Bluetooth, NFC, Wi-Fi ac | 4G, NFC, Bluetooth, Wi-Fi |
| Claimed battery life    | Not specified               | Not specified               | Not specified               | Not specified            | Not specified             |
| Cameras (front/rear)    | 13Mp, 1080p video           | 20.7Mp, 1080p video         | 13Mp, 1080p video           | 5Mp, 1080p video         | 8Mp, 1080p video          |
| GPS                     | A-GPS                       | A-GPS                       | A-GPS                       | A-GPS, Glonass           | A-GPS                     |
| Dimensions, weight      | 75x146x8.9mm, 149g          | 127x64.9x8.6mm, 129g        | 71x139x9.4mm, 143g          | 146.4x70.6x9.4mm, 160g   | 79x154x8.7mm, 175g        |
| Warranty                | 1 year                      | 1 year                      | 1 year                      | 2 years                  | Not specified             |
| FULL REVIEW             | TINYURL.COM/MQ8DHUU         | TINYURL.COM/O6PVRER         | TINYURL.COM/PAFK4SZ         | TINYURL.COM/NGBWXY9      | TINYURL.COM/MRVQCKG       |

| Smartphones             | 6                         | 7                          | 8                         | 9                         | 10                        |
|-------------------------|---------------------------|----------------------------|---------------------------|---------------------------|---------------------------|
|                         | Huawei Honor 6            | Google Nexus 5             | Sony Xperia Z3            | OnePlus One               | HTC Desire Eye            |
| Price                   | £249 inc VAT              | £299 inc VAT               | £539 inc VAT              | £229 inc VAT              | £350 inc VAT              |
| Website                 | Huawei.com/uk             | Play.google.com            | Sonymobile.com            | Oneplus.net/uk            | Htc.com/uk                |
| Launch date             | Nov 14                    | Oct 13                     | Nov 14                    | Jul 14                    | Nov 14                    |
| Overall rating          | ★★★★★                     | ★★★★★                      | ★★★★★                     | ★★★★★                     | ★★★★★                     |
| Platform                | Android 4.4 KitKat        | Android 4.4 KitKat         | Android 4.4.4 KitKat      | CyanogenMod 11S           | Android 4.4.4 KitKat      |
| Processor               | 1.7GHz Cortex-A15         | 2.3GHz Snapdragon 800      | 2.5GHz Qualcomm           | 2.5GHz Qualcomm           | 2.3GHz Qualcomm           |
| Storage/media card slot | 16GB/32GB                 | 16GB/none                  | 16GB/microSD              | 16GB/none                 | 16GB/microSD              |
| Screen size/resolution  | 5in/1920x1080             | 4.95in/1920x1080           | 5.2in/1920x1080           | 5.5in/1920x1080           | 5.2in/1920x1080           |
| Screen type             | Capacitive multitouch     | Capacitive multitouch      | Capacitive multitouch     | Capacitive multitouch     | Capacitive multitouch     |
| Connectivity            | 4G, NFC, Bluetooth, Wi-Fi | HSPA+, Bluetooth, Wi-Fi ac | 4G, NFC, Bluetooth, Wi-Fi | 4G, NFC, Bluetooth, Wi-Fi | 4G, NFC, Bluetooth, Wi-Fi |
| Claimed battery life    | Not specified             | 17 hrs/300 hrs             | Not specified             | Not specified             | Not specified             |
| Cameras (front/rear)    | 13Mp, 1080p video         | 8Mp, 1080p video           | 20.7Mp, 1080p video       | 13Mp, 720p video          | 13Mp, 1080p video         |
| GPS                     | A-GPS                     | A-GPS                      | A-GPS                     | Glonass                   | A-GPS                     |
| Dimensions, weight      | 70x140x7.5mm, 130g        | 69x138x8.9mm, 130g         | 72x146x7.3mm, 152g        | 152.9x75.9x8.9mm, 162g    | 152x74x8.5mm, 154g        |
| Warranty                | 1 year                    | 1 year                     | 1 year                    | Not specified             | 2 years                   |
| FULL REVIEW             | TINYURL.COM/OYBQJVA       | TINYURL.COM/PAFK4SZ        | TINYURL.COM/K5S4KXD       | TINYURL.COM/KYW977U       | TINYURL.COM/NVMMBVF       |

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| Gaming PCs                           | <br><b>1</b>  | <br><b>2</b> | <br><b>3</b> | <br><b>4</b>  | <br><b>5</b> |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
|                                      | Chillblast Fusion Probe                                                                                                                                                         | Chillblast Fusion Ranger                                                                      | Gladiator Firestorm OC                                                                         | CyberPower Infinity Perseus XT                                                                                                                                                      | Computer Planet GX 760                                                                          |
| Price                                | £1,299 inc VAT                                                                                                                                                                  | £1,249 inc VAT                                                                                | £695 inc VAT                                                                                   | £1,499 inc VAT                                                                                                                                                                      | £983 inc VAT                                                                                    |
| Website                              | Chillblast.com                                                                                                                                                                  | Chillblast.com                                                                                | Gladiatorpc.co.uk                                                                              | Cyberpowersystem.co.uk                                                                                                                                                              | Computerplanet.co.uk                                                                            |
| Launch date                          | Feb 14                                                                                                                                                                          | Jul 14                                                                                        | Mar 14                                                                                         | Feb 14                                                                                                                                                                              | Mar 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 4.2GHz)                                                        | 3.4GHz Intel Core i5-4670K (OC 4.2GHz)                                                         | 3.4GHz Intel Core i5-4670K (OC 4.4GHz)                                                                                                                                              | 3.4GHz Intel Core i5-4670K                                                                      |
| CPU cooler                           | Corsair H55 Liquid Cooler                                                                                                                                                       | Corsair H60 Liquid Cooler                                                                     | Be Quiet Dark Rock 3                                                                           | Cooler Master Seldon 120mm                                                                                                                                                          | Corsair H60 Hydro                                                                               |
| Memory                               | 16GB DDR3                                                                                                                                                                       | 16GB DDR3                                                                                     | 8GB DDR3                                                                                       | 16GB DDR3                                                                                                                                                                           | 8GB DDR3                                                                                        |
| Storage                              | 120GB SSD + 2TB HDD                                                                                                                                                             | 120GB SSD + 2TB HDD                                                                           | 2TB HDD                                                                                        | 256GB SSD + 2TB HDD                                                                                                                                                                 | 120GB SSD + 2TB HDD                                                                             |
| Power supply                         | 750W Corsair                                                                                                                                                                    | 750W Corsair                                                                                  | 500W Corsair                                                                                   | 750W Corsair                                                                                                                                                                        | 450W Corsair                                                                                    |
| Motherboard                          | Gigabyte GA-Z87N-Wi-Fi                                                                                                                                                          | Asus Maximus VII Ranger                                                                       | MSI Z87M Gaming                                                                                | Gigabyte GA-Z87-HD3                                                                                                                                                                 | Gigabyte GA-Z87N-Wi-Fi                                                                          |
| 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                                                                                                                                                          | None supplied                                                                                 | None supplied                                                                                  | 23in AOC i2367fh                                                                                                                                                                    | None supplied                                                                                   |
| Graphics                             | Palit Jetstream GeForce GTX 780, 3GB VRAM                                                                                                                                       | PowerColor AMD Radeon R9 290 OC, 4GB VRAM                                                     | MSI nVidia GeForce GTX 750 Ti Gaming, 2GB VRAM                                                 | Powercolor AMD R9 290, 4GB VRAM                                                                                                                                                     | Zotac GeForce GTX 760, 2GB VRAM                                                                 |
| Sound                                | Onboard                                                                                                                                                                         | Onboard                                                                                       | Onboard                                                                                        | Onboard                                                                                                                                                                             | Onboard                                                                                         |
| Connectivity                         | Gigabit ethernet, 802.11n                                                                                                                                                       | Gigabit ethernet                                                                              | Low-lag ethernet                                                                               | Gigabit ethernet                                                                                                                                                                    | 2x gigabit ethernet, 802.11n                                                                    |
| Ports                                | 6x USB 3.0, 4x USB 2.0                                                                                                                                                          | 6x USB 3.0, 2x USB 2.0, 2x DVI, HDMI, DP                                                      | 8x USB 3.0, 4x USB 2.0, 2x eSATA                                                               | 6x USB 3.0, 4x USB 2.0                                                                                                                                                              | 6x USB 3.0, 2x USB 2.0                                                                          |
| Optical drive                        | DVD±RW (Blu-ray optional)                                                                                                                                                       | 24x DVD±RW                                                                                    | 24x DVD±RW                                                                                     | DVD±RW, BD-ROM                                                                                                                                                                      | None supplied                                                                                   |
| Case                                 | Aerocool Dead Silence Gaming Cube                                                                                                                                               | Corsair Graphite 230T                                                                         | Aerocool Dead Silence Cube Window Red                                                          | Cooler Master Dominator 690 III                                                                                                                                                     | Fractal Design Node 304                                                                         |
| Keyboard & mouse                     | Gigabyte M6800 mouse, Force K3 keyboard                                                                                                                                         | None                                                                                          | None                                                                                           | Gigabyte M6900 mouse, Force K3 keyboard                                                                                                                                             | None                                                                                            |
| Other                                | Optional family pack                                                                                                                                                            | None                                                                                          | None                                                                                           | None                                                                                                                                                                                | None                                                                                            |
| PC Mark 7 score                      | 6965                                                                                                                                                                            | 6852                                                                                          | 5124                                                                                           | 6731                                                                                                                                                                                | 5508                                                                                            |
| Alien vs Predator score (720p/1080p) | 169/93fps                                                                                                                                                                       | 173/97                                                                                        | 103/54fps                                                                                      | 172/96fps                                                                                                                                                                           | 103/54fps                                                                                       |
| Final Fantasy XIV (720p/1080p)       | 218/96fps                                                                                                                                                                       | N/A                                                                                           | N/A                                                                                            | 167/87fps                                                                                                                                                                           | N/A                                                                                             |
| Sniper Elite V2 (Low/High/Ultra)     | 308/187/49fps                                                                                                                                                                   | 321/164/42                                                                                    | 194/81.6/18.6fps                                                                               | 352/155/39fps                                                                                                                                                                       | 261/119/29fps                                                                                   |
| Power Consumption                    | 52/407W                                                                                                                                                                         | 67W/386W                                                                                      | 70W/166W                                                                                       | 68/484W                                                                                                                                                                             | 53W/271W                                                                                        |
| Warranty                             | 2-year collect-and-return                                                                                                                                                       | 2-year collect-and-return                                                                     | 4-year return-to-base                                                                          | 3-year RTB (2 years parts, 3 years labour)                                                                                                                                          | 3-year return-to-base                                                                           |
| FULL REVIEW                          | <a href="http://tinyurl.com/OWQ24QQ">TINYURL.COM/OWQ24QQ</a>                                                                                                                    | <a href="http://tinyurl.com/MEGK909">TINYURL.COM/MEGK909</a>                                  | <a href="http://tinyurl.com/PKDV2NG">TINYURL.COM/PKDV2NG</a>                                   | <a href="http://tinyurl.com/NKWN7V4">TINYURL.COM/NKWN7V4</a>                                                                                                                        | <a href="http://tinyurl.com/MJZKS7G">TINYURL.COM/MJZKS7G</a>                                    |

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| Mini PCs                               |  1 <b>PC ADVISOR</b><br>BEST BUY |  2 <b>PC ADVISOR</b><br>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                                                                       |
|----------------------------------|----------------------------------------|-----------------------------------------|--------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------|
|                                  | Apple iMac with 5K display             | Acer Aspire AZ3-615                     | Chillblast Volante A10                     | Asus Eee Top                                         | HP Envy Beats 23-n001na                                                 |
| Price                            | £1,999 inc VAT                         | £799 inc VAT                            | £1,299 inc VAT                             | £799 inc VAT                                         | £900 inc VAT                                                            |
| Website                          | Apple.com/uk                           | Acer.co.uk                              | Chillblast.com                             | Asus.com/uk                                          | Hp.com/uk                                                               |
| Launch date                      | Dec 14                                 | Dec 14                                  | Dec 14                                     | Dec 14                                               | Dec 14                                                                  |
| Build rating                     | ★★★★★                                  | ★★★★☆                                   | ★★★★☆                                      | ★★★★☆                                                | ★★★★☆                                                                   |
| Features rating                  | ★★★★★                                  | ★★★★☆                                   | ★★★★☆                                      | ★★★★☆                                                | ★★★★☆                                                                   |
| Performance rating               | ★★★★☆                                  | ★★★★☆                                   | ★★★★★                                      | ★★★★☆                                                | ★★★★☆                                                                   |
| Value rating                     | ★★★★★                                  | ★★★★☆                                   | ★★★★☆                                      | ★★★★☆                                                | ★★★★☆                                                                   |
| Overall rating                   | ★★★★★                                  | ★★★★☆                                   | ★★★★☆                                      | ★★★★☆                                                | ★★★★☆                                                                   |
| Processor                        | 3.9GHz Intel Core i5-4690              | 2.7GHz Intel Core i5-4460T              | 4GHz Intel Core i7-4790S                   | 2.6GHz Intel Core i5-4200U                           | 3.2GHz Intel Core i7-4785T                                              |
| RAM                              | 8GB DDR3                               | 8GB DDR3                                | 16GB DDR3                                  | 6GB DDR3                                             | 8GB DDR3                                                                |
| Storage                          | 1TB Fusion Drive                       | 1TB HDD                                 | 1TB SSD                                    | 1TB HDD                                              | 1TB HDD                                                                 |
| Screen                           | 27in                                   | 23in touchscreen                        | 24in                                       | 23in touchscreen                                     | 23in touchscreen                                                        |
| Screen resolution                | 5120x2880                              | 1920x1080                               | 1920x1080                                  | 1920x1080                                            | 1920x1080                                                               |
| Graphics card                    | AMD Radeon M9 M290X                    | nVidia GeForce GT 840M                  | nVidia GeForce GT 750M                     | Intel HD Graphics 4400                               | Intel HD Graphics 4600                                                  |
| Video memory                     | 2GB                                    | 2GB                                     | 2GB                                        | 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                                | Gigabit                                 | Gigabit                                    | Gigabit                                              | Gigabit                                                                 |
| Bluetooth                        | x                                      | x                                       | x                                          | x                                                    | x                                                                       |
| USB                              | 4x USB 3.0                             | 2x USB 3.0, 3x USB 2.0                  | 4x USB 3.0, 2x USB 2.0                     | 3x USB 3.0, 3x USB 2.0                               | 2x USB 3.0, 4x USB 2.0                                                  |
| FireWire                         | x                                      | x                                       | x                                          | x                                                    | x                                                                       |
| Thunderbolt                      | ✓                                      | x                                       | x                                          | x                                                    | x                                                                       |
| HDMI                             | x                                      | x                                       | ✓                                          | ✓                                                    | ✓                                                                       |
| Media card slot                  | ✓                                      | ✓                                       | ✓                                          | ✓                                                    | ✓                                                                       |
| Optical drive                    | None                                   | DVD Writer                              | Blu-Ray Combo                              | DVD Writer                                           | DVD Writer                                                              |
| Other                            | Final Cut Pro X, Logic Pro X, Aperture | 1Mp webcam, wireless keyboard and mouse | Logitech MK520 wireless keyboard and mouse | 2Mp webcam, Freeview TV, wireless keyboard and mouse | Wireless keyboard and mouse, Beats Audio stereo speaker system (8x 12W) |
| Operating system                 | OS X Yosemite                          | Windows 8.1 64-bit                      | Windows 8.1 64-bit                         | Windows 8.1 64-bit                                   | Windows 8.1 64-bit                                                      |
| Power consumption (idle/max)     | 46/215W                                | 46/91W                                  | 35/177W                                    | 33/69W                                               | 43/81W                                                                  |
| Sniper V2 Elite (Low/High/Ultra) | 113.8/84/21.2fps                       | 47.7/18.7/5.1fps                        | 91.5/41.2/10.5fps                          | 31.4/7.8/5fps                                        | 27.7/7.4/5fps                                                           |
| PCMark 8 Home score              | 4008                                   | 2906                                    | 3776                                       | 2828                                                 | 2702                                                                    |
| Dimensions                       | 650x203x516mm                          | 540x489x579mm                           | 585x200x450mm                              | 571x359x50-214mm                                     | 563x143x413mm                                                           |
| Weight                           | 9.54kg                                 | 8.8kg                                   | 14.6kg                                     | 9kg                                                  | 8.4kg                                                                   |
| Warranty                         | 1-year return-to-base                  | Not stated                              | 5-year labour (2-year collect-and-return)  | 1-year return-to-base                                | 1-year limited parts, labour, and pickup-and-return service             |
| FULL REVIEW                      | TINYURL.COM/NWJUJSF                    | TINYURL.COM/QEY8FOE                     | TINYURL.COM/LO8A5MC                        | TINYURL.COM/PRPHC7L                                  | TINYURL.COM/O6M4BCN                                                     |

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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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- 8GB PC3-12800 DDR3 Memory
- 1000GB Seagate SSHD Hybrid drive
  - Corsair CX600 Power Supply
  - Onboard High Definition Audio
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\* 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>

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## PC ADVISOR



| Family PCs                             |  |  |  |  |  |
|----------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                        | 1<br>PC ADVISOR<br>BEST BUY                                                       | 2                                                                                 | 3                                                                                 | 4                                                                                   | 5                                                                                   |
|                                        | Chillblast Fusion Commando                                                        | Wired2Fire Diablo Reactor                                                         | Mesh Elite 4670-PCA                                                               | Dino PC Raging Lizard V2                                                            | Arbico Family i3 4185                                                               |
| Price                                  | £799 inc VAT                                                                      | £668 inc VAT                                                                      | £799 inc VAT                                                                      | £780 inc VAT                                                                        | £675 inc VAT                                                                        |
| Website                                | Chillblast.com                                                                    | Wired2fire.co.uk                                                                  | Meshcomputers.com                                                                 | Dinopc.com                                                                          | Arbico.co.uk                                                                        |
| Launch date                            | Jul 13                                                                            | May 14                                                                            | May 14                                                                            | May 14                                                                              | May 14                                                                              |
| Build rating                           | ★★★★★                                                                             | ★★★★★                                                                             | ★★★★★                                                                             | ★★★★★                                                                               | ★★★★★                                                                               |
| Features rating                        | ★★★★★                                                                             | ★★★★★                                                                             | ★★★★★                                                                             | ★★★★★                                                                               | ★★★★★                                                                               |
| Performance rating                     | ★★★★★                                                                             | ★★★★★                                                                             | ★★★★★                                                                             | ★★★★★                                                                               | ★★★★★                                                                               |
| Value rating                           | ★★★★★                                                                             | ★★★★★                                                                             | ★★★★★                                                                             | ★★★★★                                                                               | ★★★★★                                                                               |
| Overall rating                         | ★★★★★                                                                             | ★★★★★                                                                             | ★★★★★                                                                             | ★★★★★                                                                               | ★★★★★                                                                               |
| Processor                              | 3.2GHz Intel Core i5-4570                                                         | 3.4GHz Intel Core i5-4670                                                         | 3.4GHz Intel Core i5-4670                                                         | 3.5GHz Intel Core i5-4690                                                           | 3.4GHz Intel Core i3-4130                                                           |
| RAM                                    | 16GB DDR3                                                                         | 8GB DDR3 1600MHz                                                                  | 16GB DDR3 1600MHz                                                                 | 8GB DDR3 1600MHz                                                                    | 8GB DDR3 1600MHz                                                                    |
| Storage                                | 1TB HDD + 120GB SSD                                                               | 1TB HDD                                                                           | 2TB HDD + 120GB SSD                                                               | 1TB HDD + 128GB SSD                                                                 | 1TB HDD + 120GB SSD                                                                 |
| Motherboard                            | Asus B85M-G                                                                       | Asus B85M-G                                                                       | MSI B85M-E45                                                                      | Gigabyte H97M-D3H                                                                   | MSI B85M-E45                                                                        |
| CPU cooler                             | Arctic Cooling Freezer 7 Pro                                                      | Standard Intel Cooler                                                             | Standard Intel Cooler                                                             | Standard Intel Cooler                                                               | Arctic Cooling Freezer 7 Pro                                                        |
| Power supply                           | 600W CiT                                                                          | 500W FSP                                                                          | 500W FSP                                                                          | 500W CIT                                                                            | 650W Arctic Red                                                                     |
| Screen                                 | 23in Iiyama X2377                                                                 | 24in AOC E2495Sh                                                                  | 24in Iiyama E2483HS-B1                                                            | 24in Iiyama E2483HS-B1                                                              | 23.6in AOC E2470SWHE                                                                |
| Screen resolution                      | 1920x1080                                                                         | 1920x1080 pixels                                                                  | 1920x1080 pixels                                                                  | 1920x1080 pixels                                                                    | 1920x1080 pixels                                                                    |
| Graphics                               | Zotac nVidia GeForce GTX 650 Ti                                                   | AMD Radeon R7 265                                                                 | nVidia GeForce GTX 750 Ti                                                         | nVidia GeForce GTX 750 Ti                                                           | MSI AMD Radeon R7 250                                                               |
| Video memory                           | N/A                                                                               | 2GB                                                                               | 2GB                                                                               | 2GB                                                                                 | 2GB                                                                                 |
| Connectivity                           | 802.11b/g/n, gigabit ethernet                                                     | Gigabit ethernet                                                                  | Gigabit ethernet                                                                  | Gigabit ethernet, 802.11b/g/n                                                       | Gigabit ethernet                                                                    |
| USB                                    | 3x USB 3.0, 6x USB 2.0                                                            | 3x USB 3.0, 6x USB 2.0, 2x HDMI, VGA                                              | 4x USB 3.0, 8x USB 2.0, HDMI, VGA, DVI-D, DVI, DP                                 | 5x USB 3.0, 3x USB 2.0, 2x HDMI (1x e-Mini), VGA, 2x DVI                            | 2x USB 3.0, 6x USB 2.0, HDMI, VGA, DVI-D                                            |
| Media card slot                        | None                                                                              | None                                                                              | None                                                                              | None                                                                                | None                                                                                |
| Sound                                  | Onboard                                                                           | Onboard                                                                           | Onboard                                                                           | Onboard                                                                             | Onboard                                                                             |
| Speakers                               | 2x Logitech LS220                                                                 | None                                                                              | None                                                                              | None                                                                                | None                                                                                |
| Case                                   | Cooler Master Force 500                                                           | Zalman Z3 Plus                                                                    | Zalman Z3 Plus                                                                    | Fractal Design Core 1000 USB3                                                       | CIT Templar                                                                         |
| Keyboard                               | Logitech MK260                                                                    | Octigen Wireless combo                                                            | Logitech MK270 (wireless combo)                                                   | Gigabyte KM6150 (wired combo)                                                       | Logitech MK120                                                                      |
| Optical drive                          | LG BD-ROM/DVD±RW                                                                  | LiteOn DVD RW                                                                     | 24x DVD RW                                                                        | None                                                                                | Samsung DVD RW                                                                      |
| Operating system                       | Windows 8 64-bit                                                                  | Windows 8.1 64-bit                                                                | Windows 8.1 64-bit                                                                | Windows 8.1 64-bit                                                                  | Windows 8.1 64-bit                                                                  |
| Bundled software                       | None                                                                              | None                                                                              | None                                                                              | None                                                                                | Ahead Nero, CyberLink Power2Go                                                      |
| Sniper V2 Elite score (Low/High/Ultra) | 147/59/14fps                                                                      | 240/76/18fps                                                                      | 195/68/16fps                                                                      | 196/83/20fps                                                                        | 62/22/5fps                                                                          |
| Alien vs Predator score (720p/1080p)   | 52/27fps                                                                          | 83/44fps                                                                          | 71/37fps                                                                          | 102/53fps                                                                           | 22/11fps                                                                            |
| PCMark 7 score                         | 6177                                                                              | 3938                                                                              | 7304                                                                              | 6431                                                                                | 4800                                                                                |
| Warranty                               | 2-year collect-and-return                                                         | 2-year return-to-base                                                             | 3-years labour (2-year parts, 3-months free C&R)                                  | 3-year labour (2-year parts)                                                        | 2-year return-to-base                                                               |
| FULL REVIEW                            | <a href="http://tinyurl.com/kf6g3t7">TINYURL.COM/KF6G3T7</a>                      | <a href="http://tinyurl.com/oa8ukdp">TINYURL.COM/OA8UKDP</a>                      | <a href="http://tinyurl.com/ozcshyu">TINYURL.COM/OZCSHYU</a>                      | <a href="http://tinyurl.com/pfa55f7">TINYURL.COM/PFA55F7</a>                        | <a href="http://tinyurl.com/nu7fsgb">TINYURL.COM/NU7FSGB</a>                        |

# HEAD TO [TINYURL.COM/PYWN4DA](http://tinyurl.com/pywn4da) FOR OUR DESKTOP PC BUYING ADVICE

| Sub-£150 printers      | 1                                                                                 | 2                                                                                 | 3                                                                                  | 4                                                                                   | 5                                                                                   |
|------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                        |  |  |  |  |  |
|                        | Samsung Xpress M2070W                                                             | Canon Pixma MG5550                                                                | Samsung Xpress M2022W                                                              | Canon Pixma MX535                                                                   | Brother MFC-J870DW                                                                  |
| Price                  | £100 inc VAT                                                                      | £60 inc VAT                                                                       | £68 inc VAT                                                                        | £70 inc VAT                                                                         | £120 inc VAT                                                                        |
| Website                | Samsung.com/uk                                                                    | Canon.co.uk                                                                       | Samsung.com/uk                                                                     | Canon.co.uk                                                                         | Brother.co.uk                                                                       |
| Launch date            | Mar 14                                                                            | Apr 14                                                                            | Aug 14                                                                             | Jul 14                                                                              | Jul 14                                                                              |
| Overall rating         | ★★★★★                                                                             | ★★★★☆                                                                             | ★★★★☆                                                                              | ★★★★☆                                                                               | ★★★★☆                                                                               |
| Technology             | Mono laser                                                                        | Colour inkjet                                                                     | Mono laser                                                                         | Colour inkjet                                                                       | Colour inkjet                                                                       |
| Max print resolution   | 1200x1200                                                                         | 4800x1200dpi                                                                      | 1200x1200dpi                                                                       | 4800x1200dpi                                                                        | 6000x1200dpi                                                                        |
| Actual print speed     | B=17.1ppm                                                                         | B=11.8ppm C=8.7ppm                                                                | B=18ppm                                                                            | B=9.7ppm C=3.8ppm                                                                   | B=18ppm C=11ppm                                                                     |
| Scan/fax facilities    | 1200x1200 scans                                                                   | 1200x2400 scans                                                                   | None                                                                               | 1200x2400 scans/fax                                                                 | 1200x2400 scans                                                                     |
| Supported interfaces   | USB 2.0, 802.11b/g/n, NFC                                                         | USB 2.0, 802.11b/g/n                                                              | USB 2.0, 802.11b/g/n                                                               | USB 2.0, 802.11b/g/n, AirPrint                                                      | USB 2.0, 802.11b/g/n, NFC                                                           |
| Cost per page          | B=3.8p                                                                            | B=2.4p C=4.8p                                                                     | B=5p                                                                               | B=2.7p C=4.8p                                                                       | B=3.9p C=2.5p                                                                       |
| Media card/auto duplex | xx                                                                                | x✓                                                                                | xx                                                                                 | x✓                                                                                  | ✓✓                                                                                  |
| Input capacity         | 150 sheets                                                                        | 100 sheets                                                                        | 150 sheets                                                                         | 100 sheets + 30-sheet ADF                                                           | 150 sheets + 20 ADF                                                                 |
| Dimensions             | 406x360x253mm                                                                     | 455x369x148mm                                                                     | 332x215x178mm                                                                      | 458x385x200mm                                                                       | 410x374x180mm                                                                       |
| Weight                 | 7.4kg                                                                             | 6.3kg                                                                             | 4kg                                                                                | 8.5kg                                                                               | 9.5kg                                                                               |
| Warranty               | 1 year                                                                            | 1 year                                                                            | 1 year                                                                             | 1 year                                                                              | 1 year                                                                              |
| FULL REVIEW            | TINYURL.COM/OYZKJKE                                                               | TINYURL.COM/LKWLJDE                                                               | TINYURL.COM/NFJHDOR                                                                | TINYURL.COM/N9LXVNZ                                                                 | TINYURL.COM/M52V29R                                                                 |

| £151+ printers         | 1                                                                                   | 2                                                                                   | 3                                                                                    | 4                                                                                     | 5                                                                                     |
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|                        |  |  |  |  |  |
|                        | Canon i-Sensys MF6180dw                                                             | Epson Ecotank L555                                                                  | Brother HL-L9200CDWT                                                                 | HP OfficeJet Pro X551dw                                                               | Kyocera Ecosys P6030cdn                                                               |
| Price                  | £260 inc VAT                                                                        | £330 inc VAT                                                                        | £550 inc VAT                                                                         | £360 inc VAT                                                                          | £546 inc VAT                                                                          |
| Website                | Canon.co.uk                                                                         | Epson.co.uk                                                                         | Brother.co.uk                                                                        | Hp.com/uk                                                                             | Kyoceradocumentsolutions.co.uk                                                        |
| Launch date            | May 14                                                                              | Jan 15                                                                              | Aug 14                                                                               | Aug 13                                                                                | Jul 14                                                                                |
| Overall rating         | ★★★★★                                                                               | ★★★★☆                                                                               | ★★★★☆                                                                                | ★★★★★                                                                                 | ★★★★☆                                                                                 |
| Technology             | Mono laser                                                                          | Colour inkjet                                                                       | Colour laser                                                                         | Colour inkjet                                                                         | Colour laser                                                                          |
| Max print resolution   | 1200x600dpi                                                                         | 5760x1440dpi                                                                        | 2400x600dpi                                                                          | 2400x2400                                                                             | 9600x600dpi                                                                           |
| Actual print speed     | B=24ppm                                                                             | B=8.5ppm C=4ppm                                                                     | B=30ppm C=30ppm                                                                      | B=42.9ppm C=15.8ppm                                                                   | B=27ppm C=27ppm                                                                       |
| Scan/fax facilities    | 600dpi scanner, 33.6Kb/s fax                                                        | 1200dpi scanner, 33.6Kb/s fax                                                       | None                                                                                 | None                                                                                  | None                                                                                  |
| Supported interfaces   | USB 2.0, ethernet, 802.11b/g/n                                                      | USB 2.0, 802.11b/g/n                                                                | USB 2.0, ethernet, 802.11b/g/n                                                       | USB 2.0, ethernet, 802.11b/g/n                                                        | USB 2.0                                                                               |
| Cost per page          | B=1.5p                                                                              | B=0.2p C=0.4p                                                                       | B=1p C=5.9p                                                                          | B=1p C=4.3p                                                                           | B=1.2p C=1.7p                                                                         |
| Media card/auto duplex | x✓                                                                                  | xx                                                                                  | x✓                                                                                   | x✓                                                                                    | x✓                                                                                    |
| Input capacity         | 250 + 50 sheet + 50 ADF                                                             | 100 + 30 sheet                                                                      | 750 sheets + 50 sheet                                                                | 500 + 50 sheet                                                                        | 500 sheets + 150 (2150 max)                                                           |
| Dimensions             | 390x473x431mm                                                                       | 474x377x226mm                                                                       | 410x495x445mm                                                                        | 517x399x414mm                                                                         | 345x518x480mm                                                                         |
| Weight                 | 19.1kg                                                                              | 6.2kg                                                                               | 28.3kg                                                                               | 17.1kg                                                                                | 29.5kg                                                                                |
| Warranty               | 1 year                                                                              | 1 year                                                                              | 1 year                                                                               | 1 year                                                                                | 2 years                                                                               |
| FULL REVIEW            | TINYURL.COM/LE9WA5N                                                                 | TINYURL.COM/N8NS5QL                                                                 | TINYURL.COM/PT52MH6                                                                  | TINYURL.COM/CZ05P65                                                                   | TINYURL.COM/N4MCYLF                                                                   |

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| Blu-ray drives   |      |                                                              |                                                              |                                                            |                                                              |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------------|
|                  | 1                                                                                                                                                                                                                                                                                                                                                                                                                              | 2                                                            | 3                                                            | 4                                                          | 5                                                            |
|                  | Pioneer BDR-209EBK Retail                                                                                                                                                                                                                                                                                                                                                                                                      | Pioneer BDR-209DBK OEM                                       | LG LN48919                                                   | LG BP40NS20                                                | Lite-On IHES112-115                                          |
| Price            | £59 inc VAT                                                                                                                                                                                                                                                                                                                                                                                                                    | £54 inc VAT                                                  | £60 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      | <a href="http://TINYURL.COM/LD47X7K">TINYURL.COM/LD47X7K</a>                                                                                                                                                                                                                                                                                                                                                                   | <a href="http://TINYURL.COM/LD47X7K">TINYURL.COM/LD47X7K</a> | <a href="http://TINYURL.COM/8YTUJEF">TINYURL.COM/8YTUJEF</a> | <a href="http://TINYURL.COM/BS8UAF">TINYURL.COM/BS8UAF</a> | <a href="http://TINYURL.COM/8SYECMW">TINYURL.COM/8SYECMW</a> |

| Wireless routers      |      |                                                            |                                                              |                                                              |                                                              |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|                       | 1                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2                                                          | 3                                                            | 4                                                            | 5                                                            |
|                       | Apple AirPort Extreme                                                                                                                                                                                                                                                                                                                                                                                                                    | Netgear Nighthawk R7000                                    | D-Link DIR 880L                                              | TP-Link Archer C7                                            | Asus RT-AC68U AC1900                                         |
| Price                 | £169 inc VAT                                                                                                                                                                                                                                                                                                                                                                                                                             | £150 inc VAT                                               | £108 inc VAT                                                 | £80 inc VAT                                                  | £160 inc VAT                                                 |
| Website               | Apple.com/uk                                                                                                                                                                                                                                                                                                                                                                                                                             | Netgear.co.uk                                              | Dlink.com                                                    | Tp-link.com                                                  | Uk.asus.com                                                  |
| Launch date           | Jan 14                                                                                                                                                                                                                                                                                                                                                                                                                                   | Sep 14                                                     | Sep 14                                                       | Jan 14                                                       | Jan 14                                                       |
| Overall rating        | ★★★★★                                                                                                                                                                                                                                                                                                                                                                                                                                    | ★★★★★                                                      | ★★★★★                                                        | ★★★★★                                                        | ★★★★★                                                        |
| Standards supported   | 802.11a/b/g/n/ac                                                                                                                                                                                                                                                                                                                                                                                                                         | 802.11a/b/g/n/ac                                           | 802.11a/b/g/n/ac                                             | 802.11a/b/g/n/ac                                             | 802.11a/b/g/n/ac                                             |
| Frequency modes       | 2.4GHz/5GHz (concurrent)                                                                                                                                                                                                                                                                                                                                                                                                                 | 2.4GHz/5GHz (concurrent)                                   | 2.4GHz/5GHz (concurrent)                                     | 2.4GHz/5GHz (concurrent)                                     | 2.4GHz/5GHz (concurrent)                                     |
| Antennas              | 6x internal                                                                                                                                                                                                                                                                                                                                                                                                                              | 3x external                                                | 3x external                                                  | 3x external, 3x internal                                     | 3x external, 3x internal                                     |
| Built-in modem        | x                                                                                                                                                                                                                                                                                                                                                                                                                                        | x                                                          | x                                                            | x                                                            | x                                                            |
| Manufacturer's rating | 1300/450Mb/s                                                                                                                                                                                                                                                                                                                                                                                                                             | 1300/600Mb/s                                               | 1300/600Mb/s                                                 | 1300/450Mb/s                                                 | 1300/600Mb/s                                                 |
| WPS                   | x                                                                                                                                                                                                                                                                                                                                                                                                                                        | ✓                                                          | ✓                                                            | ✓                                                            | ✓                                                            |
| Ports                 | Gigabit WAN, 3x gigabit LAN, USB                                                                                                                                                                                                                                                                                                                                                                                                         | Gigabit WAN, 1x USB 3.0, 1x USB 2.0                        | Gigabit WAN, 1x USB 3.0, 1x USB 2.0                          | Gigabit WAN, 4x gigabit LAN, 2x USB 2.0                      | Gigabit WAN, 4x gigabit LAN, 2x USB 2.0                      |
| Average power use     | 8W                                                                                                                                                                                                                                                                                                                                                                                                                                       | 9W                                                         | 10W                                                          | N/A                                                          | N/A                                                          |
| Max speed (11n/11ac)  | 171/572Mb/s                                                                                                                                                                                                                                                                                                                                                                                                                              | 171/592Mb/s                                                | 171/625Mb/s                                                  | 110/505Mb/s                                                  | 98/610Mb/s                                                   |
| Dimensions, weight    | 98x168x98mm, 945g                                                                                                                                                                                                                                                                                                                                                                                                                        | 285x186x45mm, 750g                                         | 247x190x47mm, 745g                                           | 32.5x243x160mm, 508g                                         | 160x83x220mm, 640g                                           |
| Warranty              | 1 year                                                                                                                                                                                                                                                                                                                                                                                                                                   | N/S                                                        | N/S                                                          | 3 years                                                      | 2 years                                                      |
| FULL REVIEW           | <a href="http://TINYURL.COM/MFDLLSC">TINYURL.COM/MFDLLSC</a>                                                                                                                                                                                                                                                                                                                                                                             | <a href="http://TINYURL.COM/Q2NR8Q">TINYURL.COM/Q2NR8Q</a> | <a href="http://TINYURL.COM/OZ5G7KG">TINYURL.COM/OZ5G7KG</a> | <a href="http://TINYURL.COM/KKJMPCE">TINYURL.COM/KKJMPCE</a> | <a href="http://TINYURL.COM/K4ZATKV">TINYURL.COM/K4ZATKV</a> |

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|----------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| NAS drives     | 1                                                                                 | 2                                                                                 | 3                                                                                  | 4                                                                                   | 5                                                                                   |
|                | Qnap TS-421                                                                       | Qnap HS-210                                                                       | Synology DS414j                                                                    | Western Digital Red 6TB                                                             | Synology RS814RP+                                                                   |
| Price          | £325 inc VAT (diskless)                                                           | £200 inc VAT (diskless)                                                           | £280 inc VAT (diskless)                                                            | £220 inc VAT (diskless)                                                             | £1050 inc VAT (diskless)                                                            |
| Website        | Qnap.com                                                                          | Qnap.com                                                                          | Synology.com                                                                       | Wdc.com                                                                             | Synology.com                                                                        |
| Launch date    | Mar 14                                                                            | Dec 14                                                                            | Jan 15                                                                             | Jan 15                                                                              | Dec 14                                                                              |
| Overall rating | ★★★★☆                                                                             | ★★★★☆                                                                             | ★★★★☆                                                                              | ★★★★★                                                                               | ★★★★☆                                                                               |
| Drive bays     | 4                                                                                 | 2                                                                                 | 4                                                                                  | 1                                                                                   | 4                                                                                   |
| Processor      | 2GHz Marvell single-core                                                          | 1.6GHz Marvell single-core                                                        | 1.2GHz Mindspeed Concerto                                                          | N/A                                                                                 | 2.13GHz Intel Atom D2700 dc                                                         |
| Memory         | 1GB DDR3                                                                          | 512MB DDR3                                                                        | 512MB DDR3                                                                         | 64MB                                                                                | 2GB DDR3                                                                            |
| Remote access  | ✓                                                                                 | ✓                                                                                 | ✓                                                                                  | ✓                                                                                   | ✓                                                                                   |
| eSATA          | 2x                                                                                | ×                                                                                 | 1x                                                                                 | ×                                                                                   | 1x                                                                                  |
| USB port       | 2x USB 3.0, 2x USB 2.0                                                            | 2x USB 3.0, 2x USB 2.0                                                            | 1x USB 3.0, 1x USB 2.0                                                             | n/a                                                                                 | 2x USB 3.0                                                                          |
| Raid options   | 0/1/5/6/10/JBOD                                                                   | 0/1/JBOD                                                                          | 0/1/5/6/10/JBOD                                                                    | n/a                                                                                 | 0/1/5/6/10/JBOD                                                                     |
| Software       | Backup Station                                                                    | HD Station                                                                        | DSM 5.0                                                                            | NASware                                                                             | DSM 5.1                                                                             |
| Dimensions     | 177x180x235mm                                                                     | 302x220x41mm                                                                      | 184x168x230mm                                                                      | 147x102x26mm                                                                        | 430x574x44mm                                                                        |
| Weight         | 3kg                                                                               | 1.5kg                                                                             | 2.2kg                                                                              | 750g                                                                                | 7.1kg                                                                               |
| Warranty       | 2 years                                                                           | 2 years                                                                           | 3 years                                                                            | 3 years                                                                             | 3 years                                                                             |
| FULL REVIEW    | TINYURL.COM/MCYWUB8                                                               | TINYURL.COM/OEXRYNY                                                               | TINYURL.COM/M643BSG                                                                | TINYURL.COM/NBDGM5W                                                                 | TINYURL.COM/NUO9PBW                                                                 |

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| USB drives       | 1                                                                                   | 2                                                                                   | 3                                                                                   | 4                                                                                     | 5                                                                                     |
|                  | G-Technology Professional                                                           | WD My Passport Pro 4TB                                                              | LaCie Little Big Disk                                                               | G-Technology Thunderbolt                                                              | Toshiba Stor.E Basics                                                                 |
| Price            | £250 inc VAT                                                                        | £350 inc VAT                                                                        | £753 inc VAT                                                                        | £599 inc VAT                                                                          | £80 inc VAT                                                                           |
| Website          | G-technology.com                                                                    | Wdc.com/en                                                                          | Lacie.com/uk                                                                        | G-technology.com                                                                      | Toshiba.co.uk                                                                         |
| Launch date      | Sep 13                                                                              | Aug 14                                                                              | Feb 14                                                                              | Aug 12                                                                                | Nov 13                                                                                |
| Overall rating   | ★★★★☆                                                                               | ★★★★☆                                                                               | ★★★★☆                                                                               | ★★★★★                                                                                 | ★★★★☆                                                                                 |
| Capacity tested  | 4TB                                                                                 | 4- to 8TB                                                                           | 1TB                                                                                 | 8TB                                                                                   | 2TB                                                                                   |
| Capacity range   | 2TB to 4TB                                                                          | 2- to 4TB                                                                           | 512GB to 2TB                                                                        | 4TB to 8TB                                                                            | 320GB to 2TB                                                                          |
| Disk size        | 3.5in                                                                               | 2.5in                                                                               | 2.5in                                                                               | 3.5in                                                                                 | 2.5in                                                                                 |
| Spin speed       | 7200rpm                                                                             | 7200rpm                                                                             | 5400rpm                                                                             | 7200rpm                                                                               | 5400rpm                                                                               |
| Transfer speed   | N/A                                                                                 | 230MB/s                                                                             | 635MB/s                                                                             | 329MB/s                                                                               | 94MB/s (USB 3.0)                                                                      |
| Encryption       | None                                                                                | None                                                                                | None                                                                                | None                                                                                  | None                                                                                  |
| Other interfaces | FireWire 800                                                                        | None                                                                                | None                                                                                | None                                                                                  | None                                                                                  |
| Software         | None                                                                                | None                                                                                | LaCie Backup Assistant                                                              | None                                                                                  | None                                                                                  |
| Dimensions       | 235x130x46mm                                                                        | 88x143x44mm                                                                         | 40x140x85mm                                                                         | 235x130x85mm                                                                          | 119x79x21mm                                                                           |
| Weight           | 1.35kg                                                                              | 700g                                                                                | 650g                                                                                | 2.3kg                                                                                 | 215g                                                                                  |
| Warranty         | 3 years                                                                             | 3 years                                                                             | 1 year                                                                              | 3 years                                                                               | 1 year                                                                                |
| FULL REVIEW      | TINYURL.COM/NV7F32F                                                                 | TINYURL.COM/QAGQEUG                                                                 | TINYURL.COM//KRCL3VZ                                                                | TINYURL.COM/CXEF6MH                                                                   | TINYURL.COM/LBHC8EL                                                                   |

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| SSDs                 |  |  |  |  |  |
|----------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                      | 1                                                                                 | 2                                                                                 | 3                                                                                  | 4                                                                                   | 5                                                                                   |
|                      | Crucial M550                                                                      | OCZ Vector 150                                                                    | Crucial M500                                                                       | Samsung 840 EVO                                                                     | Seagate 600 SSD                                                                     |
| Price                | £338 inc VAT                                                                      | £125 inc VAT                                                                      | £155 inc VAT                                                                       | £320 inc VAT                                                                        | £202 inc VAT                                                                        |
| Website              | Crucial.com/uk                                                                    | Ocz.com                                                                           | Crucial.com/uk                                                                     | Samsung.com/uk                                                                      | Seagate.com/gb                                                                      |
| Launch date          | May 14                                                                            | May 14                                                                            | Aug 13                                                                             | Nov 13                                                                              | May 14                                                                              |
| Overall rating       | ★★★★★                                                                             | ★★★★☆                                                                             | ★★★★★                                                                              | ★★★★★                                                                               | ★★★★☆                                                                               |
| Capacity tested      | 1TB                                                                               | 240GB                                                                             | 480GB                                                                              | 750GB                                                                               | 480GB                                                                               |
| Price per GB         | 34p                                                                               | 52p                                                                               | 32p                                                                                | 43p                                                                                 | 43p                                                                                 |
| Memory cache         | 1GB LP DDR2                                                                       | 512MB                                                                             | 512MB DDR3                                                                         | 1GB LPDDR2                                                                          | N/A                                                                                 |
| Controller           | Marvell 88SS9189                                                                  | Indilinx Barefoot 3 M00                                                           | Marvell 88SS9187                                                                   | Samsung MEX (3-core ARM)                                                            | Link A Media Device                                                                 |
| Encryption           | AES 256-bit                                                                       | AES 256-bit                                                                       | AES 256-bit                                                                        | AES 256-bit                                                                         | None                                                                                |
| Flash                | Micron 20nm MLC NAND                                                              | Toshiba 19nm MLC                                                                  | Micron 20nm MLC NAND                                                               | Samsung 19nm Toggle NAND                                                            | Toshiba 19nm MLC                                                                    |
| Firmware updated via | Bootable CD                                                                       | OCZ Toolbox, bootable                                                             | ISO boot disc                                                                      | SSD Magician for Windows                                                            | Seagate Firmware, bootable                                                          |
| ATTO peak sequential | R: 563MB/s; W: 514MB/s                                                            | R: 557MB/s; W: 534MB/s                                                            | R: 539MB/s; W: 433MB/s                                                             | R: 554MB/s; W: 537MB/s                                                              | R: 555MB/s; W: 474MB/s                                                              |
| CDM peak IOPS        | 100 / 91.7                                                                        | 92.9 / 94.7                                                                       | 89.8k (read)                                                                       | 104K (read)                                                                         | 96.8 / 88.6                                                                         |
| CDM 4kB rnd          | 30/99                                                                             | 25/97                                                                             | N/A                                                                                | N/A                                                                                 | 28/78                                                                               |
| Warranty             | 3 years                                                                           | 5 years or 91TB writes                                                            | 3 years                                                                            | 5 years                                                                             | 3 years                                                                             |
| FULL REVIEW          | TINYURL.COM/MSWD98Z                                                               | TINYURL.COM/KBED2W6                                                               | TINYURL.COM/M2NCSMJ                                                                | TINYURL.COM/L5EDQOY                                                                 | TINYURL.COM/N58RB8G                                                                 |

| Projectors              |  |  |  |  |  |
|-------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                         | 1                                                                                   | 2                                                                                   | 3                                                                                    | 4                                                                                     | 5                                                                                     |
|                         | BenQ W1300                                                                          | Optoma W316                                                                         | InFocus IN126STa                                                                     | NEC M352WS                                                                            | Optoma ML1500                                                                         |
| Price                   | £730 inc VAT                                                                        | £458 inc VAT                                                                        | £540 inc VAT                                                                         | £778 inc VAT                                                                          | £650 inc VAT                                                                          |
| Website                 | Benq.co.uk                                                                          | Optoma.co.uk                                                                        | Infocus.com                                                                          | Nec-display-solutions.com                                                             | Optoma.co.uk                                                                          |
| Launch date             | Jun 14                                                                              | Jul 14                                                                              | Sep 14                                                                               | Jul 14                                                                                | Jul 14                                                                                |
| Overall rating          | ★★★★☆                                                                               | ★★★★☆                                                                               | ★★★★☆                                                                                | ★★★★☆                                                                                 | ★★★★☆                                                                                 |
| Projection technology   | DLP                                                                                 | DLP                                                                                 | DLP                                                                                  | DLP                                                                                   | DLP                                                                                   |
| Resolution (pixels)     | 1920x1080                                                                           | 1280x800                                                                            | 1280x800                                                                             | 1280x800                                                                              | 1280x800                                                                              |
| Brightness, Contrast    | 2000, 10,000:1                                                                      | 3400, 15,000:1                                                                      | 3300, 15,000:1                                                                       | 3500, 10,000:1                                                                        | 1500, 15000:1                                                                         |
| Image size              | 300in                                                                               | 300in                                                                               | 300in                                                                                | 150in                                                                                 | 100in                                                                                 |
| Supported aspect ratios | 16:9 native                                                                         | 16:10, 16:9, 4:3                                                                    | 16:10, 16:9, 4:3                                                                     | 16:10                                                                                 | 16:10, 16:9, 4:3                                                                      |
| Noise levels (dB)       | 33 (30 eco)                                                                         | 29db                                                                                | 32db (30 eco)                                                                        | 33 (39 bright mode)                                                                   | 30db                                                                                  |
| Connections             | VGA, 2x HDMI, USB, 3D                                                               | VGA, HDMI, Mini-USB, 3D                                                             | 2x VGA, HDMI, USB, ethernet                                                          | 2x VGA, 2x HDMI, USB                                                                  | HDMI, 2x USB-A, SD                                                                    |
| Lamp/lamp life          | 240W/6000 hrs                                                                       | 190W/10000 hrs                                                                      | 278W/3500 hrs                                                                        | 278W/8000 hrs                                                                         | LED/20,000 hrs                                                                        |
| Dimensions              | 330x257x128mm                                                                       | 315x223x102mm                                                                       | 292x220x108mm                                                                        | 368x268x97mm                                                                          | 270x170x48mm                                                                          |
| Weight                  | 3.4kg                                                                               | 2.5kg                                                                               | 3.7kg                                                                                | 3.6kg                                                                                 | 1.4kg                                                                                 |
| Warranty                | 3 years                                                                             | 2 years                                                                             | 1 year                                                                               | 3 years                                                                               | 2 years                                                                               |
| FULL REVIEW             | TINYURL.COM/K4FA89Q                                                                 | TINYURL.COM/OCWTHGW                                                                 | TINYURL.COM/NHH3QPB                                                                  | TINYURL.COM/Q6J2N6W                                                                   | TINYURL.COM/QBFRYR7                                                                   |

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| Sub-£150 graphics cards | 1                         | 2                           | 3                     | 4                      | 5                         |
|-------------------------|---------------------------|-----------------------------|-----------------------|------------------------|---------------------------|
|                         | MSI Radeon R9 270X        | MSI Radeon R9 270 Gaming Ed | MSI R7 260X OC        | XFX Radeon R7-265      | Gigabyte GTX 750 Ti       |
| Price                   | £130 inc VAT              | £123 inc VAT                | £91 inc VAT           | £110 inc VAT           | £120 inc VAT              |
| Website                 | Uk.msi.com                | Uk.msi.com                  | Uk.msi.com            | Sapphiretech.com       | Uk.gigabyte.com           |
| Launch date             | Dec 13                    | Jul 14                      | May 14                | Sep 14                 | Aug 14                    |
| Overall rating          | ★★★★☆                     | ★★★★★                       | ★★★★☆                 | ★★★★☆                  | ★★★★☆                     |
| Graphics processor      | AMD Radeon R9 270X        | AMD Radeon R9 270           | AMD Radeon R7 260X    | AMD Radeon R7 265      | nVidia GeForce GTX 750 Ti |
| Installed RAM           | 2GB GDDR5                 | 2GB GDDR5                   | 2GB GDDR5             | 2GB GDDR5              | 2GB GDDR5                 |
| Memory interface        | 256-bit                   | 256-bit                     | 128-bit               | 128-bit                | 128-bit                   |
| Core clock/boost        | 1030MHz/1120MHz           | 900MHz/975MHz               | 1175MHz/none          | 900MHz/925MHz          | 1033MHz/1111MHz           |
| Memory clock/Effective  | 1.4GHz/5.6GHz             | 1.4GHz/5.6GHz               | 1625MHz/6.5GHz        | 1.4GHz/5.6GHz          | 1.35GHz/5.4GHz            |
| Stream processors       | 1280                      | 1280                        | 896                   | Varies                 | 640                       |
| Texture units           | 80                        | 80                          | 56                    | 64                     | 40                        |
| Power connectors        | 2x 6-pin                  | 1x 6-pin                    | 1x 6-pin              | 1x 6-pin               | N/A                       |
| DirectX                 | 11                        | 11.2                        | 11.1                  | 11                     | 11.2                      |
| Digital interface       | 2x DVI, HDMI, DisplayPort | 2x DVI, HDMI, DP            | 2x DVI, HDMI, Mini-DP | 2x DVI, 1x HDMI, 1x DP | 2x DVI, 2x HDMI           |
| Warranty                | 2 years                   | 3 years                     | 3 years               | 2 years                | 3 years                   |
| FULL REVIEW             | TINYURL.COM/OYA2DFJ       | TINYURL.COM/MCE7353         | TINYURL.COM/OZ6WUYT   | TINYURL.COM/LV69BEM    | TINYURL.COM/Q7K4ESV       |

| £151+ graphics cards   | 1                            | 2                              | 3                         | 4                         | 5                    |
|------------------------|------------------------------|--------------------------------|---------------------------|---------------------------|----------------------|
|                        | Gigabyte GeForce GTX 770 2GB | Sapphire Radeon R9 280X        | XFX Radeon R9 290X        | MSI Radeon R9 270X        | MSI Radeon R9 295 X2 |
| Price                  | £200 inc VAT                 | £180 inc VAT                   | £300 inc VAT              | £150 inc VAT              | £680 inc VAT         |
| Website                | Uk.gigabyte.com              | Sapphiretech.com               | Xfxforce.com              | Uk.msi.com                | Uk.msi.com           |
| Launch date            | Aug 13                       | Mar 14                         | Apr 14                    | Dec 13                    | May 14               |
| Overall rating         | ★★★★★                        | ★★★★★                          | ★★★★★                     | ★★★★☆                     | ★★★★☆                |
| Graphics processor     | nVidia GeForce GTX 770       | AMD Radeon R9 280X             | AMD Radeon R9 290X        | AMD Radeon R9 270X        | AMD Radeon R9 295 X2 |
| Installed RAM          | 2GB GDDR5                    | 3GB GDDR5                      | 4GB GDDR5                 | 2GB GDDR5                 | 8GB GDDR5            |
| Memory interface       | 256-bit                      | 384-bit                        | 512-bit                   | 256-bit                   | 2x 512-bit           |
| Core clock/boost       | 950MHz/1020MHz               | 950MHz/1070MHz                 | 1GHz/1GHz                 | 1030MHz/1120MHz           | 1018MHz/N/A          |
| Memory clock/Effective | 1.5GHz/6GHz                  | 1.55GHz/6.2GHz                 | 1.25GHz/5GHz              | 1.4GHz/5.6GHz             | 1.25GHz/5GHz         |
| Stream processors      | 1536                         | 2048                           | 2816                      | 1280                      | 2x 2816              |
| Texture units          | 128                          | 128                            | 176                       | 80                        | 2x 176               |
| Power connectors       | 1x 6-pin, 1x 8-pin           | 2x 8-pin                       | 8-pin, 6-pin              | 2x 6-pin                  | 2x 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 | DVI, 4x Mini-DP      |
| Warranty               | 3 years                      | 2 years                        | 3 years                   | 2 years                   | 3 years              |
| FULL REVIEW            | TINYURL.COM/OAG6277          | TINYURL.COM/OWVAP37            | TINYURL.COM/NPET8ER       | TINYURL.COM/OYA2DFJ       | TINYURL.COM/POTAOGZ  |

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| Sub-£200 flat-panel displays |  |  |  |  |  |
|------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                              | 1 <b>PC ADVISOR</b><br>BEST BUY                                                   | 2 <b>PC ADVISOR</b><br>RECOMMENDED                                                | 3                                                                                  | 4                                                                                   | 5                                                                                   |
|                              | AOC i2369V                                                                        | Philips 234E5QHAW                                                                 | NEC MultiSync E243Wmi                                                              | BenQ EW2740L                                                                        | BenQ GL2450                                                                         |
| Price                        | £130 inc VAT                                                                      | £130 inc VAT                                                                      | £185 inc VAT                                                                       | £177 inc VAT                                                                        | £108 inc VAT                                                                        |
| Website                      | Aoc-europe.com/en                                                                 | Philips.co.uk                                                                     | Nec-display-solutions.com                                                          | Benq.co.uk                                                                          | Benq.co.uk                                                                          |
| Launch date                  | Jul 14                                                                            | Jul 14                                                                            | Jun 14                                                                             | Aug 14                                                                              | Jul 14                                                                              |
| Overall rating               | ★★★★★                                                                             | ★★★★★                                                                             | ★★★★★                                                                              | ★★★★★                                                                               | ★★★★★                                                                               |
| Screen size                  | 23in                                                                              | 23in                                                                              | 23.8in                                                                             | 27in                                                                                | 24in                                                                                |
| Panel type                   | IPS matt                                                                          | IPS matt                                                                          | IPS matt                                                                           | VA semi-matt                                                                        | TN matt                                                                             |
| Native resolution            | 1920x1080 pixels                                                                  | 1920x1080 pixels                                                                  | 1920x1080 pixels                                                                   | 1920x1080 pixels                                                                    | 1920x1080 pixels                                                                    |
| Pixel density                | 96ppi                                                                             | 96ppi                                                                             | 93ppi                                                                              | 82ppi                                                                               | 92ppi                                                                               |
| Brightness                   | 220cd/m <sup>2</sup>                                                              | 187cd/m <sup>2</sup>                                                              | 250cd/m <sup>2</sup>                                                               | 300cd/m <sup>2</sup>                                                                | 261cd/m <sup>2</sup>                                                                |
| Static contrast ratio        | 630:1                                                                             | 210:1                                                                             | 650:1                                                                              | 280:1                                                                               | 610:1                                                                               |
| Response time                | 6ms                                                                               | 5ms                                                                               | 6ms                                                                                | 4ms                                                                                 | 5ms                                                                                 |
| Ports                        | HDMI, HDMI/MHL, DP, VGA                                                           | 2x HDMI (QHAB) or 1x HDMI (QDAB), VGA                                             | DP, DVI-D, VGA                                                                     | 2x HDMI, VGA                                                                        | DVI-D, VGA                                                                          |
| Dimensions                   | 531x204x398mm                                                                     | 532x213x414mm                                                                     | 558x214x380-490mm                                                                  | 623x191x451mm                                                                       | 579x179x436mm                                                                       |
| Weight                       | 3.75kg                                                                            | 3.5kg                                                                             | 6.3kg                                                                              | 4.2kg                                                                               | 4.1kg                                                                               |
| Warranty                     | 3 years                                                                           | 2 years                                                                           | 3 years                                                                            | 2 years                                                                             | 2 years                                                                             |
| FULL REVIEW                  | TINYURL.COM/OOEFYPR                                                               | TINYURL.COM/KLYLW4V                                                               | TINYURL.COM/KNCGVOU                                                                | TINYURL.COM/OO6EC5L                                                                 | TINYURL.COM/OOUPFUE                                                                 |

| £201+ flat-panel displays |  |  |  |  |  |
|---------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                           | 1                                                                                   | 2                                                                                   | 3                                                                                    | 4                                                                                     | 5                                                                                     |
|                           | LG 34UM95                                                                           | HP DreamColor Z27x                                                                  | Dell UltraSharp 32 Ultra                                                             | BenQ PG2401PT                                                                         | ViewSonic VP2772                                                                      |
| Price                     | £851 inc VAT                                                                        | £770 inc VAT                                                                        | £1,478 inc VAT                                                                       | £855 inc VAT                                                                          | £540 inc VAT                                                                          |
| Website                   | Lg.com/uk                                                                           | hp.com/uk                                                                           | Dell.co.uk                                                                           | Benq.co.uk                                                                            | Viewsoniceurope.com/uk                                                                |
| Launch date               | Dec 14                                                                              | Jan 15                                                                              | Jun 14                                                                               | Oct 14                                                                                | Jun 14                                                                                |
| Overall rating            | ★★★★★                                                                               | ★★★★★                                                                               | ★★★★★                                                                                | ★★★★★                                                                                 | ★★★★★                                                                                 |
| Screen size               | 34in 21:9                                                                           | 27in                                                                                | 31.5in                                                                               | 24.1in                                                                                | 27in                                                                                  |
| Panel type                | IPS matt                                                                            | AH-IPS                                                                              | IGZO                                                                                 | IPS                                                                                   | AH-IPS                                                                                |
| Native resolution         | 3440x1440                                                                           | 2560x1440 pixels                                                                    | 3840x2160 pixels                                                                     | 1920x1200 pixels                                                                      | 2560x1440 pixels                                                                      |
| Pixel density             | 110ppi                                                                              | 109ppi                                                                              | 140ppi                                                                               | 94ppi                                                                                 | 109ppi                                                                                |
| Brightness                | 320cd/m <sup>2</sup>                                                                | 250cd/m <sup>2</sup>                                                                | 350cd/m <sup>2</sup>                                                                 | 317cd/m <sup>2</sup>                                                                  | 350cd/m <sup>2</sup>                                                                  |
| Static contrast ratio     | 1000:1                                                                              | 800:1                                                                               | 550:1                                                                                | 540:1                                                                                 | 560:1                                                                                 |
| Response time             | 5ms                                                                                 | 7ms                                                                                 | 8ms                                                                                  | 5ms                                                                                   | 6ms                                                                                   |
| Ports                     | HDMI, DP, Thunderbolt, USB 3.0                                                      | HDMI, DP, USB 3.0, USB 2.0                                                          | HDMI, DP, Mini-DP, 4x USB 3.0                                                        | DVI, DP, HDMI, VGA, 3x USB 3.0                                                        | HDMI, DVI, Mini-DP, 4x USB 3.0                                                        |
| Dimensions                | 830x83x380mm                                                                        | 641x655x379mm                                                                       | 750x214x483-572mm                                                                    | 543x254x555mm                                                                         | 643x348x470mm                                                                         |
| Weight                    | 6.7kg                                                                               | 8.8kg                                                                               | 9.2kg                                                                                | 7kg                                                                                   | 8.5kg                                                                                 |
| Warranty                  | 2 years                                                                             | 3 years                                                                             | 3 years                                                                              | 1 year                                                                                | 3 years                                                                               |
| FULL REVIEW               | TINYURL.COM/QYKH6UM                                                                 | TINYURL.COM/NKUF9EN                                                                 | TINYURL.COM/O4CTO3S                                                                  | TINYURL.COM/PMV5L5V                                                                   | TINYURL.COM/LLQRWTX                                                                   |

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MATT EGAN



# CES has its head in the clouds

**I** am intrigued by the coverage afforded to CES Las Vegas. Not the volume of that coverage, nor the fact that it now leaks into the mainstream press. CES is important, just as consumer tech is important to consumers. And we are all consumers.

Each year CES tells us exactly what manufacturers will hope to sell us nine months hence, in the all-important fourth quarter of this year. So although neither wearables nor 4K TVs has yet become a popular mainstay, this year's CES shows us that the major tech manufacturers desperately hope they will be come Christmas 2015. And if your home isn't smart yet, they sure want it to be by New Year's Eve.

A couple of years ago at CES, you couldn't move for tablets or 3D TVs. Neither has been the success the industry hoped, but we knew they were going to try when they went big at CES. In fact, the failures are often the most significant development. I may never forget the night in 2010 when Steve Ballmer opened CES with a somewhat desperate attempt to hype the HP Slate, and breathe life into the then moribund tablets market. Microsoft and HP will forever deny it, but I'm certain that they knew Apple had something up its sleeve, and what felt like a very weird keynote was an attempt not to be caught with tech trousers around analogue ankles.

(When Apple launched the iPad in the April of that year, the shock was that it was a big iPhone rather than a small MacBook. Something that has now come full circle with the proliferation of hybrid Windows devices on show at CES this year. You may not want to buy one, but CES 2015 tells us that Microsoft and Intel hopes to change your mind.)

What I find strange is the angle of much of the coverage. Every year we get used to national newspapers and the BBC featuring CES in news stories in which they set out to uncover the 'best' gadget in the show. One year everyone went gaga over the AR Drone. I think it was last year that the smart fork featured in all known media. But the hunt for a cool gadget is lazy and missing the point.

Lazy because - without wishing to pour daylight on magic - that stuff is spoon (or smart fork-) fed to journalists. The AR Drone was a hit a few years ago principally because its marketers paid for it to feature in a journalists-only PR event before CES opened. Any right-thinking hack knows that footage of a drone being flown from an iPhone is a quick route to the front page or the six o'clock news. (The organisers of CES promote 'best gadget' competitions for exactly this reason. The name of the game is press coverage, after all.)

And it's missing the point because it isn't what's important at CES. The AR Drone is a cool product, now flowering in popularity as drones become the gift du jour for men of a certain age who don't like golf or cycling. But it was never part of any significant tech trend when it made its debut at CES. Nor are any of the 'coolest gadgets at CES' you will see this and every year. Wither the smart fork now?

I'm not being a killjoy. Or rather, I know I am being a killjoy. I revel in killing joy. But I do understand that 'look at this cool wearable smart fork drone we found' is more likely to briefly divert the attention of the average punter than is a worthy dissection of tech trends for the coming year. It's just not what we go to CES to do. ☒

**“The AR Drone is a cool product, now flowering in popularity as drones become the gift du jour for men of a certain age, but it was never part of any significant tech trend”**





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