

DIGITAL VERSION

10 BLUETOOTH SPEAKERS

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COMPUTER SHOPPER

BRITAIN'S BIGGEST TECHNOLOGY MAGAZINE • MARCH 2014

**128
REVIEWS
INSIDE**

YOUR PERFECT LAPTOP

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- ✓ Full HD screens



MEDIA STREAMING

Your media on any device anywhere



**20
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GUIDE**

LUMIA 2520

Nokia's first tablet

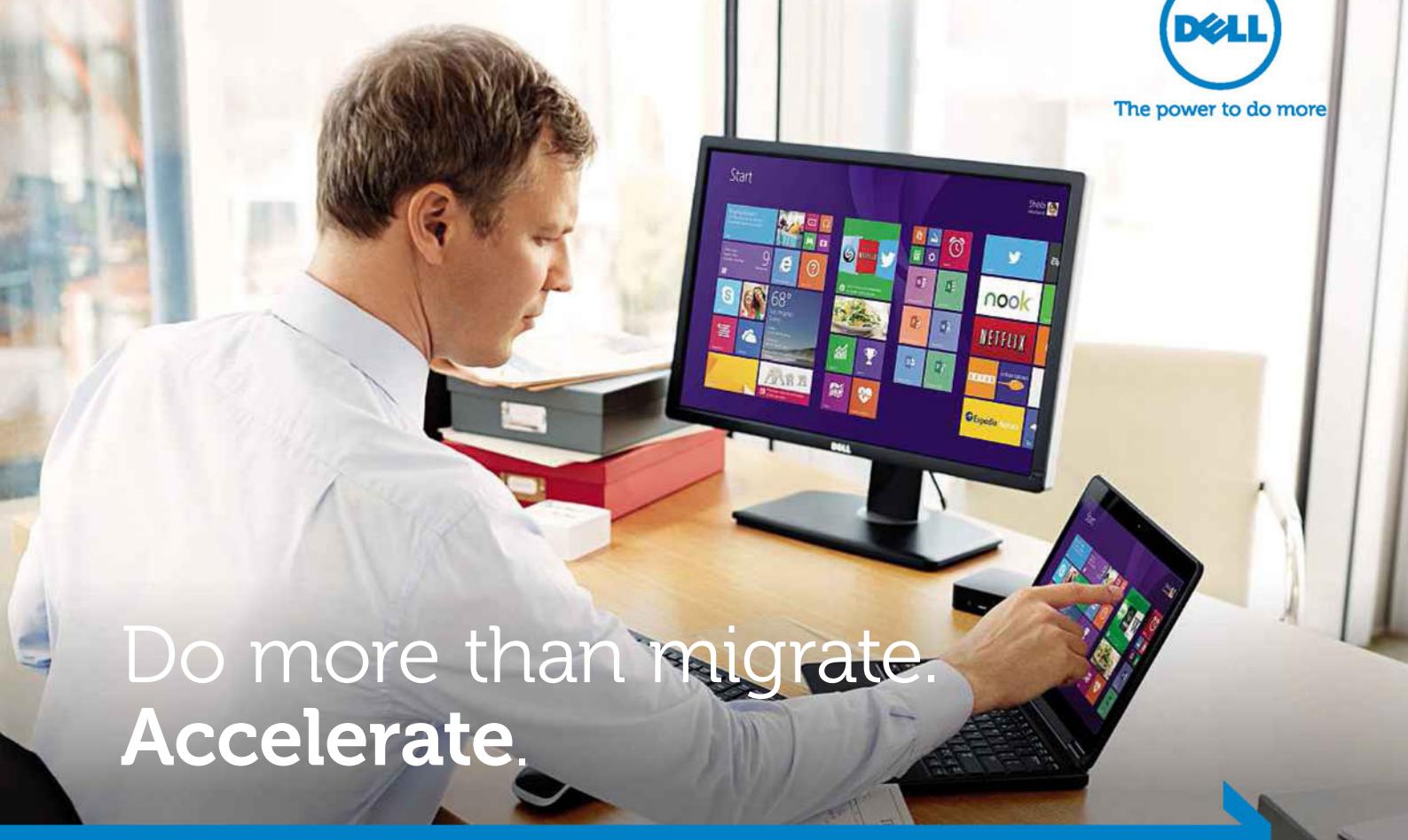
WD Black2 hybrid

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Built for business Windows 8 Pro



Welcome!



MOST OF US have accumulated gigabyte upon gigabyte of photos, music and video since digital media became popular around 10 years ago. It's not much fun if all that content just moulders on a PC's hard disk or a network drive where it's hardly ever seen.

Fortunately, thanks to media streaming, you can instantly stream your media from where it's stored to devices around the home, whether a laptop, tablet, phone or TV. Turn to page 108 to find out how you can free your media with our ultimate guide.

Tablets and smartphones are useful for casual web surfing and gaming, but if you really want to get some work done, do an online grocery shop or book a holiday, you'll find it far easier to use a laptop. Luckily, you're spoilt for choice. This month we've gathered 12 different models, from a £300 award winner to a top-spec ultra-portable. Find the perfect laptop for your needs on page 82.

The last generation of games consoles had an incredibly long shelf life, hanging around for nearly eight years. They've finally

been replaced, though, and the new Xbox One and PlayStation 4 offer much more than games, as they aim to become the centre of your home entertainment system. But which is the best? Turn to our comprehensive head-to-head on page 128 to find out.

The sheer convenience of MP3s has made them incredibly popular despite having worse audio quality than CDs. Music is finally moving on, however, and a new generation of high-resolution audio content and playback devices promises to deliver a significant step up in fidelity from CD, while maintaining the convenience of the digital formats we know and love. Read all about the audiophile future on page 136, and check out our reviews of high-resolution audio kit on page 50.

It's rare that we say this, but there are some things you just can't do with a PC. In *Multimedia Expert* we examine how using camera filters can create effects that aren't even possible in the mighty Photoshop. See what we mean on page 152.

Chris Finnamore, Editor

chris@computershopper.co.uk

MEET THE TEAM

QUESTION OF THE MONTH

Now Google has bought Boston Dynamics, which robot do you want it to produce first?



Chris Finnamore

“A vigilante bot to enforce Google's ‘Don't Be Evil' motto. Permanently”



David Ludlow

“Jony (f)live to help design phones and tablets”



Seth Barton

“An apple-eating, man-sized green Android that's identical to its OS mascot”



Andrew Unsworth

“A Gmail-based ED-209 rip-off. ‘You have 20 seconds to reply’”



Kat Orphanides

“An enormous T-Rex style dinobot that I can commute to work on. With a Tesla cannon”



Tom Morgan

“The T-1000 from *The Terminator*. The next logical next step for humanity after that is time travel”



Katharine Byrne

“A life-size Gundam, provided Google invents Gundanium alloy first, naturally”

THIS MONTH'S COLUMNS



David Robinson

After dealing with his most troublesome customer, David Robinson looks for a free replacement for Microsoft Office



Gordon Holmes

The Pythons are back together, so it's a good time for our retired policemen to contemplate the evils of spam



David Neal

Everyone loves free things, don't they? Not David Neal, who is royally sick of the so-called premium model

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Letters

We love free software when it's an office suite or operating system, but we're less keen when it's a malicious browser plug-in or an inadequate anti-virus tool. This month our readers help us sort the wheat from the chaff

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COURIER SUICIDE

I'd like to warn *Shopper* readers that emails are being sent, supposedly from courier services, that contain a virus or Trojan in an attachment. I received one that claimed to be from DHL, but I was suspicious as I wasn't expecting a delivery. What's more, the email began "Dear Customer" rather than using my name, and I had to open an attachment to view the details. A further hint that it was bogus was that it said I'd missed a delivery on 24th November, which was a Sunday.

So be diligent, especially at this time of year when more parcels are being sent.

Nicholas G Dyer

Thanks for the warning, and well done for not falling for the ruse. This particularly nasty scam is designed to take advantage of gift buying during the season of goodwill. Gordon Holmes, our resident Cybercop, discussed it in *Shopper* 311. His advice, as ever, is never to open an attachment in an email unless you're expecting it, and if in doubt, double-check.

BACK ISSUE CATCH-UP

I've just retired, and was about to dump a pile of magazines when I realised – I don't read your mag. When it arrives I have a quick look and feel excited about what I'm about to read, but then it gets put in a pile and left for when I have time. I stuck with the mag after Kay Ewbank helped me with a database problem I had at work nine years ago, but since then the mags

have just piled up after a quick read, to be reluctantly binned when space was required.

Now I have the time, and not wanting to miss anything that might be of interest, I've been catching up and getting quite a surprise at just what is packed into a magazine that purports to be just about shopping for PCs.

One thing that puzzles me is that you don't seem to cater for the shopper who wants to buy a touchscreen monitor. I have an excellent Lenovo Yoga 13 convertible laptop, which does everything I need, but I'd like to augment it with a larger screen if possible. Does this mean that the one thing Microsoft seems to have pipped Apple on – a touchscreen on a normal PC – is looked down on by your resident geeks? It's the one omission I have found frustrating.

James Howley

We're glad retirement has given you the time to catch up on your *Shopper* reading, and hope you find the reviews, features and guides interesting and useful. We do review touchscreen monitors occasionally, although certainly less often than standard displays. You're in luck in this issue, however, as we test a fantastic 27in 10-point Iiyama touchscreen in the Reviews section on page 45. It's expensive but brilliant.

WARE AWARE

As a long-established reader of *Shopper* I have just read your recent article on Security Software (*Shopper* 312). Would it be possible to include reputable programs that can detect and hopefully remove existing Malware such as Aartemis.com, which has infected a friend's system? There is so much rogue software

★ Star letter

THE DIGITAL DIVIDE

I have a six-month-old Chillblast Vantage with a 240GB SSD and a stonking graphics card, plus two other PCs, a laptop, a Nexus 7 pad, an HTC mobile and a Smart TV, so I can hardly be accused of being a Luddite. However, I have a few issues with new technology.

My BT Broadband connection ran at just 2.8Mbit/s, so I contacted the company to see if I could upgrade to BT Infinity. The answer was, "We have no plans to upgrade your area anytime soon". I live half a mile from Norwich Airport – not exactly the back of beyond. So I went to Virgin, which has fibre in my area, and my connection is now 10 times faster at 28Mbit/s. I'm reliably informed that I'll receive an upgrade to a faster speed soon, but it will cost me £3 extra (boo). However, I'm due for a pension increase (hurrah) but of only £2.50, and will have to cope with the extra eight per cent increase on my heating and lighting bills myself.

What about 4G? It doesn't work anywhere near me. Indeed, we only get very intermittent 3G coverage, and in the north of the county no connection at all in many places – in a part of the country where a lump of dirt 10 feet above sea level is considered a mountain.



▲ Broadband may be sketchy in East Anglia but at least they have electricity

Still, I should be happy, as I watched a program recently about some poor wretch in Scotland who was looking forward to receiving his new technology; can you guess what it was? Faster broadband? A mobile connection? HD TV? No, electricity!

Martin Smith

The next time anyone at *Shopper* complains about a 7Mbit/s internet connection and occasionally patchy 3G they will be reminded of that chap in Scotland. We can imagine he has lovely views, though.

out there that I'm sure some guidance would be much appreciated by all.

John McCubbing

We'd never heard of Aartemis.com, but it appears to be a browser hijacker that first appeared in 2009. As you've no doubt seen, this kind of malware hijacks your web browser's start page and redirects it to Aartemis.com, and also hijacks your default search engine. It then collects search information and targets adverts to the user.

Our tests focus on how well anti-virus tools prevent infection in the first place, as once malware has installed itself it can be tricky for even a security suite to remove. Our researchers run what they call a remediation test to see how anti-virus packages deal with infected PCs, and they describe the results as "depressing". It seems that prevention is far better than cure, and if you are suffering from a nasty infection, you need to follow step-by-step guides available online to clean your system manually.

A SMARTER TV

Earlier this year, after reading reviews of Smart TVs, I found one I liked. I didn't think the included content was all that great, though, so I decided to look for an alternative source. I discovered an Android TV box that costs £75 and has given me everything I need and more, including Android apps, email, Google Play store and iPlayer. Its XBMC software allows access to all sorts of catch-up services streamed from across the world. I also bought a mini Wi-Fi keyboard for £15, which works a treat, and a Creative Live!Cam at £17 to use with Skype. For less than £110 I now have an expandable Smart TV that surpasses many on the market. Your feature on mini computers ('Cheap as chips', Shopper 310) prompted me to write, as there are many alternatives to the mainstream technologies.

Pete Clough

An Android box is certainly an effective way to turn a TV into



↑ An Android TV box offers a wealth of Smart TV features for very little cost

a Smart TV, and all you need is a spare HDMI port. As well as boxes, you can buy Android sticks, which are barely bigger than a USB flash drive and are true portable computers.

STALWART DEFENDER?

I was looking forward to your anti-virus software test to see how well Windows Defender did, but was disappointed that you didn't include it. My PC runs Windows 8.1 and has Windows Defender built in. It updates its virus definitions every day, scans at off-peak times and seems satisfactory. Hopefully, you can test Windows Defender for the next issue. Until recently I used AVG Free Edition, but I got fed up with the adverts to upgrade.

Mick Penn

The view from our anti-virus Labs, borne out by some smaller-scale testing, is that Windows Defender is similar to Security Essentials and so provides only a basic shield against malware. It's sufficient to let you set up your PC and go online to buy a full security suite. Even Microsoft admitted that Security Essentials, and by extension Windows Defender, provides only "baseline" protection – see <http://tinyurl.com/msebaseline>. After the first few days, and before any more adventurous web browsing, you should install a full AV package.

FREE FOR ALL

I've started using LibreOffice on my Windows 7 64-bit laptop rather than paying for the exorbitant upgrade to Office Pro just to get a database for personal use. The suite is quite

impressive, and I'm beginning to regret ever paying for Office Home in the first place.

At first I found the database tricky to use, as although it has some helpful wizards, a few of the basic functions (such as printing query results) aren't covered, so I struggled.

The word processor and spreadsheet are conventional, but the integration, including the ability to drag and drop across the elements, blew my mind. The suite also has drawing and presentation programs. How about some articles on using this excellent open-source system?

Nelson Bowker

LibreOffice is an excellent alternative to Microsoft Office (although our Reviews Editor has struggled with its database functions in the past and would still recommend Access over LibreOffice Base). One of the best things about LibreOffice is how similar it is to Office, which makes the transition fairly easy.

Aside from our Business Help section, which often covers office software-related topics, we tend not to write features about Office software, as the suites do so many different things that we could only scratch the surface of the suite's potential. However, LibreOffice's online help (<http://tinyurl.com/odzrhuj>) is comprehensive enough to get you started.

TORRENT OF ABUSE

Like many people I have been using LibreOffice as an alternative to Microsoft Office. So far it has been very satisfactory. However, it looks as if someone has persuaded the authors to switch the downloading of updates to BitTorrent. This involves downloading the BitTorrent software and then working out how to do something with whatever it produces.

My first attempt to download BitTorrent software tried to install some very nasty spyware. The next attempt



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downloaded software that announced it had completed its task but left things hanging without any further explanation. This isn't useful to anyone just wishing to get on with their computing tasks.

To those who mourn the passing of what was a good project, we should arrange a wake. To those who are still working on the LibreOffice project, either get real or I suggest you make sure to turn off the lights before handing the office keys back to the landlord.

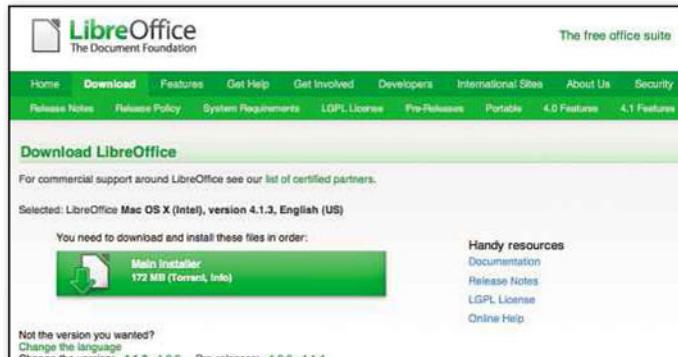
R M Ormsby

We've always managed to download LibreOffice and its updates without BitTorrent. Try downloading the installer from <https://www.libreoffice.org/download> when a new version arrives to avoid the problem.

MISSED COMPATIBILITY

As a subscriber to *Shopper* I read all the hardware reviews you publish each month. I run a dual-boot PC with Windows 7 and Kubuntu, so I also read your regular features on Linux. One disappointment is that there doesn't seem to be any link between these two areas in your publication. I have yet to see any mention of compatibility with Linux in your hardware reviews.

For example, you published an excellent group test of 10 multifunction peripherals in



The screenshot shows the LibreOffice download page. At the top, it says 'The free office suite'. Below that is a navigation bar with links like Home, Download, Features, Get Help, Get Involved, Developers, International Sites, About Us, and Security. Under 'Download LibreOffice', it says 'Selected: LibreOffice Mac OS X (Intel), version 4.1.3, English (US)'. It then lists the file to download: 'Main installer 172 MB (Torrent, Info)'. Below this, there's a note: 'Not the version you wanted? Change the language: 4.1.3 4.0.5 Pre-releases: 4.2.0 4.1.4'. On the right side, there's a sidebar titled 'Handy resources' with links to Documentation, Release Notes, LGPL License, and Online Help.

↑ You can download LibreOffice for free from the organisation's own website

Shopper 311. However, nowhere in the article is operating system compatibility mentioned – let alone any availability of Linux (or Mac) drivers. It would be an enormous help if you could test hardware on a Linux system.

RG Willis

We don't usually list hardware's compatibility with Linux, but printers are an exception. The MFP feature table in *Shopper* 311 shows whether each printer is compatible with OS X or Linux – in the case of Linux, usually through the Common UNIX Printing System (CUPS).

The problem with checking for Linux compatibility is the number of distributions available. Due to time constraints, we'd only ever be able to test a piece of hardware with one distro – and the information would only be valid until the next update. However, if one Desktop Linux distro were to become dominant and challenge Windows for

market share, we'd start Linux testing in earnest.

BRIGHT SPARK

I've been a subscriber to *Shopper* for years and find it as relevant to my interests now as when I started. That said, I've been thinking of replacing my iPad as I'd like a brighter screen, so when *Shopper* 312 arrived, I turned straight to the reviews.

The article was interesting, but it didn't give me any real idea of the displays' brightness. Fortunately, I also subscribe to *PC Pro*, which usually includes this information. Would it be possible to measure screen brightness in future reviews?

Niall Edwards

We've been trying to find a good way to do this, and we think we may be able to use our laptop and PC display calibrator to measure the brightness of tablet screens. Look out for our findings in future reviews. ☐

WRITE IN AND WIN

Do you wish your computer was faster when booting and loading applications? Thanks to Crucial, you can achieve your dream of a faster PC or laptop with the M500 SSD. The writer of our Star letter will be awarded one of these solid-state devices, which can be installed in a desktop PC or a laptop.

This super-fast SATA3 6Gbit/s SSD will make your computer boot incredibly quickly and make applications faster to load. With 120GB of storage space, there's plenty of room for Windows and all your applications, too.



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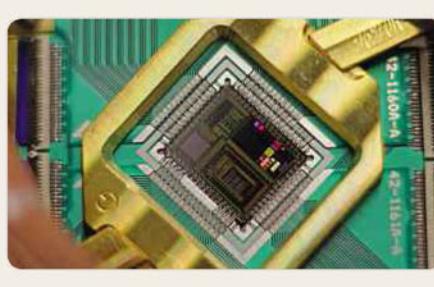


► QUANTUM COMPUTING

Quantum Computing won't just make PCs faster; it will alter our perception of what is possible. Find out more in our feature

► SETTING UP A CCTV SYSTEM

With a couple of IP cameras and a NAS box, you can set up an inexpensive home or business CCTV system. We show you how



► ROUTER GROUP TEST

You don't have to stick with your ISP's router. Get better performance and more features with a new wireless router

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- Internet Content Filtering



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- IPSec & SSL VPN
- IPv6 & IPv4 dual-stack
- Internet Content Filtering



Vigor3900 Gigabit Quad-WAN Router

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- 100Mbps Firewall Throughput
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- IPSec & SSL VPN
- IPv6 & IPv4 dual-stack
- Internet Content Filtering



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Office politics

After dealing with another wayward BlackBerry, **David Robinson** settles in with a program that can do everything Microsoft Office can do without costing him a penny



DAVID ROBINSON
Software and systems developer
davidr@computershopper.co.uk

AFTER ALL THE fuss with Effing Jeff losing his phone last month, you'd think I'd be able to get down to some real work. Setting up a BlackBerry to get email from a regular email account on a company server normally takes a few minutes. But when you're talking an IT-phobic user through the process over a voice-only connection, an hour is nearer the mark. Having completed the job, it was no more than an hour before we received a follow-up call from Jeff's PA, Zdzisława. The lost phone had been found. It had been in Jeff's computer bag the whole time, but since that's a place he visits infrequently (the spiders in there live a peaceful life), it was the last place anyone thought to look. "Jeff likes the old phone better than the new one," she said, "but there's no mail getting to it."

I explained that a BlackBerry is a Highlander device (there can be only one), and although a single BlackBerry can feed off several email accounts, each BlackBerry user ID can only be associated with one BlackBerry device at a time. "So switch it back," said Zdzisława imperiously, as if the time spent helping her set up Jeff's new phone

considerable. I keep telling customers that they can't just go to PC World and buy a Student or Home version and use it at work, nor can they use it on multiple PCs. "But it's half the cost!" is the usual lament. I tell the custards it's irrelevant; either pay the proper price for the correctly licensed version or do without. Anything else would end in severe consequences – certainly for us, as we should know better.

PRICE RACKET

Sadly, the proper price can be difficult to work out. A Google search for MS Office Professional 10 reveals that some suppliers will sell it for £159 a copy. A vendor called Buy It Ultra Cheap will sell you one for £399.95 discounted to £349.95, which is big of them. If you fancy keeping up to date with Office 2013, Play.com charges £184.99, the Microsoft Store wants £389.99 and our friends at Buy It Ultra Cheap are asking £110 less for 2013 than for the older version, at a mere £239.95 a copy. Confused? I thought I was, until I consulted Patrick about Microsoft's corporate licensing prices. Then I was really confused. I had more chance of getting a first-class honours degree in nuclear physics than grasping that policy.

Still, the price of MS Office doesn't affect me, as I don't use it any more. Motivated by trying to find a more cost-effective alternative, I bit the bullet two years ago and started using a freebie when I changed to the Lenovo laptop. Like many Office users, I don't use any Exchange group sharing facilities and only around 10 per cent of the Office features. Years ago, I'd tried the free Star Office but couldn't get on with it. But I put Star Office descendant LibreOffice on to the Lenovo and haven't looked back. For my personal and business use, I've yet to find something I can't do and the past 25 *Under Developments* have all been written using LibreOffice Writer.

I did try to get some of Jeff's staff to convert to it. Their needs, like mine, are basic. They had one document template that formed the basis of all customer quotes, with a variety of data fields and tickboxes on it. What messed up the trial was a rectangular light grey box that stretched across the top of the page. This had the word 'Quotation' superimposed over it. In LibreOffice Writer, this looked fine onscreen, but every time the document was printed, the box appeared halfway down the page in the middle of the sales blurb. I couldn't find documentation on this topic, and despite several hours of fruitless experimentation I didn't solve the problem. This encouraged one of Jeff's staff (a Jeff wannabe) to circulate an email describing LibreOffice as s*lt. This cost Jeff £15,000 for new copies of MS Office when the factory server got replaced. This seems a lot for printing a grey box, but maybe that's just me.

WRITER REPLY

Recently, I've switched from LibreOffice to the free version of Kingsoft Office. I first saw this product as an Android app on my Nexus 7 tablet and liked it a lot, then discovered a Windows version. Unlike LibreOffice, there's no Linux version. But Kingsoft Writer really does the job, including printing the grey box in the right place. The spreadsheet works well with every Excel file that clients have sent me, as well as some gruesome ones conjured up by Jeff's wannabe. So far, I haven't caught Kingsoft out, although if I had Kay Ewbank's knowledge of MS Office (see *Business Help*, page 140), maybe I'd find things it can't do that Microsoft's product can.

I've often said there's no such thing as a free lunch, but maybe I'm wrong when it comes to Office substitutes. If you use LibreOffice or Kingsoft Office, please feel free to email me with your experiences. 

“I've more chance of getting a first-class honours degree in nuclear physics than grasping Microsoft's licensing prices **”**

was of no consequence. I believe the Facebook/Twitter shorthand for my reply is 'OFFS'. Cue another hour of trying to work out which screen she was looking at after having pressed the wrong button.

VERSION TERRITORY

Anyway, back to what should have been the subject of last month's column: Microsoft Office, or rather, things that do what Office does but without the hefty bill. This is important when you have a network of 100 users, as the costs of Office can be

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No such thing as a freemium lunch

Has freemium finally put paid to the notion that the best things in life are free?

David Neal contemplates how easy it is for a fool and his money to go separate ways



DAVID NEAL

Freelance journalist

letters@computershopper.co.uk

I'VE RECENTLY STARTED to play a free game on my tablet computer; most of the games I have on my tablet are free. The game I'm playing is a new spin on an old game. The main change is that this version of the game asks repeatedly for me to spend money within its virtual walls, something I know for sure that the original never did.

The game is unrelenting in its desire to put out its hand, give you a meaningful look and cough. You can play on average one two-minute game without being polled on whether you want to invest in more in-game gewgaws, and are then plunged back into advertising lures and pop-up ads that employ some kind of dark art to make their Close buttons tricky to spot.

MONEY FOR NOTHING

Playing the game, which shall remain nameless to spare the publisher's blushes, is fun – up to a point. A lot of things stay locked when you play the free version, and those who play for nothing are shut out from power updates, showy finishing moves and other features that enrich the experience. You earn in-game coins by playing, and an occasional in-game lottery lets you increase the frequency of your participation by using hard cash, but scraping together virtual wonga is a slow process.

People who don't use Facebook are also given a lesser experience. In a good-hearted attempt to remedy this, the game offered me the chance to connect the game with a social networking account once every 10 minutes. On this particular selection page, the 'Log in to Facebook' button is huge, while the 'No, thanks' option is an oxpecker bird to Facebook's black rhino. This, along with the hidden Close buttons and the 'This doesn't quite look like a buy button'

buttons, all adds up to a rather cynical gaming experience.

CHILD'S PLAY

In the past, I've criticised parents for not making enough effort to prevent their children spending hundreds and thousands of pounds on in-app and in-game purchases, and insisted that it's easy to avoid your offspring bankrupting you this way. I've realised I was wrong.

I'm fairly computer-savvy. I avoid registering where possible, I don't share my details, my passwords are so complicated I can never remember them, and I have never made an intentional in-app purchase. Boy, have I come close, though! The other day, while I was in a coffee shop pretending to work, I accidentally downloaded a couple of megabytes of an update. I must have commanded the app to update, but dashed if I know how and when I did it.

I've also got close to buying those additional coins that the game insists on offering me. This happens when I follow a button that says 'Deploy' in relation to a power-up. It would be better, and more truthful, if the button said 'Get me to the store and take some of my money'. Backing out of this particular screen informs me that I have cancelled my purchase, which would be fine were it not for the fact that I never intended to purchase anything in the first place.

If the basic game itself wasn't playable, this behaviour would be enough to make me drive my tablet into the ground with a hammer. But the insidious nature of the title is such that I want to keep playing, and the more I play the more opportunities it has to relieve me of my post-tax income.

I've even come close to buying coins intentionally just to progress. I suspect that the game is wearing me down through attrition, and at some point I will

invest in some virtual money that I can only spend on blocky virtual crap in a virtual world.

All that stands between me and app-related financial oblivion are the Apple store rules, which insist that a password is put in before a purchase is made. If it weren't for those, I'd be 50 quid in the hole by now.

THE PRICE OF SHAME

Firms such as Apple and groups such as Ofcom are making strides against freemium apps, and certain game companies have realised when they go too far. One games firm – best known for pitching feathered things against things that go 'oink' – was criticised for having an in-app purchase that cost £70. The company capitulated, saying such an expensive extra was probably a mistake.

This volte-face may be a turning point for the mobile game industry, but I'm not convinced. There must be some seriously good money in the freemium approach. A free game called Sweet Smash, or something close to that, is one of the highest-earning titles in the application stores, according to the people who watch over this sort of thing, and pulls in a massive £525,000 per day. That's great business for something that on screen, and on paper, is free.

You only have to keep an eye on the news to see where this kind of money comes from. This year, a woman loudly complained after her 10-year-old son spent £575 on in-game purchases in three hours. She was refunded, but I suspect that the refund came in good faith from her hardware provider – in that case, Apple – rather than the cynical firm that makes child-friendly games you can spend £500 in.

As for me? Once I get past level 11, I'm deleting this game – for good. ☐

“ I suspect the game is wearing me down through attrition, and at some point I will invest in virtual money that I can only spend on blocky virtual crap in a virtual world **”**

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Spam in the works

A classic comedy sketch team has given him a reason to smile, but **Gordon Holmes** notes that spam generally is showing no sign of abating – and it's no laughing matter



GORDON HOLMES

With more than 30 years of experience in law enforcement, our retired cybergold gives a police officer's perspective on the sticky subject of cybercrime
letters@computershopper.co.uk

GREAT NEWS! THE Monty Python team is getting together again for a one-off live stage performance of the sketches that redefined comedy in the 1970s. These guys were a beacon of light in what seemed to be a never-ending period of study for me at the start of that decade. All my friends knew the scripts off by heart and we would often greet each other by speaking in Pythonese. At a press conference, Michael Palin, Eric Idle, John Cleese, Terry Gilliam and Terry Jones said they wanted to see if they "were still funny". We can look forward to Norwegian Blues, crunchy frogs and, of course, plenty of Spam from the quintet with a combined age of 357.

Sadly, my contacts in the online banking security industry tell me that they have noticed spikes in the distribution of spam with attachments that are designed to steal your login details or to recruit your machine as another slave in the increasing number of botnet networks. Some of this spam is distributing the Cryptolocker ransomware, which locks your computer until you pay the bad guys a ransom in return for a key to unlock your system. Cryptolocker has been

and personal PC users, and is spread in very high volumes.

Subject lines include 'DHL tracking information' or 'Scanned from a Xerox Multifunction device' and the message will contain links that download a malicious executable file, usually a derivative of the Zeus Trojan. These subject lines are crafted to lure individuals at work to click on the attachment. The bad guys are targeting small businesses which they feel are small enough not to employ a security professional but big enough to have a few grand in the bank. A few of my banking security contacts have run these files against popular anti-virus products and the detection rate is appallingly low.

NUMBER CRUNCHING

According to my information, among the users of internet banking in large retail banks, between 10 per cent and 15 per cent of all customers logging on are detected as having some sort of computer virus that could compromise transactions. With millions of registered internet banking customers, this gives a rough finger-in-the-wind estimate of hundreds of thousands.

This figure does not include corporate networks, where the problem of compromised machines is often swept under the carpet. There's a general acknowledgement that the majority of botnets are hosted in such environments.

One reader has contacted me with a valid point – thanks Guy (that's his name, and not an attempt by me to get down with the kids). He is often contacted by the marketing departments of legitimate companies with whom he has a commercial relationship but who still send out unsolicited mail. Within this mail, he is invited to click on a link to create a free encrypted portal account for communications, or is told that there is a message from the company waiting to be read.

“ Having educated users to never open attachments on mails that arrive unsolicited, why are companies using such procedures to interact with customers? ”

the subject of a high-profile warning issued by the recently formed National Crime Agency.

You may have a spam filter with your email service and are probably wondering what makes this campaign different from all the rest. Well, the difference lies in the social engineering aspect of the subject lines used and the fact that this spam is aimed both at the corporate environment

Having educated users to never click links or open attachments on mails that arrive unsolicited, why are legitimate companies using such procedures to interact with their customers? This desensitises users to valid security procedures and plays into the hands of the cybercriminal. A far better approach would be to send the mail and invite the customer to complete the procedure on the company's legitimate website without the link being part of the email.

THIRD-PARTY FAVOURS

Changing tack entirely, I'd like to follow up on a subject I covered a few months ago: privacy concerns regarding the use of third-party cookies. Regular readers will know that I climbed on my soapbox and discussed how I had disabled the setting of third-party cookies in my browser (Cybercop, Shopper 304). Why should ad agencies make money out of my daily internet use? I find their tracking activities sinister and underhand.

Well, it seems someone was listening, as USA Today reported that Google is considering the development of an anonymous identifier, or AdID, which would replace third-party cookies as a way of tracking internet use. As Google accounts for a third of all worldwide online advertising revenue, this is not an insignificant development. The AdID would be transmitted to advertisers and ad networks which have agreed to basic guidelines, giving consumers more privacy and control over how they browse the Web.

Apple's Safari browser has blocked third-party cookies since its introduction in 2003, and introduced its own ad identifiers for its iOS mobile platform in 2012. However, the Google initiative, if implemented, will be a great step forward for individual internet privacy as well as a personal victory for me. My tongue's in my cheek for that last bit, mind. □

Rants & Raves

What's rattled our cages or made us giddy with delight this month? Our resident technological gurus wax lyrical and vent spleen on what's hot – or not – at the moment

Chris Finnamore RANTS

He likes a good laugh as much as the next guy, but **Chris Finnamore** is far from amused at all the zany social media content being bandied around the internet in the name of fun

"THIS IS THE best thing ever!" "The funniest thing you'll see all day!" "This is EPIC!" Up and down the land, thousands of news feeds groan under the weight of such hyperbole. The format? Gushing praise, a link to a piece on Buzzfeed, Funnyjunk or Cheezburger, likes, retweets and +1s underneath. Sometimes I bite. I see an acquaintance fawning over some new bit of digital entertainment, and I click through. I am, almost exclusively, hugely disappointed. The mismatch between expectation and reality is so jarring I should claim for whiplash.

A pizza with cheeseburgers in the crust, cynically created by a pizza company to go viral and raise brand awareness. Someone falling over. Oh, and cats. More cats than you could possibly ever imagine. Beadle-era You've Been Framed was more edifying.

Now there are employees of large corporations paid to manage the social accounts of their companies, using official feeds to act like crazy students, having their antics reported on lulz-farming websites, reposted and retweeted by thousands of personal accounts. It's the blank, featureless corporate face of humour. It's a sinister white mannequin in a dark suit holding up a 'laugh' sign.

THAT JOKE ISN'T FUNNY

The twee, contrived, infantile nature of the social media managers' banter ("Hey, tea company! Let's ask biscuit company to join our party! Everyone loves tea and biscuits!") would be bad enough if it were confined to Twitter, only to be seen by those misguided enough to follow the Twitter accounts of grocery firms.

Unfortunately, other sites make a living creating stories around such infuriatingly zany content, and those stories are then shared straight back on social media, just in case you were lucky enough to miss them the first time. They are not epic. They are not funny. They are about as far from the best thing anyone has ever seen that it is possible to be, unless that person has grown up in one of the less interesting parts of a disused water tank.

In a world where huge digital multinationals can casually discard 200 years of employment law and sack people for being ill, I think it's about time we all grew up.



David Ludlow RANTS

It's one step forward and two steps back for **David Ludlow**, as he gripes that the newest version of Windows is making him more than a bit nostalgic for the one he was using before

I HAVE A confession: I quite like Windows 8. Yes, the new Start screen is annoying at first and I only use it as a giant launcher, but the OS is a big improvement over Windows 7. It starts faster, hasn't blue-screen crashed, and the changes made to the Desktop have made windows and applications easier to manage, especially over multiple monitors. Windows 8.1 could only make things better, right?

Sadly, that doesn't seem to be the case. After a month of using the new version, I'm wishing for Windows 7 again. You see, for everything Microsoft seems to have fixed in Windows 8.1, something else seems to have gone wrong on at least one of my computers. Then there are the changes that are, well, pointless.

Take the new Start button. Practically everybody wanted this to launch the original Windows Start menu for Desktop-mode users. Nobody wanted it to be a shortcut to the new Start screen. This is a pointless addition, as there's already a dedicated key on your keyboard that does that, and under Windows 8 you could just click in the bottom-left corner of the screen. All Microsoft has done is take up a bit more space on the taskbar. Microsoft should either have stuck to its guns with the Start screen or given people the full Start menu back. What remains is a messy compromise.

FINISHING WHINE

A bigger problem is that on one of my desktop PCs, Windows 8.1 takes more than 10 minutes to finish shutting down. The screen goes black, the hard disks stop, but the fans and power light stay on as the PCs works out which final tasks it needs to perform. I tried everything I could think of to fix this, and was close to throwing the PC out of a window, when I found the problem lay with the 'Fast startup' option, which is designed to make your computer faster to boot, seemingly by making it take forever to shut down. Turn that off (see *Helpfile* on page 143), and the PC shuts down.

It's hard to excuse this. Throw in the fact that the wired network connection stops working at random times, and Windows 8.1 is annoying me quite a lot. As a major upgrade to a big OS, I wanted more – but more features and improvements, not bugs.



Kat Orphanides RAVES

You won't tempt Kat Orphanides with the lure of sexy new inkjets, not as long as her trusty laser is churning out the good stuff

LASER PRINTERS ARE still popularly regarded as being fast and good quality but also big, heavy, expensive and entirely unsuitable for home users. As someone who's had a laser printer at home for the last six years, I beg to differ on all counts.

Admittedly, I currently use a large colour laser MFP that you'd more typically see in an office than a sitting room, but it was cheap and I was sold on the idea of economies of scale. Three years in, I've barely made a dent in its 3,000-page starter toner cartridges. Unlike with an inkjet printer, I don't have to worry about ink drying up or nozzles becoming clogged if I

don't print anything for a few weeks. When I do need to print something, it doesn't matter if it's three pages or three hundred; I can be confident that my printer will work and that I'll have enough toner. The MFP will even email me if I start running low on consumables.

When I do eventually need to replace the toner, I'll have to spend at least £60 per cartridge, but that works out as around the same price as three years' worth of any given colour for my favourite inkjet printer. It's a bigger single outlay, but it happens so rarely I don't resent it. It's also worth noting that many laser printers have much cheaper

toner than mine; I've reviewed models that'll cost you around £30 per cartridge.

Even if you're short of space, you shouldn't have a problem finding room for a laser. You can buy mono laser printers with the dimensions of a bread bin. They're smaller than even the most compact inkjet and their clever paper tray designs mean you can just stick them on your desk without worrying about leaving extra space in front of them for the paper tray. The smallest colour laser printer we've seen, Samsung's CLP-360, is little more than a square foot in size. It also costs just £100; even colour laser printers can be cheaper than you'd think.

GOLLY GLOSS

The final thing that converted me to lasers was the print quality. It's not that lasers are necessarily more detailed or sharper than inkjets. There are loads of inkjets capable of producing highly sharp text, but the one thing none of them can reproduce is the glossy, eminently professional-looking finish of a colour laser print. Lasers might not be sold as the home-friendly option, but my network laser MFP has caused me far less grief and cost less than any inkjet I've owned, and should continue to do so for years to come.



Mel Croucher RANTS

Put away your party hats and refuse to pop your poppers, as **Mel Croucher** uncelebrates the anniversary of a Very Bad Thing

I AM LOOKING for a word to express the opposite of a celebration, as I wish to mark the anniversary of something malevolent and loathsome. You see, it's the Silver Jubilee of this malevolent, loathsome thing that causes misery to millions of computer users, and I want to mark the occasion with the opposite of a celebration. How about a rue-in, or a scorncfest? No, it's an abomination. Join me in an abomination, for it's the twenty-fifth anniversary of the first computer virus.

With a dramatic irony worthy of Electra – the Greek avenger who released the Furies because of her dad Agamemnon – Robert Morris Junior, the man who released the original worm 25 years ago, was the son of Robert Morris Senior, the chief scientist of America's National Computer Security Centre.

Robert Morris Senior was instrumental in creating the computer security and password standards for Unix, and in an act worthy of Greek tragedy, Robert Morris Junior's virus attacked mail accounts running on Unix. The virus infected one in 10 systems linked to the internet, and unleashed escalating damage that has reached plague proportions, infecting not only domestic machines but the internal networks of nuclear plants, hospital administration systems and the International Space Station.

THE WORM HAS TURNED

At least 20,000 new viruses, Trojans, worms and bots get spotted by detection databases every day. There are five-and-a-half million signatures of different malware routines

doing the rounds, and the number of threats doubles every year. Statistically, we will all be the victim of Robert Morris Junior's legacy several times over.

The obvious question to ask of the scumbags who create so-called malware is why do they do it? Is it to show off their skills to a handful of their peers? Is it, as with Electra and the Furies, a misguided act of revenge triggered by authority figures such as their parents? Or is it a conspiracy by cynics and software security companies to drum up new business? Sadly, these reasons are consigned to ancient history, because they have all been superseded by the most powerful motivation of all: the extortion of money. An unguarded click can now trigger the sort of ransomware that locks your computer unless you pay 200 quid to release your own files or suffer them being destroyed. There may have been kudos in writing a virus in the past, but there is no honour among today's thieves.

At least Electra avenged her father instead of urinating on his reputation. Robert Morris Junior was ordered to complete 400 hours of community service for his creation of the monster that threatens us all. So, as we hold our commemorative abomination for the misguided talent of the son, let us consider what the world would be like if his parents had produced a daughter. ☐

Valve releases SteamOS



VALVE HAS OFFICIALLY released SteamOS, the Linux-based operating system designed specifically for gaming, following the start of its Steam Machine hardware beta programme. It's the next step for Valve as it moves into the living room, making PC hardware that could eventually challenge traditional games consoles for a spot under your TV set.

SteamOS is based on the Debian 7 'Wheezy' Linux distribution, which Valve has optimised specifically for the living room. Under the surface it uses the Gnome desktop environment, which will let users download and install their own software as they choose, but it defaults to the custom-built Steam interface.

This interface is a slightly tweaked version of the Big Picture mode which was launched in 2012, with large icons and text that show the store, Steam Community and your game collection. It's far easier to read on a television screen than it is on the desktop client, which was designed for computer monitors.

Valve has made a big effort to hide much of the base Linux operating system, in order to make SteamOS feel more like a games console than a PC. It automatically pulls updates directly from Valve's custom Linux repository and you have to enable the Linux desktop manually if you want to use SteamOS as a computer.

Unfortunately, the number of SteamOS-compatible games is currently just a small subset of the complete Steam catalogue. However, Valve has confirmed that a number of major developers are already working on adapting their new releases for the operating system.



▲ SteamOS should look familiar to anyone that's used Big Picture mode before

The 300 Steam Machine hardware prototypes, which were sent out to lucky North American beta testers earlier this month, were designed specifically to run SteamOS, but anyone can put the software

or higher, at least 500GB of hard disk space and an Nvidia graphics card. Currently SteamOS doesn't support AMD or Intel graphics chips, although Valve promises they will be added in the future.

“Valve has confirmed that a number of major developers are already working on adapting their new releases for the operating system”

through its paces. Valve posted a set of guideline specifications that will let anyone build their own Steam Machine system; you'll need a 64-bit Intel or AMD CPU, UEFI-enabled motherboard, 4GB of RAM

Those lucky enough to be included in the hardware beta also get to try Valve's custom controller. For everyone else, SteamOS recognises wired Xbox 360 controllers as well as most major USB gamepads. Unfortunately, the Home Streaming feature Valve has promised isn't yet implemented in SteamOS, so SteamOS is currently just another way to play a smaller number of your Steam games than is possible on your home PC.

If you want to help Valve test for bugs, or you just want to see the operating system in action for yourself, installing SteamOS should be relatively straightforward for anyone familiar with Linux. There are two versions: a 2.7GB disk image and a 960MB installer which runs from within the UEFI BIOS. Both will completely format your hard disk, and there's currently no way to dual-boot SteamOS with Windows or a regular Linux distribution. You can get detailed instructions at <http://store.steampowered.com/steamos/buildyourown>.



▲ Valve's first hardware prototype is essentially a mid-range PC in a box no bigger than an Xbox One

Dual-SIM HTC One coming soon

OUR ONE MAJOR gripe with the HTC One smartphone was its lack of expandable storage. Unless you bought the top-end model, you could quickly run out of space.

HTC has clearly been listening to its critics, as it has revealed it will be launching an updated handset in the UK that will have a microSD card slot for adding extra storage space, as well as dual SIM card slots. The HTC One Dual SIM is aimed primarily at business users, who currently have to carry both a home and work phone, or who like to use a different SIM card when abroad. Both SIM cards are active at the same time, so you can always be reached on both numbers. This is somewhat rare for the UK; dual-SIM handsets are typically more popular in developing nations, and rarely see a release here.

The phone's design has changed significantly in order to accommodate the extra cards. The original



HTC One is a sealed unit, but the dual-SIM model has a removable back cover. However, as with the larger HTC One Max, just because you can remove the back it doesn't mean you can replace the battery.

Peter Frølund, HTC's UK general manager, said: "By bringing business and pleasure together in the best-designed handset in the market, we're creating a new approach and one that we believe will appeal to businesses and their employees alike."

Consumers will probably be just as keen on the new handset for personal use, if only to have the option of expandable storage.

Although no release date has been confirmed, you can pre-order the handset for £495 from www.officialhtcstore.com now. Unfortunately, you have to make a choice between extra storage and faster internet speeds, as the dual-SIM model doesn't support 4G LTE networks. If you live in an area without 4G coverage, however, this could be an easier decision.

4G comes to Three

THREE HAS BECOME the latest mobile network operator to launch a super-fast 4G service. The company began switching customers living in London, Manchester, Birmingham and Reading to the new faster service at the beginning of December, starting with 3,000 customers chosen specifically by Three to receive 4G first.

The 4G rollout is set to accelerate in January, with Three estimating it will have upgraded 1.5 million customers with a compatible device with 4G access by the end of the first quarter. The company aims to cover 50 additional cities with 4G by the end of 2014 and reach 98 per cent of the population by the end of 2015.

The first cities that can expect 4G upgrades are Aberdeen, Blackpool, Bolton, Bournemouth, Bradford, Brighton, Bristol, Cambridge, Cardiff, Coventry, Derby, Dundee, Edinburgh, Exeter, Glasgow, Gloucester, Huddersfield, Ipswich, Kingston Upon Hull, Leeds, Leicester, Liverpool, Luton, Milton Keynes, Newcastle, Northampton, Norwich, Nottingham, Oxford, Peterborough, Plymouth, Portsmouth, Preston, Sheffield, Slough, Southampton, Southend on Sea, Stoke on Trent, Stockport, Swindon, Watford and York.

The only requirement for getting faster speeds is that you have a 4G-ready handset; unlike rival networks EE, Vodafone and O2, there is no need to take out a new contract, get a different tariff or pay off any existing 3G line-rental in order to benefit from the faster speeds.

Three also revealed it would be axing roaming charges in a selection of countries including the USA. The Feel at Home promotion already includes Austria, Australia, Denmark, Hong Kong, Italy, the Republic of Ireland and Sweden, letting customers put their UK bundle allowances towards data, texts and calls when abroad, and will now include USA, Indonesia, Sri Lanka and Macau.

Three chief executive Dave Dyson said the company plans to add more countries to the programme in the near future.



TV Anywhere now on Android

VIRGIN MEDIA HAS launched an Android version of its TV Anywhere app, letting tablet and smartphone owners access a selection of TV channels when away from their TVs.

Until now, mobile viewing was limited to PCs and iOS devices, but the new TV Anywhere app opens up 67 channels to Virgin Media customers with an Android handheld, 39 of which are not available on rival service Sky Go. These include BT Sport, ITV, Channel 5, CBS Reality and Premier Sport, although you still don't get access to the full 90 channels available to watch through a PC web browser.

Virgin Media also added nine channels to the TV Anywhere line-up, including Alibi, Dave, Drama, Good Food, Home, Watch and Yesterday.

The app is free to download for all Virgin Media TiVo customers and lets you remotely manage your TiVo recording schedule, delete watched recordings and set reminders for upcoming shows.

Unfortunately the app appeared to have a few teething problems, namely that at the time of writing it didn't support the latest Android 4.4 KitKat operating system. Older, non-TiVo Virgin DVRS also don't work with the app, and rooted Android handsets aren't supported at all. You also can't watch live TV using mobile data, although this is a fairly common restriction with live TV apps. You can at least access the full programme guide and schedule recordings when on 3G.

Virgin Media's director Scott Kewley said: "Virgin TV Anywhere is the market-leading service for those who want to take the best of their home entertainment with them to watch wherever they are at no extra cost."

The TV Anywhere app is now available on iPad, iPhone and iPod touch, as well as a wide range of Android mobiles and tablets. You can download it now from the Google Play store.



► You don't even need to be at home to set your TiVo box recording with the TV Anywhere app

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Smartphones and tablets given green light for flights

AIRLINE PASSENGERS HAVE finally been given the green light to use personal electronic items such as smartphones, tablets, eBook readers and handheld games consoles during take-off and landing, after the European Aviation Safety Agency (EASA) updated its guidelines.

Currently, all handheld electronics must be switched off for take-off and landing, but are allowed once a plane has reached cruising altitude if they have a flight mode. According to the new guidelines, your devices will still need to be in Flight mode, as Wi-Fi and Bluetooth signals still have the potential to interfere with equipment, but you won't need to turn them off altogether at any point during the flight.

It follows a similar move by the US Federal Aviation Authority (FAA) in October, but unfortunately this doesn't necessarily mean you won't have to turn off your gadgets the next time you fly. It will be down to individual airlines to decide on whether to relax the restrictions or not.

The UK, which is governed by the Civil Aviation Authority (CAA), could have to wait several months before such changes are put in place. However, British Airways – which already allows passengers to turn on their phones as soon as the plane lands – has already made the change, while both BA and Virgin Atlantic have expressed an interest in working with the CAA to speed up the process.



▲ Passengers will have one less thing to worry about now that restrictions on personal electronic gadgets have been lifted

Xbox One backwards compatibility hoax fools gamers

MICROSOFT HAS WARNED gamers against following instructions purporting to enable backwards compatibility on the Xbox One, after a hoaxter took a leaked guide on turning the console into a development box and altered it to cause the machine to reboot constantly.

Prior to launch, Microsoft promised that it would add the ability to create content on the Xbox One by enabling selected tools typically reserved for special 'dev box' consoles on standard hardware. It turns out part of that functionality is already included on the system, as going into the Xbox One settings menu and hitting the shoulder buttons in a specific sequence enables a new settings sub-menu for development.

However, changing any of the settings seen on that page, particularly the console's 'Sandbox ID', can cause it to fall into a boot loop, rendering it useless. Microsoft issued a formal warning against using the technique to gain early access to the development settings, saying that it was "only intended for developers for Xbox One", and that this screen alone "does not turn the console into a development kit. We strongly advise consumers against



▲ The Xbox One may be a powerful next-generation console, but there's no magic switch to enable backwards compatibility

changing these settings as it could result in their Xbox One becoming unusable," the company said in a statement.

Unfortunately, pranksters used this warning to prey on gamers disappointed in the Xbox One's lack of backwards compatibility with Xbox 360 games. An official-looking infographic instructing console owners to edit their Sandbox ID to enable backwards compatibility quickly did the rounds online, but Microsoft confirmed it was false.

"To be clear," Microsoft's Xbox Live director of programming Larry Hryb explained, "there is no way to make your Xbox One backwards compatible and performing steps to attempt this could make your console inoperable."

For those who have purchased an Xbox One but still have a backlog of Xbox 360 games to play, using the HDMI input of the Xbox One to pass Xbox 360 video through to your TV is as close as you're likely to get to backwards compatibility.

Any Xbox One owners who have put their consoles into the developer mode can revert the machine by restoring factory defaults under Settings, System, then Restore Factory Defaults.

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Yotaphone eInk smartphone launched

THE YOTAPHONE, THE first dual-screen Android smartphone to combine a traditional LCD screen with a second eInk display, has gone on sale in Europe, and will be coming to the UK soon.

St Petersburg-based Yota, which was previously best known for making modems and routers, has developed the phone specifically to combat battery drain. According to the company, the always-on eInk display will have up to 10 times the battery life of other smartphones.

"The typical user picks up and activates their smartphone more than 150 times a day," Yota Devices CEO Vlad Martynov said at the launch event. "By including a second screen that uses electronic paper display technology, users have access to the information they want and need on a continual basis without having to wake up their phone."

While the 4.3in, 1,280x720 resolution LCD display on the front will be used for most tasks, notifications, maps, books and other specifically adapted apps will appear on the 4.3in, 640x260 eInk

“According to the company, the always-on eInk display will have up to 10 times the battery life of other smartphones”

display on the rear. The handset runs a customised version of Android 4.2 Jelly Bean, which heavily relies on BlackBerry-style swipe gestures to navigate through the operating system. According to early reports it feels fiddly at first, but we said the same when we tried BlackBerry's BB10 OS for the first time.

Specifications aren't exactly top of the range: the Yotaphone is powered by a previous-generation Qualcomm Snapdragon S4 Pro processor and 2GB of RAM, although it does include support for 4G networks and has a 13-megapixel rear camera. The eInk display even tells you to smile when taking photos, although you'll have to be



▲ A second screen is an interesting way to reduce battery life, and eInk technology is incredibly power efficient

careful not to block the lens – it's near the bottom of the handset, rather than near the top, so as not to block the rear display.

The Yotaphone costs €499 (around £420), putting it on par with handsets from brands such as Samsung and HTC. Having already sold its initial run of pre-ordered handsets in Russia, Austria, France, Spain and Germany, Yotaphone is now taking orders for the second batch of units and will introduce the phone to the UK by March 2014.

BBC launches new HD channels

THE BBC HAS added five new high-definition television channels to its subscription-free line-up. Freeview HD, Freesat HD, Sky HD and Virgin Media TiVo boxes should have all received the new channels in December.

All five channels will broadcast the same content as their standard-definition equivalents, only at a higher resolution. Any content originally filmed in standard definition will be upscaled.

Because the BBC has used existing HD multiplex bandwidth for BBC Three and CBBC HD, all UK Freeview HD and YouView customers will be able to enjoy them right away. BBC News HD, BBC Four HD and CBeebies HD will use new HD bandwidth secured specifically for adding new channels, but this coverage has yet to reach the entire population. If you live in a remote area, you may have to wait until later this year to

receive the new channels. The extended transmission rollout will occur gradually, with final work due to finish in time for this summer's Wimbledon tennis championships. This won't be an issue for Sky, Freesat or Virgin customers, however.

BBC director-general Tony Hall said: "I am delighted that we're able to launch our new HD channels in time for Christmas, when families gather together to enjoy some of the

best TV from the BBC. This year, people will be able to watch even more of our programmes in brilliant quality."

Some services will automatically update their on-screen programme guides and rearrange channel lists to accommodate the new channels, but others will require a manual rescan in order to receive them. If your TV or set-top box can't yet see the new channels, be sure to rescan in order to view them.

BBC	BBC THREE HD	BBC FOUR HD	BBC NEWS HD	CBBC HD	CBEEBIES HD
Freeview HD / YouView	105	106	107	73	74
Freesat HD	147	148	212	607	608
Sky HD	115 or 210	116 or 211	570	613 or 633	614 or 624
Virgin Media	163	164	604	710	711

Spotify goes free on mobile devices

MUSIC STREAMING SERVICE Spotify announced this month that it will let users stream music on their smartphones and tablets for the first time, even if they don't pay for the Premium subscription. Company CEO and founder Daniel Ek revealed the news at a New York press conference, where he also disclosed that Spotify was the first streaming service to secure the back-catalogue of rock legends Led Zeppelin, making it the only choice for ageing metalheads.

The new free service will be ad-supported, and will work on both Android and iOS. Tablet users will get a very similar experience to the one provided by the Spotify desktop client, meaning they can play any song they want on demand with occasional adverts spliced between tracks. The smartphone app will focus on a radio-style shuffle system, which lets you pick an artist and will then stream a random mix of tracks rather than individual songs.

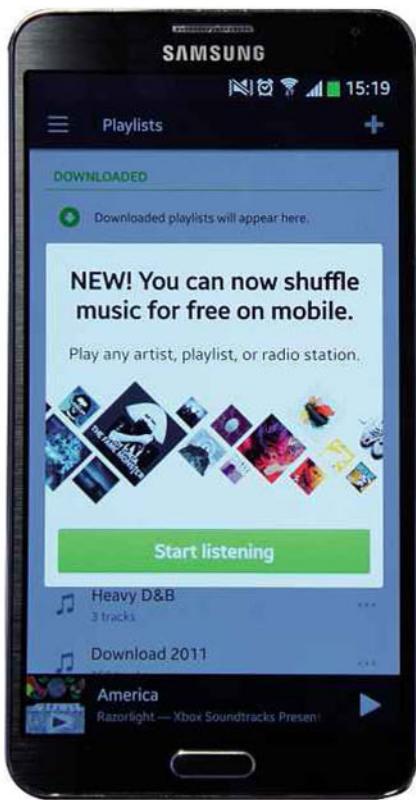
Spotify was built around playlists, so it's no surprise that both smartphone and tablet users will be able to play through their existing playlists or those shared by others. You can also create new playlists on the move, as well as skip up to six tracks per hour, but you won't be able to cache songs for offline

playback unless you pay £9.99 for a Premium subscription. This will remove all adverts, play any song at any time on any of your devices, and let you cache songs to play when you don't have an internet connection.

The free service is available now in every country where Spotify operates, including the 20 new markets announced this month: Bolivia, Bulgaria, Chile, Colombia, Costa Rica, Cyprus, Czech Republic, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Hungary, Malta, Nicaragua, Panama, Paraguay, Peru, Slovakia and Uruguay.

"We're giving people the best free music experience in the history of the smartphone and the tablet," said Ek. "Whether you're going to the gym, or having a party with friends, just sit back and let Spotify serve you great music for every moment of your life."

Spotify currently has around 26 million users, but only six million of those pay a monthly subscription. The company revealed that it has paid over \$1 billion (£610 million) in royalties to artists since 2009, but this translates to around \$0.006 per play. This means that a track would need to be played over 150 times before a musician would earn a single dollar.



Everyone can stream Spotify for free now, but Shuffle is compulsory

TalkTalk reboots Brownie Computer badge



TALKTALK HAS TEAMED up with Girlguiding UK to update the Brownies Computer badge, bringing it up to date and making it more relevant to today's members. The Computer badge, which was first introduced in 1990, has been overhauled, replacing less-relevant tasks such as shutting down a computer and cleaning a CD ROM, with a greater emphasis on internet safety and tips on safe sharing online.

Other aspects of earning the badge include being aware of different social media sites and

their age restrictions, programming details for a movable robot, learning how computers make a difference for those with visual or hearing impairments, and demonstrating how to safely send an online message.

TalkTalk CEO Dido Harding said, "In many respects, children are leading the way in technology with their intuitive understanding of digital tools. However, they also need to be educated on the application of these tools to ensure they use them safely."

"The work that Girlguiding does in helping girls build their life skills is already invaluable, so helping them update their computer badge is the perfect opportunity to ensure that these skills are extended into the online world."

Meanwhile, Girlguiding chief executive Julie Bentley stressed how the new Computer Badge could encourage more girls to consider a traditionally male-dominated career. "The Computer Badge resource is packed full of fun and challenging activities designed to give Brownies basic computer skills and the confidence to embrace new technology, whilst ensuring that internet safety is always at the front of their minds," she said.

"Our research shows that many girls dismiss entire industries such as science, technology, engineering and maths-based careers. This resource inspires girls to think of a career in a STEM (maths-based) industry as a varied and rewarding option for them".



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OLED display technology

OLED displays are getting bigger, cheaper and more efficient, but how long until the technology replaces LCD altogether? We go behind the screens and take a closer look

IT'S TAKEN A long time, but OLED televisions are finally starting to arrive in UK shops. The technology has been lauded as the future of TV for years, but high prices, complex production processes and lifespan concerns have held it back from the High Street. There is also a problem with the longevity of blue LEDs, with manufacturers struggling to make them last as long as the red and green versions.

Manufacturers have been working hard to overcome these problems, and things are beginning to change, but with the existing LCD technology so heavily entrenched, it's going to be an uphill battle for OLED. In order to understand what impact OLED will have on TVs in the near future, we've broken down the technology to see what all the fuss is about.

LIGHT FANTASTIC

In the simplest terms, Organic Light Emitting Diodes (OLEDs) sandwich an organic semiconductor between two electrodes (an anode and a cathode), which emit light as a current is passed between them. The OLED is 100 to 500 nanometres thick, or roughly 200 times thinner than a human hair. The brightness intensity depends on the current applied.

OLEDs aren't rigid and must be attached to a substrate before they can be used in a display. This substrate can be made from glass, clear plastic or foil, depending on what the screen will be used for. If the substrate is opaque or reflective, it's known as a Top-emitting structure, letting light exit in just one direction. This is the kind most commonly used for TVs, smartphones and other traditional displays. Transparent structures use a transparent substrate to let out light in both directions. These are used for Heads-up Displays (HUDs).

There are two competing OLED technologies, produced by arch-rival South Korean giants Samsung and LG. Samsung uses RGB OLED pixels, comprising red, green and blue sub-pixels. The blue sub-pixels are 1.5x larger than the others as they are less efficient, and are run at a lower brightness. This compensates for the fact that the blue OLED sub-pixels age faster than the other two sub-pixel colours. Production costs are reportedly higher than those of competing OLED designs due to the size of the laser required to produce the substrate.

LG, meanwhile, has its WOLED technology, which uses a combination of red, green and blue OLEDs to generate a white light source.

Each of these light sources is placed across four sub-pixels. Three of these sub-pixels have coloured filters to produce red, green and blue light, while a fourth pixel is left white, which helps make the display brighter.

ADVANTAGE OLED

On paper, OLED represents the ideal middle ground between the plasma and LCD technology currently powering our screens. The main advantage of OLED displays is that they do not require a backlight. LCD displays use backlights to illuminate the entire screen, and liquid crystals block this light when black is required. However, some light leaks through, which can lead to washed-out greys instead of deep blacks. Even more expensive LCD models, which use local dimming to split the backlight into different zones, can't create perfect blacks.

Plasma panels can produce incredibly deep blacks, but they use a lot of power to produce bright whites. OLED displays are more energy-efficient, even more so than LCD screens. Plasma panels can't be economically produced in sizes smaller than 32in, either, meaning the technology isn't suitable for smartphones or laptops. This hugely reduces the economies of scale for the technology.

OLED displays also have superior viewing angles to LCDs. There's no visible colour shift, even when you're sitting at almost 90° to the screen. OLEDs also have near-instantaneous response times, which are up to one hundred times faster than a typical LCD panel.

OLED panels are thinner, lighter and more flexible than both LCD and plasma displays.

Because the substrates are made from plastic rather than glass, they can be bent into shapes as well as laid flat, allowing for curved TVs like Samsung's S9C.

Finally, OLEDs will get easier to produce. As they are basically plastics, OLEDs can be made into large, thin sheets that are cut to size for specific screens. Once manufacturing processes are streamlined, OLEDs will drop in price.

COUNTING THE COST

At present, manufacturing costs for OLED TVs are much higher than for LCD or plasma displays, and the yield is low. Costs could drop as much as 36 per cent in 2014, but that will still mean paying almost five times as much for an OLED TV as an LCD set.

Currently, you can buy only curved OLED sets from Samsung and LG in the UK. When asked why there's no standard OLED TV on sale yet, LG claimed "the curved screen looks wider and delivers a more realistic experience free of image distortion, regardless of where you look". Samsung stated, "Our new 55 OLED TV is curved because we wanted to offer a special experience. It helps distinguish OLED technology from other TVs at retail."

In short, OLED is so expensive that a design statement was required to turn heads and open the biggest wallets. It's still some way off becoming the standard for new TVs, but with both Samsung and LG working hard on improving the technology, we will hopefully see affordable sets in the next three years.

► OLEDs don't have to be laid flat, which allows for curved designs such as this 55in Series 9 OLED TV from Samsung



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REVIEWS

YOUR TRUSTED GUIDE TO WHAT'S NEW

HP Envy Rove 20



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VERDICT

This would be a great family PC if it were cheaper, but it's just too expensive

PORTABLE ALL-IN-ONE PCs that resemble large tablet PCs are becoming more common. The HP Envy Rove 20 is one of the latest examples and is equipped with a dual-core 1.7GHz Intel Core i3-4010U processor and a 20in touchscreen display. As is typical with this type of all-in-one PC, it uses a mobile processor such as you'd find in a laptop. The chip is also one of Intel's latest fourth-generation Core chips, so the Envy Rove 20 has the latest processor technology.

The mobile components in the Envy Rove 20 help reduce the PC's size, conserve its battery life and stop it overheating. Although many portable all-in-one PCs are light, the Rove 20 is a little bulkier than most and its 5.4kg weight feels significant when you move it around. A sturdy stand on the back lets you prop the device upright, or you can use the Envy Rove 20 flat on its back on a desk or table. Unlike some rivals, such as the Dell XPS 2720 (see Reviews, Shopper 309) the PC isn't intended to be particularly easy to open up, although you can access the memory slots by removing the back panel.



BOARD GAMER

It may not be particularly svelte, but the Envy Rove 20 is certainly portable enough to move from room to room, so you'll have no trouble streaming your favourite drama series when in the bedroom or displaying recipes when in the kitchen. You can even gather friends and family around the PC and entertain them with onscreen board games. A manual rotation button makes multi-person gaming easier to manage, as it lets you flip the screen's orientation when it's the next player's turn rather than rotating the entire PC.

The built-in battery means you can unplug the computer and move it from one part of your home to another without having to shut it down first. In our light-use battery test the Envy Rove 20 lasted three hours and 40 minutes. That isn't particularly long, so you'll need to keep the PC plugged in if you use it for a long time, but you can easily unplug it to take into another room to show something to your family or to browse the web while sitting on the sofa for an hour or two.

The Envy Rove 20 relies on the Intel HD Graphics 4400 graphics chip built into its Intel Core i3-4010U processor. Its 3D gaming performance leaves quite a lot to be desired, as is demonstrated by the 18.4fps average frame rate it produced in our Dirt Showdown benchmark test at a resolution of 1,280x720 with graphics quality set to High. However, the Envy Rove 20 is more than up to the task of running retro and casual games, such as Plants vs. Zombies.

FAMILY FRIENDLY

The Envy Rove 20 isn't exactly overburdened with raw processing power and has only 4GB of memory installed. It scored 32 overall in our multimedia benchmark tests and struggled with our demanding multitasking test in particular. However, it's designed to be a simple, general-purpose home PC, and on that score it would certainly meet the



▲ The Envy Rove 20 has a manual screen rotation button that makes playing PC board games easier



p37 | Nokia Lumia 2520



p49 | Nvidia GeForce GTX 780 Ti



p85 | Apple 13in MacBook Air



p62 | Assassin's Creed



p101 | Cambridge Audio Minx Go

Board games to play on your PC

TICKET TO RIDE

Rail franchising might not sound like the stuff of family fun, but with network and local pass-and-play, you'll soon be vying with your family to build a transport empire



TALISMAN

Talisman looks and plays just like the original board game set in a world of magic and backstabbing. It currently supports only local multiplayer, but it's still in development



SPACE HULK

It looks a little different to the board game, but sci-fi classic Space Hulk retains the original's turn-based play and supports local pass-and-play as well as online games



requirements of the average family. If you primarily use your PC to write letters, browse the web, watch movies and play casual games, there's no point investing in a super-powerful, super-expensive gaming PC.

The Envy Rove 20 has a 1TB hybrid hard disk that provides quicker boot-up speeds than you'd expect from a regular mechanical disk, as well as a large storage capacity. Indeed, the disk is big enough to accommodate a fairly large media collection as well as your documents, which is great if you have a lot of family movies and photos you want to store locally for quick access.

An SDXC card slot is inconveniently located on the bottom front edge of the PC, which makes the slot difficult to access when the Envy Rove 20 is propped up like a monitor. There's a 3.5mm headset port on the right-hand side. A dual-band 802.11n Wi-Fi adaptor is built-in, and the PC has a Gigabit Ethernet dongle that lets you turn one of the USB ports into a fast, wired network connection. There's no optical disc drive but the PC has three USB3 ports, so you shouldn't have any trouble connecting an external DVD or Blu-ray drive. The mouse and keyboard that come with the Envy Rove 20 are wireless and communicate with a receiver built into the PC, so they don't tie up any USB ports.

The mouse and keyboard aren't particularly remarkable,

but both do the job. The mouse is a glossy black curved affair with surprisingly angular edges, but it's not awkward or uncomfortable to use for standard desktop tasks. The keyboard is rather spacious, with a full numeric keypad and plenty of room between its laptop-style keys. The hard edges of the keys take some getting used to, but we were able to touch-type accurately.

PRESS FREEDOM

The keyboard has an extra function key wedged between the Ctrl and Windows keys, which can be used to perform keyboard shortcuts for Windows 8.1. You can, for example, use the function key to open a search bar or cycle between active apps.

The 1,600x900 resolution of the Envy Rove 20's 10-point touchscreen may disappoint those used to 1,920x1,080 Full HD screens, but we had no problem with its resolution in normal use. The screen is excellent. Dark tones are rich and deep, as shown by the black measurement of 0.21cd/m² and contrast ratio of 1,167:1 as measured by our screen calibrator. Colours are accurate, too, with an sRGB gamut coverage of 93.3 per cent. The Envy Rove 20's display certainly looks good, but its glossy coating means you may see unwanted reflections. Sadly, the PC doesn't have a graphics output for connecting an additional monitor, but it supports Intel's WiDi wireless display standard, so you can connect compatible TVs wirelessly.



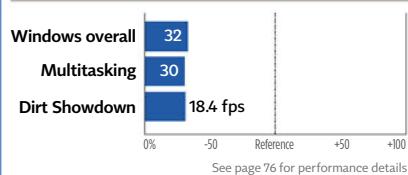
The internal speaker is fairly loud for something built into an all-in-one PC, but it's not great. It produced hardly any bass, and high frequencies sounded harsh and brittle, even during simple acoustic guitar music.

It's no powerhouse, but the HP Envy Rove 20 is a well-balanced family PC. Sadly, at £799 it's at least a couple of hundred pounds too expensive for what it is. This all-in-one PC has a great touchscreen but the performance of a much cheaper laptop. If you want a portable all-in-one PC that you can use anywhere in the home, the Dell XPS 18 (see Group Test, Shopper 311) is lighter and a much better deal.

Kat Orphanides

SPECIFICATIONS

CPU	1.7GHz Intel Core i3-4010U
RAM	4GB
STORAGE	1TB hybrid hard disk
GRAPHICS CARD	Intel HD Graphics 4400
OPTICAL DRIVE	None
DISPLAY	20in widescreen LCD
OPERATING SYSTEM	Windows 8.1
DIMENSIONS	324x508x29mm
POWER CONSUMPTION	0W standby, 22W idle, 54W active
WARRANTY	One-year RTB
PART CODE	20-k000ea
DETAILS	www.hp.co.uk



See page 76 for performance details

ASUS Transformer Book T100TA

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VERDICT

This great-value touchscreen hybrid has a great screen and superb battery life

THE £329 ASUS Transformer Book T100A must be the cheapest hybrid laptop we've seen. At the press of a button the 10.1in screen detaches from its tiny keyboard dock so that you can use it as a tablet. The screen on its own weighs 550g – just 81g heavier than an iPad Air – so it's light enough to hold for long periods, and its rounded edges are comfortable and easy to grip.

With the keyboard dock attached the T100TA is almost twice as heavy, but it's still highly portable. Its glossy plastic chassis feels a little cheap to the touch but is surprisingly tough; we didn't see any flex in the tablet's back panel, for example.

The device doesn't have many ports, with a single USB3 port on the keyboard dock, a microSD card reader, micro USB and HDMI ports and a combined headphone and microphone jack. It has 32GB of storage built in but only 28.2GB was available for use, so



Atom Z3740 isn't ideal for running lots of programs at once, but it still scored an impressive 22 overall in our multimedia benchmarks. It's not far behind the Sandy bridge-based Asus X550C (see Group Test, Shopper 310), which scored 24 overall.

The processor can't cope with 3D games, but less demanding games from the Windows 8 Store should work fine. Titles such as Jetpack Joyride played smoothly, for example.

one of the best displays we've seen on a laptop at this price, and while a lack of shadow detail made it difficult to make out the finer detail in a few night shots, it wasn't enough to detract from the overall quality.

Even more impressive is the T100TA's huge battery life. It lasted a stunning 11 hours and 49 minutes in our light-use battery test, which is only slightly less time than the Microsoft Surface Pro 2's score of 11 hours and 51 minutes. You'll be able to use the T100TA nearly all day without having to return it to the mains. Just be aware that the T100TA takes quite a long time to charge because it's powered by low-voltage Micro USB instead of a normal laptop power adaptor.

With so many outstanding features, the Asus Transformer T100TA has redefined what we should expect from a sub-£350 laptop

Katharine Byrne

you may want to pay more for the 64GB version if you need to store a lot of files. As the T100TA runs the full version of Windows 8.1, you can install any program you like on it, which makes it more versatile than Windows RT devices such as the Microsoft Surface 2 (see Group Test, Shopper 312).

The T100TA also uses one of Intel's latest Baytrail Atom processors, which gives it a huge performance boost over last year's Atom-based tablets. The T100TA's 1.3GHz Intel

dock's small keyboard felt cramped at times but is pleasant to type on once you get used to its size and the spacing of its compact keys. The tiny all-in-one touchpad proved more fiddly. It's fine for moving the cursor across the screen and clicking files and folders, but we found multi-touch gestures such as pinch-zooming difficult to control.

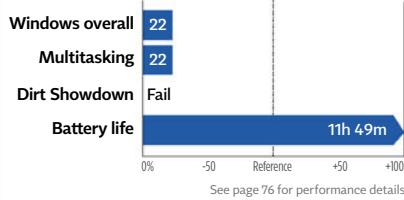
This isn't too much of a problem, though, as the responsive 10-point touchscreen more than makes up for the touchpad. Text and graphics look sharp on the 1,366x768-resolution display, and we had no trouble opening and closing internet tabs or minimising windows by tapping the screen.

We were impressed by the display's image quality, too. It has deep, vibrant colours, and contrast levels are also excellent – we measured a huge contrast ratio of 1,036:1. With this and the screen's wide viewing angles, we were able to see images clearly from almost any position, and our high-contrast test photos were full of detail. It's easily



SPECIFICATIONS

CPU 1.3GHz Intel Atom Z3740
RAM 2GB
STORAGE 32GB
GRAPHICS Intel HD Graphics
OPTICAL DRIVE None
DISPLAY 10.1in widescreen LCD touchscreen (1,366x768)
OPERATING SYSTEM Windows 8.1
DIMENSIONS 24x263x171mm, 1.1kg
POWER CONSUMPTION 1W standby, 6W idle, 9W active
WARRANTY One-year RTB
PART CODE T100TA-DK002H
DETAILS www.asus.com



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VIBOX Tempest



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VERDICT

A powerful graphics card makes this one of the best gaming PCs you can get at this price

THE VIBOX TEMPEST is a gaming PC with an overclocked six-core 4.4GHz AMD FX-6350 processor, a huge 16GB of RAM, a 120GB SSD and a 1TB hard disk. Crucially, the PC is armed with a powerful graphics card in the form of a 2GB AMD Radeon R9 270X.

The stylised front panel won't suit all tastes, but it's attractive in its own way. The system is relatively compact but has enough room inside for a fairly large graphics card.

The AMD Radeon R9 270X graphics card uses the same Pitcairn processor as the older Radeon HD 7870, but performed a little better than its predecessor in our tests. The Tempest produced an average frame rate of 78.2fps in Dirt Showdown and a jerky 19.5fps in our Crysis 3 benchmark at Very High quality. Its Crysis 3 performance was much better with graphics quality set to High, when it produced an average frame

better, the Tempest scored 101 in the multitasking portion of our benchmark suite, which is no doubt helped by the processor's six cores. These scores mean the Tempest has plenty of power, whether you're gaming or using desktop applications.

The processor is fitted into a Gigabyte 990XA-UD3 motherboard, which has a good range of expansion slots including two PCI slots, two PCI-E x1 slots and three PCI-E x16 slots. Only the top PCI-E x16 slot actually runs at x16, though, and if the second slot is in use, both it and the top slot will run at x8 speed, while the third slot runs at x4. One of



swings open for easy access to the front drive bays, which include four 5½in bays and two 3½in bays. Four more internal 3½in bays sit in their own fixed drive cage at the bottom of the chassis. Here you'll also find a 120GB SSD that houses your Windows installation, and a 1TB HDD for data. The motherboard has six SATA3 ports, only two of which are in use, so there's plenty of room to add more internal storage if you need it.

The Vibox Tempest is a fine gaming PC, and it's refreshing to see a capable AMD processor in this kind of system. It's faster in games than the similarly priced Braebro Selene (see Reviews, Shopper 311) and the £809 configuration of the Palicomp Sniper Elite2 Gamer (see Reviews, Shopper 309), but its rivals have better overall application performance. If gaming is all, though, the Tempest is a good buy.

Kat Orphanides

rate of 37fps. Even with graphics quality reduced to High, Crysis 3 still looks fantastic. The AMD Radeon R9 270X has two DVI ports, an HDMI port and a DisplayPort output, so you should have no problem connecting it to your monitor.

The Tempest scored 90 overall in our benchmarks, which is a good score and only 10 points off the score of our reference PC with its Intel Core i5-3570K processor. Even

the PCI-E x1 slots is blocked by the graphics card, but there's a free PCI-E x1 slot above it. One of the PCI slots is occupied by an 802.11n Wi-Fi adaptor, which is handy if you don't want to use a wired Ethernet connection or tie up a USB port with a Wi-Fi dongle.

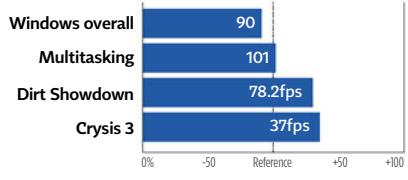
The motherboard provides a Gigabit Ethernet port on the back panel, as well as 3.5mm ports for up to 7.1 analogue surround sound, an optical S/PDIF output, a PS/2 port for a mouse or keyboard and, unusually, a FireWire port. Ten USB ports on the back panel provide plenty of connectivity, but only two are USB3 ports. Sadly, you lose one USB3 port to a pass-through cable that hooks up the front panel USB3 port. Even though there's an unused USB3 header on the board, the front-panel connectors aren't equipped to use it. There are also two standard USB ports on the Tempest's front panel, as well as an SDXC and MMC card reader and audio ports.

A porthole-shaped display provides information about the PC's temperature, uptime and fan speed. The front panel



SPECIFICATIONS

CPU	4.4GHz AMD FX-6350
RAM	16GB
STORAGE	120GB SSD + 1TB hard disk
GRAPHICS CARD	2GB AMD Radeon R9 270X
OPTICAL DRIVE	DVD+/-RW +/-DL
OPERATING SYSTEM	Windows 8.1
DIMENSIONS	460x195x482mm
POWER CONSUMPTION	3W standby, 77W idle, 226W active
WARRANTY	One-year RTB
PART CODE	Tempest
DETAILS	www.vibox.co.uk



See page 76 for performance details

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CHILLBLAST Defiant Mini

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BEST BUY**★★★★★**£899 inc VAT • from www.chillblast.com**VERDICT**

A great value and powerful gaming laptop in an attractive 13in chassis

WE'VE REVIEWED MANY Chillblast PCs, but this is the first gaming laptop we've seen from this largely PC-based system builder. The Defiant Mini makes a great first impression, though, as this 13in laptop not only has one of the best off-the-shelf Clevo cases we've ever seen, with its soft-touch lid and angular design, but its internal components also pack a serious punch.

Our review sample had a 2.4GHz Intel Core i7-4700MQ processor, which can increase its clock speed to 3.4GHz when the processor is cool enough, and 8GB of RAM. These components powered the Defiant Mini to an impressive overall score of 85 in our multimedia benchmarks. This puts it just six points behind the larger, similarly priced Scan 3XS Graphite LG155, and is a good score for a desktop PC, never mind a laptop.

The laptop's 2GB Nvidia GeForce GTX 765M graphics processor was even more impressive, producing a smooth average frame rate of 90.3fps in Dirt Showdown at a resolution of 1,280x720 with graphics quality set to High. The GeForce GTX 765M is one of the most capable dedicated graphics processors we've ever used, and although its fans were working hard, that didn't stop it producing an excellent 67.9fps at 1,920x1,080 resolution and High graphics quality.

In our much more challenging Crysis 3 benchmark the laptop produced an average frame rate of 20.5fps at 1,920x1,080 with graphics set to High quality. That's not smooth enough to play the game properly, but reducing the quality to Low produced a smoother 28.2fps. It's outstanding performance for a 13in laptop, although you'll want to keep your hand away from the vents on the left-hand side as they get very warm.

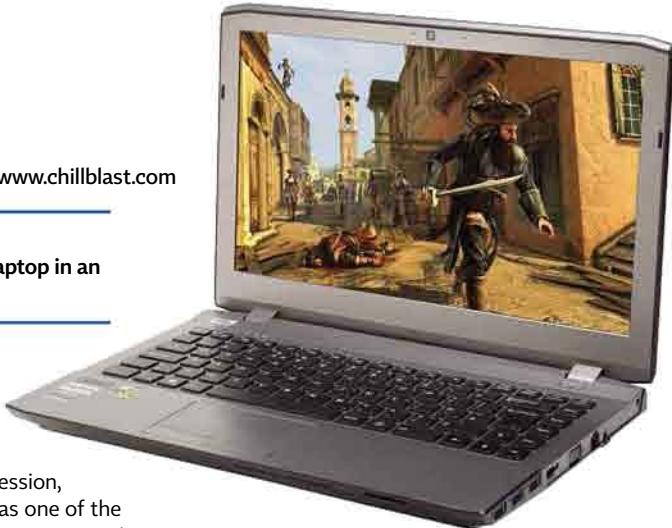
Happily, the Defiant Mini is great for everyday tasks, too. Its keyboard is very comfortable to type on and although its springy mechanical keys are a little noisy, they give plenty of tactile feedback.

CRUDE GESTURES

We'd recommend connecting a mouse if you'll use the laptop for long periods, though, because we didn't like the Defiant Mini's touchpad at all. We had great trouble performing multi-touch gestures such as two-finger scrolling and pinch-zooming, although Windows 8 gestures worked fine.

The Defiant Mini has a good selection of ports for such a small laptop, including one USB2 and three USB3 ports. It also has HDMI and VGA video outputs, an SD and MMC card reader, a Gigabit Ethernet port and separate headphone and microphone jacks.

We like the 13.3in screen, too. With an sRGB colour gamut coverage of 85.5 per cent, reds,



greens and blues looked rich and vibrant, and whites were bright and clean with no trace of grey. Blacks were deep and inky, too, despite the screen's somewhat average black level reading of 0.37cd/m², and we didn't see any backlight bleed.

The screen's contrast levels were a little less impressive. Even though we measured a promising contrast ratio of 914:1, finer shadow detail was lost in our high-contrast test photos. Night scenes suffered the most, with areas of shadow appearing as solid black, so make sure you adjust the in-game contrast settings if you want to help illuminate dark environments when playing games.

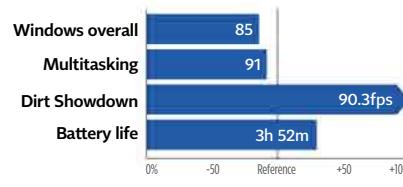
DRAIN TIMETABLE

Battery life was also fairly average for a gaming laptop, as the Defiant Mini's battery lasted just three hours and 52 minutes in our light-use test with the screen set to half brightness. This is to be expected from such a power-hungry system.

With its powerful hardware and highly capable graphics processor, the Chillblast Defiant Mini is a superb gaming laptop. It not only manages to combine the speed and power of larger gaming systems into a smaller 13in chassis, but it does so at a competitive price. The Defiant Mini is a great value laptop and wins a Best Buy award.

*Katharine Byrne***SPECIFICATIONS**

- CPU 2.4GHz Intel Core i7-4700MQ
- RAM 8GB
- STORAGE 1TB hard disk
- GRAPHICS Nvidia GeForce GTX 765M
- OPTICAL DRIVE None
- DISPLAY 13.3in widescreen LCD (1,920x1,080)
- OPERATING SYSTEM Windows 8.1
- DIMENSIONS 32x330x227mm, 2.1kg
- POWER CONSUMPTION 0W standby, 30W idle, 115W active
- WARRANTY Two-year collect and return
- PART CODE Defiant Mini
- DETAILS www.chillblast.com



See page 76 for performance details

TOSHIBA Satellite P50t-10U



£999 inc VAT • From www.isme.com

VERDICT

A powerful laptop with great battery life, but its dim display and sub-par image quality disappoint

TOSHIBA'S SATELLITE P50T-10U is an attractive laptop with a quad-core 2.4GHz Intel Core i7-4700MQ processor that can Turbo Boost up to 3.4GHz when temperatures allow, and a huge 16GB of RAM. The Core i7-4700MQ is a powerful processor that should be able to handle the most demanding applications. However, we were still a little disappointed that the P50t-10U scored just 78 overall in our multimedia benchmarks.

An overall score of 78 is still good for a mobile processor, but we've seen this chip perform a lot better in other laptops such as the award-winning MSI GE60 (see *Reviews, Shopper 307*) and Scan 3XS Graphite LG155 (see *Reviews, Shopper 309*), both of which produced scores above 90 overall.

More surprising is the P50t-10U's outstanding battery life. Very powerful laptops rarely last beyond four hours in our tests, but the P50t-10U lasted six hours and 48 minutes in our light-use benchmark. This is one of the best battery results we've seen from a quad-core laptop, although more intensive tasks will drain the battery faster.

The P50t-10U is also a capable gaming laptop thanks to its 2GB Nvidia GeForce 740M graphics processor. It produced a respectable average frame rate of 43.9fps in our *Dirt Showdown* test at a 1,280x720-pixel resolution with graphics quality set to High.

In the same test at the screen's native 1,920x1,080 resolution, the laptop produced a comfortably smooth 59.5fps with Low quality graphics and anti-aliasing disabled. The P50t-10U isn't designed to be a gaming laptop, but these results show that you can certainly enjoy some fairly recent 3D games as long as you're willing to reduce the graphics quality.

The 15.6in touchscreen made a good first impression. It was a little dimmer than we'd like, but its 10-point touchscreen is quick and



responsive, and we were able to open and close internet tabs with ease.

Unfortunately, the overall image quality left a lot to be desired. Our colour calibrator showed that the screen was displaying 72.8 per cent of the sRGB colour gamut. This is average compared with other laptop screens we've tested, but we'd expect to see deeper, richer colours on a laptop at this price. We also recorded a black level reading of 0.55cd/m², which is reasonably deep, but blacks looked a little grey overall next to the

an external display, an HDMI output that supports Ultra HD resolutions, a multifunction card reader, a Gigabit Ethernet port, separate headphone and microphone jacks and a DVD optical drive. The P50t-10U also has a set of Harmon Kardon speakers built in. With plenty of bass and volume on offer, they're certainly above par for laptop speakers, although they won't replace a dedicated sound system.

“The P50t-10U is a capable gaming laptop thanks to its 2GB Nvidia GeForce 740M graphics processor”

laptop's glossy black screen bezel.

The screen's biggest problem is its poor viewing angles. At a normal working angle, the lower part of the screen was much lighter than the top, which had a huge impact on colour uniformity across the screen. We had to tilt the screen back beyond our usual working angle to improve the image, but even then it wasn't perfect. The narrow viewing angles also made detail difficult to see in our high-contrast test photos. The low contrast ratio of 358:1 certainly didn't help, but we still struggled to pick out fine shadow detail, even when we found a good angle.

At least the P50t-10U is very comfortable to use for everyday tasks. The full-size keyboard provides a good level of feedback when typing, despite a worrying amount of flex in the keyboard tray, and there's enough room for a numeric keypad too. The large all-in-one touchpad is also very responsive and we had no trouble at all using it to navigate through files on our desktop.

One advantage of the laptop's large size is that there is a plentiful supply of connection ports. It has four USB ports, two of which are USB3, a VGA output for connecting



SPECIFICATIONS

CPU 2.4GHz Intel Core i7-4700MQ

RAM 16GB

STORAGE 1TB hard disk

GRAPHICS Nvidia GeForce GT 740M

OPTICAL DRIVE DVD+/-RW +/-DL, DVD-RAM

DISPLAY 15.6in widescreen LCD touchscreen (1,920x1,080)

OPERATING SYSTEM Windows 8

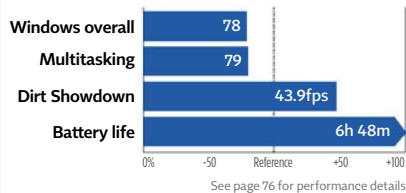
DIMENSIONS 30x377x244mm, 2.6kg

POWER CONSUMPTION 1W standby, 9W idle, 53W active

WARRANTY One-year collect and return

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DETAILS www.toshiba.co.uk



See page 76 for performance details

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HTC One Max



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VERDICT

Great screen, but the phone's performance and camera could be better

A CURRENT TREND for smartphone manufacturers is to take their latest high-end model and make it larger, perhaps with extras such as a stylus. With the One Max, HTC seems simply to have made a bigger, more expensive HTC One.

The One Max certainly looks similar to the smaller model. However, while the HTC One has a unibody design that doesn't open, the One Max has a removable aluminium rear cover. Strangely, you still can't replace the battery, as the cover just gives access to the microSD card and SIM slots. This means you lose the neatness of a unibody design without gaining the flexibility of being able to replace the battery, which is a pity. You wouldn't need to carry a spare, though, as the One Max lasted for a huge 15 hours 45 minutes in our video battery rundown test, but it will limit the handset's useful lifespan.

Nestled under the camera at the rear is a fingerprint reader. This works differently to the reader built into the iPhone 5S, which can unlock the phone and authorise purchases from the App Store. The One Max's reader can learn up to three different fingerprints, and you can use them to unlock the phone, or unlock it and launch an app. We found the fingerprint reader's position on the back of the phone less convenient than that of the iPhone 5, which is on the front, but it's still a more secure way of unlocking a phone than using a passcode or unlock pattern.

TO THE MAX

The One and the One Max have the same core components, with quad-core Qualcomm Snapdragon 600 processors running at 1.7GHz and 2GB of RAM. This offers performance that, while strong for early 2013, now looks decidedly mid-range. The One Max completed the SunSpider JavaScript benchmark in 1,182ms, which compares poorly with the 706ms of Google's Nexus 5 (see Reviews, Shopper 312).

Sadly, the One Max couldn't run Android 4.3 with the same effortless smoothness we've seen on Snapdragon 800 smartphones. The animation when opening the app tray is slightly jerky, for example.



In the 3DMark benchmark, the One managed 6,928 in the Extreme test, which is low compared with the Xperia Z Ultra's 17,899. The One Max is still significantly quicker than the cheaper Galaxy Mega (see Reviews, Shopper 309), which scored just 2,782 in the same test. We certainly noticed the One Max's slower 3D performance in games. Real Racing 3 was noticeably less smooth than it was on a Google Nexus 5, for example.

We're fans of the HTC One Max's Full HD LCD screen. The resolution works well on such a big screen, making headlines, standfirs and captions on web pages easy to read when zoomed out. This is also possible on 5in 1080p displays, and even on the 1,280x720 display of the Galaxy Mega, but it's easier on the One Max. We liked the display's colour balance best at maximum brightness, as it was slightly too cool at lower levels.

Compared with the Google Nexus 5's screen, the One Max's has purer whites, with none of the Nexus 5's slight yellow tinge.

The large display is great for watching films, and the forward-facing stereo speakers are loud and good, so you don't necessarily have to use headphones. We enjoyed watching YouTube clips of stand-up comedy shows, but the lack of bass and thin mid-range means the speakers aren't best suited to music.

BROKEN RESOLUTION

The One Max has a 4-megapixel camera, which is far fewer pixels than the 8- or 12-megapixels we usually see on modern smartphones. When HTC launched the One,

it claimed that the sensor uses what it calls Ultrapixels, which are bigger than typical smartphone sensor pixels and capture more light, helping the camera perform better in low light.

The One Max certainly takes impressive low-light shots, with more detail and less noise than we'd expect. However, we weren't impressed with its daylight images, which were well exposed but lacked detail. They were far below the standard we expect from even a budget smartphone. The One Max is a phone to avoid if you're even vaguely serious about photo quality.

Whether or not you want such a big phone is a matter



of personal taste. With a 6in smartphone you really don't need a tablet, as it's perfectly big enough for casual web browsing. However, the One Max did poke out of our jeans pocket, and we often couldn't sit comfortably unless we removed it. The One Max isn't particularly comfortable to hold for long phone calls, either, and using the touchscreen one handed isn't really practical.

The HTC One Max is a reasonably impressive example of a super-sized smartphone. We like the design, the screen and the battery life, but the phone's performance doesn't match its premium price, and the camera is substandard. We'd be tempted to save some money and buy a Samsung Galaxy Mega instead. However, the Samsung Galaxy Note 3 is still king of the monster phones.

Chris Finnmore

SPECIFICATIONS

OPERATING SYSTEM	Android 4.3
PROCESSOR SPEED	1.7GHz
NUMBER OF CORES	4
RAM	2GB
MOBILE DATA	4G
DISPLAY	5.9in 1,920x1,080 LCD
CAMERA	4-megapixel
INTERNAL STORAGE	16,384MB
MEMORY CARD SLOT	microSD
CLAIMED BATTERY LIFE	28 hours talktime, 24 days standby
DIMENSIONS	165x83x10.3mm, 217g
PART CODE	HTC One Max
DETAILS	www.htc.com



See page 76 for performance details

NOKIA Lumia 2520



£399 inc VAT • From www.johnlewis.com

VERDICT

4G is fantastic if you need it, but Windows RT is still a stumbling block

THE NOKIA LUMIA 2520 is a Windows RT tablet that's available in a range of colours, which gives the device more personality than many tablets. At 615g it's slightly lighter than Microsoft's Surface 2 (see *Group Test, Shopper 312*), but both tablets are 8.9mm thick.

The rounded edges of the Lumia 2520 may be comfortable to hold, but they don't leave much room for connectivity. The power and volume controls are on the top edge, while the 3.5mm audio and proprietary power sockets are on the left-hand side. Its Micro HDMI port is a welcome inclusion, as it lets you connect the tablet to a TV or monitor. The Lumia 2520 even has a USB3 micro B port, but you'll need a cable to connect flash drives and cameras.

Bluetooth and Wi-Fi are standard inclusions, but near-field communication (NFC) is less common on tablets. With NFC the Lumia 2520 can stream photos and videos from a Lumia smartphone with a tap, or pair with Nokia's Purity Pro wireless headset.

“The Lumia 2520 lasted an impeccable 14 hours 53 minutes in our video rundown test”

Perhaps the Lumia 2520's best features are its SIM card slot and 4G LTE modem. These are great if you need fast internet access on the move.

The rear camera has a 6.7-megapixel sensor. However, the Windows RT camera app is disappointingly basic, so it's good to see that Nokia has added its own app with extra features such as ISO, exposure and shutter speed control. Sadly, image quality is average. Tap to focus works well in bright light, but as soon as the light begins to drop it struggles to maintain sharpness and loses detail.

The Lumia 2520 might not impress with the quality of its own photos, but the 10.1in, Full HD screen makes other images look superb. Colours are vibrant and viewing angles are exceptional, so even though the 1,920x1,080 display can't match the iPad Air for sheer number of pixels, it looks gorgeous for everyday tasks such as web browsing and watching videos. Nokia's ClearBlack screen technology helps contrast significantly, and

we were able to pick out the details in dark images even under bright light, although the screen coating attracts fingerprints like no other tablet we've seen.

Inside the device is a Qualcomm Snapdragon 800 chipset with four 2.2GHz cores. It's certainly fast and makes Windows RT feel smooth. The Surface 2's Nvidia Tegra 4 chip might compete with the Lumia 2520 for raw performance, but we found that apps loaded slightly faster on the Lumia 2520 and everything felt a little more responsive.

The Lumia 2520 completed the SunSpider JavaScript test in 502ms, putting it behind the Surface 2, which completed the test in



10in tablet, though, outlasting Apple's iPad Air by more than two hours.

Our major concern is the operating system. Windows RT has improved a lot since the recent Windows 8.1 update, but it still lacks many of the apps we take for granted on a tablet. In particular, multimedia apps such as LoveFilm, ITV Player and Twitch TV were missing at the time of writing.

Considering Microsoft's focus on gaming with the excellent Smartglass app, there's little other support for gaming apps such as Battlefield Battlelog or Call of Duty Elite. It's also worth noting that you can't install desktop Windows apps, which means you're completely reliant on the Windows Store.

At least you get Office RT, which includes Word, Excel, PowerPoint and Outlook and makes the tablet ideal if you need an inexpensive work machine. Office RT has far more features than QuickOffice for Android or the many iOS productivity apps, but Office hasn't been redesigned to suit a touchscreen. The high-resolution display makes it tricky to tap icons and use menus accurately.

If you want a portable device purely for web browsing and Microsoft Office, the Lumia 2520 is a good buy. The Surface 2 is cheaper, but we think the extra cost is justified given the Lumia 2520's integrated 4G, faster processor and better battery life. If you're willing to give Windows RT a chance, the Lumia 2520 is the best device to try it on.

Tom Morgan



SPECIFICATIONS

CPU 2.2GHz Qualcomm Snapdragon 800

RAM 2GB

STORAGE 32GB

GRAPHICS Qualcomm Adreno 330

DISPLAY 10.1in widescreen LCD touchscreen (1,920x1,080)

OPERATING SYSTEM Windows RT

DIMENSIONS 267x168x8.9mm, 615g

WARRANTY One-year RTB

PART CODE Lumia 2520

DETAILS www.nokia.co.uk



See page 76 for performance details

HTC Desire 500



£210 inc VAT SIM-free, free on £17-per-month contract •
From www.handtec.co.uk (SIM-free), www.mobiles.co.uk (contract)

VERDICT

A good-looking phone that can't quite stand up to some extremely strong competition

THE GREAT-VALUE Motorola Moto G (see Reviews, Shopper 312) has thoroughly disrupted the budget smartphone market, so any new budget handset will have to be pretty special to impress potential buyers. We liked the Budget Buy-winning Desire X, so we were hopeful that the 500 would also be a wallet-friendly champion.

Our first impressions were good, as the Desire 500 is slim and looks great. Despite its high-end looks, however, its specification is more modest. The screen is an 800x480-pixel display, with a lower resolution than the Moto G's 1,280x720 display. Android looks fine at this resolution but it isn't ideal for desktop-mode web pages. Headlines are fairly easy to read but you'll have to zoom in to decipher smaller text. The display is reasonable, with clean whites and no colour tint, but it's not particularly inspiring. Most text is grey rather than black, and colours lack punch.

The Desire 500 has a 1.2GHz quad-core processor, which is standard for the price, and 1GB of RAM, which is the least we'd expect. Its performance is generally reasonable. The Desire 500 isn't quite as slick as the Moto G when going back and forth to the app tray, possibly due to some overhead from HTC's Sense interface, but it's perfectly usable.

WEB CRAWLER

We noticed that the Chrome browser worked more slowly than the default HTC web browser when displaying desktop-mode web pages, with a significant delay between swiping the screen and the phone responding. The default HTC browser showed no such problems. The phone completed the SunSpider JavaScript benchmark in 1,790ms, which is fine for an inexpensive handset, but this was significantly slower than the Moto G's 1,410ms. However, there was little to choose between the two phones' web browsing performance in use.

We had less luck testing the phone's 3D performance, though, as 3DMark refused to run all its tests. The Desire 500 ran Real Racing 3 smoothly but the game had reduced its resolution and detail settings and was no longer

particularly pretty. The Desire 500 isn't the phone to choose if you want to enjoy fancy graphical effects in the latest Android titles.

HTC has made extensive modifications to the Android interface. The most obvious change is Blink Feed, which first appeared on the HTC One. It's a tiled feed on one of your home screens that shows updates from news sources of your choice, as well as your social networks. If you love to keep up with current affairs and your contacts, you could find it useful, but the sources you can choose are limited. You can choose from Reuters, The Financial Times, the Guardian and The Independent, as well as some design blogs, a couple of sports sites and three tech sites. As for social networking, Blink Feed supports Facebook, Flickr, LinkedIn and Twitter, but you're out of luck if you use Google+. If you don't like Blink Feed you can set a standard Android home screen as your default.

You may find other design decisions more obtrusive. The apps in the app tray, for example, are widely spaced, which leaves room for only nine apps on a screen, rather than 16 on most Android phones with this display resolution. You may find yourself doing a lot of flicking through app screens if you have many programs installed.

NOT JUST A PRETTY INTERFACE

Generally, though, HTC's interface is prettier than the stock Android 4.1.2 underpinning it, so we don't have a problem with the software tweaks. The main problem with the software is how much space it seems to occupy. After a factory reset, only 0.9GB of the phone's 4GB storage is free for apps and files. You'll definitely need to buy a microSD card and install bigger apps to it.

Sadly, a couple of mapping problems cropped up during our tests. The Desire 500 has a weak GPS receiver that often lost its signal when we were driving. The Motorola Moto G could acquire a signal indoors when next to a window, but not the Desire 500. The other problem was the apparent lack of a compass. This is a significant loss when navigating around a city, such as when you emerge from a station and need to know which way to turn. We had to walk a few yards and see in



which direction the blob on the map moved, and definitely missed the reassuring direction arrow in Google Maps.

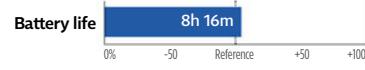
The 8-megapixel camera is reasonably good. Low-light shots had little noise and plenty of detail considering the phone's price, but daylight shots were trickier to judge. On one hand they were sharp and detailed with not much noise, and we were impressed by the camera's ability to capture colours accurately. On the other hand photos were overexposed, with light areas blowing out and no detail in the sky. Overexposure is typical of smartphone cameras, and despite this the Desire 500's camera remains above average.

Apart from the lack of a compass, we like the HTC Desire 500. It's a great-looking phone with a reasonable screen, good camera and acceptable performance. However, it struggles to compete with the cheaper Motorola Moto G, which has a better screen, similar performance and more storage space.

Chris Finnmore

SPECIFICATIONS

OPERATING SYSTEM	Android 4.1.2 (JellyBean)
PROCESSOR SPEED	1.2GHz
NUMBER OF CORES	4
RAM	1GB
MOBILE DATA	GPRS, EDGE, 3G
DISPLAY	4.3in 800x480 LCD
CAMERA	8-megapixel
INTERNAL STORAGE	4GB
MEMORY CARD SLOT	microSD
CLAIMED BATTERY LIFE	12 hours talktime, 18 days standby
DIMENSIONS	132x67x10mm, 123g
PART CODE	Desire 500
DETAILS	www.htc.com



See page 76 for performance details

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PANASONIC

Lumix DMC-GM1

COMPUTER SHOPPER

★★★★★

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VERDICT

The smallest CSC to date and one of the best, too

THE PANASONIC LUMIX DMC-GM1 is tiny, measuring 58mm from its LCD screen to its lens cap, and it weighs 279g, which is a full 236g less than the DMC-GX7. Given the DMC-GM1's interchangeable lens mount, its petite design is a phenomenal achievement. Crucially, the DMC-GM1 is the first compact system camera (CSC) with a zoom lens that will fit in many trouser pockets.

This extra portability is partly down to the new kit lens, which weighs 70g and extends just 24mm from the lens mount. The kit lens has a 2.7x maximum zoom and a 24-64mm (equivalent) range. It's good to have a 24mm wide-angle setting, as many kit lenses have a 28mm (equivalent) minimum focal length. Sadly, there's no focus ring, so you must adjust focus on the camera.

REET PETITE

The DMC-GM1's body couldn't conceivably be any smaller. The lens mount covers the entire height of the camera and the 3in touchscreen virtually fills the back, save for a smattering of

Amazingly, Panasonic has still found room for a pop-up flash and mode dial on top of the camera. There's even a switch for single autofocus, continuous autofocus and manual focus settings. We suspect most people would rather have a dial for drive mode or exposure compensation, but this is welcome nonetheless.

The DMC-GM1 has an impressive set of Wi-Fi features, with wireless transfers and comprehensive remote control via iOS and Android apps. Sadly, the DMC-GM1 doesn't have NFC for touch-and-go pairing, but it isn't much of a chore to connect to your mobile device by pressing buttons.

The DMC-GM1 was quick to take photos, capturing its first shot within a second of being switched on. It focused in 200ms and captured a shot every half a second for JPEGs and Raw. The camera shot continuously at 4.8fps with fixed focus, and managed an impressive 4.2fps with continuous autofocus.



Lightroom 5 gave a boost to details and let us recover blown-out shadows and highlights.

Noise at fast ISO speeds was marginally higher than from the best CSCs at this price, such as the Fujifilm X-M1 (see Reviews, Shopper 311). Still, with usable results up to ISO 6400, the GM1 delivered the goods for typical indoor shooting challenges.

The main benefit of a CSC is to deliver SLR quality in a smaller package. To that end, the GM1 represents a major milestone with its petite dimensions. The fact that image quality, video quality and performance show no signs of compromise is even more impressive.

RIVAL INTEREST

There are lots of great CSCs at this price, but the DMC-GM1's closest rival is probably the Sony Cyber-shot DSC-RX100 II (see Reviews, Shopper 311). The DSC-RX100 II's sensor has only half the surface area, but its lens is four times brighter for wide-angle shots and remains over twice as bright when zoomed in. This means the DSC-RX100 II and DMC-GM1 are roughly equal for image quality. The DMC-GM1 is faster in normal use and its videos are sharper, but the DSC-RX100 II has longer battery life, an articulated screen and a hotshoe, and it's even slimmer. However, it's the DMC-GM1's interchangeable lenses that bring it out on top. The fact that other lenses are a bit big for the camera is a setback, but it doesn't dampen our enthusiasm for this tiny camera.

Ben Pitt

SPECIFICATIONS

SENSOR SIZE 16 megapixels (4,592x3,448)

ZOOM 2.7x optical (24-64mm)

LCD 3in (1,036,000 pixels)

STORAGE (INTERNAL) SDXC card (none)

BATTERY Li-ion

DIMENSIONS 58x99x58mm, 279g

WARRANTY One-year RTB

PART CODE DMC-GM1K-EB-K

DETAILS www.panasonic.com/uk

Battery life 230 shots



See page 76 for performance details



PICTURE THIS

As for the DMC-GM1's image quality, colours were lifelike, with expertly chosen automatic settings and impeccable autofocus performance. Details in JPEGs were crisp and smooth, and the lens performed superbly into the corners of frames. Processing Raw shots in

CANON

PowerShot G16



£477 inc VAT • From www.wexphotographic.com

VERDICT

Superb controls and competitive image quality among increasingly stiff competition

CANON'S G-SERIES cameras have provided discerning photographers with pocket-sized cameras for over a decade. With their optical viewfinders, hotshoes and plentiful supply of buttons and dials, G-Series models make SLR users feel right at home. However, the PowerShot G16's 12-megapixel $1\frac{1}{17}$ in sensor looks small, especially considering that the new wave of compact system cameras (CSCs) have sensors between three and nine times bigger (by surface area). Can the G16 compete on image quality?

AT THE CONTROLS

We can't fault the PowerShot G16's controls. There's a command dial and rear wheel to adjust settings, a mode dial and another dial for exposure compensation. Labelled buttons cover ISO speed, focus mode and exposure lock duties, and there's a customisable button that we assigned to a one-touch manual white balance control. Other functions, including

293). It's great to have an optical viewfinder, but it'd be even better if the view was bigger and less blurry. Looking through it involved perching an eyebrow on the hotshoe, which wasn't the most comfortable experience.

The PowerShot G16 has Wi-Fi built in, but it's a simple implementation. Photos and videos can be browsed and copied using the iOS and Android apps, and there's an option to use a phone's GPS radio to geo-tag photos. The camera can't transfer Raw files to the app, though, and there's no remote control function.

The G16 switched on and captured a shot in 1.7 seconds, and took the same time between subsequent shots, which isn't a blistering performance. Bizarrely, it performed better in Raw mode, capturing a shot every second.

When used in continuous mode, the G16 captured JPEGs at an incredible 10fps for over 50 frames before it slowed slightly. Only the



Given that there are cameras with bigger sensors and similar prices that are also pretty compact, we feared that the G16's noise levels would be a lot higher for a given ISO speed. However, its brighter lens means there's no need to worry. When we set the Panasonic Lumix DMC-GM1 (opposite) and the G16 to the same $1/20$ s shutter speed in low light, the G16's wider aperture meant it could use ISO speeds that were around four times lower. Image quality from both cameras was remarkably similar, and we struggled to pick a winner.

As for video, the PowerShot G16 lets you record videos at a resolution of 1,920x1,080 at 30 or 60fps, and our test footage was packed with crisp details. Noise reduction kept low-light shots looking clean without reducing detail levels too much. Autofocus sometimes wandered off track, but on the whole the camera performed well.

QUALITY COMPARISON

Ultimately, there's not a huge amount of difference in image quality between the Canon PowerShot G16 and the Lumix DMC-GM1. If money were no object, we'd go for the Lumix DMC-GM1 CSC because of the flexibility afforded by its interchangeable lenses. However, the PowerShot G16 beats the DMC-GM1 for physical controls, and it includes a viewfinder. If these features are more important to you than interchangeable lenses, you should go for the G16.

Ben Pitt

drive mode, JPEG and Raw settings and the integrated ND filter, are neatly organised in the quick-access menu, which can be customised to hide any settings you don't need.

Beyond these controls, the ergonomics are more mixed. At 356g, the G16 is relatively heavy for a compact camera, but it feels reassuringly solid and sits comfortably in the hand. The 3in, 922,000-dot screen is sharp, but we wish it had the articulated design of the PowerShot G1X (see Reviews, Shopper

Canon S120 (see Reviews, Shopper 312) matches this performance. As with the S120, the G16 can also shoot at around 5fps with continuous autofocus. However, the camera drifted in and out of focus, and only a small percentage of photos were sharp. The G16's continuous mode is impressive, but we'd have preferred a slower continuous mode that delivered more consistent results.

PHOTO FINISH

Photo quality makes or breaks a camera such as this and in this respect, the G16 does well. Automatic exposures were well judged, with colours that struck a balance between flattery and accuracy. Details weren't quite as precise as from the similar Nikon P7800 (see page 42), both for JPEG and Raw output, but in most instances the difference was negligible. This is

most noticeable towards the edges of frames, with the P7800 delivering clear focus and the G16's output looking fuzzy in comparison.

However, the G16 took a narrow lead in low light, with less intrusive noise-reduction artefacts.



SPECIFICATIONS

SENSOR SIZE 12 megapixels (4,000x3,000)

ZOOM 5x optical (28-140mm)

LCD 3in (922,000 pixels)

STORAGE (INTERNAL) SDXC card (none)

BATTERY Li-ion

DIMENSIONS 78x109x40mm, 356g

WARRANTY One-year RTB

PART CODE 8406B012AA

DETAILS www.canon.co.uk

Battery life 360 shots



See page 76 for performance details

NIKON Coolpix P7800



£450 inc VAT • From www.johnlewis.com

VERDICT

Beautiful photos and sublime ergonomics, but the P7800's performance lets it down

THE NIKON COOLPIX P7800 is a premium compact camera with a 12-megapixel sensor, hotshoe, electronic viewfinder (EVF) and plenty of buttons and dials. However, it could never be described as svelte. Weighing 406g, standing 80mm tall and measuring 56mm from the back of its viewfinder to its lens cap, this is a camera that's more comfortable hanging from its neck strap than stuffed into a pocket. We can imagine taking it for a long hike, but not on a night out.

ELECTRONIC MUSINGS

Optical viewfinders are common on this type of camera, but Nikon has plumped for an electronic viewfinder (EVF) on the P7800. Both types have their merits, but we prefer the P7800 viewfinder's crisp 921,000-dot (640x480-pixel) image to the small, blurry optical viewfinder on the Canon PowerShot G16 (see page 41). As the viewfinder is

only two of the three are active at the same time, depending on the exposure mode. Holding down the Fn1 button beside the lens reassigns the command dials and rear wheel to alternate, customisable roles. We quickly got used to the system, which worked particularly well when using the EVF.

Certain functions aren't so accessible. A quick-access menu groups together various functions, including white balance, bracketing options and metering, but it's unresponsive to user input and slow to navigate. Oddly, the main menu is more responsive. Whichever menu you use, manual white balance calibration is slower than it needs to be. The P7800 also seemed lethargic when browsing photos.

It's not that quick at taking photos, either. The P7800 switches on and shoots in 1.1 seconds,

“This is a camera that's more comfortable hanging from its neck strap than stuffed into a pocket”

electronic, it can show menus and information such as a histogram and the selected autofocus area. It's not the biggest EVF around, but it's a big improvement on the 200,000-dot EVFs found on some bridge cameras.

The 3in LCD screen has the same 921,000-dot resolution, and is articulated at the side so that it can point in virtually any direction, including forwards for self-portraits. It's a shame there's no eye-level sensor to switch between the two screens automatically, though. There's a button to switch manually, but it takes over a second to respond.

Thanks to the P7800's five dials and 14 buttons, adjusting settings is a highly tactile experience. The P7800 has dual command dials and an exposure compensation dial, but

which is a solid result, but 1.9 seconds between shots is slower than we'd expect from a camera at this price. The autofocus seems largely to blame, taking around 0.5 seconds in favourable conditions and sometimes more than two seconds to focus in low light. Continuous capture was at a healthy 6fps but lasted only for six frames. At least the camera was ready to go again after five seconds. There are 4fps and 1fps modes, too, but none includes a live preview, so there's little hope of tracking moving subjects. Raw performance was worse, with the camera managing a shot every 5.6 seconds in normal use. Continuous Raw mode delivered six frames at 3fps, but took 24 seconds to save them, despite using a fast SDHC card.

Photo quality is this camera's saving grace. Details in brightly lit shots were impeccably sharp and smooth, with no hint of noise.

Focus was sharp right into the corners of frames, too.

Comparing JPEG and Raw versions of the same shot, it's clear that Nikon is using digital processing to eliminate chromatic aberrations, and it's doing an extremely good job.

Noise levels were good rather than excellent for a given ISO speed. We'd use ISO 1600 at a push, but faster speeds are only really suitable for sharing at small sizes.



However, the wide-aperture lens helps to keep the ISO speed down. The camera's f/2 maximum aperture for wide-angle shots and f/4 aperture for telephoto aren't as bright as those of various competing cameras that use the same 1/1.7in sensor size. However, many cameras provide smaller zoom ranges than the P7800's 28-200mm (7.1x) range.

Video quality can't quite live up to the standard of the P7800's photos. Clips looked decent enough in isolation, but comparisons with the Panasonic Lumix DMC-G16 made details in the P7800's videos look coarse, and diagonal lines had a pixelated appearance. The P7800 struggled in low light, with a constant fizz of noise in shadier parts of the frame. This is a shame, as the camera is well specified for video, with a choice of automatic, aperture-priority or manual exposure modes, clips up to 29 minutes and an external mic input. The articulated screen is a great asset for video, too.

COMPETITION RULES

The big problem for Nikon is the strength of the competition. There are some outstanding compact system cameras (CSCs) available for around the same price, such as the Panasonic Lumix DMC-GF6 (see Reviews, Shopper 310). Still, the DMC-GF6 can't match the P7800 for sheer number of controls, and the P7800's electronic viewfinder and fully articulated screen make it a solid choice for landscape photographers who value manual control and a generous zoom range.

Ben Pitt



SPECIFICATIONS

SENSOR SIZE 12 megapixels (4,000x3,000)

ZOOM 7.1x optical (28-200mm)

LCD 3in (921,000 pixels)

STORAGE (INTERNAL) SDXC card (86MB internal)

BATTERY Li-ion

DIMENSIONS 80x127x56mm, 406g

WARRANTY One-year RTB

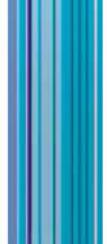
PART CODE VNA670E1

DETAILS www.europe-nikon.com

Battery life 350 shots



See page 76 for performance details



i2369Vm

New milestone in IPS display technology

This 58.4 cm (23") Full HD model sets a new milestone in IPS display technology. It boasts a great design and offers extensive connectivity options, such as D-Sub, two HDMI connectors and a DisplayPort. Its practical MHL interface even allows you to directly hook up your Android mobile devices to the monitor. IPS is known for vivid colours as well as high viewing angle stability. Until recently mainly used by professionals and enthusiasts, the competitively priced i2369Vm proves that this technology and high standard has become affordable to all. The display comes with a 250 cd/m² brightness, a typical contrast of 1000:1 (dynamic contrast: 50,000,000:1) and a 6 milliseconds GTG response time for your ultimate viewing experience.



Multiple inputs for enhanced multimedia capabilities



Ultra-slim profile



3 year warranty

PRODUCT DETAILS

- D-Sub, 2x HDMI, Display port
- 6 ms GtG
- 1920 x 1080 @ 60 Hz
- MHL, -3° ~ +21° Tilt, VESA Wallmount
- 250 cd/m²

ELMO BOXI-T350



£426 inc VAT • From www.personalprojector.co.uk

VERDICT

A good portable projector, but it has a limited range of ports and is very noisy

ELMO MAY NOT be a household name in the UK, but this Japanese company has been making projectors for use in business and education since the 1920s. The BOXI-T350 fits into both categories but is also one of Elmo's first mobile DLP projectors that's aimed at home users.

Weighing just 500g and measuring 132x143x43mm, it's almost as small as the Best Buy-winning Optoma ML550 (see *Reviews, Shopper 310*) so it won't take up much room on a shelf or in your bag. The 300 ANSI lumen LED lamp isn't as bright as those of other portable projectors we've tested, but its long life of 20,000 hours means you shouldn't have to replace it for a long time. The projector doesn't have an internal battery, though, so you'll need to carry the power supply with you if you want to use it away from home or the office.

We were a little concerned that the lamp wouldn't be powerful enough to cope with our brightly lit test room, but we were able to see our test PowerPoint presentation clearly. Black-on-white and white-on-black text was perfectly legible, even with our test room's lights on, and the BOXI-T350's manual focus ring made it easy to increase the clarity of the picture. This is a good projector to use if you want to give a presentation without plunging the meeting room into cinema-like darkness.

We'd recommend turning out the lights when viewing photos and movies, though, as we found it hard to make out colours and detail in our test photos and movies with the test room's lights on.

The BOXI-T350's native 1,280x800 resolution looks sharp, and its short throw range means you won't have to place it far from the wall to get a large picture. The



projector managed a diagonal screen size of 84in from roughly 2m away, so it's great for placing on a coffee table or on the floor, and there are two small height-adjustable feet on the bottom of the projector to help aim the picture upwards.

You won't want to sit too close to the BOXI-T350, though, as the projector's fan is considerably louder than those of many other portable projectors we've tested, producing 47dB(A) of sound with Eco mode switched off. The fan noise can be irritating if you use the projector for long periods in silence or aren't playing any music to help drown it out.

The device doesn't have many connection ports, although its HDMI input and 3.5mm audio output should prove useful for many users. A convenient HDMI cable is included. We'd expect to see a few more connections on a projector at this price, though. The similarly priced Optoma ML550, for instance, has a microSD card slot for easy photo viewing, as well as MHL support so you can project the displays of MHL-compatible phones and tablets.

We weren't particularly impressed with the BOXI-T350's menu settings either. You can only alter a handful of settings, including brightness, contrast and vertical keystone correction. You can also choose from several picture settings, including Normal, User, Movie, Photo, Game, Graphs and Max, but most of them looked almost identical.

We preferred to use the customisable User mode, but even this was fairly restrictive.

Besides the general brightness and contrast controls, the only options available are colour temperature, gamma settings and a choice of 'wide or 'standard' colour gamut.

This doesn't leave much scope for fine-tuning images when you're watching movies or playing games, but once we'd selected the wide colour gamut option and turned the lights off, our images looked great. Colours were bright, vivid and accurate, and we didn't feel any need to adjust anything else in the menu settings.

The Elmo BOXI-T350 is a good portable projector, but our main concern is the price. You don't have to spend much more to buy the Optoma ML550, which has a wider range of ports, a quieter fan and a brighter lamp. The T350's lack of internal memory also makes it less versatile than the Asus P1M (see *Reviews, Shopper 304*).

Katharine Byrne

SPECIFICATIONS

NATIVE RESOLUTION	1,280x800
CONTRAST RATIO	10,000:1
RATED BRIGHTNESS	300 ANSI lumens,
LAMP COST (ECONOMY)	N/A
DIMENSIONS	43x132x143mm, 500g
POWER CONSUMPTION	0W standby, 46W active
WARRANTY	Two-years RTB
PART CODE	T350
DETAILS	www.elmoeurope.com

BYTE SIZE

LEXAR Jumpdrive P10 64GB



£83 inc VAT • From www.pixmania.co.uk

The Lexar Jumpdrive P10 is a USB3 flash drive which feels particularly well made. It has the same sturdy metal base and glossy black plastic top, as well as a retractable slider mechanism to protect the plug.

The P10 comes without any extras except a small loop for threading the drive on your keyring. What it lacks in extras, however, it makes up for in speed. It was incredibly fast at copying large files, writing them at 92MB/s and reading them at 138MB/s. Its small file



speeds were slower, at 12MB/s when writing small files and 51.8MB/s when reading them.

The LaCie XtremKey USB 3.0 (see *Reviews, Shopper 302*) is a little faster at reading large files but much slower at writing small files. It has a much more robust all-metal case, but unless you need the XtremeKey's sturdier build, the P10 is the better buy for anyone who needs a fast, huge-capacity USB3 flash drive.

Alan Lu

PART CODE LJDP10-64GCRBEU DETAILS www.lexar.com

IIYAMA ProLite T2735MSC



£457 inc VAT • From www.ebuyer.com

VERDICT

It's expensive, but this 27in touchscreen offers great image quality and a wide selection of ports

TOUCHSCREEN MONITORS ARE becoming more popular, but Iiyama's ProLite T2735MSC is the first 27in display we've seen with full 10-point touch. The screen has 70° of tilt, so finding a comfortable working angle is simple, but the display takes up a lot of room because the bezel sits on your desk.

The T2735MSC has a good selection of ports, with VGA and DVI-D inputs, an MHL-compatible HDMI input, a two-port USB3 hub and separate headphone and microphone jacks.

SPECIFICATIONS

SCREEN SIZE	27in widescreen
RESOLUTION	1,920x1,080
CONTRAST RATIO	3,000:1 (5,000,000:1 dynamic)
BRIGHTNESS	260cd/m ²
PORTS	VGA, HDMI, DVI
POWER CONSUMPTION	1W standby, 36W on
WARRANTY	One-year RTB
PART CODE	T2735MSC
DETAILS	www.iyama.co.uk

The 1,920x1,080-resolution touchscreen is incredibly responsive. We had no trouble swiping the side of the screen to display Windows 8 shortcuts, and were able to perform more precise tasks such as using the close and minimise buttons in the corners of the screen every time. You'll have to be careful when using art applications, though, as the monitor can't distinguish between your hand and a stylus, so you'll have to refrain from resting your hand on the screen while interacting with it.

The image quality is superb. We weren't expecting much from its AMVA panel, but according to our colour calibrator it was displaying 98.3 per cent of the sRGB colour gamut at its default settings, which is great.

Coverage was strong across all the main primary colour groups. The monitor's only slight weakness was its blue and cyan coverage. We were able to improve this very slightly after calibrating the monitor, increasing its overall gamut score to 98.5 per cent.



Not surprisingly, our solid colour images looked great. Reds, greens and blues were bright and vibrant, and the monitor's glossy finish really helped them stand out. Whites were lit evenly across the screen and blacks were deep, reflecting our low black level reading of 0.19cd/m².

The monitor's contrast levels were even better. We were a little disappointed at first when our measured contrast ratio of 1,505:1 didn't match Iiyama's claimed figure of 3,000:1, but this didn't seem to affect the quality of our high-contrast test images. Darker areas showed plenty of fine detail.

The Iiyama ProLite T2735MSC is one of the best touchscreen monitors we've ever tested. It's large and expensive, but its image quality is second to none and you don't need a calibrator to get the best out of it.

Katharine Byrne

PHILIPS 272P4QPJKEB/00



£445 inc VAT • From www.ebuyer.com

VERDICT

A good-value 2,560x1,440 display, but it needs a colour calibrator to get the best image quality

THIS PHILIPS MONITOR'S 27in display has a huge resolution and looks razor sharp, but you'll need a dual-link DVI-D cable to take advantage of its full 2,560x1,440 pixels. As well as the DVI input, the display has two HDMI inputs, a DisplayPort input and a convenient three-port USB3 hub.

The 272P4QPJKEB's stand is height-adjustable and its super-flexible hinge can pivot 90°, which means you can view the monitor in portrait mode as well as the more typical landscape orientation.

SPECIFICATIONS

SCREEN SIZE	27in widescreen
RESOLUTION	2,560x1,440
CONTRAST RATIO	1,000:1 (20,000,000:1 dynamic)
BRIGHTNESS	300cd/m ²
PORTS	DisplayPort, HDMI, DVI
POWER CONSUMPTION	0W standby, 39W on
WARRANTY	One-year RTB
PART CODE	272P4QPJKEB/00
DETAILS	www.philips.co.uk

The 272P4QPJKEB uses a PLS panel, which is a type of IPS technology. These are known for superior colour accuracy and wide viewing angles, but our colour calibrator revealed that the screen was displaying just 89.1 per cent of the sRGB colour gamut at its default settings, which is much lower than we expected.

The main area of weakness was in its red coverage, but we suspect this was due to the 272P4QPJKEB's strange default colour settings, which had the red colour value set much lower than its blue and green counterparts. Calibrating the display increased colour accuracy to a much more respectable 97.3 per cent. This is more in line with what we'd expect from a PLS panel, but it's still a few per cent lower than the Iiyama ProLite XB2779QS (see *Reviews, Shopper 311*).

Despite this, our subjective tests looked great and our solid colour images were deep and vibrant. Blacks could have been a fraction deeper, but the screen's black level reading of 0.33cd/m² is still good.



Contrast levels were also excellent. We were a little concerned when we measured a contrast ratio of 799:1, which is lower than expected, but high-contrast images showed plenty of detail. We were particularly impressed by the level of detail in shadows.

The Philips 272P4QPJKEB has a lot to recommend it, not least its price – it's one of the cheapest 27in 2,560x1,440 displays we've seen. It's just a shame that this screen doesn't have better image quality out of the box to match the similarly priced Iiyama ProLite XB2779QS. The Philips screen's USB3 hub and rotatable stand will be attractive to some users, but those who want outstanding image quality by default and a nicer looking chassis should buy Iiyama's screen.

Katharine Byrne

SONY VPL-VW500ES

COMPUTER SHOPPER

★★★★★

ULTIMATE

£8,798 inc VAT •

From www.projectorpoint.co.uk

VERDICT

True 4K projection has become slightly cheaper with the VPL-VW500ES

ULTRA HD VIDEO has incredible impact when projected on a wall, and even though Sony's VPL-VW500ES is expensive it's still cheaper than many Ultra HD projectors.

The VW500ES is similar to Sony's VW1000ES, with a centrally mounted lens and gorgeous sculpted black chassis, but it's smaller, so it should fit in more living rooms than the VW1000ES. Otherwise, Sony has made very few sacrifices to reduce the cost. The biggest changes are lower brightness, which has been reduced to 1,700 ANSI lumens from 2,000, and the VW500ES's lens, which is partly made from plastic. The lens cover is no longer motorised, so you must reach up to remove it when settling down to watch a film.

Connection ports are located on one side, but there are few, with just two HDMI inputs, and no audio connections. You'll need to pass video signals through an amplifier to hear sound, and the amplifier must support Ultra HD pass-through for this to work. The VW500ES's HDMI inputs conform to the 2.0 standard, so you'll be able to play full-



We like the onscreen menus, as Sony has arranged them sensibly to make calibrating and customising the VW500ES straightforward. Beyond the brightness, contrast, colour, sharpness and colour temperature settings, there are lots of extra processing options including Cinema Black Pro, which produces deep blacks during darker scenes.

The comprehensive list of nine picture modes provides plenty of choice if you're happy to use Sony's calibrated presets. The best are Cinema Film 1 and Cinema Film 2, but the game mode is a useful option if you'll use the projector with a PC or console.

Reality Creation sits right at the top of the picture settings menu. This feature is used to make Full HD content look great when projected at Ultra HD resolutions. Reality Creation does a great job of sharpening native

VW1000ES, but you'd only notice when the two projectors were set up side by side.

The 4,096x2,160 projection engine produces incredible images when fed a native 4K signal. The texture detail in the opening scene of our 4K test film *Tears of Steel* is far sharper here than on any 4K TV we've tested. Colours are vibrant out of the box. There's a tendency to favour reds, but this can be adjusted using the colour correction setting.

At 1,700 lumens, the VW500ES is bright enough to use in daylight if you're watching bright content such as a football match. For darker content such as films, you'll still want to draw the curtains in order to make out all the details. Contrast is excellent, with no real need to tweak the picture further in order to see everything as the director intended.

This projector impressed us with its motion handling. The Smooth High and Smooth Low settings made films recorded at 24fps look more like broadcast television and smoothed images too aggressively. However, the Impulse mode reduces motion blur without adding the same negative effects. It does dim the picture, though, so you should watch footage in a dark room with this feature enabled.

The VW500ES excelled in our everyday use tests, and was quiet throughout testing. We could barely hear it when watching films.

POSITIVE PROJECTION

With the VW500ES, Sony has created a projector with plenty of features and impressive image quality. It's expensive, but its HDMI 2.0 inputs mean the projector will stay up to date, and it's cheaper than an 84in Ultra HD TV. If you need an Ultra HD home cinema projector, this should be at the top of your shopping list.

Tom Morgan

**SPECIFICATIONS**

NATIVE RESOLUTION 4,096x2,160

CONTRAST RATIO 200,000:1

RATED BRIGHTNESS 1,700 ANSI lumens

LAMP COST (ECONOMY) £0.08 (£0.07) inc VAT

DIMENSIONS 496x195x464mm, 14kg

POWER CONSUMPTION 0W standby, 375W active

WARRANTY Three-year collect and return (one year lamp)

PART CODE VPL-VW500ES

DETAILS www.sony.co.uk

PHILIPS 65PFL9708



£4,499 inc VAT • From www.hispek.com

VERDICT

One of the cheapest 4K TVs out there, but it isn't as futureproof as the competition

NOT ONLY DOES Philips' 65PFL9708 let you watch Ultra HD content on its massive 65in screen, but it can also upscale Full HD content to an Ultra HD resolution of 3,840x2,160. Although Ultra HD TVs are becoming more common, they're still expensive, so one of the most attractive features of the 9708 is its price. At £4,499 the 65PFL9708 is cheaper than Ultra HD TV sets from Sony, Samsung and LG.

The 65PFL9708 has a good selection of connection ports, with no fewer than five HDMI ports. The fifth port feeds directly into a dedicated processing board designed to handle Ultra HD content. Unfortunately, it doesn't conform to the new HDMI 2.0 standard, so users won't be able to view Ultra HD content at 60 frames per second until Philips releases an external upgrade kit.

The 65PFL9708 also has component and SCART video inputs, an optical digital audio output, three USB ports, a Common Interface slot and an Ethernet port.

The 65PFL9708 makes good use of Philips' Ambilight system. This uses an array of LEDs on the back of the TV to project colours on the surface behind the television. The Ambilight LEDs change colour to reflect the colours onscreen so the pictures you're viewing appear to bleed out of the top and sides of the frame. This effect provides a greater sense of immersion when watching films and sport.

Philips provided us with a video server for the purposes of our review; this contained ultra high-definition video footage. However, the footage was mostly made up of high-resolution time-lapse photography that had been spliced together to make a video rather than native Ultra HD motion video. The detailed vistas, brightly coloured skies and sharp textures looked impressive, but to see how the TV coped with proper Ultra HD video we watched the Blender Foundation's open-source Ultra HD video *Tears of Steel*.

DETAILS OF THE UNEXPECTED

The extra detail present in Ultra HD video is breathtaking. Facial features, cloth textures and texture detail in things such as brickwork and metal look incredible, thanks in part to the 9708's brilliantly sharp picture. A further Ultra Resolution setting added more details, but most people won't be able to spot them from an average viewing distance.

Action sequences were more troublesome, and we did see artefacts, such as when watching football on the supplied footage. The artefacting doesn't ruin the picture, but it is distracting.



Philips has used a VA panel for the 65PFL9708. VA panels may not be able to match IPS panels for viewing angles, but the 9708's VA panel helped to create excellent contrast in darker scenes. The Colour Enhancement option made colours look a little too saturated, but the 65PFL9708 produced more natural-looking images when we switched Colour Enhancement off, changed colour temperature to neutral and slightly reduced the colour saturation setting.

The 65PFL9708 can upscale Full HD footage to Ultra HD thanks to its Ultra Resolution feature, but this produced a slightly grainy image that was only a little sharper than with the Ultra Resolution feature switched off. Hair, facial features and clothing looked more natural when



upscaled than at Full HD resolution, but only up close. Differences were minimal from a distance, even on the 65PFL9708's 65in screen.

Although Ultra Resolution mode can add a little extra detail to Blu-ray films, it can't rescue standard-definition broadcasts. Low bit rate channels such as Dave and BBC News are unsalvageable, so we saw compression noise and a lack of detail when watching those channels.

The 65PFL9708's Ultra HD 3D picture quality was above average. This TV uses passive 3D technology, so there is zero flicker, almost no crosstalk and minimal reduction in brightness. It's also harder to spot the reduced vertical resolution inherent in passive 3D systems when watching 3D content, which is a bonus over existing 1080p passive 3D TVs.

The 65PFL9708 produces clear, powerful audio. At higher volume levels, it impressed us

with its dynamic range. The TV even produced a reasonable amount of bass.

Sadly, we were unimpressed with the speed of the onscreen interface. We often waited for the TV to respond to the remote when we changed menus or used Smart TV apps.

The online services provided by the 65PFL9708 are fewer than we'd like, too. Philips has increased the number of services and you can use BBC iPlayer, Netflix and YouTube to find entertainment, but there's no LoveFilm, ITV Player, 4oD or Demand 5. Philips has integrated Facebook and Twitter into the 65PFL9708 very well. The TV places a sidebar at the side of the currently playing channel so you can post as you watch TV. The most welcome new feature is Cloud Explorer, which lets you stream multimedia content from your Dropbox web storage.

The online services provided by Philips' TVs are getting better, but we still found the 9708's Smart TV interface less user-friendly than Samsung's Smart Hub or Sony's SEN.

TV QUICK

Currently, the 65PFL9708 is one of the cheapest Ultra HD TVs you can buy in the UK. Even with a large 65in panel, the 9708 costs far less than the competition. However, lack of a HDMI 2.0 input and the delicate balance of settings required to get the best from it mean you still make sacrifices for early 4K adoption.

Tom Morgan

SPECIFICATIONS

TV TYPE LCD

RESOLUTION 3,840x2,160

CONTRAST RATIO Not disclosed

BRIGHTNESS 450cd/m²

CONNECTIONS 5x HDMI, 1x SCART, 1x component

TUNER Freeview HD, DVB-S2

POWER CONSUMPTION 0W standby, 137W on

WARRANTY One-year RTB

PART CODE 65PFL9708

DETAILS www.philips.co.uk

SAMSUNG

UE32F6800



£579 inc VAT • From www.currys.co.uk

VERDICT

Has Freesat HD, but minor differences make the F6800 look expensive compared to the F6400

SAMSUNG'S LINE-UP of mid-range TVs is a bit confusing this year, with three very similar models that appear to differ only in outward appearance. The 32in F6800 reviewed here is the most expensive, with a transparent bezel and two-pronged stand. Looking at the spec pages on Samsung's website, it appears the only internal difference between the F6800 and the cheaper F6400 is a faster refresh rate and the addition of an integrated Freesat HD tuner.

This TV has support for active 3D, integrated Wi-Fi and the full Samsung Smart Hub interface, with access to the essential UK TV catch-up services including BBC iPlayer, ITV player, 4oD and Demand 5. It also has Netflix, LoveFilm and Blinkbox on-demand movie services built in, as well as dedicated Facebook, Twitter, Skype and web browser apps. The Smart Hub feels responsive and is sensibly laid out across distinct home screens that are easy to navigate using either of the included remote controls.

The UE32F6800's dual-core processor can't match the quad-core processor found in Samsung's more expensive TVs, but we didn't notice any major slowdown when flicking between menus or opening smaller apps. However, it did take longer to load Netflix.

As for connections, the UE32F6800 has four HDMI ports, SCART, component and composite video inputs, an optical digital audio output, a Common Interface slot for pay TV channels and three USB ports. You can use



the USB ports to connect an external hard disk so that you can record live TV, or play media from a USB flash drive. The UE32F6800

panning shots and moving objects; it does a great job on this TV thanks to a faster Clear Motion Rate than the F6400, speeding

“The UE32F6800's dual-core processor can't match the quad-core processor found in Samsung's more expensive TVs, but we didn't notice any major slowdown **”**

played every one of our test files, even our DivX, MKV and QuickTime files. You can connect the TV to your home network via its Ethernet port or built-in Wi-Fi.

The sound quality of the UE32F6800's tiny built-in speakers is basic at best; they produce quiet audio that struggles to fill a medium-sized room. Audio sounds tinny and there's no real bass presence, even at sensible volume levels.

VISUAL PROWESS

Thankfully, the UE32F6800's picture quality was far more pleasant. By default, Samsung's presets are a little aggressive, with overly vibrant colours and slightly too much noise reduction, but once you dive into the picture settings menu, a few easy fixes turn the UE32F6800 into a fantastic TV for the price. With noise reduction disabled, standard-definition TV and HD broadcasts looked crisp, and Samsung's comprehensive colour management system let us reduce the colour intensity without losing contrast or brightness.

The backlight was even with no dimmer spots, which is impressive for an edge-lit LED TV. The UE32F6800 illuminated the entire panel uniformly. This even illumination is helpful when watching dark scenes, especially because black level response and shadow detail were excellent. We could pick out every detail in Star Trek's space scenes, which looked rich and showed none of the milky greys usually seen on the screens of mid-range LCD sets.

The Motion Plus image smoothing feature uses frame interpolation to smooth fast

up the rate of backlight refreshes to give the appearance of a smoother picture. Unless you put this TV side by side with a less expensive model, you probably won't notice the difference, though.

This TV's active 3D display is refreshingly free of crosstalk and the panel's high contrast helps add definition to the depth effects, but at 32in the UE32F6800 isn't big enough to fill your vision so 3D video loses a lot of its impact. Also, you'll need to buy the glasses separately.

The UE32F6800 is a fully featured mid-range TV, with everything we expect from Samsung, including comprehensive Smart TV and ample picture quality settings, but the minor differences between this and the cheaper F6400 make it look a little expensive. If you like the design of the F6800 then the choice is clear, but if you're more value-conscious, we think the F6400 is a better buy.

Tom Morgan



SPECIFICATIONS

TV TYPE	LCD
RESOLUTION	1,920x1,080
CONTRAST RATIO	Not disclosed
BRIGHTNESS	Not disclosed
CONNECTIONS	4x HDMI, 1x SCART, 1x component, 1x composite inputs
TUNER	Freesat HD, Freeview HD
POWER CONSUMPTION	0W standby, 50W on
WARRANTY	One-year RTB
PART CODE	UE32F6800
DETAILS	www.samsung.co.uk

Synology®



Full HD
1080

SM **DLNA**®

DS214 play

TWO-BAY NAS SERVER FEATURING
VIDEO TRANSCODING WITH LOSSLESS QUALITY

NEW



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A TRUE DLNA® CERTIFIED MEDIA SERVER

Serving as a ready DLNA DMS (Digital Media Server) with the capability to host digital multimedia contents for remote playback, DS214play could stream music, photos and videos to DLNA-compliant devices.

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Dual core CPU powered by a built-in Floating-Point Unit and hardware transcoding engine, speeds up thumbnail processing and enables photo-viewing. A refreshingly new experience.

Where to buy

amazon.co.uk dabs.com

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[broadband
buyer.co.uk](http://broadbandbuyer.co.uk)

Synology apps available on

iOS



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SONY Walkman NWZ-F886



£250 inc VAT • From www.amazon.co.uk

VERDICT

High-resolution audio on the move is finally here, but this portable media player is remarkably expensive

THE SONY WALKMAN NWZ-F886 is a 32GB media player designed to play high-resolution audio so you can enjoy music recorded at a higher-than-CD sound quality at up to 24-bit/192kHz. It also runs Android 4.1.1, so you can use it to enjoy games and watch movies.

The NWZ-F886 uses Sony's S-Master digital amplifier chip to produce sound and filter noise. Annoyingly, Sony uses a proprietary connector for its Walkman rather than the Micro USB slots used by most other Android devices. In Japan, the company has released a cable to output sound from the Walkman via an external USB DAC, but there's been no sign of a UK release date for this hardware.

While many Android media players are essentially smartphones without the phone, Sony has added some very specific hardware elements to the NWZ-F886. There are extra control buttons on its right-hand side, including a play button and keys to skip back and forth between tracks. These are useful, particularly if you want to use the player without taking your hand out of your pocket. You must apply some pressure to the buttons to activate them, so there's little chance they will be accidentally pressed. The player's more angular than many current mobiles, though, which makes it feel uncomfortable to hold. It doesn't look very stylish, either.

very well. Sadly, it's less effective at reducing the volume of a busy office.

The supplied in-ear headphones are better than many we've used, producing clear sound that flatters most music. However, we found that the bulky earpieces tended to pull away from our ears, no matter how we wore them.

The NWZ-F886's operating system is Android 4.1.1, and it has a range of Sony media apps pre-installed. The most notable is Sony's Music Player app, which is more slickly designed than Google's Music app or most third-party audio players for Android. The Music Player app is part of a suite of apps that share interface design elements, control gestures and icons.

Also included are video and photo viewers. Conveniently, the NWZ-F886 has a DLNA browser that lets you stream music from UPnP shares on your local network.

The apps are excellent, but not without flaws. We found that music unexpectedly stops playing when you take a screenshot and resumes when the task is complete. It also stopped when we tried to add cover art to an album that lacked an associated image. However, we experienced no such problems



our standard quality tracks on the iPod and the NWZ-F886 was negligible. They're capable of around the same maximum volume, too.

The NWZ-F886 is designed to play high-resolution audio tracks. Its high-resolution sound reproduction wasn't as pleasant as the richer sound produced by our reference Arcam rPAC's headphone amp. Even so, we were glad we could enjoy our high-resolution tracks while travelling. The Walkman compares well with its iOS driven rival in our battery tests, too, lasting for 22 hours of audio playback and four hours and 10 minutes of video.

WALK THIS WAY

At £250, the 32GB version of the NWZ-F886 is a bit more expensive than the 32GB iPod Touch. We don't think the NWZ-F886 is as pleasant as the iPod Touch to handle or look at, but you can't fault its massive array of features. If you want a dedicated portable media player that supports high-resolution audio, this is a great buy.

Kat Orphanides

“We like the way Sony doesn't tie you to its own music store or a limited range of audio formats”

The NWZ-F886's 4in screen has a resolution of 854x480 pixels. It's bright and attractive, but its glossy surface shows up fingerprints. Other features include NFC, which lets you pair the NWZ-F886 with compatible Bluetooth devices, such as portable speakers, more easily. The NWZ-F886 also uses the aptX Bluetooth streaming standard to ensure you get the best possible audio when streaming music, but your speaker will need to support aptX. There's also an FM radio tuner built in.

This player has integrated digital noise cancelling, which should help to reduce the volume of ambient sound. The noise cancellation had a deadening effect on sound, but it blocked sounds such as engine noise

when we browsed through our photos using the Sony photo viewer or Google gallery apps.

We like the way Sony doesn't tie you to its own music store or a limited range of audio formats. Neither are you restricted to using Sony's software to transfer tracks to your Walkman. You can drag and drop media on to the NWZ-F886 in Windows, but Sony's Media Go makes it easy to organise music and videos, although it's available only for Windows PCs.

In direct audio quality comparison tests with our iPod Touch using the same CD-quality files, the NWZ-F886 had a brighter, more detailed treble. This was noticeable in the clarity it brought to string instruments, but the audible difference between most of



SPECIFICATIONS

STORAGE 32GB flash memory

DISPLAY 4in 845x480 resolution LCD

AUDIO SUPPORT WMA, AAC, Ogg, Wav, Audible, MP3

VIDEO SUPPORT WMV, WMV-HD, MPEG4 AVI, MPEG4 MP4

IMAGE SUPPORT BMP, TIFF, JPEG

INTERFACES USB

DIMENSIONS 59x8x116mm, 103g

WARRANTY One-year RTB

PART CODE NWZ-F886

DETAILS www.sony.co.uk

Audio battery life

22h 4m

Video battery life

4h 10m

0% -50 Reference +50 +100

See page 76 for performance details

SONY HAP-S1 HDD Audio Player System



£799 inc VAT • From www.sony.co.uk

VERDICT

Brilliant sound and build quality, but let down by limited streaming options

SONY'S HAP-S1 IS a hi-fi separate with a built-in 500GB hard disk on which you can store high-quality, high-resolution audio tracks as well as regular CD-quality MP3 and Wav files. The HAP-S1 also has a built-in 40W amplifier, so you only need to connect a set of speakers to use it.

The HAP-S1 is part of Sony's push to make high-resolution audio more common, and it supports 192KHz/24-bit high-resolution audio files, plus Sony's own DSD format. Given that a FLAC track of under four minutes' duration, a sample rate of 192KHz and a bit depth of 24 bits occupies 100MB of storage space, there should be room for around 4,000 such files.

Should you require more storage, you can connect an external hard disk to the HAP-S1 via a USB port on the back. However, you can't just plug in a USB drive of music and play it directly or copy your music to the HAP-S1's internal hard disk. Instead, you must format connected external drives to the HAP-S1's own format.

You can transfer your music to the HAP-S1 with Sony's HAP Music Transfer utility, which is available for Windows and Mac OS X, or copy files to the HAP-S1's hard disk over your network. Conveniently, you can select a folder on your PC and have any tracks that you add to it transferred to the HAP-S1 automatically.

The HAP-S1 has a brushed metal exterior, uncluttered controls and a bright 4.3in display. At the front, along with dials to navigate the menus and change the volume, is a 1/4in headphone port. At the back are speaker connections. There's also a stereo pair of phono outputs, two sets of phono inputs, an optical S/PDIF input and a coaxial S/PDIF input.

The remote control, although stylish, is limited in function, as it provides no way of navigating the player's menus. You can change the volume, skip, start and stop tracks, turn on and mute the HAP-S1, but that's it. Luckily, there's an iOS and Android app that gives you full access to all the HAP-S1's features.

It would have been great if the mobile app could stream tracks from our phone to the



HAP-S1, but that isn't possible. The HAP-S1 can't play DLNA streams or access files from a shared folder on your network, either. These would have been useful features, particularly given the relatively small capacity of the built-in hard disk. The only audio streaming option is vTuner internet radio. This includes BBC radio and lots of independent music stations, but all are low quality, with none higher than 192kbit/s. Sadly, the HAP-S1 has no support for popular streaming services such as Spotify and Last.fm.

However, the menu system of both the app and the HAP-S1's onscreen display are elegantly designed and easy to control, and your music can be sorted by artist, genre or album. Alternatively, Sony's SensMe music

detail and space between the harsh guitars of Coldworld's *Hymn to the Eternal Frost*.

With the press of a button, the HAP-S1 can also use Sony's DSEE sound enhancement technology. This uses digital interpolation to restore high-frequency sound removed by lossy compression. If you're familiar with a particular piece of music then you'll notice some improvement in quality when DSEE is enabled. However, we'd still recommend using lossless file formats in the first place.

AUDIO VISION

The HAP-S1 sounds fantastic, but it's expensive for something that lacks so many of the features we've come to expect. We were

“The HAP-S1 is part of Sony's push to make high-resolution audio more common”

analysis system can create playlists of songs that fit into categories such as Mellow, Energetic, Emotional and Extreme. We were delighted to find that our music, which is analysed and put into a SensMe category when you transfer it to the player, was accurately assigned to different categories, making it easy to find something to suit your moods without building a playlist by hand.

Sound quality through headphones and the main amp is outstanding. We tested the system with Sony's SS-HA1 speakers (£499, www.sony.co.uk), which are designed to have a broad 48Hz-50KHz frequency response to make the most of the system's high-resolution output. The sound was clean, detailed and spacious. We distinguished lots of detail in our favourite tracks, from the natural slap of drum skins in King Crimson's *The Court of the Crimson King* to the warm strings of Ulver's *Like Music*. There was also clearly audible

surprised that we couldn't connect and play an external drive full of tracks, and the inability to stream tracks from other devices on your network seems like a missed opportunity given the HAP-S1's Ethernet port. Lack of support for popular streaming services such as Spotify is also a serious omission.

Denon's £275 Ceol Piccolo DRA-N5 streaming home audio system lacks a hard disk, but its support for 192KHz/24-bit streaming audio makes it a more sensible alternative for those who don't have to keep all their music in one place. Although we like the HAP-S1, we hoped it would deliver modern, networked convenience along with its excellent sound quality, and it doesn't. If there's a way that Sony can implement wider streaming and online service access with a software update then the HAP-S1 would be near-perfect.

Kat Orphanides



SPECIFICATIONS

CONNECTIONS 1x passive speaker output, 1x stereo phono output, 1x coaxial S/PDIF input, 1x optical S/PDIF input, 2x phono inputs

AUDIO SUPPORT WMA, AAC, Ogg, Wav, MP3, FLAC, ALAC, ATRAC, AIFF

POWER CONSUMPTION 1W standby

WARRANTY Two-year RTB

PART CODE HAP-S1

DETAILS www.sony.co.uk

SYNOLOGY DiskStation DS214play

COMPUTER SHOPPER
BEST BUY



£285 inc VAT • From www.ebuyer.com

VERDICT

This terrific NAS enclosure uses hardware transcoding to help stream your media

SYNOLOGY'S DISKSTATION DS214PLAY is a regular two-bay Synology NAS enclosure with an added extra; it uses a special Intel Atom processor with built-in transcoding hardware to stream video or audio files to computers or devices that may not otherwise be able to play them. This feature is handy if you want to watch a video or listen to a song stored on your DS214play but the media player on the computer or device you're using for playback doesn't support the file's format.

The DS214play lets you transcode any file containing an H.264 (AVC), MPEG4 Part 2, MPEG2 or VC-1 video stream into a form that can be handled by media software and appliances with only limited wrapper support, such as Windows Media Player. It can also transcode more rare audio formats such as FLAC and Ogg. Find out more about the DS214play's transcoding capabilities at www.synology.com/en-uk/support/faq/577.

Installing disks in the DS214play is easy. The NAS's drive trays are tool-less; 3½in hard disks just clip in. However, you must still use screws to fit 2½in disks.

The DS214play's software is easy to set up. At the time of writing, the NAS uses the DiskStation Manager (DSM) 4.3 operating system. DSM 4.3 gives you an easy-to-use point-and-click environment in which to manage your NAS and its features. If you can

for managing data redundancy. SHR provides full redundancy for your data, so if one of your disks fails you'll be able to recover data from the other disk.

To test the data transfer performance of the DS214play, we ran our standard throughput tests, in which we write and read sets of large and small files to and from the NAS we're testing. We tested the DS214play with its disks configured as an SHR volume. Large files always transfer more quickly than small files, but the DS214play did well in both transfer tests. In our large file test, the DS214play produced a write speed of 104.4MB/s and a read speed of 48.7MB/s. In our small file test, it produced a write speed of 16MB/s and a read speed of 18.4MB/s.

We didn't have too much trouble setting up media streaming. To enable DLNA media streaming, you must install the Media Server app with DSM's Synology Package Centre, which is easy enough.

Audio and video transcoding can be enabled within Media Server. Just select the file types you want to transcode, and you're away. Even on Microsoft's ageing and limited



Station and Video Station, and use these apps to play media files stored on the DS214play through your web browser, or on phones or tablets via Synology's mobile apps. You can even make these programs accessible to non-admin users, which is helpful if you want to let your family access media stored on the DS214play. We had some trouble streaming to older Internet Explorer versions, but no problems with Google Chrome.

MEDIA MOGUL

The DS214play is one of the more specialised NAS devices we've seen from Synology, and it performs well. The transcoded video and audio streams we tested were perfect, with no artefacts, glitches or loss of synchronisation. Many DLNA clients, including Windows Media Centre and the Xbox 360, are limited in their format support, and some hardware streaming media receivers struggle with decoding formats such as MKV. If you struggle to play your media on your computer or mobile device's media players, the DS214play could be ideal.

In terms of throughput, the DS214play compares well with the similarly priced, Best Buy-winning DS213+, and its transcoding performance makes it ideal for those who need a NAS enclosure for media storage.

Kat Orphanides

“ The DS214play is one of the more specialised NAS devices we've seen from Synology and it performs well **”**

use Windows or Mac OS X, you'll soon become comfortable with DSM 4.3. By default, the DS214play will set up installed hard disks so that they use Synology Hybrid RAID (SHR), which is Synology's own system

Windows Media Player, we could stream FLAC audio and MKV video files that were slickly transcoded in real time.

You can download and run other multimedia programs in DSM, such as Audio Station, Photo

► Enable transcoding in your media server settings to make your videos accessible to almost any program

SPECIFICATIONS

CONNECTIONS 10/100/1000Mbit/s Ethernet, 3x USB ports, SDXC card reader

EXTRAS UPnP media, iTunes, print, USB disk, web, FTP servers

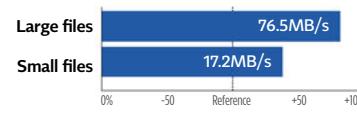
WARRANTY Two-year RTB

DIMENSIONS 165x108x233mm

POWER CONSUMPTION 20W active, 13W standby

PART CODE DS214PLAY

DETAILS www.synology.com



Your Home Multimedia Storage

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- ◆ Cross-platform file sharing for Windows, Mac and Linux users.
- ◆ Ensure the safety of your data with RAID 1 mirroring.
- ◆ Access and share your data securely anywhere!
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1.6GHz Dual-core | 2GB DDR3 RAM | DLNA | HDMI | Intel Atom

TS-230

Silent NAS for the Living Room

HS-210

1.6GHz CPU | 512 MB RAM | Fanless | DLNA

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- ◆ Perfect for your home theater!
- ◆ High performance without unwanted noise.
- ◆ Over 100 apps for extending NAS abilities.

Browse & stream your media from NAS to TV



AirPlay / DLNA support - Stream video & photos via Apple TV & DLNA-compliant devices.

Store photo albums on your personal cloud



Photo Station - Easily manage and share photos via email, social networking sites or secure sharing links.

Back up, share & enjoy your music collection



Music Station - Create and enjoy your personal music center in the cloud anywhere.

HP Envy 4500



£49 inc VAT • From www.hp.co.uk

VERDICT

A cheap MFP with strong features and decent performance, but it's a bit slow

HP'S ENVY 4500 may be cheap, but its specs look expensive. There's support for wireless networking and automatic duplex printing, for example. However, once set up, you can see where HP has made some savings. The Envy 4500 takes black and tricolour ink cartridges rather than the individual tanks on more expensive printers, and its monochrome display isn't touch-sensitive. Neither compromise is unreasonable, but the paper handling is basic. The input tray is captive in the base, and when loaded with A4 paper the front panel won't close.

The interface in the print driver tidies away too many common options in the Advanced section, including paper size, a basic setting for anyone printing photos. The TWAIN scan interface is similarly over-simplified, and gives only pre-defined resolution choices that don't include 150dpi, a standard test resolution.

The Envy 4500 produced decent black text on plain paper, while colour graphics were excellent. Colours had real strength, and there

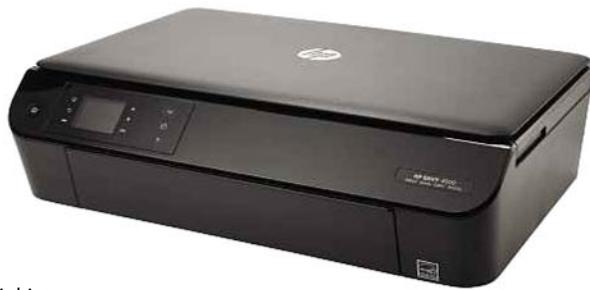
was little sign of banding or other inkjet weaknesses. With only four colours, this isn't an amazing photo printer, but the results were quite good on a variety of coated papers.

The scanner performed general-purpose jobs well, although high-resolution scans appeared to have been processed to boost contrast. The irritating software is unfortunate, because the scanner's ability to distinguish every shade on our test pattern suggests that the underlying hardware is very good.

Prints and copies are fairly slow, but the 4500 came close to HP's published speeds when printing text and graphics. It was slow to produce photos, with six postcard-sized borderless prints taking 27 minutes to print. Tested over Wi-Fi, scan speeds were on the slow side of typical; at two and a half minutes, our 1,200 dots-per-inch photo scan was just slow.

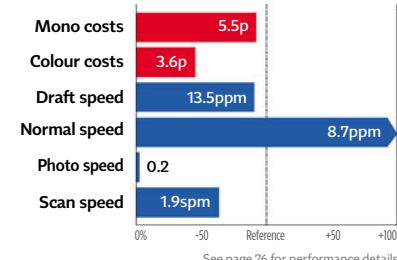
It's a reasonable MFP but, given the niggles, we'd buy the Canon's £35 MP230 instead.

Simon Handby



SPECIFICATIONS

MAXIMUM RESOLUTION	4,800x1,200dpi
QUOTED SPEEDS	9ppm mono/5ppm colour
SCAN RESOLUTION	1,200dpi
INTERFACES	USB, 802.11n wireless
DIMENSIONS	390x445x608mm
POWER CONSUMPTION	2W standby, 4W idle, 17W active
WARRANTY	One-year RTB
PART CODE	A9T80B#BHC
DETAILS	www.hp.co.uk



See page 76 for performance details

SAMSUNG C460FW



£299 inc VAT • From www.staples.co.uk

VERDICT

Good NFC and networking support, but this printer is expensive to run

SAMSUNG'S C460FW IS a compact, colour laser-class MFP with wired and wireless networking support, a 40-page ADF and a two-line monochrome display. It also lets you print from mobile devices, and has built-in NFC to make the process of pairing with your phone or tablet easier.

The printer's single paper input tray with a capacity of only 150 pages means it's not much good for business use. You'll have to refill it 133 times to meet the theoretical maximum duty of 20,000 pages in a month. There's no manual feed and no duplex printing.

This is the first four-pass colour printer we've seen in a long time. In such printers, there's a single drum rather than separate drums for each colour. This reduces consumables, but it means colour pages must pass the drum once each for black, cyan, magenta and yellow, so colour prints take four times as long as mono. The drum is rated for 16,000 mono or 4,000 colour pages, while the toners are good for 1,500 pages (black) or 1,000 pages (cyan, magenta and yellow).

With medium or heavy use, you'll be changing consumables fairly often. Over three years of light use, comprising 2,400 mono and 1,200 colour pages, the C460FW will cost £580 to buy and run, not including paper or electricity. Medium use of 18,000 mono and 9,000 colour pages would increase this to £1,916, which is a large amount.

With this in mind, the strengths of the C460FW seem less relevant. Its print quality was high, and scans were sharply focused up to its maximum optical resolution of 600 dots per inch (dpi). Photocopies were gloomy at default settings, but were quick. Scans were fast, too, and the MFP scanned an A4 document at 300dpi in 30 seconds. The print speeds we recorded were less impressive; 14 pages per minute (ppm) is uncompetitive for mono printing, as is the 3.8ppm colour print time.

Unfortunately, this printer is just too expensive to run. We'd recommend spending £100 more on Kyocera's FS-C2026MFP+, which will save you money in the long run.

Simon Handby



SPECIFICATIONS

MAXIMUM PRINT RESOLUTION	600x600dpi
QUOTED SPEEDS	18ppm mono, 4ppm colour
MAXIMUM SCAN RESOLUTION	600x600dpi
INTERFACES	USB, 10/100 Ethernet, 802.11n wireless
DIMENSIONS	334x406x362mm
POWER CONSUMPTION	4W standby, 4W idle, 1,005W active
WARRANTY	One-year RTB
PART CODE	SL-C460FW/SEE
DETAILS	www.samsung.co.uk



See page 76 for performance details



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Save everything. Access anywhere.

Your zeal for capturing every moment is limited only by the capacity of today's smartphones. Or at least it was until now. Thanks to My Cloud, you'll never run out of space on your phone again, because you can save photos all in one place and instantly pull up each one - from anywhere and at any time. wd.com/mycloud



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087414.08_WESDIG_2013_My_Cloud_Print_Photographer_Computer_Shopper_Dec_MECH ROUND #: MECH

Trim: 210mm W x 297mm H Bleed: 216mm W x 303mm H Live: 185mm W x 275mm H Color Space: CMYK Fonts: Helvetica Neue

Publication Name: NA

TM: AS: AD: PA: Date: 10/29/13 Loaded Date: 12/12/2013



D-LINK ShareCenter DNS-327L



£120 inc VAT • From www.ebuyer.com



VERDICT

An inexpensive NAS enclosure, but it's not without its flaws

THE SHARECENTER DNS-327L is a passively cooled two-bay NAS enclosure, which is almost completely silent as it has no cooling fans. It can accommodate two 3½in SATA hard disks and fitting them is easy. Screw a pair of handles on to the disks and slide them into place vertically.

Software setup was easy with the CD-based setup wizard, which guides you through the

entire process of setting up the NAS, from installing disks and connecting the NAS to your router to choosing a RAID setting and mapping a drive letter.

Some other NAS manufacturers such as Synology employ management interfaces that resemble a fully fledged operating system, but D-Link has employed a simple tabbed interface. It's straightforward to use, and we had no trouble setting up user accounts, setting usage quotas and organising user accounts into groups for easier management.

There are plenty of extra features, too, including a BitTorrent server, a web server and a server for hosting your own blog. As the DNS-327L has a USB3 port, you can connect USB printers and drives to it and share them across the network, which we did without trouble. However, the iTunes and UPnP media servers were more difficult. The iTunes server worked fine when sharing music, but not movies. The UPnP media server worked well with a standalone network

media player, but not with Windows Media Player on a Windows 7 PC.

We fitted the DNS-327L with two 3TB WD Red hard disks and tested performance in JBOD, RAID 0 and RAID 1 configurations. Whether configured as JBOD and RAID 0, the NAS enclosure was fast at copying large files, but much slower when copying small files. Small files were written at 11.5MB/s and read at 18.5MB/s, while large files were written at 80.7MB/s and read at 71.1MB/s.

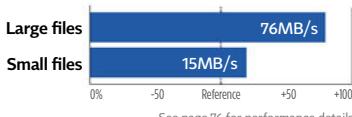
Performance was slower when the NAS was configured as RAID 1. Small files were written at 7.6MB/s and read at 7.8MB/s. Large files were copied faster, with write speeds of 56MB/s and read speeds of 60MB/s.

D-Link's ShareCenter DNS-327L isn't a bad NAS enclosure, but Synology's DiskStation DS-213j (see Reviews, Shopper 307) has more consistent performance and extra features that work more smoothly, so although it's more expensive, it's still a better buy.

Alan Lu

SPECIFICATIONS

STORAGE	Accepts 2x SATA3 disks
CONNECTIONS	10/100/1000Mbit/ Ethernet, 1x USB port
EXTRAS	UPnP media, iTunes, print, USB disk, web, FTP servers
WARRANTY	One-year RTB
DIMENSIONS	193x91x146mm
POWER CONSUMPTION	14W standby, 27W active
PART CODE	DNS-320L
DETAILS	www.dlink.co.uk



See page 76 for performance details

WESTERN DIGITAL Black2 Dual Drive



£226 inc VAT • From www.lambda-tek.com/componentshop

VERDICT

A hard disk and SSD together in one drive, but at a high price

AT FIRST GLANCE, Western Digital's Black2 Dual Drive looks like a standard 9.5mm high 2½in hard disk. However, it's actually two disks in one, and combines a 1TB hard disk and 120GB SSD. Unlike some other hybrid drives, the Black2 doesn't use the SSD as a cache; the Black2 is literally two separate

drives in one casing. The idea is that you install Windows and your programs on the SSD with your large files stored on the hard disk, but you can use the Black2's separate disks however you wish.

The Black2 comes with a couple of extras to help you install the drive in your computer. There's a USB3-to-SATA adaptor and a downloadable edition of Acronis True Image that only works with the Black2 to clone your PC's existing Windows installation to the SSD.

You don't need Acronis True Image if you simply reinstall Windows from scratch, but the software driver is essential, as without it only the 120GB SSD part of the Black2 will be visible to Windows. The driver is compatible with Windows 8.1 and Windows versions as old as XP, but a Mac-compatible version isn't yet available. Western Digital warns that the driver isn't compatible with computers that use an Nvidia or ASMedia storage controller, or with storage controllers set to RAID mode instead of EIDE or AHCI, but this shouldn't be a problem on most modern laptops.



The Black2's SSD uses 20nm NAND flash and a JMicron JMF667H controller. This SSD is not as fast as others we've seen recently, but it's much faster than any hard disk, writing large files at 167MB/s and reading them at 335.8MB/s. Small files were written at 110.1MB/s and read at 89.3MB/s.

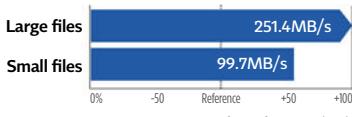
The twin-platter 5,400rpm 1TB hard disk was fast, and the Black2 wrote large files at 86.6MB/s and read them at 110MB/s. Small files were written at a slow 29.2MB/s, but read quickly at 60.9MB/s.

At 20p per gigabyte, the Black2 is more expensive than Seagate's SSHD (see Reviews, Shopper 307), but the Western Digital drive is much better at combining the benefits of both an SSD and a hard disk in a single package. If you want a great-value, high-performance and high-capacity drive, Western Digital's Black2 Dual Drive is a good buy.

Alan Lu

SPECIFICATIONS

CAPACITY	120GB + 1TB
FORMATTED CAPACITY (NTFS)	111.6GB + 931GB
INTERFACE	SATA3
SPINDLE SPEED	5,400rpm
CACHE	Not disclosed
SEEK TIME	Not disclosed
NOISE WHEN IDLE	21dBA
WARRANTY	Five-year RTB
PART CODE	WD1001X06XDTL
DETAILS	www.wdc.com



See page 76 for performance details

DEVOLO dLAN 500 Wi-Fi Network Kit



£125 inc VAT • From www.pcworld.co.uk

VERDICT

Decent Wi-Fi performance and easy setup make this a great HomePlug kit

THE DEVOLO dLAN 500 Wi-Fi Network Kit is designed to stretch your Wi-Fi coverage over multiple storeys or to the furthest corners of your home, so you can access the internet wirelessly from locations that your Wi-Fi router can't reach.

The kit uses your home's electrical wiring rather than standard networking cables to transfer data between each HomePlug adaptor. Two of the adaptors included in the kit have built-in Wi-Fi, so will provide Wi-Fi access where you plug them in.

The non-Wi-Fi adaptor (called the dLAN 500 Duo) is intended to plug into your router, as its purpose is to transfer data to the other two adaptors. Setting up the dLAN 500 Duo is simple: just plug it into a mains socket and connect it to your router with an Ethernet cable.

The other two HomePlug adaptors in the kit are dLAN 500 Wi-Fi models that provide Wi-Fi access to your network on the 2.4GHz band. These adaptors are similarly simple to set up, but Devolo has written the default Wi-Fi key on the plug side of the adaptors, so remember to copy it to a notepad before you plug one in to a mains socket.

To add the dLAN 500 Wi-Fi adaptors to your network, you simply plug them into a mains socket and press the encryption buttons on both the dLAN 500 Duo and the dLAN 500 Wi-Fi adaptors. Once they're set up, you can connect to the dLAN 500 Wi-Fi adaptors wirelessly using the default wireless security code written on the adaptor. You don't have to worry about unauthorised people accessing your network because the

Wi-Fi connection is protected by default. You can, of course, change the default security code to a password of your choice.

We often criticise HomePlug devices for being too large and having Ethernet ports in their base, as this design can cause problems if your mains sockets are located just above your skirting boards. Although the dLAN 500 Duo and dLAN 500 Wi-Fi adaptors still have Ethernet ports in their base, they're small enough to be plugged into mains sockets that we've been unable to use with regularly sized HomePlugs.

SPEED LIMIT

Although the kit is rated at 500Mbit/s, the dLAN 500 Duo and dLAN 500 Wi-Fi adaptors have only Fast Ethernet ports, which have a theoretical top speed of 100Mbit/s. In practice, this means the maximum data transfer speed you'll achieve over Ethernet is 93.2Mbit/s. Although the HomePlugs are capable of greater data transfer speeds, the Fast Ethernet ports limit them, which is disappointing.

To test Wi-Fi speeds we connected the dLAN 500 Duo to our test PC directly over Ethernet, plugged a dLAN 500 Wi-Fi adaptor into an adjacent plug socket and connected to the dLAN 500 Wi-Fi with our test laptop's built-in Wi-Fi adaptor. In this arrangement the kit produced a data transfer speed of 49.7Mbit/s at a distance of one metre and 42.7Mbit/s at 10 metres. It failed to complete the test at a distance of 25 metres. It's worth noting that our test environment is highly congested with Wi-Fi signals on the 2.4GHz band, however, so you may get better performance than we did.

The dLAN 500 Wi-Fi adaptors performed better than the dLAN 500 AV Wireless+ HomePlug (Reviews, Shopper 305), which achieved a data transfer rate of just 28.5Mbit/s at one metre and 7.9Mbit/s at 10 metres, although the AV Wireless+ did pass the 25-metre test with a speed of 2.1Mbit/s.

The dLAN 500 Wi-Fi adaptors use Devolo's WiFi Move Technology, which makes sure each adaptor has the same SSID and security settings, so you will always connect to the adaptor with the strongest signal. This feature was difficult to test in our lab, but we connected to one



dLAN 500 WiFi adaptor, plugged in a second and then unplugged the first. Our test laptop didn't drop the Wi-Fi connection, transmitting seamlessly between adaptors.

CONFIGURE IT OUT

You can configure your Devolo dLAN network with the included Devolo Cockpit software, which shows a graphical map of your network and the HomePlugs connected to it. It's also available as an app for iOS and Android devices, so you can configure your HomePlug network if you don't have a PC to hand.

Configuring the dLAN 500 Duo adaptor is pretty much limited to changing the name of the adaptor, blocking data transfer and disabling its LEDs. The dLAN 500 Wi-Fi adaptors, on the other hand, have many of the configuration options you'd expect to see on a wireless access point. You can change the HomePlugs' Wi-Fi SSIDs to something more memorable so that you can identify it easily in the list of Wi-Fi connections available. You can also change the Wi-Fi channel and set up a guest account.

We prefer this kit to the Devolo dLAN 500 AV Wireless+ kit, and the fact you get three HomePlugs makes the dLAN 500 Wi-Fi Network Kit good value. If you want a HomePlug kit to deal with Wi-Fi dead zones in your home or office, it's a great buy.

Andrew Unsworth

↑ The software utility that comes with the kit makes configuring your HomePlug adaptors easy

SPECIFICATIONS

NUMBER OF ADAPTORS 3

HOMEPLUG STANDARD (SPEED) HomePlug (500Mbit/s)

PORTS 1x 10/100Mbit/s Ethernet ports

POWER SOCKETS None

DIMENSIONS 189x231x79

POWER CONSUMPTION 2W on

WARRANTY Three-years RTB

PART CODE 09092

DETAILS www.devolo.co.uk

Throughput 93Mbit/s



See page 76 for performance details

NVIDIA GeForce GTX 780 Ti

COMPUTER SHOPPER ★★★★
ULTIMATE

£516 inc VAT • From www.scan.co.uk

VERDICT

Gamers with enough money should look no further: this is the best graphics card available

NO SOONER HAD we declared the AMD Radeon R9 290X the best gaming graphics card available than Nvidia released the GeForce GTX 780 Ti in an unexpected bid to reclaim its gaming crown. Like the original GeForce GTX 780 and the excellent GTX Titan, the GTX 780 Ti uses Nvidia's GK100 graphics processor. However, the GTX 780 Ti has 2,880 CUDA cores, which is 576 more than the original GTX 780 and 192 more than the GTX Titan.

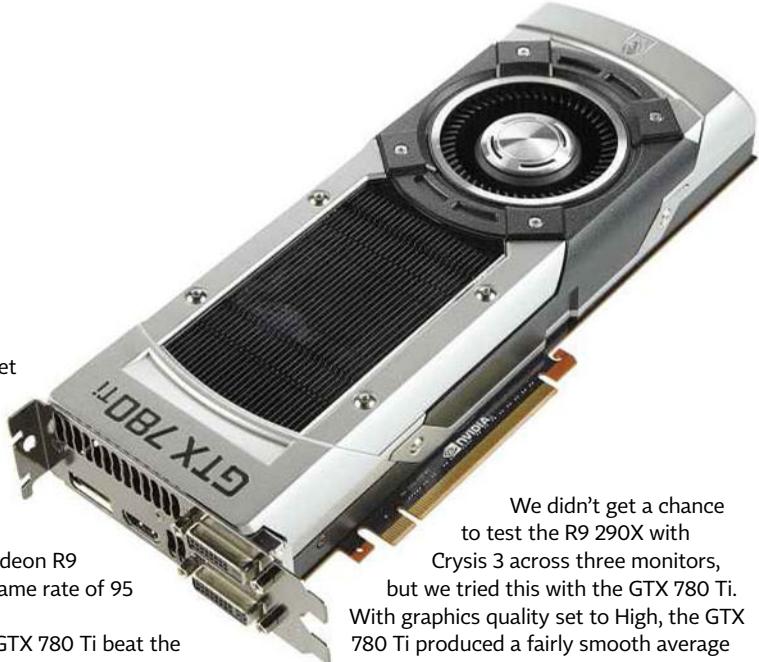
The GTX 780 Ti also has higher clock speeds, with a 876MHz base clock speed and 928MHz boost clock speed rather than the original 780's 863MHz base clock speed and 900MHz boost clock speed. The amount of graphics memory available remains at 3GB, but the GTX 780 Ti has higher memory bandwidth than the GTX 780 and GTX Titan, at 336GB/s as opposed to 288GB/s.

To power the GTX 780 Ti you'll need two PCI-E power adaptors: one six-pin and one

2,560x1,440 with graphics quality set to Ultra. The GTX 780 Ti produced an average frame rate of 86fps, which was lower than the AMD Radeon R9 290X's average frame rate of 95 in the same test.

However, the GTX 780 Ti beat the Radeon R9 290X in all our other single-monitor Dirt Showdown tests. The GTX 780 Ti produced an average frame rate of 130fps at a resolution of 1,920x1,080 with graphics quality set to High, for example, whereas the Radeon R9 290X produced 111.5fps in the same test.

The GTX 780 Ti proved much faster than its rival in every part of our Crysis 3 test. At 1,920x1,080 with graphics quality options set to Very High, the GTX 780 Ti produced an



We didn't get a chance to test the R9 290X with Crysis 3 across three monitors, but we tried this with the GTX 780 Ti. With graphics quality set to High, the GTX 780 Ti produced a fairly smooth average frame rate of 28fps. Reducing graphics quality to Medium had little effect, raising the average frame rate to just 30fps.

As is common with GeForce cards, users can download and install GeForce Experience, a utility that lets users record their game play and create videos that can be uploaded to social media. GeForce Experience also lets you optimise certain games so that they run at the highest frame rates.

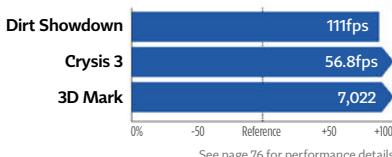
We used GeForce Experience to optimise the graphics quality settings for Crysis 3. It set the Shading and Shadows options to High and Medium respectively, and set anti-aliasing to 1x SMAA. At these settings the GTX 780 Ti produced a smooth and highly impressive average frame rate of 54fps at 2,560x1,080. We recorded a minimum frame rate of 39fps and a maximum frame rate of 62fps at the GeForce Experience settings.

Nvidia's GeForce GTX 780 Ti is a fantastic gaming card and easily the best available. It even beat the GTX Titan in our Dirt Showdown benchmarks. Apart from the quirky result in Dirt Showdown at its highest graphics settings, the GTX 780 Ti was faster than the AMD R9 290X in every test. If you want to play the latest games at the highest quality settings, buy the Nvidia GeForce GTX 780 Ti is the card to have.

Andrew Unsworth

SPECIFICATIONS

CHIPSET Nvidia GK100
CORE SPEED 876MHz
RAM 3GB GDDR5 (1.75GHz)
WARRANTY One-year RTB
PART CODE NE5X78T010FB-P2083F
DETAILS www.nvidia.com



See page 76 for performance details

eight-pin. You'll also need to make sure there's enough room in your PC case to fit the GTX 780 Ti, as it's 270mm long.

As usual with high-end graphics cards, the GeForce GTX 780 Ti provides four common graphics outputs: two dual-link DVI, one HDMI and one DisplayPort. You can also configure the GTX 780 Ti to output to three monitors with Nvidia's Surround mode, which is great if you enjoy multi-monitor gaming.

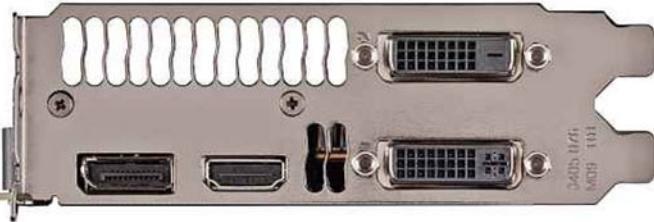
In use, the GeForce GTX 780 Ti is very quiet. It was almost silent while we were using desktop applications and emitted a soft purr when we ran games – so soft that we were able to forget about it almost as soon as the game had loaded.

We first tested the GTX 780 Ti with our Dirt Showdown benchmark at a resolution of

average frame rate of 46.4fps, whereas the Radeon R9 290X produced an average of 32fps in the same test. The difference in frame rates was still considerable at a resolution of 2,560x1,440, where the GTX 780 Ti produced an average frame rate of 31.5fps compared with the Radeon 290X's 22.6fps.

Given this level of power, the GTX 780 Ti is predictably capable of playing the latest games in Nvidia's Surround gaming mode across three monitors. With three monitors attached to the GTX 780 Ti, resolution set to 5,760x1,080 and graphics at Ultra, the GTX 780 Ti produced a smooth average frame rate of 56.2fps in Dirt Showdown. Curiously, the Radeon R9 290X again beat the GTX 780 Ti running on three monitors, with an average frame of 66fps.

Still, the GTX 780 Ti consistently beat the Radeon R9 290X when we reduced graphics quality, producing 114.6fps with graphics quality set to High across three monitors; the Radeon R9 290X produced 100fps in the same test.



AMD A10-6790K



★★★★★

£95 inc VAT • From www.kikatek.com

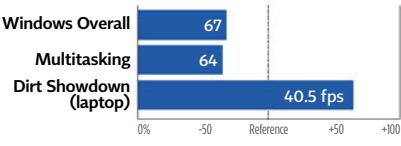
VERDICT

Good stock performance and great overclocking potential make this processor a bargain buy

WE'VE ALWAYS FOUND AMD's A-series processors great value, as they combine a good level of processing power with a highly impressive built-in graphics processor. For this reason we were keen to review the AMD A10-6790K, an A-series processor with

SPECIFICATIONS

CORES	4
CLOCK SPEED	4GHz
SOCKET	FM2
CACHE	4GB L2
TDP	100W
WARRANTY	One-year RTB
PART CODE	A10-6790K
DETAILS	www.amd.com



See page 76 for performance details



the same Radeon HD 8670D graphics processor as the Best Buy-winning A10-6800K (see Reviews, Shopper 307) but with slightly reduced clock speeds.

The A10-6790K has a slightly lower base clock speed of 4GHz than the A10-6800K, which runs at 4.1GHz. It also has a lower boost clock speed of 4.3GHz compared with the A10-6800K's 4.4GHz. In practice these slight variations made very little difference in our benchmark tests; the A10-6790K scored 67 overall and the A10-6800K scored 70 when tested with an Asus A88X-Pro motherboard.

However, the K in the A10-6790K's name indicates that you can overclock it. Depending on your motherboard, you can have the chip running at 4.4GHz with a little configuration.

When clocked to 4.4GHz, the A10-6790K scored 73 overall in our benchmarks. The largest increase in performance occurred in the multitasking segment of the

benchmark test, where the A10-6790K scored 70 – an increase of six points from the 64 it scored at stock speeds.

When we increased the clock speed further to 4.8GHz, the A10-6790K scored 76 overall, which is an impressive jump in speed and a remarkable overclock considering we were just using a stock CPU cooler.

Eager to test the A10-6790K's graphical performance, we ran our Dirt Showdown benchmark at a resolution of 1,280x720 with 4x anti-aliasing and graphics quality set to High. The processor's built-in graphics processor produced an average frame rate of 40.5fps, which is mighty impressive, and means you won't need a separate graphics card to play games.

The A10-6790K is currently around £10 cheaper than the A10-6800K, and given its high level of performance when overclocked, it's a bargain. It wins a Best Buy award.

Andrew Unsworth

AMD Radeon R7 250

★★★★★

£63 inc VAT • From www.dabs.com

VERDICT

A fair budget graphics card, which can play modern games at medium detail

THE R7 250 is an entry-level Radeon card that doesn't require extra power connections to work – you simply plug it into a PCI Express x16 slot and it's ready to go. This makes it ideal for use in PCs with modest power supplies that don't have PCI Express power connectors. The card provides HDMI, DVI and VGA video connections, so you shouldn't have any trouble connecting it to your display.

The graphics processor has 384 stream processors and runs at 1.05GHz. It's paired with 1GB of graphics memory running at 1.15GHz. This isn't a particularly impressive specification, but it's acceptable if you want a general-purpose graphics card and don't intend to play games at high quality settings.

Indeed, the R7 250 produced an average frame rate of 27.1fps in our Dirt Showdown test at a resolution of 1,920x1,080 with graphics quality set to Ultra, which is too low for truly smooth gameplay. However, reducing graphics quality to High increased the average frame rate to a much smoother 47fps.

The R7 250 failed our Crysis 3 benchmark at a resolution of 1,920x1,080 with graphics quality set to High, and reducing graphics quality to Medium only raised the average frame rate to 17.6fps. This is no surprise given the specification, but when we reduced the resolution to 1,280x720 and graphics quality to Medium the R7 250 produced a much smoother average frame rate of 31.3fps. That's pretty good for a £63 graphics card.

These results compare well with those of the more expensive Asus GTX 650-E (see What's New, Shopper 304), which, like the R7 250, requires only bus power. The GTX 650-E produced an average frame rate of 20fps in Dirt Showdown at 1,920x1,080 and Ultra quality, which is slower than the R7 250. However, the GTX 650-E beat the R7 250 by around 5fps with reduced quality levels in this benchmark.

Everyone would like to play the latest games at the highest settings, but graphics cards that can handle that are expensive. It's

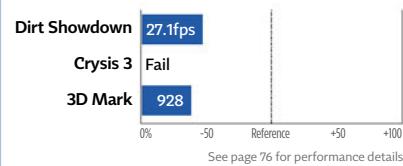


entirely possible to enjoy Crysis 3 at 1,280x720 and Medium quality, so if you have a low-power PC or a limited budget the R7 250 may be for you. However, we think gamers would be better off paying more for a Radeon R7 260X (see Reviews, Shopper 311).

Andrew Unsworth

SPECIFICATIONS

CHIPSET	R7 250
CORE SPEED	1.05GHz
RAM	1GB GDDR5 (1.15GHz)
WARRANTY	One-year RTB
PART CODE	11215-00-20G
DETAILS	www.amd.com



See page 76 for performance details

SERIF WebPlus X7



£90 inc VAT • From www.serif.com

VERDICT

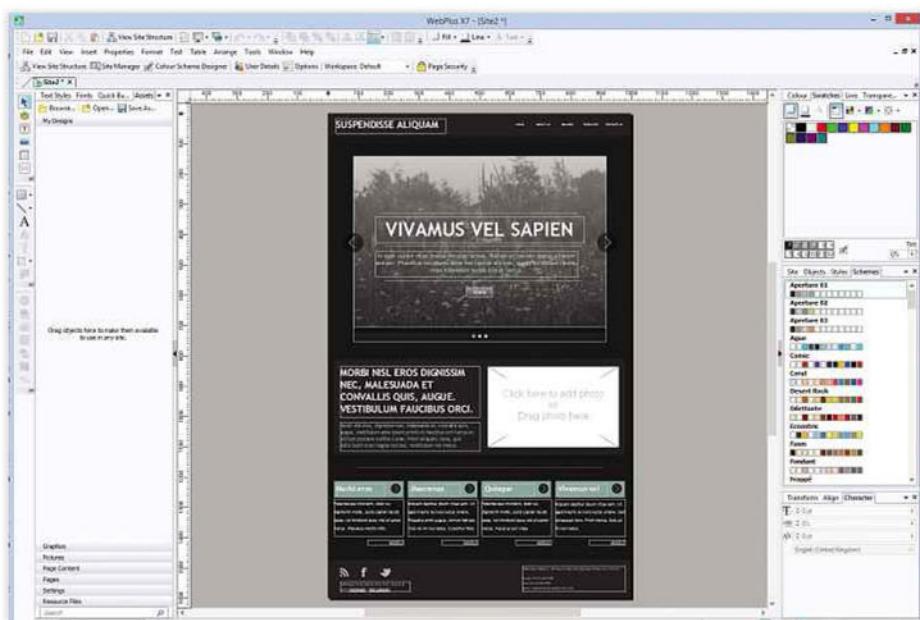
WebPlus X7 makes it easy to construct a fully functional site without having to write code

WEBPLUS X7 IS a feature-packed web design package for users who want to design sites visually using drag-and-drop elements, although you can tweak the code of your site to a limited extent. The websites you can create are static and best employed when you want to create something to promote your shop or organisation rather than a blog. If you want to create a front-end for a website based on a content-management system such as WordPress, you should look elsewhere.

WebPlus X7's WYSIWYG interface lets you build a glossy looking site using templates into which you can drag and drop elements. However, few of the templates are examples of cutting-edge design. Many are distinctly twee, even those that are supposed to be for businesses. The same can be said for most of the template packs that Serif sells on its website. Although some very stylish templates can be bought from third-party sites, there's nothing like the range and variety of themes available for popular web content management systems.

THEME ACADEMY

The template browser represents all the themes and templates you can choose from as thumbnails. A magnification slider lets you increase the templates in size to a point where you can get a reasonable idea of what each looks like before you load it. Each template comes with a few pre-generated pages you can include, such as a front page, location map and contact form. You can also apply a variety of pre-defined colour schemes to the templates, or create your own with the colour scheme designer. Serif has provided templates for sites designed to be viewed on mobile devices, as well as those designed for desktop



↑ Serif WebPlus X7 makes it easy to create static websites by dragging and dropping items on to a web page

browsers. Unfortunately, all the template styles we saw were dependent on fixed width layouts, so making a site that looks good on both mobile and desktop browsers is a hard task unless you're prepared to make separate websites for both targets.

If you're designing a site from scratch, WebPlus's helpful interface may become a hindrance. WebPlus X7 doesn't create pages of editable code. Instead, it keeps everything in its own inaccessible proprietary project format until you export your site. This frustrated us even when we performed simple tasks. We're particularly keen on WebPlus X7's ability to take a selected text box and turn it into an image, for example. However, you must export the entire site and open the image from the exported files in order to edit it in another program. If you want properly integrated image editing beyond a few basic adjustments, you must buy Serif PhotoPlus X10, which is well integrated with WebPlus X7.

To its credit, this package outputs neat, correct code that passes W3C's conformance checker perfectly. Conveniently, WebPlus X7

adds comments to code that it has generated, which makes editing and understanding the code at a later date much easier. This is quite an achievement, given the relative complexity of HTML5, CSS3 and JavaScript. We're not fans of WebPlus X7's built-in HTML editor, though, because it doesn't give you free rein to add hand-coded elements. You're encouraged to add them with a HTML code fragment tool instead, and you're restricted in terms of where you're allowed to make additions. We'd have liked its HTML viewer to wrap text, too.

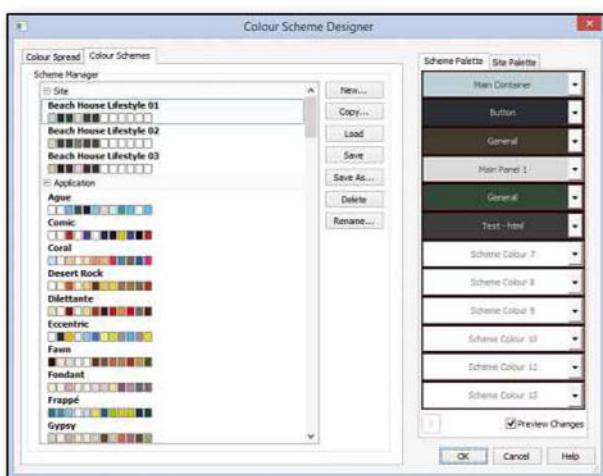
When you create a new page, a helpful properties box lets you set parameters such as filename, a header description and keyword sections to make the page search engine-friendly and to specify its relationship to the other pages in your site. WebPlus's HyperLink shortcut makes it easy to link between pages on your site, while all top-level pages are added to an automatically generated navigation bar. You can add more pages beneath the top-level pages. This, and a Site Navigation overview tool, makes it easy to visualise the structure of your site.

It's also easy to add images; simply drag an image box on the page wherever you want the image to appear. Other elements, many of them based around Flash or JavaScript, can easily be added to any page via WebPlus X7's Insert menu. You can choose from a number of photo gallery styles, plus image sliders, video players, social media widgets, forms and mouseover effects.

SEVEN UP

WebPlus X7 is fairly cheap for a fully featured WYSIWYG web design tool. The page creation and site navigation tools make it easy to build an elegant site from scratch. However, this is still a limited program. It's not suitable for editing or creating templates for CMS-driven web development tools such as WordPress, and the lack of a proper HTML editor is irritating. If you are code-averse and don't need much flexibility, WebPlus is great; we assembled the bones of a clean, stylish website quickly with minimum effort. Just be aware of its limitations and give the trial version a go before you buy.

Kat Orphanides



↑ There are some good customisation options in Serif WebPlus X7

SPECIFICATIONS

SYSTEM REQUIREMENTS Windows XP/Vista/7/8,

1GB RAM, 340MB disk space

PRODUCT CODE WPX7INTDVDR

DETAILS www.serif.com

ACDSEE Pro 7



£124 inc VAT • From www.acdsee.com

VERDICT

Good creative effects and photo management, but we still prefer Lightroom

ACDSEE PRO 7 aims to make the process of organising and editing your pictures easier, with features such as geographical mapping facilities and creative effects. Any software of this type must really impress to switch our attention from the Best Buy-winning Adobe Lightroom 5 (see Reviews, Shopper 307). Still, ACDSee Pro is off to a good start, as it has similar features and is just as responsive.

ACDSee Pro 7 introduces mapping facilities that are a good match for those found in Lightroom. Photos taken with GPS-enabled cameras are plotted automatically, and adding others to the map is a simple matter of dragging and dropping them. A Reverse Geocode function uses the GPS coordinates to tag photos with location-based keywords, from country all the way down to street names. ACDSee Pro 7's database doesn't include places of interest, such as museums and parks. Even so, the map provides a useful way to search for photos by location.

DESTRUCTIVE CRITICISM

Our main criticism with previous versions of ACDSee Pro was that they used a mixture of destructive and non-destructive editing, restricting the order in which features could be used. Destructive editing saves edits by overwriting the original file or saving the changes to a new file, so you have potentially confusing multiple edits, while non-destructive editing leaves original files unchanged. We prefer to edit non-destructively.

Colour correction often involves lots of adjustments to a multitude of interrelated controls, and applying them destructively would make it harder to re-adjust or undo them later. Furthermore, each adjustment introduces small quantising errors that can build up and result in colour banding.



↑ The new mapping facilities provide a fun way to navigate photo libraries

To its credit, ACDSee Pro makes it clear which type of editing you're using. The Develop tab is non-destructive, while the Edit tab is destructive. In practice, it's best to make all necessary adjustments in the Develop tab before moving to the Edit tab.

It's good to see key features making their way from the Edit to the Develop tab to create a more non-destructive workflow. These include the Clone and Heal tools, which are used to cover up blemishes. It's now possible to jump freely between these tools and other non-destructive tools at any time. However, there's still no way to amend existing Clone and Heal edits, other than with Undo and Reset commands. In contrast, Lightroom has the ability to amend or delete each brush stroke. Lightroom's Heal tool gives better results, too, and automatically matches the colour of the cloned material to its new surroundings. ACDSee Pro's implementation retains the colours of the thing you're trying to cover up, which rather defeats the point.

The new Linear Gradient and Radial Gradient tools are more successful. They join the Develop Brush introduced in ACDSee Pro 6 to correct colour, and sharpen and blur limited parts of an image. The Linear Gradient tool is perfect for adjusting colours in large expanses of an image, while the Radial Gradient can apply vignette effects or add presence to the main subject. The ability to tweak the shape and colour correction settings in tandem makes it easy to achieve subtle but effective results.

Even better, there's no difficulty in amending edits made with these gradient tools and the Develop Brush at a later date. We blurred the edges of a photo with the Radial Gradient tool, then sharpened certain areas back to their original state with the Develop Brush. This

behaviour is testament to ACDSee Pro 7's robust image-processing engine, and it wouldn't be possible if the blur effect had been applied destructively. Sadly, there's still no facility to apply white balance or any other hue-based adjustments locally, except by applying them destructively via the Edit tab.

CREATIVELY SPEAKING

We've complained about the Edit tab, but it does have its uses, and ACDSee Pro 7 has functions that are unavailable in Lightroom. There's no layer-based editing, though, so ACDSee can't combine multiple images.

Some effects are crude, but the ability to limit them to specific areas with the brush, linear gradient and radial gradient tools adds flexibility. Lomo and Orton emulate film-era effects to give photos an atmospheric vintage appearance. The Tilt-Shift effect blurs around a band or ellipse of sharp focus and includes options for creating realistic bokeh effects.

Ultimately, it's the small details that count. In most cases, Lightroom comes out on top as its noise reduction for Raw files produces better results and is quicker to preview. Lightroom includes a database of lens profiles for automatic correction of lens distortions and vignetting, and its chromatic aberration removal is automatic. These must be applied manually in ACDSee Pro 7. Then there are the frustrations with library management in ACDSee, whereby meta data filters are presented as fixed values such as 1/125s and 1/250s shutter speeds.

Although ACDSee Pro 7 has no shortage of commendable features, Lightroom 5 is a more elegant and rewarding application.

Ben Pitt



↑ The new Tilt-Shift effect is one of many processes that push photos in more creative directions

SPECIFICATIONS

SYSTEM REQUIREMENTS Windows XP (SP3)/Vista/7/8, Pentium III processor, 512MB RAM (Pentium 4, 1GB recommended), 310MB disk space

DETAILS www.acdsee.com

UBISOFT

Assassin's Creed 4: Black Flag

£25 inc VAT • From www.cdkeys.com**VERDICT**

Mix assassins and pirates and you get something awesome - though still very familiar

THE UNDISPUTED HEAVYWEIGHT champion of historical action games is back, and this time we're setting sail to the Golden Age of Piracy. It's the early 1700s and Spain and England have called a truce in their long war, leaving many skilled privateers in the West Indies without respectable employment. That can only lead to one thing: piracy on the high seas.

Assassin's Creed 4: Black Flag expands the series by adding seamless naval gameplay. Ubisoft has come a long way from the largely linear ship sections in the last outing. The new game engine sets you free to explore land and sea, and there's little loading to be seen – only when starting main story missions or arriving at one of the game's larger ports.

You can run across the rooftops in a fishing village, leap down into your boat – the Jackdaw – and whisk her out of harbour. Sailing is dumbered down – you pretty much point your ship and go, while speeding up and slowing down involves raising or lowering your sails like changing gears in a car. The navigable area, which is centred around Cuba, is huge and takes about 30 minutes to cross.

Once in open waters, you can use your spyglass to spot merchant vessels to plunder – as long as the defending Galleons aren't too close. After weakening the vessel with your cannons, bringing your ship alongside and climbing the rigging, you can jump across to wreak havoc from above the melee before taking out the captain and claiming the ship.

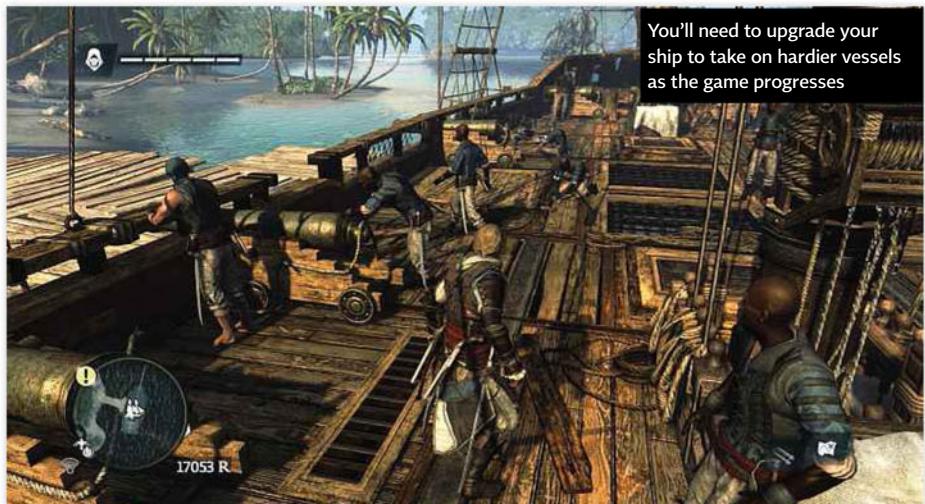
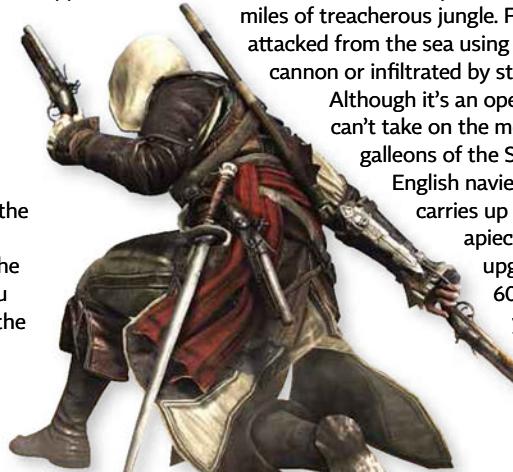
It's blood-stirring stuff, and free-running amid the rigging and the cut-and-thrust of close combat fit perfectly with the mechanics and feel of previous Assassin's Creed games. Even so, it's all largely familiar, with only slight refinements to the combat, free-running, exploration and stealth elements.

A SALTY DOG

At least the story takes a new approach.

Protagonist Edward Kenway, a much-feared Buccaneer, blunders into the age-old conflict between Templars and Assassins. As well as fighting for fame and fortune, he must take on the Templars and their allies.

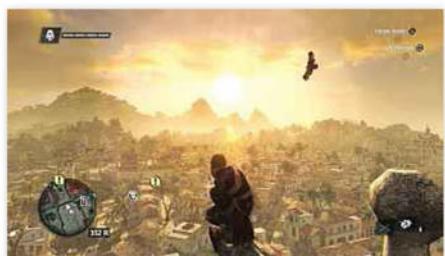
Ubisoft persists with the dual narrative, making you (yes, that's actually you) the modern-day protagonist.



You'll need to upgrade your ship to take on harder vessels as the game progresses



↑ Chasing a merchant ship and its escort through a brewing storm is a thrilling experience



↑ Fans of the series will be pleased to hear that there are still large urban areas and towers to climb

Occasionally you're pulled out of Kenway's life to work at a swanky games development company. It's all very clever, and helps justify many of your objectives, but we'd prefer it if Ubisoft just left us to enjoy the main game.

The Caribbean location looks stunning and the small islands, forts, fishing villages and coves sparkle with character. Legendary pirate figures Blackbeard, Calico Jack and other real-life swashbucklers are central to the plot.

The graphics are sublime, with detailed textures, long draw distances and great particle effects. The sea is like a living, heaving thing, and smashing through waves in a storm is thrilling. The jungle-choked islands look superb and the towns feel as well-researched as ever, enlivened with historical detail.

EMERALD ISLES

The game is spread across 50 or so locations on the open world map. As well as the big ports of Havana (Spanish), Kingston (British) and Nassau (a pirate freetown), there are fishing villages and plantations to plunder, hidden coves and Mayan ruins to explore and miles of treacherous jungle. Forts can be attacked from the sea using your ship's cannon or infiltrated by stealth from land.

Although it's an open world, you can't take on the most powerful galleons of the Spanish and English navies at first. Each carries up to 100 guns apiece. You'll need to upgrade your 60m-long ship as you progress, from six

cannons up to 56, and by adding mortars, explosive mines, swivel guns and a diving bell for underwater exploration.

Eventually, you'll earn your own pirate base, which you can upgrade with shops, and gain your own fleet of ships that will plunder in your name and for your profit. There's also treasure to find and maps to follow, which you can view on a tablet or smartphone.

On top of all this, there's a solid multiplayer mode, although sadly it doesn't include naval combat. Still, the sneaking, running, chasing and backstabbing are a nice change of pace from the usual repetitive shooting of most online competitive games.

If you haven't played an Assassin's Creed game recently, this is a great place to get back onboard. The meta-narrative has been rebooted, the historical setting is the best yet and the sea-faring elements are an excellent addition. If you've tired of the series' key mechanics, though, you'll find that this game feels very familiar in parts.

That said, it's far greater than the sum of its parts and arguably the best pirate game ever (sorry Monkey Island). However, it's hard not to mark it down for its familiarity. If you're new to all this it's a five-star game, but you may want to knock one off if you're an old hand with those hidden blades.

Seth Barton

SPECIFICATIONS**SYSTEM REQUIREMENTS**

Windows Vista/7, 2.1GHz quad-core processor, 30GB hard disk

PRODUCT CODE B00BSR6IV4

DETAILS www.ubi.com

ELECTRONIC ARTS Need for Speed Rivals

★★★★★

£24 inc VAT • From www.play.com

VERDICT

Drop-in multiplayer and hectic open-world racing give the series a nitrous boost

THE NEED FOR Speed franchise has been variable since EA started releasing a new game every year, with titles alternating between good and mediocre. After last year's Most Wanted, which was well received by gamers and critics alike, things didn't look good for Rivals. Thankfully, developer Ghost Games has delivered a brutally fast, incredibly fun racer.

As the name suggests, Rivals pits players against each other, either as street racers or cops. The major change from previous games is that every other racer is controlled by a player. Rivals drops you into the open world of Redview County alongside other gamers, and a leaderboard and speed camera compare your times and top speeds with everyone else's, as well as with global leaderboards. Your Origin friends can drop in and out of games on the fly, and you can challenge anyone to a race at any point – even while you're in the middle of a police pursuit.

CATCH THE TERRAIN

Rockport County may not be as big as Grand Theft Auto's San Andreas, but it still has 100 miles of roads. The varied terrain can see you flying through city streets one minute and forests or deserts the next. There are lots of jumps and hidden shortcuts to find, and you can access it all from the outset, although some events are locked until you increase your driver level. You do this by completing speed lists – groups of challenges that involve winning races, taking out other racers, hitting jumps and driving at a certain top speed.



Slick cars, a huge and varied landscape and weather effects help bring the game to life

After completing a speed list you need to bank your points at a safe house or Police checkpoint, as being taken out or busted by a cop or having a major crash resets your score. You use points to buy new cars and upgrades, so you'll want to bank them as soon as possible. The more speed points you have, the higher your wanted level and the more police will join a pursuit if you get their attention.

You can escape these using skill alone, but eventually you'll have to turn to pursuit technology. These upgrades let you sabotage enemy racers or cops using EMP pulses, electronic jamming mines or shock waves. Racers get exclusive access to the Turbo upgrade, which helps you escape hectic police pursuits, while the cops have spike strips that can take out racers' tyres instantly. You can only pick two at once, and some cars are better suited to certain upgrades; larger cars can withstand more damage and are best used to ram opponents, whereas lighter, faster cars are better for outrunning enemies.

Picking faster cars is the best way to increase your chance of evading capture. The selection of vehicles available in Rivals is exclusively high-end. American muscle cars such as the Ford Mustang and Dodge

Challenger are tail-happy and struggle with cornering, European sports cars such as the Porsche 911 and Ferrari 458 are friendlier in the bends and hypercars such as the McLaren P1, Bugatti Veyron and Koenigsegg Agera can outrun just about everything. Most cars are available to racers and cops alike, but certain models are exclusive to one side or the other.

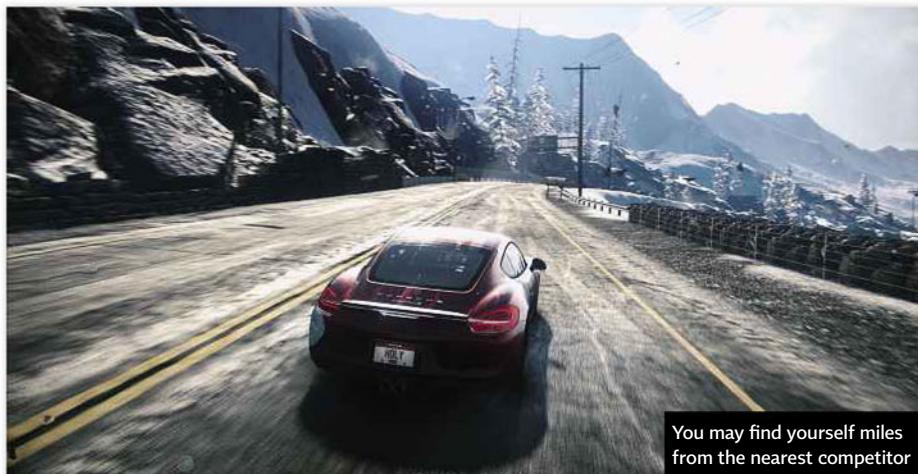
Each car is beautifully modelled from the outside – there's no cockpit view. Raindrops glisten off the paint as you drive through a storm and body panels fly off in a shower of carbon fibre and paint flecks when you crash. Rivals uses the Frostbite engine, last seen in Battlefield 4, and looks great in motion. It may not have the precise detail of simulations such as Forza Motorsport 5, but Rivals makes up for it with a dynamic weather system and a day/night cycle that makes the world feel a lot more alive than previous games.

COME ALIVE

Technically, Rivals is more alive than other titles thanks to its multiplayer-focused AllDrive system, although some of the excitement wears off when players drop out and the AI drivers take over. There are no instant takedowns, so the spontaneous driving battles are less satisfying than they were in 2010's Hot Pursuit. The map feels a little too big for the number of players, too, so you can find yourself miles from your nearest rival.

Ghost Games has made a fantastic effort, though, breaking the cycle of off-year Need for Speed games. It may not be the best in the series, but it comes closest to bringing the arcade-style thrills of classic racers such as Outrun to the current gaming generation.

Tom Morgan



You may find yourself miles from the nearest competitor

SPECIFICATIONS

SYSTEM REQUIREMENTS 2.4GHz dual-core processor, 4GB RAM, Nvidia GeForce 8800GT/AMD Radeon 3870 or better, 30GB hard disk space

PRODUCT CODE nfs-rivals-2014--ANW
DETAILS www.ea.com

RESCUETIME

RescueTime Premium



£44 inc VAT a year • From www.rescuetime.com

VERDICT

The best method we can think of for finding out exactly where you're wasting time online

WHEN BOTH YOUR work and personal life are dominated by a computer, it's easy to let the two cross over. Online shopping and social media make it all too tempting to procrastinate, which means you work late and wonder where the day went. If you often find yourself missing work deadlines, you may need RescueTime, a web-based service that helps you stop wasting precious minutes and hours.

RescueTime uses a desktop client to track exactly what you're doing with your time, and set goals and classify tasks based on how productive you think those tasks are. If, for example, you find that replying to emails and attending meetings take up too much of your time, mark those tasks as unproductive.

GOAL POSTS

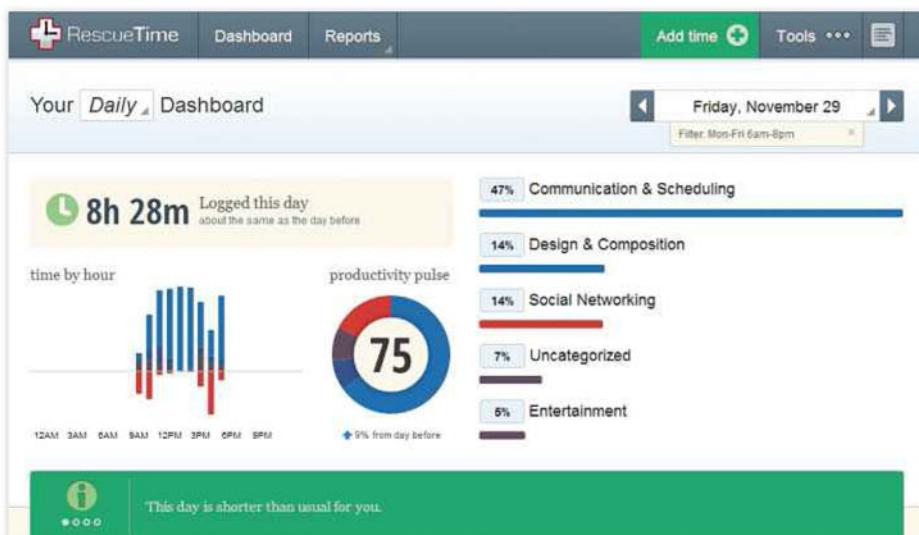
When you first sign up to RescueTime, a 'getting started' guide introduces you to the web interface's main dashboard and you're prompted to set goals. You can also block distracting websites, access a full record of your productivity over time, and log any time spent away from the computer.

We started by setting some basic goals for what we wished to achieve. We wanted to spend less than two-and-a-half hours of unproductive time between 6am and 8pm, and more than two-and-a-half hours of productive time in both the morning and afternoon, including our lunch break.

Over the course of a day, RescueTime monitors your activity and displays your



↑ RescueTime's advanced filters let you configure time blocks for which you can then set goals



↑ RescueTime uses graphs to detail the percentages of time spent on various daily computing activities

productivity pulse, which shows how productive you are as a percentage. Doing activities you've classed as productive will raise the productivity pulse, while wasting time on unproductive activities lowers it.

Over the first few days, you'll probably want to refine RescueTime's default settings. Your goals might need a bit of tweaking, too. Within our definition of productive time, we found that we almost never met our morning

after five minutes of inactivity, asking you what you were doing while away from the computer. It's possible to accidentally log activities for the same time period twice if you're using multiple PCs, but you can edit RescueTime's logs later to rectify this.

The desktop client's context menu contains several useful options. Our favourite is Focused mode, which enables temporary content filtering to block any website you've

“RescueTime is one of the best tools we've used to increase our personal productivity and analyse working patterns to see where improvements can be made **”**

goal but exceeded our afternoon goal. We could use this information to see how realistic our goals were, as well as our most efficient periods during the day. We also discovered some surprising things about our productivity: Friday afternoons were our least-efficient period when working in the office, but our most productive period when working from home.

Those who tend to overwork, either at home or at the office, will be pleased to know that you can configure alerts to let you know that you've hit a certain goal for the day. You can be notified via email or a pop-up message. You can also use the alert system to give you a nudge if it looks as if you're falling behind. A mobile app for Android and iOS lets you track activities when you're away from your PC.

The desktop client can log everything you do over 24 hours, but tracking productivity over this long period can reduce the accuracy of your productivity score if you use the same computer for work and play. Thankfully, you can define a specific period of time to monitor. You can also use RescueTime's Advanced Filters settings to monitor different periods for different days.

If, like us, you work on multiple computers in different locations over the course of a day, you can install the RescueTime client on each of those PCs. The client displays a dialog box

classified as Very Distracting. This feature is handy if you have a tendency to 'rest your eyes' by viewing Facebook when you should be working. You can temporarily unblock sites if you must use them, but RescueTime warns you not to do so. We found Focused mode works well, and improved our concentration.

Enabling Focused mode disables some of the desktop client's other shortcuts, so you can't use them to wriggle out of your focused zone.

TIME TO SHINE

Although we like RescueTime, we think some screens could be simplified even further. We'd like all the time-related options to be in one place, for instance, rather than spread out over different screens. Even so, RescueTime is one of the best tools we've used to increase our personal productivity and analyse working patterns to see where improvements can be made. Soletraders and freelancers in particular will benefit from this software, and will make up the yearly cost in increased productivity.

Kat Orphanides

SPECIFICATIONS

SYSTEM REQUIREMENTS Windows XP/Vista/7/8, Mac OS X

PRODUCT CODE

DETAILS www.rescuetime.com

SAGE Sage One Accounts Extra



£25 inc VAT per month • From www.sage.co.uk

VERDICT

A comprehensive version of the Sage One cloud accounting software, but it's missing some important features

THE SAGE ONE Accounts online accounting software impressed us when we reviewed it near the end of 2012 (see *Reviews, Shopper 298*), but that's a simple product that's not suitable for experienced bookkeepers or those who need great control over their finances. With Sage One Accounts Extra, Sage has added many more advanced features. This software is more expensive than Sage One Accounts, though, which remains good value at £10 excluding VAT per month. Sage One Accounts Extra is £25 excluding VAT per month, putting it in direct competition with Xero's Premium subscription.

Initially, you're presented with a Getting Started page containing four sections and 20 available tasks that let you add business information and set up products and services.

Sage One Accounts Extra supports multiple users, and you can give each user read-only, restricted access or full access to the entire software. If necessary, you can give a user different access permissions to different areas, which is useful if you want sales staff to manage their own invoicing, but wish to keep them away from bank or product information.

Much as in Sage 50, Sage One Accounts Extra lets you create departments and projects to which expenditure and sales revenue can be assigned, helping you better analyse where money is spent and generated. It's possible to



▲ Sage has introduced lots of excellent data visualisations; the cashflow forecast could be particularly helpful

create customer, supplier and product groups, which is potentially useful if your business has multiple strands or you need to segment it for other analyses. There's also a built-in system that lets you create quotes, mark quotes when they are declined, and convert quotes to an invoice.

COOL REPORTS

One criticism we made of Sage One Accounts was that it had few reports. Happily, Sage One Accounts Extra has a comprehensive set of reports that detail aged creditors and debtors, profit and loss, cash flow and unreconciled bank transactions, to name but a few.

Perhaps more importantly, Sage has introduced widespread data visualisation throughout the software. While Sage One Accounts relies almost exclusively on a tabular display of numbers, Accounts Extra employs some excellent graphing to help you understand your business's vital information.

A particularly good example of this can be found on the sales summary page, which shows a large line graph of invoice value against time. Under the line graph is a pie chart that displays outstanding and overdue invoices, and another that illustrates quote performance. Three simple tables add a snapshot of your biggest customers and debtors, among other things.

Many firms will find the cash flow overviews particularly useful. The statement view graphs the money flowing in and out of the business alongside the cash held in its accounts, while a forecast version does the same for the following month, based on the amounts and settlement dates of the invoices you raise. The forecast graph tries to forecast future expenses based on past outgoings to give the most realistic picture possible.

Despite these improvements, Sage One Accounts Extra isn't perfect. There's an inconsistent feeling to its navigation, which puts key features such as sales, purchases, contacts and banking on their own tabs, but places the overview screens on sub-tabs within the Summary tab. Some of the features shown in the Getting Started page are hidden

away behind an Accounts Extra Settings link, which is itself hidden within the Settings menu.

In some instances where data is tabulated, columns are too generously padded for enough information to be visible at typical display resolutions. When batch-entering invoices on a laptop screen that's 1,366 pixels wide, for example, supplier names, ledger account names and item details are all truncated.

As with Xero, there's no payroll system built into Accounts Extra, but you can add it for five, 10 or 15 employees for £5, £10 or £15 excluding VAT per month respectively. That's a reasonable expense if you have colleagues, but a sole director with no other staff will still need the £5 package to pay themselves. Similarly, there's no quick facility to raise a dividend, generate a voucher and make a corresponding bank payment. By comparison, Crunch Complete (see *Reviews, Shopper 304*) supports simplified dividend payments and payroll for up to four directors.

There's also no support for third-party plug-ins for payment systems such as PayPal, although you can use Sage's Sage Pay system. The Sage One family still doesn't support automated bank feeds, either, and without them Sage One Accounts Extra can't be sure of your current bank balance. Reconciliation involves uploading electronic statements yourself.

Although there's no app for Sage One Accounts Extra, you can still access it on the move through your smartphone or tablet's web browser, which does add convenience.

EXTRA HELP

Sage One Accounts Extra is comprehensive and has greater potential for analysis than its cloud rivals. However, it isn't as customisable as Xero, which we narrowly prefer.

Simon Handby



▲ There's no app, but the software does work on a mobile phone screen

SPECIFICATIONS

SYSTEM REQUIREMENTS None stated

PRODUCT CODE N/A

DETAILS www.sage.co.uk

Choosing a ... PC system

01 A basic PC costing around £350 will be able to run everyday office, multimedia and education software, as well as anything on the internet. It won't cope with modern games, though. Many PCs can be sold with or without the monitor. If you don't like the display that the manufacturer is offering, use your current one or choose an alternative from our Displays section.

02 If you want to play games, you'll have to upgrade the graphics card. Budget cards such as the AMD Radeon R7 260X will cope well with this year's games, but to play next year's just as smoothly (and enjoy the best-quality graphics today) it's worth upgrading to a more powerful card such as an Nvidia GeForce GTX 770.

03 All modern PCs come with at least a dual-core processor, so they're capable of taking on most tasks. Anyone who regularly undertakes demanding tasks such as video editing and encoding should seriously consider a quad-core processor.

04 There are lots of reasons to upgrade the memory or hard disk. If you'll use your PC for gaming, video-editing or other demanding tasks, you'll need 8GB of RAM and a large hard disk; 1TB should suffice. Many new PCs come with SSDs, some of which work alongside a standard hard disk as the boot disk. These are smaller than normal hard disks but make your PC boot and load programs incredibly quickly.

05 Having plenty of USB ports is always useful, as most PC gadgets attach to these. Most new PCs have USB3 ports, which provide faster data transfers when used with supported devices. Look for a memory card reader if you have a digital camera, and make sure your camera's memory card is supported.

06 Most new PCs will come with Windows 8 installed. Don't be too easily swayed by the inclusion of other software with your PC. It may be that you'll never use it. Still, if you find a PC that includes software you'd otherwise pay for, you'll save money if it's included.

07 While most PCs come in cases of a fairly similar size, some have more compact mini tower or mini-PC cases. These smaller PCs will fit under your TV or on your desk more easily, but bear in mind that they're significantly harder to upgrade than full-size machines.

PCs

PALICOMP Sniper Elite 2 GamerCOMPUTER SHOPPER
BEST BUY

£770 inc VAT

• www.palicomp.co.uk

We reviewed this powerful PC as a complete system with a choice of upgrade options, but it's best bought without the monitor. Its Intel Core i5-4670K processor has been overclocked to 4.2GHz. It has lots of storage and can be fitted with an optional Nvidia GeForce GTX 660 for top gaming performance.

CPU 2.4GHz Intel Core i5-4670K • RAM 8GB • STORAGE 128GB SSD + 2TB hard disk • GRAPHICS CARD 2GB Nvidia GeForce GTX 660 • OPTICAL DRIVE DVD+/-RW +/-DL • DISPLAY 23.6in widescreen LCD • OPERATING SYSTEM Windows 8 • DIMENSIONS 326x194x460mm • POWER CONSUMPTION 7W standby, 85W idle, 224W active • WARRANTY Three-year RTB • PART CODE HAS1 • DETAILS www.palicomp.co.uk • FULL REVIEW Nov 2013

**VERYPC** Nano SketchCOMPUTER SHOPPER
BEST BUY

£549 inc VAT

• www.very-pc.co.uk

Far more powerful than a typical mini PC, this system is built with a Core i3 processor rather than a weedy Atom or similar. Although you can get the same kind of performance for less money, this is the best miniature system we've seen in a long time and is an ideal basic system if size matters more than power.

CPU 1.8GHz Intel Core i3-3217U • RAM 4GB • STORAGE 1TB hybrid hard disk • GRAPHICS CARD Intel HD Graphics 4000 • OPTICAL DRIVE None • OPERATING SYSTEM Windows 8 • DIMENSIONS 38x190x155mm • POWER CONSUMPTION 1W standby, 15W idle, 22W active • WARRANTY Two-year collect and return • PART CODE NS7620 • DETAILS www.very-pc.co.uk • FULL REVIEW Feb 2014

**APPLE** 21.5-inch iMacCOMPUTER SHOPPER
BEST BUY

£1,149 inc VAT

• <http://store.apple.com/uk>

This latest version of Apple's popular iMac all-in-one looks beautiful, with an incredibly thin body and an excellent display. It's also immensely powerful, scoring 90 overall in our benchmarks. If you want both style and substance, the new iMac is the computer to buy.

CPU 2.7GHz Intel Core i5-4570R • RAM 8GB • STORAGE 1TB hard disk • GRAPHICS CARD Intel Iris Pro Graphics 5200 • OPTICAL DRIVE None • DISPLAY 21.5in widescreen IPS • OPERATING SYSTEM OS X 10.8 • DIMENSIONS 450x175x28mm • POWER CONSUMPTION 1W standby, 23W idle, 48W active • WARRANTY One-year RTB • PART CODE 21.5-inch iMac (Late 2013) • DETAILS www.apple.com/uk • FULL REVIEW Jan 2014



Laptops

MSI GE60COMPUTER SHOPPER
ULTIMATE

£1,120 inc VAT

• www.saveonlaptops.co.uk

The GE60 gaming laptop looks stunning and is home to some seriously powerful hardware, including one of Intel's brand-new quad-core Haswell processors, 8GB of RAM and a powerful dedicated graphics card. It's our Ultimate laptop.

CPU 2.4GHz Intel Core i7-4700MQ • RAM 8GB • STORAGE 750GB hard disk + 128GB SSD • GRAPHICS 2GB Nvidia GeForce GTX 765M • OPTICAL DRIVE DVD+/-RW +/-DL • DISPLAY 15.6in widescreen LCD (1,920x1,080) • OPERATING SYSTEM Windows 8 • DIMENSIONS 32x383x249mm, 2.4kg • POWER CONSUMPTION 1W standby, 15W idle, 74W active • WARRANTY One-year RTB • PART CODE GE60 2QE-039UK • DETAILS www.msi.com • FULL REVIEW Oct 2013

SCAN 3XS Graphite LG155COMPUTER SHOPPER
BEST BUY

£892 inc VAT

• <http://3xs.scan.co.uk>

This laptop may not be as stylish as the MSI GE60, but it has an almost identical specification and is better value. It has a new Intel quad-core Haswell processor, 8GB of RAM and one of the most capable graphics chips we've seen on a laptop. Its Full HD screen looks great, too, making it a Best Buy winner.

CPU 2.4GHz Intel Core i7-4700MQ • RAM 8GB • STORAGE 1TB • GRAPHICS 2GB Nvidia GeForce GTX765M • OPTICAL DRIVE DVD+/-RW +/-DL • DISPLAY 15.6in widescreen LCD (1,920x1,080) • OPERATING SYSTEM Windows 8 • DIMENSIONS 42x374x250mm, 2.7kg • POWER CONSUMPTION 5W standby, 33W idle, 85W active • WARRANTY One-year RTB • PART CODE 3XS Graphite LG155 • DETAILS <http://3xs.scan.co.uk> • FULL REVIEW Nov 2013

APPLE 13-inch MacBook AirCOMPUTER SHOPPER
BEST BUY

£949 inc VAT

• <http://store.apple.com/uk>

The new MacBook Air is stunning and uses one of Intel's new fourth-generation processors. Its Core i5 processor is slightly slower than the chip in last year's model, but its ultra-low power consumption makes a huge difference to the battery life. It doesn't have a Retina display, sadly, but the 10-hour battery life more than makes up for that.

CPU 1.3GHz Intel Core i5-4250U • RAM 4GB • STORAGE 128GB SSD • GRAPHICS Intel HD Graphics 5000 • OPTICAL DRIVE None • DISPLAY 13.3in widescreen LCD (1,440x900) • OPERATING SYSTEM Mac OS X 10.8 • DIMENSIONS 17x325x227mm, 1.4kg • POWER CONSUMPTION 0W standby, 8W idle, 23W active • WARRANTY One-year RTB • PART CODE 13-inch MacBook Air • DETAILS www.apple.com/uk • FULL REVIEW Sep 2013

Choosing a ...

Tablet

01 All tablets

rely on an operating system (OS) to run apps.

There are three main choices:

Apple's iOS, which runs on the iPad and iPad Mini, Android,

which Google licenses to various manufacturers,

and Microsoft's Windows RT, which

is a cut-down version of Windows 8. If you own an Apple or Google smartphone, you'll be able to download your apps, music and so on to a tablet running the same OS, so it makes sense to stick with a compatible device.



02 It's important that you pick a tablet with a good screen and the highest resolution you can get. Many budget tablets have 1,280x800-resolution displays, but better tablets have Full HD 1,920x1,080 panels. Entry-level tablets typically use TN panels, which don't have particularly good viewing angles. The viewing angles of IPS panels are much better.

03 If you want to listen to lots of music, watch films and play games, make sure your tablet has plenty of storage. Many come with 8GB or 16GB of internal memory as standard, although some budget tablets have less. You'll typically pay more for a larger-capacity model. Many tablets have microSD slots that let you add extra storage, although you won't find one on an Apple iPad. MicroSD cards are a cheap way of boosting storage capacity.

04 Unlike smartphones, it's rare for a tablet to include a SIM card slot. This means you'll have to rely on Wi-Fi signals to get online, although some tablets will let you access the internet through your smartphone. If you want mobile access to the internet, look for 3G- and 4G-ready devices. However, these almost always cost more than Wi-Fi-only models.

05 Your choice of tablet determines the apps you can use. You may find that some of the apps you want are available on iOS but not Android and vice versa. Android and iOS devices currently have more apps than Windows RT.

SMARTPHONES

SAMSUNG Galaxy S4

COMPUTER SHOPPER
ULTIMATE ★★★★★

£415 SIM-free, free on £26-per-month contract •

www.expansys.com (SIM-free), www.buymobiles.net (contract)

The Galaxy S4 was worth waiting for. It's a powerful Android smartphone with a great screen, camera and battery life and some innovative software.

GOOGLE Nexus 5

COMPUTER SHOPPER
BEST BUY ★★★★★

£299 SIM-free, free on £21-per-month contract •

www.google.co.uk/nexus/5 (SIM-free), www.mobilephonesdirect.co.uk (contract)

The Nexus 5 is incredible value. It's a top-spec smartphone with a Full HD screen, a super-fast quad-core processor and the latest version of Android.

MOTOROLA Moto G

COMPUTER SHOPPER
BUDGET BUY ★★★★★

£130 SIM-free, free on £6.50-per-month contract •

www.phones4u.co.uk (SIM-free), www.mobilephonesdirect.co.uk (contract)

With its quad-core processor and impressive 1,280x720-pixel display, the budget Moto G blows away anything else this side of £200.

HUAWEI Ascend W1

COMPUTER SHOPPER
BUDGET BUY ★★★★★

£120 prepay, free on £14-per-month contract • www.o2.co.uk

Huawei's first Windows Phone mobile is a triumph, with smooth performance, a good screen and an impressive camera for the price. Its battery life is superb, too, pushing the W1 ahead of most Nokias.

APPLE iPhone 5S

COMPUTER SHOPPER
BEST BUY ★★★★★

£549 SIM-free, £99 on a £41-per-month contract •

<http://store.apple.com/uk> (SIM-free), www.three.co.uk (contract)

The 5S may not look too different from the 5, but it's screamingly fast and the new fingerprint sensor makes it easier to unlock and more secure.

TABLETS

GOOGLE Nexus 7 (2013)

COMPUTER SHOPPER
BEST BUY ★★★★★

£199 inc VAT • <https://play.google.com/store/devices>

Google has improved on the original Nexus 7 in almost every way with this updated model. The screen is stunning and the slimmer, more streamlined design is gorgeous. The 2013 Nexus 7 is the best 7in Android tablet around.

APPLE iPad Air

COMPUTER SHOPPER
ULTIMATE ★★★★★

£399 inc VAT • <http://store.apple.com/uk>

Apple has revamped the design for this fifth version of the iPad, which is slimmer but retains the same stunning 9.7in Retina display. For anyone who likes the iOS operating system, this is the best tablet available today.

KOBO Arc 10HD

COMPUTER SHOPPER
BEST BUY ★★★★★

£300 inc VAT • <http://store.kobobooks.com/en-gb>

Kobo's Arc 10HD is powerful, with a high-resolution screen and doesn't use a convoluted custom user interface. As Kobo hasn't altered the Android OS much, this is the best-value 10in Android tablet currently on the market.

MICROSOFT Surface Pro 2

COMPUTER SHOPPER
ULTIMATE ★★★★★

£719 inc VAT • www.microsoftstore.co.uk

Microsoft's second-generation Surface Pro impressed us with its great performance, improved battery life and new backlit keyboard covers. It runs the full version of Windows 8.1 too, making it a superb tablet-laptop hybrid.

ASUS MemoPad HD 7

COMPUTER SHOPPER
BUDGET BUY ★★★★★

£129 inc VAT • www.very.co.uk

With its high-quality screen, decent battery life and slim, sturdy construction, the MemoPad HD 7 is an absolute bargain for £129. No cheaper alternative can match it for performance and features.

OPERATING SYSTEM Android 4.3 • **PROCESSOR** SPEED 1.9GHz • **NUMBER OF CORES** 4 • **RAM** 1GB • **MOBILE DATA** 4G • **DISPLAY** 5in 1,920x1,080 LCD • **CAMERA** 13-megapixel • **INTERNAL STORAGE** 16GB • **MEMORY CARD SLOT** microSD • **CLAIMED BATTERY LIFE** 17 hours talktime, 15 days standby • **DIMENSIONS** 137x70x8mm, 130g • **PART CODE** GT-19505 • **DETAILS** www.samsung.co.uk • **FULL REVIEW** Aug 2013

OPERATING SYSTEM Android 4.4 (KitKat) • **PROCESSOR SPEED** 2.2GHz • **NUMBER OF CORES** 4 • **RAM** 2GB • **MOBILE DATA** 3G • **DISPLAY** 5in 1,920x1,080 LCD • **CAMERA** 8-megapixel • **INTERNAL STORAGE** 16GB • **MEMORY CARD SLOT** None • **CLAIMED BATTERY LIFE** 17 hours talktime, 10 days standby • **DIMENSIONS** 138x69x9mm, 150g • **PART CODE** LG-D821 • **DETAILS** www.google.co.uk/nexus/5 • **FULL REVIEW** Feb 2014

OPERATING SYSTEM Android 4.3 • **PROCESSOR SPEED** 1.2GHz • **NUMBER OF CORES** 4 • **RAM** 512MB • **MOBILE DATA** 3G • **DISPLAY** 4in 480x800 LCD • **CAMERA** 5-megapixel • **INTERNAL STORAGE** 4GB • **MEMORY CARD SLOT** microSD • **CLAIMED BATTERY LIFE** Not disclosed • **DIMENSIONS** 130x66x1.6mm, 145g • **PART CODE** Moto G • **DETAILS** www.motorola.co.uk • **FULL REVIEW** Feb 2014

OPERATING SYSTEM Windows Phone 8 • **PROCESSOR SPEED** 1.2GHz • **NUMBER OF CORES** 2 • **RAM** 512MB • **MOBILE DATA** 3G • **DISPLAY** 4in 480x800 LCD • **CAMERA** 5-megapixel • **INTERNAL STORAGE** 4GB • **MEMORY CARD SLOT** microSD • **CLAIMED BATTERY LIFE** 10.5 hours talktime, 20 days standby • **DIMENSIONS** 124x63x10mm, 130g • **PART CODE** Ascend W1 • **DETAILS** www.huaweidevice.co.uk • **FULL REVIEW** Aug 2013

OPERATING SYSTEM Apple iOS 7 • **PROCESSOR SPEED** 1.3GHz • **NUMBER OF CORES** 2 • **RAM** 1GB • **MOBILE DATA** 4G • **DISPLAY** 4in 1,366x640 LCD • **CAMERA** 8-megapixel • **INTERNAL STORAGE** 16GB • **MEMORY CARD SLOT** None • **CLAIMED BATTERY LIFE** 10 hours' talktime, 10 days' standby • **DIMENSIONS** 124x267x7mm, 112g • **PART CODE** iPhone 5S • **DETAILS** www.apple.com/uk • **FULL REVIEW** Jan 2014

CPU 1.5GHz Qualcomm Snapdragon S4 Pro • **RAM** 2GB • **INTERNAL STORAGE** 16GB • **GRAPHICS** Qualcomm Adreno 320 • **DISPLAY** 7in, 1,920x1,200 LCD • **OPERATING SYSTEM** Android 4.3 • **DIMENSIONS** 200x114x9mm, 290g • **WARRANTY** One-year RTB • **PART CODE** Nexus_7_16gb • **DETAILS** www.google.co.uk/nexus/7 • **FULL REVIEW** Dec 2013

CPU 1.4GHz Apple A7 • **RAM** 1GB • **INTERNAL STORAGE** 16GB • **GRAPHICS** Apple A7 • **DISPLAY** 9.7in LCD (2,048x1,536) • **OPERATING SYSTEM** Apple iOS 7 • **DIMENSIONS** 240x169.5x7.5mm, 469g • **WARRANTY** One-year RTB • **PART CODE** iPad Air • **DETAILS** www.apple.com/uk • **FULL REVIEW** Feb 2014

CPU 1.8GHz Nvidia Tegra 4 • **RAM** 2GB • **INTERNAL STORAGE** 16GB • **GRAPHICS** Nvidia Tegra 4 • **DISPLAY** 10.1in wide-screen LCD (2,560x1,600) • **OPERATING SYSTEM** Android 4.2 • **DIMENSIONS** 253x172x9.9mm, 627g • **WARRANTY** One-year RTB • **PART CODE** Arc 10HD • **DETAILS** www.kobo.com • **FULL REVIEW** Feb 2014

CPU 1.6GHz Intel Core i5-4200U • **RAM** 4GB • **INTERNAL STORAGE** 64GB • **GRAPHICS** Intel HD Graphics 4400 • **DISPLAY** 10.6in wide-screen LCD touchscreen (1,920x1,080) • **OPERATING SYSTEM** Windows 8.1 Pro • **DIMENSIONS** 173x125x13.5mm, 900g • **WARRANTY** One-year RTB • **PART CODE** Surface Pro 2 • **DETAILS** www.microsoft.com • **FULL REVIEW** Jan 2014

CPU 1.2GHz MTK 8125 • **RAM** 1GB • **INTERNAL STORAGE** 16GB SSD • **GRAPHICS** PowerVR SGX 544 • **DISPLAY** 7in 1,280x800 • **OPERATING SYSTEM** Android 4.2 • **DIMENSIONS** 197x121x1mm, 302g • **WARRANTY** One-year RTB • **PART CODE** MemoPad HD 7 • **DETAILS** www.asus.com • **FULL REVIEW** Nov 2013

Choosing a ...

Monitor

01 A basic 24in LCD monitor will cost around £100. It will be fine for typical Windows work, but is likely to have poor viewing angles, so you'll need to sit straight on to achieve the best picture quality. Colour accuracy may not be very good, though.



02 A VGA input lets you use the monitor with any PC, but the quality may not be quite as good as it is over a DVI or HDMI input. Both are digital connections and require a compatible graphics card but they avoid the need for digital-to-analogue or analogue-to-digital conversions, which can reduce image quality. A digital connection automatically achieves the best picture, so you won't have to adjust clock or phase settings as you do with an analogue connection. Many DVI and all HDMI connections support HDCP, which lets you watch protected video content, such as Blu-ray movies, on your monitor. DisplayPort is becoming more popular, but you'll need a graphics card with a DisplayPort output (mini or full-size) to use this input on your monitor.

03 A larger monitor will be easier on the eye and may have a higher resolution. Most monitors have resolutions of at least 1,920x1,080 (1080p), which provide lots of room for working with multiple windows at the same time. For even higher resolutions, you'll need a larger display. Some 27in and 30in screens have a massive 2,560x1,600 resolution. You'll need a graphics card with a dual-link DVI output and a dual-link DVI cable or either HDMI or DisplayPort to use a monitor at this resolution.

04 If you want better picture quality, look for a monitor with a high contrast ratio. The higher the ratio, the whiter the whites and the blacker the blacks. You'll also be able to see more fine detail in images with high contrast levels. Viewing angles are important, as wider angles mean you don't have to sit directly in front of the monitor to get the best picture. Wider viewing angles also allow more people to view the screen at the same time.

Fast response times reduce ghosting, but don't be dazzled by the numbers. A response time of 25ms or quicker is fine for all applications.

PHOTOGRAPHY

CANON Ixus 255 HS

COMPUTER SHOPPER BEST BUY



£174 inc VAT • www.wexphotographic.com

Impeccable image quality is the highlight of this superb ultra-compact point-and-shoot camera. It beats some tough competition for low-light shots and produces sharp video footage, making it a Best Buy.

PANASONIC Lumix DMC-TZ40

COMPUTER SHOPPER BEST BUY



£219 inc VAT • www.jessops.com

The Lumix DMC-TZ40 is the successor to the excellent Lumix DMC-TZ30, and improves on it with built-in Wi-Fi and a higher-resolution sensor and touchscreen. It's the best ultrazoom available at the moment.

NIKON D7100

COMPUTER SHOPPER BEST BUY



£953 inc VAT • www.wexphotographic.com

The Nikon D7100 offers class-leading image quality, exceptional ergonomics and a sophisticated autofocus system. If you're a photography enthusiast, you'll love the Nikon D7100. This kit comes with the 18-105mm VR lens.

CANON EOS 700D

COMPUTER SHOPPER BEST BUY



£564 inc VAT • www.johnlewis.co.uk

A superb all-rounder that avoids the minor flaws of its predecessors. It produced consistently better results than similarly priced cameras with its 18-55mm kit lens, and there are many affordable extra lenses available.

PANASONIC DMC-GF6

COMPUTER SHOPPER BEST BUY



£359 inc VAT • www.currys.co.uk

This is the best all-round CSC and a bargain at this price. Its pictures live up to a DSLR's, and it's quick and easy to use. It comes with an articulated touchscreen and Wi-Fi, and there's a great range of lenses available for it.

DISPLAYS

DELL U2713H

COMPUTER SHOPPER ULTIMATE



£555 inc VAT • www.laptopsdirect.co.uk

This 27in IPS panel has a huge 2,560x1,440 resolution and DVI, HDMI, DisplayPort and mini-DisplayPort inputs, as well as a four-port USB3 hub. It has the widest colour gamut we've ever seen and is packed with features.

EIZO Foris FS2333

COMPUTER SHOPPER BEST BUY



£299 inc VAT • www.wexphotographic.com

Images look stunning on this first-class 23in IPS panel, and its superb colour accuracy and great viewing angles are far above those of any other display we've seen at this size. This is an excellent monitor.

DELL U2913WM

COMPUTER SHOPPER ULTIMATE



£439 inc VAT • www.lambda-tek.com

The U2913WM has a super-wide 29in IPS panel with a 2,560x1,080 resolution. Its image quality is superb, it has a wide range of inputs and its large 21:9 aspect ratio makes it perfect both for office tasks and media.

OPTOMA HD25

COMPUTER SHOPPER BEST BUY



£600 inc VAT • www.richersounds.com

This 3D-ready DLP projector is in a class of its own when it comes to home cinema and big-screen gaming. It has a Full HD resolution and a bright 2,000 ANSI lumen lamp, and comes with a pair of 3D glasses.

BENQ BL2410PT

COMPUTER SHOPPER BUSINESS BUY



£185 inc VAT • www.laptopsdirect.co.uk

This is one of the best business monitors we've tested. It's not particularly elegant but the 24in VA panel looks excellent and the highly adjustable stand has many ports. You can also twist the screen into portrait mode.

SENSOR SIZE 12 megapixels (4,000x3,000) • **ZOOM** 10x optical (24-240mm) • **LCD** 3in (461,000 pixels) • **STORAGE (INTERNAL)** SDXC card (none) • **BATTERY** Li-ion • **DIMENSIONS** 517x97x23mm, 144g • **WARRANTY** One-year RTB • **PART CODE** 82048006AA • **DETAILS** www.canon.co.uk • **FULL REVIEW** Jul 2013

SENSOR SIZE 18 megapixels (4,896x3,672) • **ZOOM** 20x optical (24-480mm) • **LCD** 3in (920,000 pixels) • **STORAGE (INTERNAL)** SDXC card (12MB) • **BATTERY** Li-ion • **DIMENSIONS** 610x109x30mm, 198g • **WARRANTY** One-year RTB • **PART CODE** DMCTZ40EBK • **DETAILS** www.panasonic.co.uk • **FULL REVIEW** Aug 2013

SENSOR SIZE 24 megapixels (6,000x4,000) • **ZOOM** 5.8x optical (27-157mm) • **LCD** 3.2in (1,228,800 pixels) • **STORAGE (INTERNAL)** Dual SDXC card (none) • **BATTERY** Li-ion • **DIMENSIONS** 108x137x160mm, 1.2kg • **WARRANTY** Two-year RTB • **PART CODE** I0205745 • **DETAILS** www.nikon.co.uk • **FULL REVIEW** Oct 2013

SENSOR SIZE 18 megapixels (5,184x3,456) • **ZOOM** 5x optical (29-88mm) • **LCD** 3in (1,040,000 pixels) • **STORAGE (INTERNAL)** SDXC card (none) • **BATTERY** Li-ion • **DIMENSIONS** 111x134x151mm, 785g • **WARRANTY** One-year RTB • **PART CODE** 85968027A • **DETAILS** www.canon.co.uk • **FULL REVIEW** Nov 2013

SENSOR SIZE 16 megapixels (4,592x3,448) • **ZOOM** 3x optical (28-84mm) • **LCD** 3in (1,040,000 pixels) • **STORAGE (INTERNAL)** SDXC card (none) • **BATTERY** Li-ion • **DIMENSIONS** 65x112x97mm, 439g • **WARRANTY** One-year RTB • **PART CODE** DM-GF6KEB-K • **DETAILS** www.panasonic.co.uk • **FULL REVIEW** Dec 2013

RESOLUTION 2,560x1,440 • **CONTRAST RATIO** 1,000:1 • **BRIGHTNESS** 350cd/m² • **PORTS** DVI, HDMI, DisplayPort, mini-DisplayPort • **POWER CONSUMPTION** IW standby, 60W on • **WARRANTY** Three-year RTB • **PART CODE** U2713H • **DETAILS** www.dell.co.uk • **FULL REVIEW** Jun 2013

RESOLUTION 1,920x1,080 • **CONTRAST RATIO** 1,000:1 • **BRIGHTNESS** 300cd/m² • **PORTS** VGA, DVI, HDMI • **POWER CONSUMPTION** IW standby, 23W on • **WARRANTY** One-year RTB • **PART CODE** E2773HS • **DETAILS** www.eizo.co.uk • **FULL REVIEW** Oct 2013

RESOLUTION 2,560x1,080 • **CONTRAST RATIO** 1,000:1 • **BRIGHTNESS** 300cd/m² • **PORTS** VGA, DVI, HDMI, DisplayPort, mini-DisplayPort • **POWER CONSUMPTION** IW standby, 52W on • **WARRANTY** Three-year RTB • **PART CODE** U2913WM • **DETAILS** www.dell.co.uk • **FULL REVIEW** Jun 2013

NATIVE RESOLUTION 1,920x1,080 • **CONTRAST RATIO** 20,000:1 • **RATED BRIGHTNESS** 2,000 ANSI lumens • **LAMP COST (ECONOMY)** £11 (E0.06) • **DIMENSIONS** 97x324x234mm, 3.1kg • **POWER CONSUMPTION** IW standby, 237W active • **WARRANTY** Two-year RTB • **PART CODE** HD25 • **DETAILS** www.optoma.co.uk • **FULL REVIEW** Jul 2013

RESOLUTION 1,920x1,080 • **CONTRAST RATIO** 5,000:1 • **BRIGHTNESS** 250cd/m² • **PORTS** VGA, DVI, HDMI • **POWER CONSUMPTION** IW standby, 23W on • **WARRANTY** One-year RTB • **PART CODE** BL2410PT • **DETAILS** www.benq.co.uk • **FULL REVIEW** Jul 2013

Choosing an ...

MP3 player

01 Basic MP3 players with 1GB or 2GB capacities are available for under £10. A good-quality 8GB player costs around £30 and can store thousands of MP3s encoded at 192Kbit/s. Most small MP3 players use solid-state flash memory for storage. This is immune to shocks, knocks and bumps, making such players ideal for use while jogging, for example.

02 If you want to carry your entire music collection with you, look for a high-capacity player. The highest-capacity models can hold up to 160GB of media and usually have a compact 1in or 1.8in hard disk. However, high-capacity MP3 players are available with flash memory storage up to 64GB, while others accept microSDXC cards to upgrade their storage by as much as 128GB. Hard disk players are bulkier than flash-based devices and are more likely to be damaged if dropped.

03 It's unusual for an MP3 player to have a battery life of less than 10 hours, with the exception of a few ultra-compact sports players. Ideally, you should buy one that lasts at least 15 hours. Flash-based players tend to use less power than hard disk players, but many hard disk players have larger batteries. Few modern MP3 players use disposable batteries, but it's worth looking for one if you'll be away from a power supply for long periods.

04 If you download music from online stores, make sure your player supports the appropriate formats. Apple's iTunes store sells tracks in AAC format, while other stores use Microsoft's WMA-DRM, and Audible's audiobooks use the proprietary AU format. Not all players support a wide range of formats. If you want to listen to music in unusual formats such as Ogg or FLAC, for example, you need a player that supports them.

05 Many MP3 players can also play video. Although they come with software to convert video to their preferred format, some are more flexible than others when it comes to file formats, so check the specifications before you buy.

06 If you want to use your MP3 player for games and apps, you'll have to buy a touchscreen player that runs Apple's iOS or Google's Android. These tend to be expensive, but you can expect a battery life of over 22 hours for music and a wealth of features beyond simple audio playback.

HOME CINEMA

SAMSUNG UE55F8000

COMPUTER SHOPPER
BEST BUY

★★★★★

£1,999 inc VAT • www.currys.co.uk

Samsung's UE55F8000 is one of the best LCD TVs on the market. It offers an incredible array of features and its picture quality is fantastic. It's expensive but worth the cost.

PANASONIC TX-P42GT60B

COMPUTER
SHOPPER
BEST BUY

★★★★★

£999 inc VAT • www.superfi.co.uk

If you want the best possible image quality for less than £1,000, Panasonic's TX-P42GT60B plasma is the TV to buy. It has incredibly dark blacks and amazing contrast, making it the obvious choice for film fans.

SONY BDP-S790

COMPUTER
SHOPPER
ULTIMATE

★★★★★

£170 inc VAT • www.johnlewis.com

Sony's top-end Blu-ray player from 2012 is so good that it remains the flagship model even now. It has everything you could need and even offers 4K upscaling. This is our favourite Blu-ray player.

PHILIPS HTL5120

COMPUTER
SHOPPER
BEST BUY

★★★★★

£250 inc VAT • www.amazon.co.uk

Philips has excelled itself with the HTL5120 sound bar. It looks and sounds great, offers Bluetooth connectivity and even has multiple HDMI inputs for connecting several Blu-ray players or games consoles.

ONKYO TX-NR626

COMPUTER
SHOPPER
BEST BUY

★★★★★

£299 inc VAT • www.richardsounds.co.uk

Onkyo's 4K-ready amplifier has all the features and inputs you could want from an A/V receiver, including built-in Wi-Fi, multiple HDMI outputs and Spotify music streaming.

AUDIO

SOUNDMAGIC E10

COMPUTER
SHOPPER
BEST BUY

★★★★★

£30 inc VAT • www.advancedmp3players.com

These earplug-style headphones sound loud, clear and balanced, with rich bass tones and plenty of natural character. They're a great buy if you add a £15 set of T-400 sound-isolating ear tips.

KEF X300A

COMPUTER
SHOPPER
BEST BUY

★★★★★

£600 inc VAT • www.homeavdirect.co.uk

They're very expensive, but these premium-quality speakers have a built-in high-resolution USB sound card to produce the best computer audio we've ever heard from a single-unit system.

DENON Ceol Piccolo

COMPUTER
SHOPPER
BEST BUY

★★★★★

£400 inc VAT • www.johnlewis.com

The Piccolo can play music stored on your network, stream internet radio and play music from Last.fm and Spotify. You can even use it with a USB drive or docked iOS device. It's easy to use and sounds great.

APPLE iPod Touch

COMPUTER
SHOPPER
BEST BUY

★★★★★

£220 inc VAT • www.currys.co.uk

The fifth iPod Touch is the best device of its kind. Its battery lasts for three days of continuous music playback or eight hours of video. Its display is great and its audio is as reliable as ever, although format support is limited.

ARCAM rPAC

COMPUTER
SHOPPER
ULTIMATE

★★★★★

£144 inc VAT • www.superfi.co.uk

This USB audio processor may lack audio inputs, but if you're after unparalleled stereo sound for the best possible reproduction of high-quality audio files, it's exactly what you need.

TV TYPE LCD • **RESOLUTION** 1,920x1,080 • **CONTRAST RATIO** 9,000,000:1 dynamic • **BRIGHTNESS** Not disclosed • **CONNECTIONS** 4x HDMI, 1x SCART, 1x VGA, 1 component, 1x composite inputs • **TUNER** Freeview HD, Freesat HD • **POWER CONSUMPTION** 0W standby, 189W on • **WARRANTY** One-year RTB • **PART CODE** UESF8000 • **DETAILS** www.samsung.co.uk • **FULL REVIEW** Jun 2013

TV TYPE Plasma • **RESOLUTION** 1,920x1,080 • **CONTRAST RATIO** Not disclosed • **BRIGHTNESS** Not disclosed • **CONNECTIONS** 3x HDMI, 1x SCART, 1x VGA, 1 component, 1x composite inputs • **TUNER** Freeview HD, Freeview HD • **POWER CONSUMPTION** 0W standby, 137W on • **WARRANTY** Five-year parts and labour • **PART CODE** TX-P42GT60B • **DETAILS** www.panasonic.co.uk • **FULL REVIEW** Nov 2013

PROFILE 2.0 • **CONNECTIONS** 2x HDMI, 1x composite, 1x stereo phono • **POWER CONSUMPTION** 0W standby • **WARRANTY** One-year RTB • **PART CODE** BDP-S790B • **DETAILS** www.sony.co.uk • **FULL REVIEW** May 2013

INPUTS 2x HDMI, 1x stereo phono, 1x coaxial S/PDIF, 1x optical S/PDIF • **OUTPUTS** 1x HDMI • **POWER CONSUMPTION** 38W on, 0W standby • **WARRANTY** One-year RTB • **PART CODE** HTL5120/01 • **DETAILS** www.philips.co.uk • **FULL REVIEW** Oct 2013

INPUTS 6x HDMI, 1x component, 5x composite, 6x stereo phono, 2x coaxial S/PDIF, 1x optical S/PDIF • **OUTPUTS** 2x HDMI, 1x component, 1x composite • **POWER CONSUMPTION** 210W on, 0W standby • **WARRANTY** One-year RTB • **PART CODE** TX-NR626 • **DETAILS** www.uk.onkyo.com/en • **FULL REVIEW** Oct 2013

CONNECTION 3.5mm stereo jack plug • **CABLE LENGTH** 1.2m • **IMPEDANCE** 16 ohms • **WEIGHT** 1kg • **WARRANTY** One-year RTB • **PART CODE** E10-BKR0 • **DETAILS** www.soundmagic.com.cn/en • **FULL REVIEW** Apr 2012

SPEAKER CONFIGURATION 2.0 • **POWER RATING** 70W RMS • **CONNECTIONS** 3.5mm stereo, USB inputs • **POWER CONSUMPTION** 0W standby, 28W active • **WARRANTY** One-year RTB (five years on speaker driver) • **PART CODE** KEFX300A • **DETAILS** <http://kef.com> • **FULL REVIEW** Jun 2013

CONNECTIONS 1x mini-jack headphone output, iPod dock, phone in, optical S/PDIF in, USB port • **AUDIO SUPPORT** WMA, AAC, Wav, MP3, FLAC 192/24, WAV 192/24, ALAC • **POWER CONSUMPTION** 3W standby, 12W on • **WARRANTY** Two-year RTB • **PART CODE** DRA-N5+SC-N5 • **DETAILS** www.denon.co.uk • **FULL REVIEW** Oct 2013

STORAGE 32GB flash memory • **EXPANSION SLOT** None • **AUDIO SUPPORT** AAC, Protected AAC, Wav, Audible, MP3 • **VIDEO SUPPORT** MPEG4 MP4 • **IMAGE SUPPORT** BMP, TIFF, JPEG • **INTERFACES** USB • **DIMENSIONS** 59.6x123mm, 88g • **WARRANTY** One-year RTB • **PART CODE** MD7ZBT/A • **DETAILS** apple.com/uk • **FULL REVIEW** Feb 2012

DAC Texas Instruments Burr-Brown PCM5102 • **MAX SAMPLE RATE** 96kHz • **MAX BIT DEPTH** 24-bit • **SOUND OUTPUT** Stereo • **SIZE** 3.5mm headphone out, stereo phono out • **WARRANTY** Two-year RTB • **PART CODE** rPAC • **DETAILS** arcam.co.uk • **FULL REVIEW** Oct 2011

LCD TV

PLASMA TV

BUILT-IN PLAYER

SOUND BAR

A/V AMPLIFIER

IN-EAR HEADPHONES

STEREO SPEAKERS

INTERNET RADIO

MEDIA PLAYER

AUDIO INTERFACE

Choosing a ...

Multi-function printer



01 A multifunction printer combines a printer and scanner in a single compact unit to provide printing, copying and even fax facilities. Basic models cost as little as £30 including VAT. These are acceptable if funds and space are tight, but the quality and speed of prints and scans will be basic, print costs will be expensive and you won't get any fax capabilities.

02 If you spend a little more you can get better speed and image quality. The improvements aren't directly proportional to the price of the unit, though, so read our reviews to see how each performs. Remember that running costs can outweigh the price of the unit.

03 Sheet-fed scanners can handle multiple pages but flatbed scanners tend to offer better image quality. Cheaper models usually come with a flatbed, while pricier units combine both features.

04 If you'll be printing hundreds of pages every month, consider buying a laser rather than an inkjet model. These benefit from improved print speeds and higher duty cycles, and cost from around £80 including VAT. You'll need to spend around £190 for a budget colour laser-based device.

05 To make the most of your multifunction printer's features, it should have decent front-panel controls. These can vary from a single copy button to something that resembles a dedicated copier. If fax is important, check that the device has a built-in modem.

06 Other useful extras include memory card slots, duplexing units for printing on both sides of the paper, extra paper trays and an Ethernet port or Wi-Fi to connect the device to a network.

CAMCORDER

CAMCORDER

CAMCORDER

PVR

MEDIA STREAMER

INKJET MFP

DOCUMENT SCANNER

OFFICE INKJET MFP

INKJET PRINTER

MFP

VIDEO

CANON Legria HF R48

COMPUTER SHOPPER **BEST BUY**

£300 inc VAT • www.pixmania.co.uk

This compact Full HD camcorder has a 3.28-megapixel sensor and built-in Wi-Fi, which lets you monitor it remotely and upload videos to the web. Video shot in darker environments can be noisy, but otherwise it's great.

PANASONIC HC-X920

COMPUTER SHOPPER **ULTIMATE**

£699 inc VAT • www.parkcameras.com

This camcorder uses three $\frac{1}{2.3}$ in BSI MOS sensors to record Full HD video with excellent colour reproduction and tremendous detail. Its built-in Wi-Fi adaptor lets you connect a smartphone or stream video on your network.

CANON Legria HF G30

COMPUTER SHOPPER **ULTIMATE**

£1,033 inc VAT • www.ilgs.net

This fantastic enthusiast camcorder has a capacitive touchscreen monitor, a great electronic viewfinder and a sensible array of function buttons. Its image quality is excellent, making it an Ultimate award winner.

HUMAX YouView DTR-T1010

COMPUTER SHOPPER **BEST BUY**

£230 inc VAT • www.currys.co.uk

The YouView DTR-T1010 is basically the DTR-T1000 with a facelift, but it's still a fantastic PVR. Catch-up TV integrates seamlessly with its EPG, and it has a built-in 500GB hard disk and a great price. It's a definite Best Buy.

WESTERN DIGITAL WDTV Live

COMPUTER SHOPPER **BUDGET BUY**

£67 inc VAT • www.amazon.co.uk

This media streamer supports a variety of formats and can output video at up to 1080p. Its interface is well designed, and you can even control it with an iOS or Android app. It offers a range of services, including BBC iPlayer.

PRINTERS AND SCANNERS

CANON Pixma MX525

COMPUTER SHOPPER **BUDGET BUY**

£69 inc VAT • www.tesco.com/direct

The low-cost MX525 is ideal for a home office. It has everything except duplex printing, and delivers great quality scans, prints and copies. It's compact, easy to use and has very competitive running costs.

CANON ImageFormula P-215

COMPUTER SHOPPER **BUSINESS BUY**

£204 inc VAT • <http://www.laptopsdirect.co.uk>

This portable A4 scanner is perfect for mobile workers who need to capture multi-page documents. You can load a stack of paper, press the button and quickly turn a document into a PDF with searchable text.

HP Officejet Pro X576dw

COMPUTER SHOPPER **BUSINESS BUY**

£623 inc VAT • www.viking-direct.co.uk

This inkjet MFP prints a page of black text in less than a second. Scans and photocopies are also fast, with good results. It costs slightly more than some equivalent colour lasers to buy but is much faster and far cheaper to run.

CANON Pixma iP7250

COMPUTER SHOPPER **BUDGET BUY**

£60 inc VAT • www.dabs.co.uk

It may be Canon's top single-function A4 inkjet printer but the iP7250 isn't expensive to buy or run. This versatile all-rounder prints laser-like text and stunning photos. We can't think of an A4 inkjet that gives better results.

KYOCERA Ecosys FS-C2026MFP+

COMPUTER SHOPPER **BEST BUY**

£449 inc VAT • www.oyyo.co.uk

This bulky MFP has a reasonable scanner and an impressive printer, which together produce very good copies. You can make double-sided copies from single- or double-sided originals, and its running costs are low.

SENSOR $\frac{1}{2.3}$ in CMOS • **STORAGE** SDXC and flash memory • **ZOOM** 32x optical • **DISPLAY** 3in LCD • **PC CONNECTIONS** Micro HDMI out, Mini USB • **A/V INTERFACES** A/V out • **DIMENSIONS** 57x53x16, 277g • **WARRANTY** One-year RTB • **PART CODE** Legria HF R48 • **DETAILS** www.canon.co.uk • **FULL REVIEW** Jul 2013

SENSOR $\frac{1}{2.3}$ in BSI MOS • **STORAGE** SDXC • **ZOOM** 12x optical • **DISPLAY** 3.1in LCD • **PC CONNECTIONS** Mini HDMI out, Mini USB • **A/V INTERFACES** A/V out, 3.5mm microphone input, 3.5mm audio output • **DIMENSIONS** 72x67x50mm • **WARRANTY** One-year RTB • **PART CODE** HC-X920EB-K • **DETAILS** www.panasonic.co.uk • **FULL REVIEW** May 2013

SENSOR $\frac{1}{2.3}$ in CMOS • **STORAGE** SDXC • **ZOOM** 20x optical • **DISPLAY** 3.1in LCD • **PC CONNECTIONS** Mini HDMI out, Mini USB • **A/V INTERFACES** A/V out, 3.5mm microphone input, 3.5mm audio output • **DIMENSIONS** 84x189x102, 900g • **WARRANTY** One-year RTB • **PART CODE** 845480094A • **DETAILS** www.canon.co.uk • **FULL REVIEW** Sep 2013

STORAGE 500GB hard disk • **TUNERS** 2x digital • **CONNECTIONS (INPUTS/OUTPUTS)** 1x SCART, 0/1x composite, 0/1 stereo phono, 1x optical S/PDIF • **DIMENSIONS** 380x246x55mm • **POWER** Consumption 0W standby, 18W on • **WARRANTY** One-year RTB • **PART CODE** DTR-T1010 • **DETAILS** www.humaxdirect.co.uk • **FULL REVIEW** Sep 2013

CONNECTIONS 1x optical S/PDIF output, 1x HDMI output, 1x composite output • **AUDIO SUPPORT** WMA, AAC, Ogg, Wav, MP3, FLAC, MKA, AIFF • **VIDEO SUPPORT** MPEG1, MPEG2, MPEG4, APC, H.264, x.264, AVC, VC-1, Xvid, AVI, MPG, MPEG, VOB, MKV, TS, TP, M2T, MP4, MOV, M2TS, WMV9, FLV • **POWER** Consumption 6W standby, 18W on • **WARRANTY** One-year RTB • **PART CODE** WDBGX7000NBK • **DETAILS** www.wdc.com • **FULL REVIEW** Apr 2012

MAXIMUM RESOLUTION 4,800x1,200dpi • **QUOTED SPEEDS** 10ipm mono/6ipm colour • **SCAN** Resolution 1,200x2,400dpi • **INTERFACES** USB, Ethernet, 802.11n wireless • **DIMENSIONS** 200x458x285mm • **POWER CONSUMPTION** 1W standby, 6W idle, 21W active • **WARRANTY** One-year RTB • **PART CODE** 6990B006 • **DETAILS** www.canon.co.uk • **FULL REVIEW** Jan 2014

SCANNER TYPE CIS • **OPTICAL RESOLUTION** 600dpi • **COLOUR OUTPUT** 24-bit • **INTERFACE** USB • **DIMENSIONS** 40x285x95mm • **WARRANTY** One-year RTB • **PART CODE** 5608B003 • **DETAILS** www.canon.co.uk • **FULL REVIEW** Jun 2012

MAXIMUM RESOLUTION 2,400x1,200dpi • **QUOTED SPEEDS** 70ppm mono/70ppm colour • **SCAN** Resolution 1,200dpi • **INTERFACES** USB, 10/100 Ethernet, 802.11n wireless • **DIMENSIONS** 517x517x399mm • **POWER CONSUMPTION** 5W standby, 1W idle, 83W active • **WARRANTY** One-year RTB • **PART CODE** CN598A • **DETAILS** www.hp.co.uk • **FULL REVIEW** Jun 2013

MAXIMUM RESOLUTION 9,600x2,400dpi • **QUOTED SPEEDS** 15ipm mono/10ipm colour • **INTERFACES** USB, 802.11n wireless • **DIMENSIONS** 128x453x368mm • **POWER CONSUMPTION** 2W standby, 1W idle, 29W active • **WARRANTY** One-year RTB • **PART CODE** G219B008AA • **DETAILS** www.canon.co.uk • **FULL REVIEW** Sep 2013

MAXIMUM RESOLUTION 9,600x6,000dpi • **QUOTED SPEEDS** 26ppm mono/26ppm colour • **SCAN** Resolution 600x600dpi • **INTERFACES** USB, 10/100 Ethernet • **DIMENSIONS** 580x514x550mm • **POWER CONSUMPTION** 9W standby, 26W idle, 850W active • **WARRANTY** Two-year onsite (developer and drum three years or 200,000 pages) • **PART CODE** N102M43NLD • **DETAILS** [kyoceradocumentsolutions.eu](http://www.kyoceradocumentsolutions.eu) • **FULL REVIEW** Jan 2014

Choosing a ...

NAS device



01 A network-attached storage (NAS) device lets you store media, documents and other files on its hard disks so that you can share them with others on your network. Some have disks already installed, while others are empty enclosures into which you install your own disks.

You should buy one with a Gigabit Ethernet interface, as these provide the highest transfer speeds. To use a NAS device at these speeds, you'll need computers with Gigabit Ethernet network adaptors and a Gigabit Ethernet switch or router. Computers with Fast Ethernet adaptors can still access the NAS device, but only at 100Mbit/s.

02 The amount of network storage you need depends on the types of files you use. If you want to store Word and Excel documents, for example, a 1TB device will be more than enough. In fact, a 1TB device will be sufficient for a family's entire media collection. Small businesses should consider higher storage capacities, depending on the nature of the business.

03 If you can see no end to your storage needs, buy an upgradable NAS device. Many have a USB port for adding an external disk. Devices such as Synology's barebones NAS kits have spare disk trays for cheaper and faster upgrades.

04 If you want extra protection for your data, look for a device that supports RAID. RAID 1 and RAID 5 arrays reduce the available capacity, but your data will remain safe if a disk fails.

05 If you need access to your files while you're away from home or the office, look for a NAS device with an FTP server. Some can also share a USB printer across your network, saving you the expense of buying an Ethernet printer. A NAS device with a Universal Plug and Play (UPnP) media server can stream your music, photos and videos to a network media player, so you can enjoy your media collection in another room.

NETWORKS

NETGEAR R6300

COMPUTER SHOPPER
ULTIMATE

★★★★★

£180 inc VAT • www.currys.co.uk

This 802.11ac dual-band router is the fastest we've ever tested, transferring data at an astonishing 280Mbit/s. Its Wi-Fi signal covers a wide area and it's easy to set up. It's perfect for home cinema, gaming and office setups.

ASUS RT-AC66U

★★★★★

£158 inc VAT • www.morecomputers.com

This 802.11ac router has lots of features, including a media and print server. It produced fast data transfer rates of 209Mbit/s at 1m and 10m and 126.5Mbit/s at 25m. It's not the fastest router, but it's a great buy.

SOLWISE Piggy HomePlug adaptor

COMPUTER SHOPPER
BEST BUY

★★★★★

£23 inc VAT • www.solwise.co.uk

This HomePlug adaptor lets you network your PC using your home or office's electric cabling without using up a mains socket. It's rated at 500Mbit/s, and we saw fast transfer rates of 139Mbit/s.

NETGEAR XAUB2511 Powerline Music Extender

COMPUTER SHOPPER
BEST BUY

★★★★★

£89 inc VAT • www.scan.co.uk

With this HomePlug kit, you can stream music to speakers from Airplay-compatible devices or a PC connected to your network. You can also attach a USB drive or a printer. It's simple to set up and use.

AVM Fritz!Box 3390

COMPUTER SHOPPER
BEST BUY

★★★★★

£125 inc VAT • www.cclonline.com

This dual-band ADSL router has an excellent and incredibly user-friendly web interface that makes it easy to set up and administer. Its Wi-Fi performance is great and it also has two USB ports.

STORAGE

SANDISK Extreme II 240GB

COMPUTER SHOPPER
BEST BUY

★★★★★

£165 inc VAT • www.ebuyer.com

This slim 240GB SSD is just 7.5mm thick, so it will fit in ultra-portable laptops. It produced excellent overall transfer speeds of 451MB/s for large files and 116MB/s for small files, and it's great value, too.

CAPACITY 240GB
FORMATTED CAPACITY (NTFS) 232GB
INTERFACE SATA3
WARRANTY Five-year RTB
PART CODE SDSS-DXP-240G-G25
DETAILS www.sandisk.co.uk
FULL REVIEW Oct 2013

SAMSUNG 840 Pro 256GB

★★★★★

£169 inc VAT • www.pixmania.co.uk

The 256GB Samsung 840 Pro provides fast data transfers, a five-year warranty and a sensible selection of accessories. At £169 – or just 66p per gigabyte – it's also comparatively good value.

CAPACITY 256GB
FORMATTED CAPACITY (NTFS) 238GB
INTERFACE SATA3
WARRANTY Five-year RTB
PART CODE MZ-7PD256
DETAILS www.samsung.co.uk
FULL REVIEW Apr 2013

CRUCIAL M500 480GB SSD

COMPUTER SHOPPER
BEST BUY

★★★★★

£256 inc VAT • www.ebuyer.co.uk

The Crucial M500 480GB is one of the fastest SSDs we've seen, scoring 437.4MB/s overall in our read test and a cracking 121.8MB/s in our write test. It's not cheap, but it's great value considering its capacity.

CAPACITY 480GB
FORMATTED CAPACITY (NTFS) 447GB
INTERFACE SATA3
WARRANTY Three-year RTB
PART CODE CT480M500SSD1
DETAILS www.crucial.com
FULL REVIEW Aug 2013

WESTERN DIGITAL Blue 1TB

COMPUTER SHOPPER
BEST BUY

★★★★★

£288 inc VAT • www.dabs.com

The Blue 1TB is just 7mm thick despite its 1TB capacity and has a low cost per gigabyte. This makes it a great choice if you have a slim laptop and need a vast of amount of storage space.

CAPACITY 1TB
FORMATTED CAPACITY (NTFS) 931GB
INTERFACE SATA3 + SPINDEL SPEED 5,400rpm
CACHE 16MB + SEEK TIME 5.5ms
NOISE WHEN IDLE 21dB(A)
WARRANTY Three-year RTB
PART CODE WD10SPCK
DETAILS www.wdc.com
FULL REVIEW Dec 2013

WESTERN DIGITAL My Passport Ultra 1TB

COMPUTER SHOPPER
BEST BUY

★★★★★

£68 inc VAT • www.ebuyer.co.uk

This compact 5,400rpm USB3 external hard disk delivered excellent performance in our small-files test and comes with excellent backup and encryption software.

CAPACITY 1TB
SPINDEL SPEED 5,400rpm
INTERFACES USB3
DIMENSIONS 15x82x111
WARRANTY Three-year RTB
PART CODE WDBZP0010BBK
DETAILS www.wdc.com
FULL REVIEW Sep 2013

WIRELESS ROUTER

WIRELESS ROUTER

POWERLINE PLUG

POWERLINE KIT

WIRELESS ROUTER

SSD

SSD

SSD

HARD DISK

USB HARD DISK

Choosing a ...

Graphics card



01 A basic graphics card such as an AMD Radeon HD 6450 will cost around £30. It can support two monitors at high resolutions, so you can easily add a second monitor to your PC, giving you lots of room on your Windows Desktop. This kind of setup is ideal if you regularly use two applications at once.

02 You'll need to spend more money if you want to play games, though, as the card above isn't powerful enough to play the latest 3D titles. Look for a card with at least an AMD Radeon HD 7770 chipset. High-powered cards tend to be more expensive, so expect to pay around £100 if you want to play games at 1,920x1,080 at high-quality settings.

03 Check that your chosen card has the graphics outputs you need. Only low-end cards now have VGA outputs, but many come with a DVI-to-VGA adaptor. Depending on your monitor, you may also want an HDMI output or even DisplayPort. Bear in mind that AMD's Eyefinity triple-monitor gaming mode requires at least one DisplayPort monitor, but you can buy DVI-to-DisplayPort adaptors for around £20. Nvidia's Surround three-monitor mode needs only DVI and HDMI ports.

04 The amount of memory a card has is important if you want games to look their best at high resolutions. If possible, get a card with 2GB of RAM, as this should allow you to select the highest-quality textures in games.

05 A card's size, noise output and power requirements are the final considerations. Make sure your PC's case can accommodate your chosen card. Double-slot cards with large fans tend to be quieter than single-slot cards with small fans but will block expansion slots on your motherboard. Check that your power supply can provide the amount of power the card needs and that it has the right connectors. Many cards require a six-pin PCI Express power connector, and some also need an additional eight-pin connector.

COMPONENTS

AMD Radeon 290X



£440 inc VAT • www.scan.co.uk

AMD's latest high-end graphics card took our benchmarks in its stride, delivering an average 107fps in Dirt Showdown and 59.6fps in Crysis 2. It also has TrueAudio real-time audio processing.

CHIPSET Radeon R9 290X
CORE SPEED 1GHz
RAM 4,096MB GDDR5 (1.25GHz)
WARRANTY One-year RTB
PART CODE Radeon R9 290X
DETAILS www.amd.com
FULL REVIEW Jan 2014

INTEL Core i5-4670K



£180 inc VAT • www.novatech.co.uk

The Core i5-4670K is the successor to the Core i5-3570K and is just as popular. It can be overclocked to high speeds and has a much improved built-in graphics processor. It's also better value than the Core i7-4770K.

CORES 4 • CLOCK SPEED 3.4GHz
SOCKET LGA1150
CACHE 4x 256KB L2, 6MB L3
TDP 84W
WARRANTY Three-year RTB
PART CODE Core i5-4670K
DETAILS www.intel.com
FULL REVIEW Aug 2013

AMD A10-6800K



£106 inc VAT • www.scan.co.uk

The A10-6800K 'Richland' processor has an excellent built-in graphics chip and provides great desktop performance. It can also work in CrossFire mode if paired with a suitable AMD graphics card.

CORES 4 • CLOCK SPEED 4.1GHz
SOCKET FM2
CACHE 2x 2,048KB L2, L3
TDP 100W
WARRANTY Three-year RTB
PART CODE A10-6800K
DETAILS www.amd.com
FULL REVIEW Sep 2013

AMD Radeon R7 260X



£103 inc VAT • www.scan.co.uk

The 260X is excellent if you want to enjoy Full HD games without spending a fortune. You may need to reduce settings for some games but not by much. It has a variety of outputs and can cope with multi-monitor gaming.

CHIPSET R7 260X
CORE SPEED 1GHz
RAM 2,048MB GDDR5 (1.63GHz)
WARRANTY One-year RTB
PART CODE Radeon R7 260X
DETAILS www.amd.com
FULL REVIEW Jan 2014

GIGABYTE Z87-D3HP



£102 inc VAT • www.dabs.com

This relatively low-cost Haswell motherboard has lots of SATA3 and USB3 ports, HDMI and DVI outputs, and four RAM slots. It's easy to overclock, and achieved high frequencies with an Intel Core i5-4670K processor.

PROCESSOR SOCKET LGA1150
CHIPSET Intel Z87
MEMORY SLOTS 4x DDR3
EXPANSION 2x PCI Express x16 slots, 2x PCI Express x1 slots, 2x PCI slots, 6x SATA III ports
WARRANTY Three-year RTB
PART CODE GA-Z87-D3HP
DETAILS <http://uk.gigabyte.com>
FULL REVIEW Aug 2013

SOFTWARE

MIXVIBES Cross 2.5



£83 inc VAT • www.mixvibes.com

With a simple interface that's easy to understand, responsive controls and high-level features such as timecode control, looping and hot-cues, Mixvibes Cross 2.5 is a bargain for DJs.

SYSTEM REQUIREMENTS Windows XP or later, Mac OS X 10.6, 2.2GHz Intel Core 2 Duo, 2GB RAM
PRODUCT CODE Cross 2.5
DETAILS www.mixvibes.com
FULL REVIEW Nov 2013

SERIF PagePlus X7



£82 inc VAT • www.serif.com

This desktop-publishing application gives you full control over the layout and appearance of all your printed documents. The latest version adds support for 64-bit processors, which improves performance.

SYSTEM REQUIREMENTS Windows XP (32 bit only), Windows Vista/7/8 (32 or 64 bit), 1GB RAM, 740MB free disk space, 1,024x768 monitor resolution
PRODUCT CODE
DETAILS www.serif.com
FULL REVIEW Oct 2013

CANONICAL Ubuntu 13.10



Free • www.ubuntu.com

The latest version of the free operating system is the best yet. Canonical has made Ubuntu easier to use than ever and a credible rival to Windows. Unlike Microsoft's operating system, it runs well on old computers, too.

SYSTEM REQUIREMENTS 700MHz processor, 385MB RAM, 5GB hard disk space
DETAILS www.ubuntu.com
FULL REVIEW Aug 2012

ABLETON Live 9 Standard



£269 inc VAT • www.decks.co.uk

Ableton Live 9 builds on the success of its predecessors with audio-to-MIDI conversion, which lets you turn an audio clip into a series of MIDI notes that you can reuse as you wish. If you make music, buy Live 9.

SYSTEM REQUIREMENTS Windows XP/Vista/7/8 or Mac OS X 10.5 or later, multi-core processor, 2GB RAM, 12GB disk space
PRODUCT CODE
DETAILS www.ableton.com
FULL REVIEW Jul 2013

ACRONIS True Image 2014 Premium



£60 inc VAT • www.acronis.co.uk

This latest version of Shopper's favourite backup software offers a wealth of features including system migration tools, support for Windows' dynamic disks and backup and restoration from the cloud.

SYSTEM REQUIREMENTS Windows XP/Vista/7/8
PRODUCT CODE N/A
DETAILS www.acronis.co.uk
FULL REVIEW Jan 2014



ASUS All-in-One PC ET2321 Simple. Slim. Stylish.

Next-generation technology

Windows 8

4th Generation Intel® Core™ i7 processor

Ultra-fast 802.11ac 5G Wi-Fi

Bright and vibrant images

23-inch Full HD 10-point multi-touch display

IPS technology for wide viewing angles

Powerful discrete graphics

**ASUS ET2321-INTH features
an Intel® Core™ i7 processor.**



Astonishing sound quality

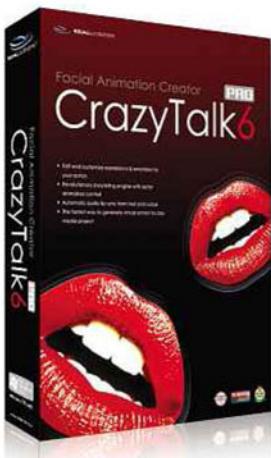
Immersive sound with high-quality built-in speakers

Desktop subwoofer for rich, resonant bass

ASUS SonicMaster Premium audio technology

Free software guide

Your free gifts are now even easier to enjoy. Just download all the software at www.shopperdownload.co.uk/313 and register with your unique coupon code



Reallusion CrazyTalk 6 SE

STANDARD PORTRAIT SHOTS of friends and family can often seem dull. With Reallusion CrazyTalk 6 SE, you can bring a still image of any face to life, whether it's a friend, family member or celebrity. The head will move, the eyes will blink and the nose will wrinkle; you can even make your animated friend talk.

You don't need Pixar-level animation skills to make this happen, either. Just import an image, draw a box around the face, then position four dots around the eyes and mouth. Once you've set the orientation of the face, just click Play and your image will blink, nod, look around and more besides. It can be amazingly realistic.

Adding speech is even easier. Click Script on the toolbar, then double-click one of the script templates and click Play. Your photo will say the words in your selected script. If you fancy providing your own words, just click the Text-To-Speech button on the left-hand side, type whatever you'd like your animation to say, then click OK, Play and watch it talk.

REQUIREMENTS Windows XP, Vista, 7 or 8 32/64-bit, 200MB hard disk space
WEBSITE www.reallusion.com
NOTES N/A



If your animation isn't working as you'd expect, there are plenty of ways to improve the results. You can redefine the position of the face and eyes, for instance, for an even more accurate animation. Just keep clicking Play and the Preview window will show you how things are progressing. When you've finished, click Output and you can save your creation as an HD video, ready to share with the world.

GETTING STARTED

The download instructions on the following page show you how to connect to the download site. Please make sure that you type in the web address exactly as shown. You'll need your coupon code the first time you log on.

ANY PROBLEMS

If you need help with any of the software this month, please send an email to letters@computershopper.co.uk. We check this inbox regularly. Please include the issue number of the magazine and your coupon code.

WHY DOWNLOADS

Software manufacturers have been requiring us to use online registration for some time now, but increasingly we're being asked to provide the program as a download. In order to continue bringing you the best free software, we've revamped our download site. You need to use the unique code printed in the box on the facing page to register and download the software in this issue.

The unique code means we stop the deals leaking online, so only Shopper readers get the software. You'll also enjoy a smoother registration, where we handle the registration process.

NO CODE

If you don't have the card insert with the unique code, you must buy the £4.99 print version of the magazine. If you have bought this, please contact letters@computershopper.co.uk for help and a new code.

Leawo iOS Data Recovery



PICTURES, VIDEOS, MUSIC, messages – there are all kinds of important files on your iOS devices. So what would you do if it all disappeared? Don't panic, there could still be hope. Whether you've lost data due to an iOS upgrade or accidental deletion, there's a good chance Leawo's iOS Data Recovery can restore your files.

The program is extremely easy to use. Launch it, connect your iOS device when prompted (there's full support for all iPhone, iPad and iPod Touch models), click Start, and your work is done. Leawo iOS Data Recovery will crawl over every byte of storage, looking for lost photos, videos, contacts, messages, calendars, reminders, notes and more.

Once the process is complete, you'll see a Preview window detailing everything the program has found. If your device was packed with data, this could be a very long list, but fortunately a Search tool helps you zoom in on the file you need. Alternatively, you can opt to view only deleted data, which is perfect if you just need to recover something you've accidentally wiped. In the Preview window, select the data you need, or just choose everything if you're not sure. In a click or two, you'll have iOS Data Recovery transferring everything back to your PC.

If the Preview window is empty, this may make life a little more complicated, but don't give up; there's one more option. If scanning your iOS devices directly brings no results, Leawo iOS Data Recovery can also scan your iTunes backups, listing your various devices and the last time they were backed up. Once again, the Preview window allows you to view everything the program has found, and you can select and recover anything from a single file to a full backup in just a few clicks.

REQUIREMENTS Windows XP, Vista, 7 or 8 32/64-bit, 20MB hard disk space
WEBSITE www.leawo.com
NOTES Register to obtain your serial code

Chat and Communication

Digsby (Build 92) Access all your instant messaging services from one application; there's support for Windows Live!, Yahoo!, AIM, Google Talk, ICQ and Jabber.

Evernote 5 Store your notes, ideas and plans in the cloud, and synchronise them between computers.

UPDATED Mozilla Thunderbird 24.11 FINAL A powerful email client from the organisation better known for the Firefox web browser.

Postbox Express 1.01 An email client that provides a comprehensive array of tools to help you manage your messages more easily.

UPDATED Skype for Windows 6.11 Make internet voice and video calls for free, and buy credit to make calls to mobiles and landlines. **Trillian 5.1** Use all your instant messaging accounts with one application; this program has support for Windows Live!, AIM, Yahoo! and Google.



Customisation

7 Taskbar Tweaker 4 Customise the Windows 7 taskbar so that it works exactly to your liking.

Metro UI Tweaker for Windows 8 Tweak the new user interface for Windows 8.

Mosaic Desktop Beta 1 Refresh Add Windows 8's mosaic-tiled Desktop to your computer without having to upgrade.

Rainmeter 3 Customise the Desktop with your choice of information, tools and shortcuts.

Windows 8 Transformation Pack 7 Emulate the look of Windows 8 on an earlier version of the operating system.

Windows 8 UX Pack 7 Give Windows 7 an interface upgrade so that it looks like Windows 8.



General

UPDATED Free Studio 6.2 This software provides an easy way to convert your video and audio files into different formats.

Paragon Partition Manager 2013 Free Create, format, split, merge and reorganise all your hard disk's partitions.

UPDATED PeaZip 5.2 A tremendously powerful archive-management tool.

UPDATED Screenshot Captor 4.8 Create and manage screenshots the easy way.

UPDATED SUMo 3.9.3 Quickly scan your PC's installed applications and find any updates available for them.

ZipGenius 6.3 A flexible file-compression tool with support for a huge number of compressed file formats.



Internet and Network

CrossLoop Free 2.82 Control another computer remotely over the internet, and even charge for the time you spend fixing a problem.

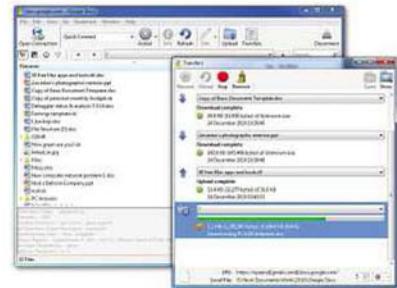
Cyberduck 4.4 A very powerful but easy-to-use FTP client.

Easy WiFi 4 Find free Wi-Fi hotspots while you're out and about with the help of this free tool and its comprehensive database.

UPDATED LogMeIn Free 4.1.3 Control your computer over the internet for free, wherever you happen to be.

NetBalancer 6.5 Make the most of your internet connection by assigning download and upload priorities to your web applications.

UPDATED Vuze 5.2 Powerful BitTorrent client to help you locate, share and download files.



Tweaking and Performance

UPDATED CCleaner 4.08 Remove unwanted information, temporary files, browsing history, huge log files and even the settings left behind by uninstalled software.

Defraggler 2.16 Ensure that your system is defragmented and improve its performance.

Finestra Virtual Desktops 2.5 Set up four or more virtual Desktops on your PC.

UPDATED IObit Advanced SystemCare 7.1 A complete computer security, maintenance and optimisation suite.

Revo Uninstaller Free 1.95 Remove installed applications completely, including all their folders, system files and Registry entries.

Simple Performance Boost 1 Tweak the Windows Registry to give your PC a performance boost. ☐



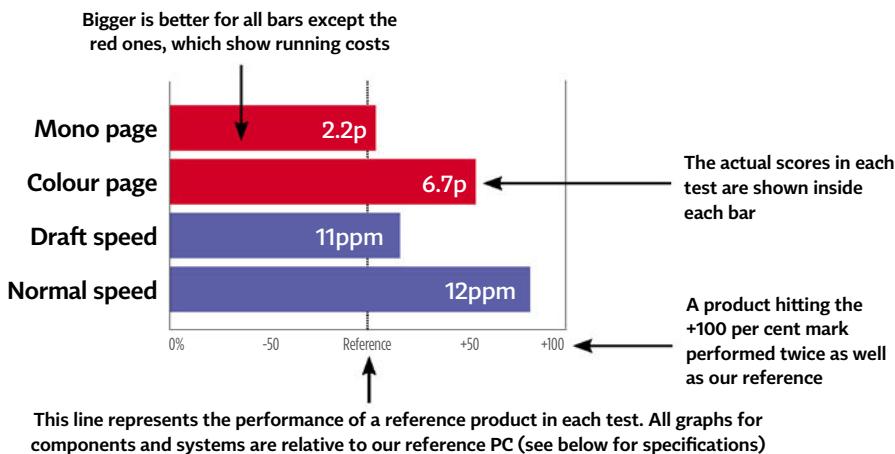
How we test

Find out how well products perform with the help of Computer Shopper's comprehensive tests

COMPUTER SHOPPER'S REVIEWS

use some of the most exhaustive testing procedures you'll find in any PC magazine. Every product is subjected to qualitative and quantitative tests that show how it performs in practical use. Graphs for performance, battery life scores and costs are used in the Reviews section, as shown on the right. Look in the 'Summary of tests' box (below) for details on each test we run.

For PCs and laptops, we evaluate performance using our own custom benchmarking suite. See below for a brief description of our benchmarking software and game tests.



SUMMARY OF TESTS

PC SYSTEMS

Windows overall	Average speed across numerous demanding tasks
Multitasking	Speed when running simultaneous applications
Dirt Showdown	Frames per second at 1,920x1,080 4xAA, Ultra detail
Crysis 3	Frames per second at 1,920x1,080, High detail

LAPTOPS

Windows overall	Average speed across numerous demanding tasks
Multitasking	Processor-intensive multitasking test
Dirt Showdown	Frames per second at 1,280x720 4xAA, High detail
Battery life	Run time in minutes for web browser use

HANDHELD/PORTABLE MEDIA PLAYERS/TABLETS

Battery life	Run time in minutes for continuous video playback
Draft speed	Pages per minute for draft-quality inkjet text
Normal speed	Pages per minute for correspondence-quality text
Greyscale speed	Pages per minute for presentable text and graphics
Mixed colour speed	Pages per minute for presentable text and graphics
Photo speed	6x4in photos per minute at top quality setting
Scan speed	A4 scans per minute at 300dpi
Mono costs	Running costs expressed as pence per page
Colour costs	Running costs expressed as pence per page

DIGITAL CAMERAS

Battery life	Number of shots from full charge
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CAMCORDERS

Battery life	Run time in minutes for recording
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MP3 PLAYERS

Battery life	Run time in minutes for continuous playback
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ROUTERS

Centrino 2 1m	Mbit/s at 1m with Centrino 2 adaptor
Own brand 1m	Mbit/s at 1m with own-brand adaptor
Centrino 2 10m	Mbit/s at 10m with Centrino 2 adaptor
Own brand 10m	Mbit/s at 10m with own-brand adaptor
Centrino 2 25m	Mbit/s at 25m with Centrino 2 adaptor
Own brand 25m	Mbit/s at 25m with own-brand adaptor

NETWORK-ATTACHED STORAGE

Large files	Average MB/s for read/write of 100MB large files
Small files	Average MB/s for read/write of 100MB small files

HARD DISKS

Large files	Average MB/s for read/write of 100MB large files
Small files	Average MB/s for read/write of 100MB small files

PROCESSORS

Windows overall	Average speed across numerous demanding tasks
Multitasking	Speed when running simultaneous applications

MOTHERBOARDS

Windows overall	Average speed across numerous demanding tasks
Multitasking	Speed when running simultaneous applications
Dirt Showdown	Frames per second at 1,920x1,080 4xAA, Ultra detail

GRAPHICS CARDS

3DMark	Performance settings, 1,920x1,080, 4xAA, 16xAF
Dirt Showdown	Frames per second at 1,920x1,080 4xAA, Ultra detail
Crysis 3	Frames per second at 1,920x1,080, High detail

BENCHMARKS

SHOPPER BENCHMARKS

Our benchmark suite uses open-source software that runs on Windows, Mac OS X and Linux systems. This lets us use objective results to compare PCs and laptops, no matter which operating system they run. It's designed to test each computer to its limit, using a combination of intensive image-editing, video-encoding and multitasking tests.



We ran the tests on our reference PC, which has an Intel Core i5-3570K processor and 4GB of DDR3 RAM. We normalised our results so this PC had a score of 100. This makes it easy to draw comparisons between test systems.

The resulting overall score is shown at the bottom of every PC and laptop review. As we use the same tests in our standalone and group test reviews, you can compare the performance of any computer, whether it's a netbook, laptop or desktop, from both sections of the magazine.

To see how your computer compares with those we've tested, you can download the suite from <http://bit.ly/shopperbenchmarks>. Versions are available for 32-bit and 64-bit operating systems.

3D BENCHMARKS

CRYYSIS 3

With full DirectX 11 support and high-resolution textures, Crysis 3 will push any PC to the limit. You'll need at least 30fps for smooth gameplay.



DIRT SHOWDOWN

Dirt Showdown is a cracking racing game that makes good use of DirectX 11's fancy graphical effects. You'll need at least 30fps for smooth racing.



3DMARK

Futuremark's latest synthetic 3D benchmark tests the latest DirectX 11 graphics features. It's representative of current and future titles.



RATINGS & AWARDS

Computer Shopper rates products out of five:

Avoid	★
Below average	★★
Good	★★★
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ULTIMATE The very best products, when money is no object, win our Ultimate award.



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Overclocked To 4.4Ghz Per Core
ASUS Z87-K
PATRIOT 8GB DDR3 1600Mhz
SEAGATE 2TB SATA3 HDD
SONY 24X DVD+/-RW Drives
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AMD R9 270X 2GB Graphics Cards
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PATRIOT 16GB DDR3 1600Mhz
CRUCIAL 128GB M4 SATA3 SSD
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AMD R9 290X 4GB Graphics Card
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ASUS Z87-K
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The Custom Gamer 20i will make your enemies quake in fear thanks to its brand new 4th generation Intel Core i7 4770 processor and NVIDIA GeForce GTX 770 graphics card.



3XS Graphite LG155

- Intel® Core™ i5 4200M processor
- 8GB Corsair DDR3 1600MHz memory
- 2GB NVIDIA GeForce GTX 765M
- 15.6in 1,920 x 1,080 screen
- 500GB WD 7200rpm hard drive
- Microsoft Windows 8.1



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The Graphite LG155 is a next-generation gaming laptop that is based around the 4th generation Intel Core i5 4200M processor and NVIDIA GeForce GTX 765M graphics card.



3XS Graphite LG1710

- Intel® Core™ i7 4700MQ processor
- 8GB Corsair DDR3 1600MHz memory
- 3GB NVIDIA GeForce GTX 770M
- 17.3in 1,920 x 1,080 screen
- 500GB WD 7200rpm hard drive
- Microsoft Windows 8.1

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The Graphite LG1710 is a high-end gaming laptop that can do everything a desktop gaming PC, at a fraction of the size. It's 17.3in screen is available with either an NVIDIA GeForce GTX 770M or 780M or AMD Radeon HD 8970M graphics card.

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Coolermaster Dominator 2 CM-692 Black
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LCD monitor is not included but optional

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4th Generation Intel® Processor

Windows 8.1

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2GB Nvidia GeForce GTX 760 Graphic Card

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Windows 8.1

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Nvidia® GTX 780 Ti Graphic Card
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1x HDMI	2x USB 3.0	3 hr	2.58 kgw	8X±RW	Built-in Wireless
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DO-IT-ALL LAPTOPS

Something for everyone

From touchscreen ultra-portables to powerful desktop replacements, we've got everything to help you find your perfect laptop. With prices starting at less than £300, it won't break the bank, either

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WHETHER YOU'RE LOOKING for a slim and powerful ultra-portable, a touchscreen model to act like a tablet or a high-end desktop replacement, this month we've got the models to match. With 12 laptops on test and prices starting at less than £300, it's fair to say that no matter what your needs or budget, we've got the model that will suit you.

CRITICAL COMPONENTS

In this group test, you'll see laptops with a fair distribution of both AMD and Intel processors, ranging from a low-end AMD A4 to a super-fast, high-end Intel Core i7. There's a huge difference in application performance between this month's most powerful processors and the basic AMD model. You can see how each laptop performed in our graphs on page 98. Typically speaking, the faster the processor, the more expensive

the laptop, so you'll need to match the performance you need with your budget.

All the laptops here ship with a minimum of 4GB of RAM, although the more expensive models have 6GB or 8GB. The amount of memory doesn't make much difference when running normal Windows applications, but extra RAM helps when running several memory-intensive programs at once and can make a big difference when performing tasks such as working with large images.

There's a fair bit of variety available when it comes to the hard disks in the laptops we've tested. The cheapest laptops have a regular hard disk has 500GB of space, which is enough

video. If you want to go even further, the 13-inch MacBook Pro with Retina Display has a 2,560x1,600 resolution. It uses some clever trickery to make sure that text and icons aren't too small, and everything looks incredibly sharp on it.

Many laptop screens have a glossy finish, which can produce more vibrant colours and deeper contrast but can also cause reflections. If you work in a room with bright overhead lights or need to use your laptop in direct sunlight, the glare can make it tricky to see what's on the screen. Business-orientated laptops often have glare-reducing matt screens, but the common trade-off is a

➔ Ultra-portable laptops are easier to carry around but often sacrifice other features such as internal optical drives

tests; see the graphs on page 98 for more information.

Screen size is a good indicator of how heavy a laptop will be. Ultra-portables tend to have 13in screens or smaller and weigh between 1kg and 1.6kg, but often sacrifice power and features such as an internal optical drive. Larger 15in laptops often weigh between 2kg and 3kg.

“ Extra RAM helps when running several memory-intensive programs at once and can make a big difference when working with large images ”

for all your documents and media. Some of the more expensive laptops have a solid-state drive (SSD), which start at 128GB. This is fine for everyday use, although you should look to upgrade to a 256GB drive or invest in an external drive for when you're at home.

Although you'll rarely run out of space on a modern laptop, bear in mind that many lack optical drives, so if you prefer to watch DVDs rather than stream movies from the internet or like to make backups to disc, make sure you choose a model with a DVD writer or budget for an external USB drive.

FAST FRAMES

Most of the laptops we've looked at this month use their processor's integrated graphics chipset. This shares memory with the operating system, leaving less for your programs. Not many integrated graphics chipsets are powerful enough to run modern 3D games unless you lower the resolutions and quality settings to their absolute minimum levels, but they should cope with older titles and can handle HD video with ease. On-chip graphics are also fine for casual Windows 8 games from the Microsoft Store.

Some of the more expensive laptops here have dedicated graphics chips, which provide you with much better performance in games. You can see how each laptop did in our gaming benchmarks by looking at the graphs on page 98.

SEEING IS BELIEVING

You can't upgrade a laptop's screen, so choosing one with a decent display is vital. We mention the quality of the screen in each review. Most laptops with screens 15in or smaller have resolutions of 1,366x768, which is fine for web browsing and 720p video, but some of the models in this test have Full HD 1,920x1,080 screens. Larger resolutions are useful for multitasking, as you can work on two documents side by side, and 1080p displays are perfect for watching Full HD

less vibrant display that doesn't show off games and films at their best.

Windows 8 has more touch-friendly features than any previous version of the operating system, so we were pleased to see a couple of touchscreen laptops in the test. The Windows 8 Start Screen and many of the associated apps are optimised for touch control, but the operating system is very easy to use with a keyboard and touchpad. A touchscreen will inevitably pick up fingerprints, so it's worth having a cleaning kit to hand.

Apple's OS X Mavericks doesn't support touchscreens, but that doesn't matter as the Macs have incredible touchpads that support multitouch gestures.

SPEAK YOUR WEIGHT

A laptop's size, weight and battery life are less important if you plan to keep it on your desk all the time, but if you want to carry it around and use it while travelling, you'll need to consider how long its battery lasts.

Judging the longevity of a laptop's battery is always difficult, as it depends on the applications you use. Relatively undemanding programs such as web browsers, email clients and word processors use far less battery power, for example, than games. Most modern 15in laptop batteries last for at least five hours in our light-usage test, which simulates web browsing, but lighter laptops that are designed to be carried around should last longer, and a typical ultra-portable should work for at least six hours on a full charge. Laptops with Intel's Haswell processors last even longer in our standard



A HUMAN INTERFACE

No matter how powerful a laptop is, it will be unpleasant to use if its keyboard or touchpad are badly designed. Most laptops we see have so-called chiclet-style keyboards, with flat, rounded keys with space all round them, but although this design can lend itself to fast and accurate typing, keyboards with more closely positioned keys can also work well for touch-typists.

Smaller laptops often have keyboards that deviate from the standard layout or include half-size keys that can be fiddly to use. Some 15in laptops also have separate numeric keypads, which are particularly useful for spreadsheet work. Our reviews describe what each keyboard is like to use.

Few people use a mouse with their laptop, so it's important to have a good touchpad. We state whether a touchpad is responsive and accurate in the reviews. Most new touchpads support multitouch gestures, which are useful for scrolling, zooming in or for accessing shortcuts to bring up Windows 8 features such as the Charms bar. The size and positioning of touchpads can make a great difference to their ease of use, so once again, we test each laptop for comfort and convenience.

SATISFACTION GUARANTEED

Warranties vary greatly. The minimum warranty you'll get lasts for a year and is return to base, so you'll have to pay for any shipping costs incurred when sending the laptop back to the manufacturer for repair.

Some warranties are longer or offer a collect-and-return service, where the manufacturer covers shipping costs. Onsite warranties are rare for consumer laptops but more common for business models. With an onsite warranty, the manufacturer repairs the laptop on your premises or swaps the faulty unit for a replacement.

ACER Aspire V3-772G

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£794 inc VAT • From www.cclonline.com

VERDICT

A powerful desktop replacement with dedicated graphics and a superb screen

THE ACER ASPIRE V3-772G is more imposing than most desktop replacements, but this huge 17.3in laptop has some seriously powerful components inside its chunky chassis.

Its quad-core 2.2GHz Intel Core i7-4702MQ processor can Turbo Boost up to 3.2GHz, giving it near-desktop levels of processing performance for intensive media programs. Paired with 8GB of RAM, it breezed through our multimedia benchmarks, scoring 86 overall. This isn't far off our reference desktop processor, a 3.4GHz Core i5-3570K, so you can be sure the V3-772G will be able to handle almost any task you throw at it.

The V3-772G's 2GB Nvidia GeForce GT 750M graphics chip also turns it into a capable gaming laptop. It produced a smooth 64.2fps in our Dirt Showdown test on High quality settings at a 1,280x720 resolution, the kind of frame rate we normally see only on laptops that cost more than £1,000. It's even fast enough to handle games at the laptop's native 1,600x900 resolution as well, as we managed over 40fps on High quality at this resolution and over 50fps on Medium.

The graphics chip may struggle with the latest 3D games at 1,600x900, as we weren't able to get a playable frame rate in our Crysis 3 test on any quality setting at this resolution. We had to lower the resolution to 1,280x720 and set the quality to Low before we saw a playable 31.8fps, but even this is still quite respectable for a non-gaming laptop.

We like the Aspire V3's 17.3in display. Its Full HD resolution means everything looks sharp, and its matt finish diffused all the reflections in our brightly lit office. Colours are a little on the cool side, but otherwise its image quality is excellent. Our colour calibrator showed it was displaying 83.5 per cent of the sRGB colour gamut, which is



above average for a laptop, and our solid colour image tests looked bright and vibrant.

We were particularly impressed with the screen's deep black levels. We recorded a black level reading of just 0.17cd/m² with our colour calibrator, which is excellent for a sub-£800 laptop, and solid blacks were almost the same shade as the glossy bezel.

when dragging files across our desktop. Windows 8 gestures sometimes took a few attempts to work, particularly swiping from the left to switch windows, but otherwise multitouch gestures all worked perfectly.

The large chassis gives the V3-772G room for a wide range of ports. There are four USB ports, two of which are USB3, VGA and HDMI

It produced a smooth 64.2fps in our Dirt Showdown test, the kind of frame rate we normally see only on laptops that cost more than £1,000

Contrast levels are also excellent. With our measured contrast ratio of 910:1, we saw a great level of detail in our high contrast test shots and shadow detail in particular stood out brilliantly. Our only minor complaint came from the screen's narrow viewing angles, as tilting the display backwards and forwards created a noticeable shift in contrast which affected how much detail we were able to see onscreen. Fortunately, its viewing angles

were just wide enough to see the screen clearly from a comfortable working angle, so it shouldn't make too much difference in everyday use.

The keyboard is very similar to those used on other Acer laptops, and is a joy to work on. The bouncy keys gave a superb level of feedback while we were typing and the addition of a numeric keypad is a welcome extra.

The large all-in-one touchpad is responsive as well, and at no point did we hanker for a pair of dedicated buttons

video outputs, an SDXC card reader, a Gigabit Ethernet port, separate headphone and microphone jacks and a DVD optical drive.

Battery life is around average for a 17in laptop. The V3-772G lasted for five hours and eight minutes in our light-use battery test with the screen set to half brightness. However, the V3-772G's size means it's likely to stay tethered to your desk rather than be carried around in a backpack.

The Acer Aspire V3-772G is an excellent desktop replacement. It's one of the most powerful laptops we've seen for less than £800, and wins a Best Buy award.



SPECIFICATIONS

CPU	2.2GHz Intel Core i7-4702MQ
RAM	8GB
STORAGE	750GB hard disk
GRAPHICS	Nvidia GeForce GT 750M
OPTICAL DRIVE	DVD+/-RW +/-DL
DISPLAY	17.3in widescreen LCD (1,600x900)
OPERATING SYSTEM	Windows 8
DIMENSIONS	34x415x275mm, 3.2kg
POWER CONSUMPTION	0W standby, 21W idle, 65W active
WARRANTY	One-year carry-in
PART CODE	NX.M74EK.001
DETAILS	www.acer.co.uk

APPLE 13-inch MacBook Air

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VERDICT

We'd have liked a higher-resolution screen, but the MacBook Air is the best thin-and-light laptop you can buy

THE LATEST MACBOOK Air has two key improvements over the previous version: better battery life and a lower price. To be fair to Apple, the rest of the laptop didn't really need to change. After all, when you've got a super-thin, all-aluminium laptop that weighs 1.35kg and looks fantastic, what's to change?

It's battery life that really makes the new MacBook Air stand out. Thanks to a fourth generation Intel Core i5 Haswell processor, it's more power efficient than the previous model, even though it has the same capacity battery.

In our light-use battery test, which simply scrolls through an HTML version of *War and Peace*, the previous model lasted almost 12 hours; the new version lasted 18 hours, 35 minutes, a 50 per cent increase. This is largely down to Haswell CPUs having very low-power sleep modes, so when they don't have a lot of workload, they don't draw a lot of power.

To see how the laptop would cope when asked to do a bit more, we ran a new battery benchmark, which played a 10-minute video every 30 minutes. In other words, the laptop would be busy for approximately one-third of the time. In this test, it lasted an incredible nine hours, 46 minutes. That shows that the MacBook Air should live up to Apple's promise of all-day battery life.

NOT SO FAST

One trade-off is that the 1.3GHz Core i5-4250U CPU is slightly slower. We saw an overall score of 45 for the 2013 13-inch MacBook Air, while the old model scored 53. It's important to note that operating systems and applications haven't become more demanding. However, it's not that big a difference and OS X still feels smooth and responsive, so we have no complaints.

We're pleased that Apple hasn't changed the keyboard. Without a doubt this is the best we've used on a laptop. With incredibly responsive keys and plenty of feedback, it's easy to type quickly and accurately.

It's safe to say that the large and responsive touchpad is also the best you can get. Thanks to OS X having multitouch support, the touchpad becomes a simple way to control



your laptop and negates the need for a touchscreen. For example, swipe up with three fingers to view Mission Control and all your open documents, and scroll with two fingers through a document; try and do that as easily with a Windows PC and touchscreen.

A 128GB SSD is still the minimum storage for the 13-inch model, but the price has dropped by £50, while the flash used is 45 per cent faster, according to Apple. This is a reasonable amount of space for most people, particularly if the MacBook Air is a second computer, but if it's your primary laptop or you have a lot of files, you'll want to pay £180 more to get a 256GB drive instead.

RAM IT UP

Other upgrade options include upgrading the memory from 4GB to 8GB (£80) and upgrading the CPU to a Core i7 (£120). More memory could be worthwhile, particularly if you do a lot of photo or video editing, but the Core i7 is unlikely to make much difference to performance, as the Core i5 is so good.

The one area where the MacBook Air could have done with an upgrade is the screen. It still has the same 1,440x900 resolution as the old model, but the Windows

competition has caught up and it's common now to see Full HD resolutions at this size.

We'd have liked to have seen the same 2,560x1,600 resolution as the MacBook Pro with Retina Display, although squeezing this display into the Air isn't that easy without affecting weight and battery life.

The lack of a Retina display or higher resolution may be disappointing, but it doesn't ruin the laptop. In fact, the quality of the screen is so good that we actually prefer this display to some Full HD displays on Windows laptops. Apple has used a brilliant

panel that has excellent viewing angles, bright and vibrant colours and a nonreflective screen coating, so you can see it comfortably under any lighting condition. Text is sharp and easy to read, while OS X makes the best use of the screen space, so this resolution feels far from cramped.

PORTING LIFE

Given the size of the case you can't expect a lot of expansion ports, and the MacBook Air is a little basic. Two USB3 ports (one either side), Thunderbolt (a DisplayPort-compatible output that also connects to fast storage), a headphone out and an SDXC card slot are all you get. The only addition to the chassis is a second microphone, designed to make audio on FaceTime calls via the 720p camera clearer.

Wireless technology has been upgraded with Bluetooth 4.0 and 802.11ac. The latter will make the biggest difference, as this standard is seriously fast: we've seen throughputs of around 280Mbit/s using the technology.

We'd have liked to have seen a higher-resolution screen, but even without it the MacBook Air remains a superb laptop. If you want something that's thin and light enough to carry with you all day, has a brilliant keyboard and a fantastic screen, this is the model to buy.

SPECIFICATIONS

CPU	1.3GHz Intel Core i5-4250U
RAM	4GB
STORAGE	128GB SSD
GRAPHICS	Intel HD 5000
OPTICAL DRIVE	None
DISPLAY	13.3in LCD (1,440x900)
OPERATING SYSTEM	OS X Mavericks
DIMENSIONS	17x325x227mm, 1.4kg
POWER CONSUMPTION	0W standby, 8W idle, 23W active
WARRANTY	One-year RTB
PART CODE	MD760X/A
DETAILS	www.apple.com/uk



APPLE 13-inch MacBook Pro with Retina Display

COMPUTER SHOPPER



ULTIMATE

£1,499 inc VAT • From <http://store.apple.com/uk>**VERDICT**

A beautiful Retina display, powerful Haswell processor and excellent integrated graphics

AS WITH OTHER Apple laptops, the MacBook Pro with Retina Display has Intel's new Haswell CPUs, making it more powerful than before.

We were impressed with the Core i5's performance. Combined with 8GB of RAM, its overall score of 63 in our multimedia test makes it one of the fastest dual-core processors we've tested. Its score of 54 in the multitasking section of the test also shows it's capable of handling several tasks at once.

We were also impressed by the 512GB SSD, which is plenty of space for all your media. It's possible to upgrade to 1TB of flash storage, but you'll need a spare £400 to do so.

Luckily, such formidable power doesn't come at the expense of the MacBook Pro's battery life, as we managed an outstanding 17 hours and 21 minutes in our light-use battery test. This is a staggering seven hours more than the previous model, meaning you'll get all-day battery life when you're on the move.

To see how the laptop would cope with more demanding tasks away from the mains, we also ran our new battery benchmark, which plays a 10-minute video every half an



The components within the 13in MacBook Pro may have changed, but in many other respects the MacBook Pro remains very much the same. Apple's trademark aluminium case continues to impress, and it has a good range of ports, including an HDMI output, two Thunderbolt ports, two USB3 ports, an SDXC card reader and a combined headphone and microphone jack. We're not sure if anyone will notice, but Apple has managed to shave yet another millimetre off the laptop's overall thickness. However, the real talking

colour groups, with only slight weaknesses in its red, green and cyan coverage.

All our solid colour image tests looked fantastic, with reds, greens and blues all appearing bright and vibrant across the screen. We were a little surprised to see a black level of 0.34cd/m², as this is quite high compared with other laptops we've tested, but blacks still looked deep and inky onscreen, and whites were bright and true.

The screen's contrast levels are good but not outstanding. We measured an excellent contrast ratio of 1,118:1, but we lost some areas of dark shadow detail in our high contrast test images. Night scenes in particular weren't quite as highly detailed as we'd have liked, but lighter images looked great. This was mildly disappointing, but it's a relatively small complaint overall as the screen remains one of the best laptop displays we've seen in recent months.

The new 13in MacBook Pro is still expensive, but you get a lot for your money. With a beautiful Retina display, a large SSD, powerful hardware and improved graphics performance, the 13in MacBook Pro stands head and shoulders above every other ultra-portable available today. You simply won't find another laptop like it at this price, so it wins a well-deserved Ultimate award.

“The Retina display provides users with a superb pixel density of 227 pixels per inch**”**

hour. Under these conditions, the laptop lasted for nine hours and seven minutes, which is still incredibly impressive.

One thing you can't customise on the 13in MacBook Pro is the graphics chip, as graphics performance comes from the Iris Graphics 5100 graphics processor built into the laptop's CPU. Don't worry, though: the Iris Graphics 5100 chip is a cut above many on-chip graphics processors.

As there aren't many gaming benchmarks available for the Mac, we installed Windows 8 to see how the Iris Graphics 5100 graphics processor would cope with our Dirt Showdown test. With graphics quality set to High and with the game running at a resolution of 1,280x720, the laptop delivered a respectable 29.8fps. If you lower graphics settings, you can play games at 1,920x1,080 and even at 2,560x1,600.

point is the 13in MacBook Pro's beautiful 2,560x1,600 Retina display.

All new 13in MacBook Pro models come with a Retina display that provides users with a superb pixel density of 227 pixels per inch. By default the display is set to give as much desktop space as a 1,280x800 screen, so icons and windows appear the right size, only they look a lot sharper. However, Retina-enabled applications can run some parts of the screen at full res. For example, a Retina-enabled photo-editing package would show the image at its native resolution, but the interface would be scaled up to be readable.

The screen's image quality is superb. Our colour calibrator showed the MacBook Pro was displaying 93.2 per cent of the sRGB colour gamut, which is the highest gamut reading we've seen on a laptop. Its colour coverage was even across all the main

**SPECIFICATIONS****CPU** 2.6GHz Intel Core i5-4288U**RAM** 8GB**STORAGE** 512GB SSD**GRAPHICS** Intel Iris Graphics 5100**OPTICAL DRIVE** none**DISPLAY** 13.3in widescreen IPS (2,560x1,600)**OPERATING SYSTEM** Mac OS X Mavericks**DIMENSIONS** 18x314x219mm, 1.6kg**POWER CONSUMPTION** 2W standby, 6W idle, 54W active**WARRANTY** One-year RTB**PART CODE** ME866B/A**DETAILS** www.apple.com/uk

ASUS X200CA

**COMPUTER
SHOPPER**
BUDGET BUY



£300 inc VAT • From www.pcworld.co.uk

VERDICT

Its battery life could be better, but this budget touchscreen laptop is great value

WHEN ASUS LAUNCHED its 11in VivoBook in 2012, it was one of the cheapest and best touchscreen laptops around. Now there's a lot more competition, but Asus's new X200CA proves it's still the king of affordable touchscreen ultra-portables. While it may be cheap, the laptop's lightly textured surface gives it a little more character and personality than the bland plastic cases of other budget models.

It's well made, too, as we couldn't see any signs of flex in its chassis. Although it's small, at just 21mm thick and 1.4kg, you don't lose out on any ports. The X200CA comes with three USB ports (one of which is USB3), HDMI and VGA video outputs, an SDXC card reader, a Fast Ethernet port and a combined headphone and microphone jack.

The X200CA is a pleasant laptop to use, as its bouncy keyboard is well laid out and gives plenty of feedback. The large all-in-one touchpad is also a joy to use, as Windows 8 shortcuts and multitouch gestures such as two-finger scrolling and pinch-zooming all work perfectly. There's enough space to move the cursor comfortably round the desktop as well, and the lower half gives a good amount of feedback when you click on it to open apps and files. The only minor annoyance we encountered was how many fingerprints the touchpad picked up, which detracted from its smart design.

The real star of the X200CA is the 11.6in touchscreen. Its 10-point touch support is incredibly smooth and responsive, and its 1,366x768 resolution looks sharp on the small display. The screen isn't particularly bright, which was one of our main complaints on the previous model, but it's perfectly adequate for everyday use.

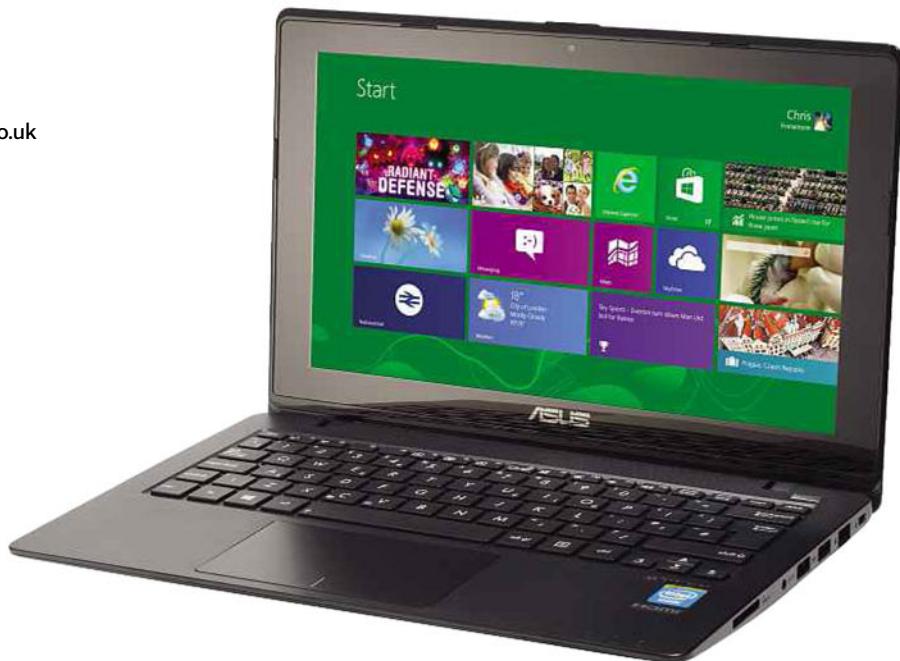


Image quality is average, but this is to be expected given the X200CA's budget price. Our colour calibrator showed it was displaying 53.6 per cent of the sRGB colour gamut, which is a little below what we'd normally expect to see on a laptop of this price, but colours still looked good in our solid image tests. The screen's glossy finish helped give our reds, greens and blues some much-needed depth and vibrancy, and whites looked clear and uniform across the screen.

This is fine for use in everyday tasks, such as web browsing and word processing.

Unsurprisingly, the Intel HD Graphics chip isn't powerful enough to handle the latest 3D games, as it failed our Dirt Showdown test. Simple titles from the Windows 8 Store should work fine, though, as we were able to run Zen Pinball FX2 with no problems.

The X200CA's battery life is disappointing. It lasted just three hours, 52 minutes in our light-use test, which is poor even for a

“The star of the X200CA is the 11.6in touchscreen. Its 10-point touch support is smooth and responsive, and its 1,366x768 resolution looks sharp **”**

Blacks were a little grey, which reflected our high black level reading of 0.54cd/m², but it was the laptop's low contrast levels that proved most problematic when we were looking at our set of test photos. We measured a contrast ratio of just 363:1, which made it difficult to see areas of dark shadow detail in our high contrast test images.

The screen's narrow viewing angles didn't help either, as there was only very limited area where photos looked good before the screen darkened and obscured details completely.

This isn't too unusual on a budget laptop, and its quick components more than make up for any deficiency in the laptop's screen. It's no powerhouse, but our review model's 1.4GHz Intel Celeron 1007U processor and 4GB of RAM scored 19 in our multimedia benchmarks.

budget laptop and compares badly to the previous models, which lasted nearly five and a half hours in our tests. You'll need to take the charger with you if you plan on using the X200CA on the move.

It's a shame the laptop's battery doesn't last a little longer, but the Asus X200CA is still a great-value budget laptop. It's one of the fastest laptops around at this price, and its responsive touchscreen is a great way to get the best out of Windows 8. It wins a Budget Buy award.



SPECIFICATIONS

CPU	1.4GHz Intel Celeron 1007U
RAM	4GB
STORAGE	500GB hard disk
GRAPHICS	Intel HD Graphics
OPTICAL DRIVE	None
DISPLAY	11.6in wide-screen LCD touchscreen (1,366x768)
OPERATING SYSTEM	Windows 8
DIMENSIONS	21x303x200mm, 1.4kg
POWER CONSUMPTION	0W standby, 13W idle, 19W active
WARRANTY	Two-year RTB
PART CODE	X200CA-CT112H
DETAILS	www.asus.com

ASUS X75VC



£599 inc VAT • From www.very.co.uk

VERDICT

The screen isn't brilliant, but this powerful desktop replacement is very reasonably priced

LARGE 17.3in LAPTOPS are often home to expensive gaming components, but the Asus X75VC is one general-purpose laptop that won't break the bank. At £600, it's one of the cheapest 17.3in laptops we've seen, and the X75VC hasn't had to compromise on processing power in order to get there either.

The dual-core 2.6GHz Intel Core i5-3230M can Turbo Boost up to 3.2GHz when there's enough thermal headroom for a significant boost in speed. This gives you plenty of speed for everyday tasks, and paired with 8GB of RAM, the X75VC scored 54 overall in our multimedia benchmarks. This outperforms almost every Core i7 Ultrabook we've tested, so it should be able to tackle more demanding tasks such as image and video editing.

The X75VC also has a dedicated graphics chip for playing games. Its 2GB Nvidia GeForce GT 720M chip won't blow anyone away with its speed, but it managed a respectable 31.1fps in our Dirt Showdown test on High quality at a 1,280x720 resolution. This is a good score for a mid-range laptop, but you'll have to adjust the settings if you want to edge closer to a perfect 60fps. We had to set the quality to Low before we saw a frame rate of 59.8fps at 720p, but we had to disable anti-aliasing before we produced 54.6fps at the X75VC's native 1,600x900 resolution on Low.

Unsurprisingly, heavy-duty games such as Crysis 2 are out of bounds for the X75VC, but you should be able to play most modern 3D games at a good speed as long as you're not too fussed about having the best graphics.

The large 17.3in display provides plenty of room for lots of windows onscreen, but its image quality leaves a lot to be desired. Our colour calibrator revealed it was showing 69.4 per cent of the sRGB colour gamut, which is average for a laptop screen, but its high concentration of yellows means the screen looks a little washed out at times. Its blue and purple coverage is particularly lacking, which had a knock-on effect in our solid colour image tests. Greens looked good, but blues and reds weren't deep at all and they were all missing a certain level of vibrancy.

This is partly due to the display's matt finish, but our solid blacks showed the lower part of the screen was also much brighter than the top half, which sapped the richness out of colours even further, making it a poor



screen to show off your photos. Its black levels were very high as well. Ideally, black levels should be as close to zero as possible, but the X75VC had a black level reading of 0.98cd/m², so blacks appeared quite grey.

The X75VC's contrast levels aren't very good either. We recorded a contrast ratio of just 260:1, which is below average even for a laptop, but some of our test images fared

Battery life is average, at five hours, five minutes in our light-use test with the screen set to half brightness. However, the X75VC's 3kg weight and bulky dimensions mean you're unlikely to want to lug it around.

A larger chassis means there's more room for ports, and the X75VC has plenty of them. As well as a Blu-Ray drive, you'll find three USB ports, an SDHC card reader, VGA and

“The X75VC outperforms almost every Core i7 Ultrabook we've tested, so it should be able to tackle demanding tasks such as image and video editing”

better than others. Areas of dark shadow detail in night shots were almost nonexistent, but lighter images with less pronounced shadows showed more detail than we were expecting. We wouldn't recommend the X75VC for fine-photo editing, but it's OK for web browsing and writing office documents.

The X75VC is comfortable to use and type on. We were a little worried by the amount of flex in the keyboard, but it didn't affect our typing and all the keys had plenty of travel and tactile feedback. They're not quite as well spaced as chiclet-style keyboards, but once we'd got used to their position, we were typing at full speed within minutes. The rounded edges of the keyboard tray didn't dig into our wrists, either, and there's enough room on the right-hand side for the numeric keypad. The large all-in-one touchpad is responsive as well, and multitouch gestures and Windows 8 shortcuts work perfectly.

HDMI outputs for connecting the laptop to an external display, a Gigabit Ethernet port and a combined headphone and microphone jack.

It's a shame the Asus X75VC's screen isn't better, but there's still plenty to like about this general-purpose laptop. It's powerful for the price, and it's more comfortable to use than other similarly priced desktop replacements. It doesn't quite match the slightly more expensive Best Buy-winning Acer Aspire V3-772G in terms of value, but if you want a large laptop for less than £600, the X75VC could be for you.

SPECIFICATIONS

CPU	2.6GHz Intel Core i5-3230M
RAM	8GB
STORAGE	1TB hard disk
GRAPHICS	Nvidia GeForce GT 720M
OPTICAL DRIVE	BD-ROM, DVD+/-RW +/-DL
DISPLAY	17.3in widescreen LCD (1,600x900)
OPERATING SYSTEM	Windows 8
DIMENSIONS	38x420x282mm, 3kg
POWER CONSUMPTION	1W standby, 13W idle, 68W active
WARRANTY	One-year RTB
PART CODE	X75A-TY103H
DETAILS	www.asus.com



DELL Inspiron 15-7537



£799 inc VAT • From www.dell.co.uk

VERDICT

A beautifully designed laptop with a great battery life, but it's not as powerful as other similarly priced desktop replacements

THE INSPIRON 15-7537 is the latest iteration of Dell's entry-level laptop, but its aluminium chassis and edge-to-edge glass display give this 15in laptop a premium look that echoes Dell's flagship XPS series and make it one of the best-looking laptops we've seen at this price. At 2.6kg, it's much lighter than other desktop replacements, although you're still not going to want to carry it far, despite its slim 22mm chassis.

The Inspiron 15-7537 uses the same 1.8GHz Intel Core i7-4500U processor as many Ultrabooks. Paired with 8GB of RAM, it managed a respectable score of 50 in our multimedia benchmarks, which is just a few points behind Dell's XPS 12 hybrid and the Asus Zenbook Prime Touch UX31A. This is more than enough speed for everyday tasks, and it should have no problem tackling demanding programs that require multithreading.

COOL RUNNINGS

The 2GB Nvidia GeForce GT 750M graphics chip managed a smooth 46.6fps in our Dirt Showdown test on High quality at a 1,280x720 resolution. This isn't bad for a non-gaming laptop, but it would have been nice to see the full 60fps we've seen on other laptops with the same chip. It's likely that the thin chassis doesn't allow for as much cooling as the graphics chip requires to run faster.

We were even able to get a playable frame rate at the laptop's native 1,920x1,080 resolution in Dirt Showdown. We only managed 35.6fps on High quality at this resolution, but lowering the settings to Medium produced 54.7fps. The graphics chip isn't quite powerful enough to run power-hungry games such as Crysis 3 at 1080p, though, as we weren't able to get a playable frame rate on any quality setting.

The laptop comes well equipped with ports, including four USB3 ports, an HDMI video output, a multiformat card reader, a Gigabit Ethernet port and a combined headphone and microphone jack. We were a little disappointed that Dell hadn't included a Blu-Ray or DVD optical drive on the rather bare left-hand side, as this would have made the Inspiron 15-7537 the perfect multimedia entertainment laptop, but when we removed the bottom panel to take a closer look, we found there simply wasn't any room due to the huge battery.



This is a shame, but we didn't mind when the laptop battery lasted almost nine hours in our light-use battery test with the screen set to half brightness. We were perhaps expecting it to last a little longer considering the sheer size of the battery, but this is still good for a 15in laptop, as other similarly priced desktop replacements we've seen have only lasted around five hours by comparison.

TOUCH AND GO

The 15.6 Full HD screen produces stunning-looking images. It's a ten-point touchscreen, which we found to be quick and responsive. Our colour calibrator showed it was displaying 89.1 per cent of the sRGB colour gamut, and our black level reading of 0.22cd/m² was equally superb. This is great for a general-purpose laptop, and our solid reds, greens and blues all looked bright and vibrant thanks to its even colour coverage. Whites didn't show any signs of grey either, and blacks almost matched the laptop's dark glossy bezel.

The laptop's contrast levels are also superb. We measured a contrast ratio of 1,151:1, which is one of the highest contrast ratios we've seen outside of an Ultrabook laptop, and our high contrast test images were packed full of detail in both the light and dark areas of each photo. Pictures looked great from every angle as well, thanks to the screen's wide viewing angles. This meant we could see the screen clearly no matter how far back we tilted the screen, making it very comfortable to look at for long periods of time.

The one thing we didn't like about the Inspiron 15-7537 was the all-in-one touchpad. For the most part, it was fine for dragging our cursor round the desktop, but its clickable lower half feels very spongy when opening

files and folders. This makes it frustrating to use on a daily basis, so we'd recommend using a mouse where possible. Otherwise, multitouch gestures are very easy to perform, and swiping from the side to perform Windows 8 shortcuts works perfectly.

FLEX YOUR MUSCLES

Fortunately, the keyboard is much more pleasant to use. At first we were a little concerned with the amount of flex present in the keyboard tray, but it didn't make any difference to our typing speed whatsoever, and the keys themselves give a good level of tactile feedback. Some keys, such as the Enter and left Shift key, are a little smaller than they are on other laptops, but we rarely found ourselves hitting incorrect keys even when typing at speed, so this shouldn't pose much of a problem.

The Dell Inspiron 15-7537 is a superb desktop replacement, and its premium design looks smart and highly desirable. Our main concern, though, is the price. At £800, it's a fraction more expensive than the more powerful and award-winning Acer Aspire V3-772G, and its graphics chip doesn't perform as well as we'd expect. This won't be a problem if you're not fussed about playing games, but if you're looking for a fast desktop replacement, the Acer is the better buy.

SPECIFICATIONS

CPU	1.8GHz Intel Core i7-4500U
RAM	8GB
STORAGE	1TB hard disk
GRAPHICS	Nvidia GeForce GT 750M
OPTICAL DRIVE	None
DISPLAY	15.6in widescreen LCD touchscreen (1,920x1,080)
OPERATING SYSTEM	Windows 8
DIMENSIONS	22x379x255mm, 2.6kg
POWER CONSUMPTION	0W standby, 10W idle, 66W active
WARRANTY	One-year next business day
PART CODE	CN7530
DETAILS	www.dell.com/uk



HP Pavilion Touchsmart 11-e030sa



£280 inc VAT • From www.currys.co.uk

VERDICT

This touchscreen laptop is beautifully designed, but its slow processor and temperamental touchpad hold it back

CHEAP LAPTOPS ARE nothing new, but few are as beautifully designed as the HP Pavilion Touchsmart 11-e030sa and have 10-point touchscreens for less than £300. Its brushed metallic finish and smart looks are striking and make it look a lot more expensive than it is. To top it all it weighs just 1.4kg, so you can easily carry it with you wherever you go.

It's well made, too. We saw hardly any flex in the screen or keyboard tray, and the wide range of ports give it plenty of versatility. We were particularly pleased to see two USB3 ports alongside its single USB2 port, and you'll also find HDMI and VGA video outputs for connecting the laptop to an external display, an SDXC card reader, a Fast Ethernet port and a combined headphone and microphone jack.

The touchscreen is wonderfully responsive and we were able to perform Windows 8 gestures without any trouble. Multitouch gestures such as two-finger scrolling and pinch-zooming are smooth, too, and the 1,366x768 resolution looks sharp on the 11.6in display. Viewing angles are also good.

“The touchscreen is wonderfully responsive and we were able to perform Windows 8 gestures without any trouble **”**

The screen's image quality is more mediocre, as our colour calibrator showed it was displaying just 53.2 per cent of the sRGB colour gamut. This is to be expected on a budget laptop, though, and colours still looked acceptable in our subjective solid colour image tests. Reds, greens and blues all retained a surprising amount of depth thanks to the screen's glossy finish, and none of them looked particularly drained or washed out.

Blacks were less impressive, though, as the screen's high black level reading of 0.52cd/m² meant they could appear quite grey depending on how we angled the screen. This also revealed the screen's rather narrow viewing angles, which made it difficult to see our high contrast test photos clearly unless the screen was at just the right angle.



We were also disappointed by the display's low contrast ratio, which we measured at just 298:1. This is one of the lowest contrast ratios we've seen, but we were pleasantly surprised by the amount of detail we were able to see when the screen was positioned correctly. Shadows were particularly well illuminated, but when we tilted the screen out of its small sweet spot, everything soon became obscured.

This is a shame, but it's a small complaint when the Touchsmart 11-e030sa is so comfortable to use on an everyday basis. The bouncy keys are well spaced on its small

comes to raw processing power; even the respectable 4GB of RAM doesn't stop this from being one of the slowest laptops we've tested. It scored just eight in our multimedia benchmarks, which makes it unsuited to anything but the most basic of everyday tasks. Attempting to use more than one program at once is out of the question, but we were able to browse the web and compose Word documents without too much hassle.

Needless to say, the only games you'll be playing on the 11-e030sa will be simple Flash games from the Windows 8 Store, as its AMD Radeon HD 8120 integrated graphics chip isn't cut out for 3D graphics. The 11-e030sa failed our Dirt Showdown test, and we couldn't even scrape 15fps when we set the quality settings to Low at 1,280x720 and disabled anti-aliasing, so you'll struggle to play any kind of 3D title.

This is a shame, as the battery life was fairly decent for a budget laptop. It lasted five hours and 44 minutes in our light-use test with the screen set to half brightness. This isn't the best score we've seen from a cheap ultra-portable, and is much more in line with what we normally expect to see from a budget laptop.

The HP Pavilion Touchsmart 11-e030sa is an appealing laptop for taking everywhere, but the superior Asus X200CA costs only £20 more, and so the 11-e030sa's good looks and longer battery life aren't quite enough to win us over.



SPECIFICATIONS

CPU 1GHz AMD A4-1250

RAM 4GB

STORAGE 500GB hard disk

GRAPHICS AMD Radeon HD 8210

OPTICAL DRIVE None

DISPLAY 11.6in widescreen LCD touchscreen (1,366x768)

OPERATING SYSTEM Windows 8

DIMENSIONS 36x290x216mm, 1.4kg

POWER CONSUMPTION 0W standby, 8W idle, 11W active

WARRANTY One-year collect and return

PART CODE 11-e030sa

DETAILS www.hp.co.uk

HP Split X2



£699 inc VAT • From www.isme.com

VERDICT

Great battery life and powerful components, but the screen's poor contrast holds it back

DETACHABLE LAPTOP/TABLET hybrids are a great idea in theory, but so far few have managed to strike the right balance between price and performance. HP's Split X2 is one of the cheapest two-in-one devices we've seen. It's the next evolution of the company's innovative but sluggish Envy X2, and improves on its predecessor in almost every way.

Unlike the Envy X2, the Split X2 runs the full 64-bit version of Windows 8. The Split X2 also has a neat trick in the form of its dual storage solution. Inside the main display, which detaches to become a tablet, is a 64GB SSD; inside the keyboard section is a 500GB hard disk. You'll need to copy files to the SSD if you want them available in tablet mode.

Detaching the screen is as easy as flipping the switch on top of the keyboard and pulling the screen off. It needs a firm push to connect it back into the keyboard, but the magnetic connectors and sturdy latch keep it in place.

TAPERED TABLET

As a tablet, the Split X2 looks stunning. Its sturdy brushed aluminium chassis showed no signs of flex in the back panel, and the smooth tapered edges make it comfortable to hold. At 13.3in, it's a little large to hold for long periods of time, and its hefty weight of 1kg means you'll probably want to rest it on your lap or a desk while tapping the screen.

The only port available in tablet mode is a combined headphone and microphone port on its flat underside, so you'll need to connect it to the keyboard dock to take advantage of its extra connections. There aren't many to choose from, but the two USB ports, HDMI output and SDXC card reader should be enough.

The 13.3in 1,366x768 touchscreen looks beautiful, and its wide viewing angles mean you can see the screen clearly at all but the most extreme angles. Initially, we were a little disappointed with the screen's colour accuracy, as our colour calibrator showed it was displaying only 60.3 per cent of the sRGB colour gamut. This is around average for a laptop screen, but our solid colour image tests still looked great. This was helped in part by the screen's glossy finish, which helps reds, greens and blues appear more vibrant than on displays with a matt finish. Whites are bright, too, and blacks deep and uniformly lit across the screen. This matched our low black level



reading of 0.25cd/m², which is one of the lowest we've seen on a laptop of this price.

Contrast levels were more disappointing. Despite recording a reasonably high contrast ratio of 851:1, we found it hard to pick out the detail in our high contrast test images. Areas of shadow simply looked black no matter how much we tilted the screen, and increasing the screen brightness to maximum did little to help. This is a shame, as the touchscreen itself is wonderfully responsive, making it perfect for passing round photos to friends and family.

CORE STRENGTHS

The Split X2 is a very capable tablet, as it uses a proper laptop processor instead of slower tablet components. It's available in two specifications; our review sample came with a 1.3GHz Intel Core i3-4010Y processor and 4GB of RAM. This processor is even more energy efficient than Intel's U series of processors as it's been designed to maximise battery life rather than performance. This means there's less power available for intensive tasks, but its overall score of 26 in our benchmarks means there's enough performance for everyday tasks, such as email and web browsing.

Battery life is also good. In tablet mode, it lasted seven hours and nine minutes in our light-use test, but when we combined it with the battery in the keyboard dock, we managed a huge 10 hours and 47 minutes under the same conditions. This makes it perfect for long journeys, and while it doesn't match the Envy X2's near 13-hour battery life, we'd happily take the extra processing power over another two hours of portability.

The Split X2's Intel HD Graphics 4200 can just about handle 3D games as well, although

you'll have to lower the settings to play them at a comfortable speed. We barely scraped 16fps in our Dirt Showdown test on High quality settings at a 1,280x720 resolution, but managed to increase this to 29fps on Low quality at the same resolution when we disabled anti-aliasing. This is one of the best scores we've seen for a Windows 8 tablet, but the Split X2 is still arguably more suited to simple touch-based games from the Windows 8 Store rather than the latest 3D titles.

LAP IT UP

The Split X2 is comfortable to use as a laptop as well. The keyboard dock more than doubles its weight, but the flat keys are well spaced and bouncy. It's a joy to type on for long periods of time, and the all-in-one touchpad is equally easy to use. Multitouch gestures and Windows 8 shortcuts are smooth and accurate, and the lower half of the touchpad gives a good level of feedback.

The HP Split X2 is a great improvement on the detachable Windows 8 laptop/tablet hybrid formula, and it's a good choice if you want a tablet that you can use as a laptop. If you'd rather have a laptop you can carry around with you, you can save a lot of money by buying the Asus X200CA, or you can get better battery life and performance with the slim Apple 13-inch MacBook Air.

SPECIFICATIONS

CPU 1.3GHz Intel Core i3-4010Y

RAM 4GB

STORAGE 500GB hard disk + 64GB SSD

GRAPHICS Intel HD Graphics 4200

OPTICAL DRIVE None

DISPLAY 13.3in widescreen LCD touchscreen (1,366x768)

OPERATING SYSTEM Windows 8

DIMENSIONS 23x340x230mm, 2.3kg

POWER CONSUMPTION 0W standby, 11W idle, 17W active

WARRANTY One-year RTB

PART CODE 13-m110sa

DETAILS www.hp.co.uk



LENOVO IdeaPad Flex 15



£550 inc VAT • From www.johnlewis.com

VERDICT

The screen and touchpad could be better, but this powerful touchscreen hybrid is a great alternative to Lenovo's expensive Yoga laptops

WHEN LENOVO LAUNCHED its ultra-flexible Yoga laptops with their 360° screen hinges, the £1,000 asking price put many people off. The IdeaPad Flex 15 brings that hybrid experience to the masses, offering a hinge with 300° of rotation for just £550.

The bulky hinge is a far cry from the elegant Yoga, but it works in the same way. Just push the screen back and the laptop folds round so the keyboard faces down on the table. Since the hinge only lets the laptop fold back 300° instead of a full 360, it transforms into a stand for the touchscreen, letting you use it on your lap or on the edge of a table easily without having to worry about the keyboard getting in the way. You don't need to worry about accidentally hitting any keys in Stand mode either, as the Flex 15 automatically disables the keyboard when you push the screen back.

The hinge is sturdy, so you'll need both hands to bend it backwards, but we were a little disappointed by how wobbly the Flex 15 was once we'd got it into a comfortable Stand position. This made using the touchscreen a bit tricky, particularly when we tried to use the onscreen keyboard, but it's fine for simple touch-based games and dragging and dropping.

TOUCH TOO MUCH

The 15.6in, 1,366x768 touchscreen reveals the laptop's budget origins, with its narrow viewing angles and average image quality. Our colour calibrator showed it was displaying just 57.1 per cent of the sRGB colour gamut, and our high black level reading of 0.45cd/m² meant blacks appeared almost grey in our solid colour image tests. The screen's warm colour coverage is particularly poor, and solid reds, greens and blues look bland and washed out. The bottom half of the screen is also much brighter than the upper half.

Contrast is also mediocre, with our test images showing varying levels of detail depending on where we angled the screen. Areas of deep shadow were often opaque, but most images were clear if the screen was angled correctly. This is a shame, as the touchscreen itself is responsive, and icons and fiddly internet tabs are easy to open and close.

The Flex 15 makes up for its below-par screen with its powerful components. Our review sample came with a 1.6GHz Intel Core i5-4200U processor and 4GB of RAM. The Flex 15's overall score of 47 in our multimedia benchmarks is what we'd normally expect to see from this type of processor, showing it's capable of handling multiple programs at once without any significant slowdown.

DIRT TRACK

In our Dirt Showdown benchmark, the integrated Intel HD Graphics 4400 managed 20.5fps on High quality at a 1,280x720 resolution. This isn't quite fast enough to play 3D games at a comfortable speed. We saw a much smoother 35.1fps when we set the quality to Low at the same resolution. This will be welcome news for those who like to play games on the move, but don't expect the Flex 15 to handle the latest 3D titles without some serious compromises in graphical fidelity.

The Flex 15 lasted an outstanding 10 hours and 34 minutes in our light-use battery test with the screen set to half brightness, a full three hours longer than the Yoga 13. This is easily one of the best scores we've seen for a laptop of this price, so you can be sure the Flex 15 won't let you down if you're using it on the move.

The keyboard is great to use for long Word documents as its springy keys give lots of tactile feedback. They're sensibly spaced, too, and there's enough room for a numeric keypad. The only thing we didn't like was the hard plastic edge round the keyboard tray, as this had a tendency to dig into our wrists while we were typing.

This wasn't too much of an issue compared to the all-in-one touchpad,



though, as we found it quite fiddly to use when navigating the desktop. Occasionally it froze completely, but our biggest complaint was how little feedback we received when we tried clicking on files and icons. Multitouch gestures also veered between being wildly sensitive and sluggishly stilted, with two-finger scrolling being particularly tricky to get right, as even small movements made the page scroll very quickly.

SLIM PICKINGS

The Flex 15 has a good range of ports for such a slim laptop, including three USB ports (one of which is USB3), an HDMI video output for connecting the laptop to an external display, an SDXC and MMC card reader, a Fast Ethernet port and a combined headphone and microphone jack.

The Lenovo IdeaPad Flex 15 isn't without its problems, but it's a fun alternative to the more expensive Yoga hybrids and its flexible hinge makes it stand out from other similarly priced touchscreen laptops. It also has the hardware to compete with more expensive Ultrabooks, and it's one of the cheapest two-in-one devices we've tested this year. If all you're looking for is a powerful mid-range laptop, the £480 Toshiba Satellite C55-A-1NO is the better buy, but for those who want a novel hybrid without breaking the bank, the Lenovo IdeaPad Flex 15 could be for you.

SPECIFICATIONS

CPU	1.6GHz Intel Core i5-4200U
RAM	4GB
STORAGE	500GB hard disk
GRAPHICS	Intel HD Graphics 4400
OPTICAL DRIVE	None
DISPLAY	15.6in widescreen LCD touchscreen (1,366x768)
OPERATING SYSTEM	Windows 8
DIMENSIONS	22x380x273mm, 2.3kg
POWER CONSUMPTION	0W standby, 9W idle, 25W active
WARRANTY	Three-year RTB
PART CODE	59395479
DETAILS	www.lenovo.co.uk

SAMSUNG Ativ Book 8



£1,409 inc VAT • From www.stuff-uk.net

VERDICT

A great laptop with a beautiful display and dedicated graphics, but a step down from its cheaper predecessor

SAMSUNG'S AWARD-WINNING Series 7

Chronos showed that 15.6in laptops could be just as powerful as a gaming laptop and still have plenty of style. The Ativ Book 8 is the successor to the Chronos, but surprisingly little has changed in the intervening months.

It's still an incredibly powerful laptop, but we were disappointed that Samsung hasn't updated the specification. Instead of using one of Intel's new Haswell processors, the Ativ Book 8 comes with an Ivy Bridge quad-core 2.4GHz Intel Core i7-3635QM processor and 8GB of RAM. This still provides the Ativ Book 8 with plenty of raw speed, though: it breezed through our multimedia benchmarks with an impressive score of 86 overall. This is just shy of our reference Core i5-3570K desktop processor, so the Ativ Book 8 should be able to handle even the most demanding media applications with ease.

CHIP SHAPE

The graphics chip hasn't changed, either. This isn't a bad thing, as the 2GB AMD Radeon HD 8870M is a great mid-range chip, but much like the processor we would have liked to have seen something a little different to make the Ativ Book 8 stand out from its predecessor. That said, 46.4fps in our Dirt Showdown test on High quality and a 1,280x720 resolution isn't to be sniffed at, and it even managed 19.2fps in our demanding Crysis 2 test on Ultra quality at 1,920x1,080. This isn't fast enough to play at a comfortable speed, but lowering the settings turns the Ativ Book 8 into a capable gaming laptop, as we managed a smooth 41.8fps on High in Crysis 2 at the same resolution.

The main attraction is the 15.6in display. Image quality is superb, with our colour calibrator showing it displays 89.3 per cent of



the sRGB colour gamut. Most laptop screens display only around 60 per cent of the sRGB colour gamut, but the Ativ Book 8 had excellent coverage across all the main primary colour groups.

Blues and yellows were particularly strong in our solid colour image tests. These looked bright and vivid, and the screen's glossy finish also helped to give them a bit more depth and vibrancy. Whites are bright and clean, too, and its low black level of 0.25cd/m² meant there was no hint of grey in solid blacks.

ALL IN THE DETAIL

Our high contrast images also looked great, but some of our test photos showed less detail than others. This was surprising, as our colour calibrator measured a contrast ratio of 1,043:1, which is above average compared to your typical laptop panel. We suspect this is due to the laptop's deep black levels, as it was the darker shadow detail that suffered most.

The 10-point touchscreen is very responsive, but we were disappointed that the screen hinge is just as flimsy as it was before on the Series 7 Chronos laptops. This makes it particularly ill suited to touch-based games and applications, but even more sedate tasks such as tapping through files and icons on our desktop made the screen wobble uncontrollably, so much so that it put us off using the touchscreen altogether.

This is a shame, but it's no great loss when the large all-in-one touchpad is so easy to use. Pinch-zooming could have been a little smoother, but for most tasks it's just as responsive as the touchscreen. Windows 8 shortcuts worked every time and there's plenty of space to move your cursor round the screen. Unlike other

touchpads, the entire surface is clickable, but the lower half gives the best feedback.

The keyboard is also a joy to use. Keys are well spaced and give lots of tactile feedback, and there's room for a numeric keypad.

The Ativ Book 8 has a good range of ports. There's no optical drive, but you'll find two USB3 and two USB ports, HDMI and VGA outputs for connecting an external display, a Gigabit Ethernet port, an SDXC card reader and a combined headphone and microphone jack. Its JBL speakers are excellent, though, so we didn't feel the need to reach for a pair of headphones when listening to music.

POWER DOWN

The most disappointing part of the Ativ Book 8 is its battery life. The Series 7 Chronos managed nine and a half hours in our test, but the Ativ Book 8 lasted just six hours and 36 minutes. This is still good by general laptop standards, but it's not quite as extraordinary as the Series 7 Chronos.

The Ativ Book 8 is a great desktop replacement, but when it's more expensive and has a worse battery life than its predecessor, we can't help feeling a little disappointed with it. There are much cheaper and more powerful general-purpose laptops available, and at this price, the 13-inch MacBook Pro with Retina Display is a much better choice.



SPECIFICATIONS

CPU	2.4GHz Intel Core i7-3635QM
RAM	8GB
STORAGE	1TB hard disk
GRAPHICS	AMD Radeon HD 8870M
OPTICAL DRIVE	None
DISPLAY	15.6in widescreen LCD touchscreen (1,920x1,080)
OPERATING SYSTEM	Windows 8
DIMENSIONS	23x376x250mm, 2.5kg
POWER CONSUMPTION	1W standby, 18W idle, 73W active
WARRANTY	One-year RTB
PART CODE	NP880Z5E-X02UK
DETAILS	www.samsung.com/uk

TOSHIBA Satellite C55-A-1N0



★★★★★

£480 inc VAT • From www.aria.co.uk

VERDICT

This is one of the most powerful desktop replacements you'll find for less than £500

THE TOSHIBA SATELLITE C55-A-1N0

desktop replacement is one of the most powerful laptops under £500 we've tested.

This is thanks to its brand new dual-core 2.5GHz Intel Core i5-4200M processor, which can Turbo Boost up to 3.1GHz for a boost in performance when there's enough thermal headroom. The M suffix shows it belongs to Intel's mobile series of processors, which are more powerful than the more common and energy efficient U models.

Paired with 4GB of RAM, it scored a hugely impressive 56 in our multimedia benchmarks, which puts it ahead of many Core i7-based Ultrabooks. This shows it's capable of handling demanding applications, and its score of 52 in the multitasking section of the test means it can also cope with several tasks at once.

Graphics are provided by its integrated Intel HD Graphics 4600 chip. This isn't the quickest onboard graphics chip we've seen, but we were impressed with its performance in our Dirt Showdown test. We saw just 19.9fps



and well spaced. The touchpad is also very easy to use, and its lightly textured surface gives a good level of grip for performing multitouch gestures such as pinch-zooming. The only gesture we had problems with was two finger scrolling. This was very temperamental and rarely worked on web pages, making surfing the web a little

The C55-A-1N0's only real flaw is its 15.6in display. It's no worse than other screens we've seen on other sub-£500 laptops, but viewing angles are quite narrow and colours looked oversaturated in our image tests. This is partly because it can show only 73.1 per cent of the sRGB colour gamut. Its warm colour coverage is particularly lacking, with reds and magentas suffering the most. Whites also looked grey depending on where we angled the screen, and its high black level reading of 0.61cd/m² meant blacks were affected in the same way.

The top half of the screen is darker than the bottom half, and tilting the display created a noticeable shift in the screen's contrast levels. At the right angle, our high contrast test images looked great, showing high levels of detail in both the light and dark areas of each image, but night scenes became almost completely obscured when we tilted the screen forwards and backwards.

This shouldn't be a problem if you're planning to use the C55-A-1N0 as a desktop replacement, though, and it certainly doesn't detract from what is otherwise a great-value laptop. It's rare to find such a powerful system for less than £500, and it shows you don't have to settle for sluggish components if you don't want to spend a lot of money. It wins a Best Buy award.

“ The C55-A-1N0 comes well-equipped with a wide range of connections **”**

on High quality at a 1,280x720 resolution, but this doubled to a smooth 41.3fps when we disabled the anti-aliasing and set the quality to Low on the same resolution. This is great for a laptop at this price and, while it's not powerful enough to run power-hungry games such as Crysis 3, it should be able to play most 3D titles at a reasonable speed once you've tailored the quality settings.

The C55-A-1N0 is a joy to use for everyday tasks as well. The keyboard gives a great level of tactile feedback and the keys are bouncy

frustrating. We liked the dedicated buttons, though, as these were firm and accurate when we pressed down on them to open files and search through folders.

You'll need to be careful about taking the C55-A-1N0 with you in a backpack, as there's a lot of flex in its plastic chassis. This is somewhat expected given the price, but the lid and the screen are particularly flimsy, so you'll want to avoid resting anything heavy on top of the laptop when the lid is shut. This is a shame, as the seven hours and 17 minutes we

managed in our light-use battery test makes it highly suitable for using on the move, even if it does weigh a rather hefty 2.3kg.

Its extra size also gives you more room for ports, and the C55-A-1N0 comes well equipped with a wide range of connections. There are three USB ports (one of which is USB3), VGA and HDMI video outputs, an SDXC/MMC card reader, a DVD rewriter, a Fast Ethernet port, and separate headphone and microphone jacks. The laptop also comes with a large 750GB hard disk for storing your media collection.

**SPECIFICATIONS**

CPU	2.5GHz Intel Core i5-4200M
RAM	4GB
STORAGE	750GB hard disk
GRAPHICS	Intel HD Graphics 4600
OPTICAL DRIVE	DVD+/-RW +/-DL, DVD-RAM
DISPLAY	15.6in widescreen LCD (1,366x768)
OPERATING SYSTEM	Windows 8.1
DIMENSIONS	33x380x242mm, 2.3kg
POWER CONSUMPTION	0W standby, 15W idle, 36W active
WARRANTY	One-year carry-in
PART CODE	PSCGJE-00D004EN
DETAILS	www.toshiba.co.uk

TOSHIBA Satellite M50-A-11C



£590 inc VAT • From www.costco.co.uk

VERDICT

A powerful laptop with dedicated graphics and a superb battery life, but its below average screen holds it back

TOSHIBA'S M50-A-11C sits between a slim ultra-portable and a general-purpose laptop, both in terms of its specification and its price. Its thin chassis is just 21mm thick, but you'll find a good variety of ports round the side, including three USB ports, two of which are USB3, an HDMI output, an SDXC/MMC card reader, a Gigabit Ethernet port and a combined headphone and microphone jack.

It's a very attractive laptop, but there's a worrying amount of flex in the keyboard tray. The upper panel between the hinges is particularly bendy, but the lower wrist rest is a lot firmer thanks to its brushed aluminium finish. You'll need to be careful putting the M50-A-11C in a bag, though.

ASSAULT AND BATTERY

This is a shame, as the M50-A-11C's battery life reaps the benefits of its Haswell processor's low energy consumption. It lasted nine hours and 50 minutes in our light-use test, which is almost twice the battery life of other laptops in this price range.

Inside, the M50-A-11C has a 1.6GHz Intel Core i5-4200U processor, which also powers the considerably more expensive Samsung Ativ Book 9 Plus, and 6GB of RAM. It scored an excellent 47 overall in our multimedia benchmarks, putting its raw processing power alongside other Core i5 Ultrabooks. This gives it plenty of speed to cope with demanding media programs as well as everyday tasks.

The 2GB Nvidia GeForce GT 740M graphics chip is even more appealing, as this turns the M50-A-11C into a competent gaming laptop as well. Admittedly, the chip didn't perform quite as well as other laptops in which we've seen it, but its steady frame rate of 34.9fps in Dirt Showdown at a 1,280x720 resolution and High quality settings is still good for a laptop



at this price. It's not powerful enough to cope with more demanding games such as Crysis 3, but you should be able to play most 3D titles without having to lower the quality settings.

BEYOND THE PALE

The M50-A-11C's 15.6in screen leaves a lot to be desired. The 1,366x768 resolution looked fine, but our colour calibrator showed the screen was displaying just 54.1 per cent of the sRGB colour gamut. This is below average even for a £600 laptop; we'd expect to see at least 60 per cent, if not higher. This meant colours looked pale and washed out, and our solid image tests lacked depth and vibrancy.

Solid blacks also revealed that the top half of the screen was lighter than the bottom. This meant blacks appeared as various shades of grey depending on how we angled the screen, and this reflected our relatively high black level reading of 0.65cd/m². Combined with some rather narrow viewing angles, this made it very difficult to get a uniform colour across the screen at any one time.

Contrast levels aren't much better. We recorded a contrast ratio of just 336:1, and it was tricky to pick out dark shadow detail in our high contrast test images.

This was only made worse by the screen's reflective glossy finish.

The keyboard is much more pleasant to use, as the well-spaced keys all give a good level of tactile feedback. They're not the bounciest laptop keys we've ever used, but they're more than adequate for typing long Word documents. A row of media buttons runs along the top of the keyboard, and there's room for a numeric keypad on the right-hand side.



We didn't get on so well with the large all-in-one touchpad. Its large slightly textured surface is fine for dragging the cursor around the desktop, but swiping from the side to perform Windows 8 shortcuts often took a few attempts. Like other Toshiba laptops, the touchpad's main surface lies in a small recess compared to the rest of the laptop, so swiping from the side doesn't always register.

SCROLL WITH IT

Multitouch gestures such as pinch-zooming are also a little stilted, but two-finger scrolling works perfectly. You may want to change the scrolling direction in the Control Panel's Mouse Settings, though, as this is set to reverse on its default setting, so scrolling down moves the page upwards, and vice versa. Luckily, altering the direction is simple. Once you're in the Mouse Settings, click the ELAN tab and select Options. Click the cog button next to Scrolling and uncheck Reverse.

It's a shame Toshiba has compromised on the screen, as otherwise the Satellite M50-A-11C is great value. It has the power to rival an Ultrabook, and its dedicated graphics chip is a rare bonus in a laptop at this price. Had the screen been better, this could have been a Best Buy winner, but instead it falls just short of awards territory.

SPECIFICATIONS

CPU 1.6GHz Intel Core i5-4200U

RAM 6GB

STORAGE 750GB hard disk

GRAPHICS Nvidia GeForce GT 740M

OPTICAL DRIVE None

DISPLAY 15.6in widescreen LCD (1,366x768)

OPERATING SYSTEM Windows 8.1

DIMENSIONS 21x377x249mm, 2.2kg

POWER CONSUMPTION 0W standby, 7W idle, 42W active

WARRANTY One-year carry-in

PART CODE PSKPNE-00R00UEN

DETAILS www.toshiba.co.uk

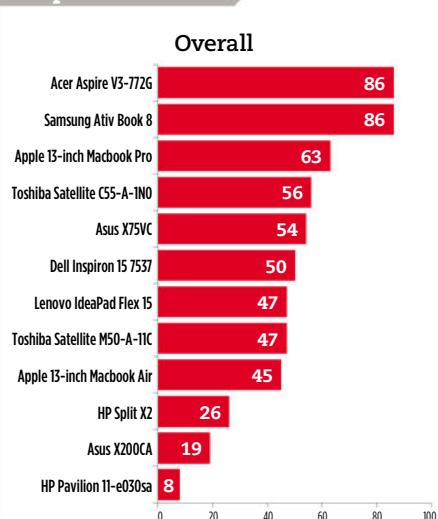
	BEST BUY	BEST BUY	ULTIMATE	BUDGET BUY		
	ACER	APPLE	APPLE	ASUS	ASUS	DELL
	Aspire V3-772G	13-inch MacBook Air	13-inch MacBook Pro with Retina Display	X200CA	X75VC	Inspiron 15-7537
Rating	★★★★★	★★★★★	★★★★★	★★★★	★★★★	★★★★
Processor	Intel Core i7-4702MQ	Intel Core i5-4250U	Intel Core i5-4288U	Intel Celeron 1007U	Intel Core i5-3230M	Intel Core i7-4500U
Speed	2.2GHz	1.3GHz	2.6GHz	1.4GHz	2.6GHz	1.8GHz
Number of cores	4	2	2	2	2	2
Memory installed	8GB	4GB	8GB	4GB	8GB	8GB
Memory slots (free)	2 (0)	N/A (N/A)	2 (0)	1 (0)	2 (0)	2 (0)
Max memory	8GB	4GB	16GB	4GB	8GB	8GB
Dimensions(HxWxD)	34x415x275mm	17x325x227mm	18x314x219mm	21x303x200mm	38x420x282mm	22x379x255mm
Weight	3.2kg	1.4kg	1.6kg	1.4kg	3kg	2.6kg
Sound	Realtek HD Audio	Not disclosed	Cirrus Logic CS4208	Intel HD Audio	Realtek HD Audio	Realtek HD Audio
Pointing device	Touchpad	Touchpad	Touchpad	Touchpad and touchscreen	Touchpad	Touchpad and touchscreen
Power consumption standby	0W	0W	2W	0W	1W	0W
Power consumption idle	21W	8W	6W	13W	13W	10W
Power consumption active	65W	23W	54W	19W	68W	66W
DISPLAY						
Screen size	17.3in widescreen LCD	13.3in LCD	13.3in widescreen LCD	11.6in widescreen LCD touchscreen	17.3in widescreen LCD	15.6in widescreen LCD touchscreen
Native resolution	1,600x900	1,440x900	2,560x1,600	1,366x768	1,600x900	1,920x1,080
Graphics adaptor	Nvidia GeForce GT 750M	Intel HD 5000	Intel Iris Graphics 5100	Intel HD Graphics	Nvidia GeForce GT 720M	Nvidia GeForce GT 750M
Graphics outputs	VGA, HDMI	Thunderbolt	HDMI, Thunderbolt	VGA, HDMI	VGA, HDMI	HDMI
Graphics memory	2GB dedicated	Not disclosed	Not disclosed	128MB shared	2GB dedicated	2GB dedicated
STORAGE						
Hard disk capacity/ capacities	750GB	128GB	512GB	500GB	1TB	1TB
Optical drive type	DVD+/-RW +/-DL	None	None	None	BD-ROM, DVD+/-RW +/-DL	None
PORts AND EXPANSION						
USB ports	4	2	2	3	3	4
Bluetooth	Yes	Yes	Yes	Yes	Yes	Yes
Networking	1x 10/100/1,000, 802.11n (dual-band)	802.11ac	802.11ac	1x 10/100, 802.11n	1x 10/100/1,000, 802.11n	1x 10/100/1,000, 802.11n
Memory card reader	SDXC, MMC	SDXC, MMC	SDXC, MMC	SD, SDHC, SDXC, MMC	SDHC, MMC	SDXC, MMC+, Memory Stick, Memory Stick Pro, MSXC
Other ports	Headphone, microphone	Thunderbolt	2x Thunderbolt, headphone, microphone	Headphone, microphone	Headphone, microphone	Headphone, microphone
MISCELLANEOUS						
Operating system	Windows 8	OS X Mavericks	OS X Mavericks	Windows 8	Windows 8	Windows 8
BUYING INFORMATION						
Parts and labour warranty	One-year carry-in	One-year RTB	One-year RTB	Two-year RTB	One-year RTB	One-year next business day
Price inc VAT	£794 inc VAT	£949 inc VAT	£1,499 inc VAT	£300 inc VAT	£599 inc VAT	£799 inc VAT
Details	www.acer.co.uk	www.apple.com/uk	www.apple.com/uk	www.asus.com	www.asus.com	www.dell.com/uk
Supplier	www.cclonline.com	http://store.apple.com	http://store.apple.com	www.pcworld.co.uk	www.very.co.uk	www.dell.com/uk
Part number	NX.M74EK.001	MD760X/A	ME866B/A	X200CA-CT112H	X75A-TY103H	CN75305

BEST BUY					
HP	HP	LENOVO	SAMSUNG	TOSHIBA	TOSHIBA
Pavilion Touchsmart 11-e030sa	Split X2	IdeaPad Flex 15	Ativ Book 8	Satellite C55-A-1N0	Satellite M50-A-11C
★★★	★★★★	★★★★	★★★★	★★★★★	★★★★
AMD A4-1250	Intel Core i3-4010Y	Intel Core i5-4200U	Intel Core i7-3635QM	Intel Core i5-4200M	Intel Core i5-4200U
1GHz	1.3GHz	1.6GHz	2.4GHz	2.5GHz	1.6GHz
2	2	2	4	2	2
4GB	4GB	4GB	8GB	4GB	6GB
1(0)	1(0)	1(0)	1(0)	2(1)	2(0)
4GB	4GB	4GB	8GB	16GB	16GB
36x290x216mm	23x340x230mm	22x380x273mm	23x376x250mm	33x380x242mm	21x377x249mm
1.4kg	2.3kg	2.3kg	2.5kg	2.3kg	2.2kg
Realtek HD Audio	Beats Audio	Realtek HD Audio	Realtek HD Audio	Realtek ALC269Q	Realtek ALC2802-CG
Touchpad and touchscreen	Touchpad and touchscreen	Touchpad and touchscreen	Touchpad and touchscreen	Touchpad	Touchpad
0W	0W	0W	1W	0W	0W
8W	11W	9W	18W	15W	7W
11W	17W	25W	73W	36W	42W
<hr/>					
11.6in widescreen LCD touchscreen	13.3in widescreen LCD touchscreen	15.6in widescreen LCD touchscreen	15.6in widescreen LCD touchscreen	15.6in widescreen LCD	15.6in widescreen LCD
1,366x768	1,366x768	1,366x768	1,920x1,080	1,366x768	1,366x768
AMD Radeon HD 8210	Intel HD Graphics 4200	Intel HD Graphics 4400	AMD Radeon HD 8870M	Intel HD Graphics 4600	Nvidia GeForce GT 740M
VGA, HDMI	HDMI	HDMI	VGA, HDMI	VGA, HDMI	HDMI
128MB shared	128MB shared	128MB shared	2GB dedicated	1.8GB shared	2GB dedicated
<hr/>					
500GB	500GB hard disk + 64GB SSD	500GB	1TB	750GB	750GB
None	None	None	None	DVD+/-RW +/-DL, DVD-RAM	None
<hr/>					
3	2	3	5	3	3
Yes	Yes	Yes	Yes	Yes	Yes
1x 10/100, 802.11n	802.11n	1x 10/100, 802.11n	1x 10/100/1,000, 802.11n	1x 10/100, 802.11n	1x 10/100/1,000, 802.11n
SDXC, MMC	SDXC, MMC	SDXC, MMC	SDXC, MMC	SDXC, MMC	SDXC, MMC
<hr/>					
Headphone, microphone	Headphone, microphone	Headphone, microphone	Headphone, microphone	Headphone, microphone	Headphone, microphone
<hr/>					
Windows 8	Windows 8	Windows 8	Windows 8	Windows 8.1	Windows 8.1
<hr/>					
One-year collect and return	One-year RTB	Three-year RTB	One-year RTB	One-year carry-in	One-year carry-in
£280 inc VAT	£699 inc VAT	£550 inc VAT	£1,409 inc VAT	£480 inc VAT	£590 inc VAT
www.hp.co.uk	www.hp.co.uk	www.lenovo.co.uk	www.samsung.com/uk	www.toshiba.co.uk	www.toshiba.co.uk
www.currys.co.uk	www.isme.com	www.johnlewis.com	www.stuff-uk.net	www.aria.co.uk	www.costco.co.uk
11-e030sa	13-m110sa	59395479	NP880Z5E-X02UK	PSCGJE-00D004EN	PSKPNE-00R00UEN

Graphs and verdict on page 98

BENCHMARKS

2D performance



Multitasking

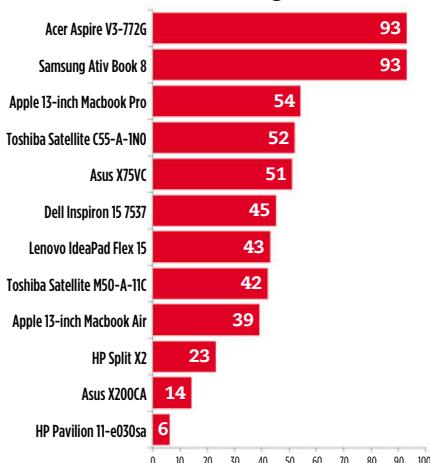
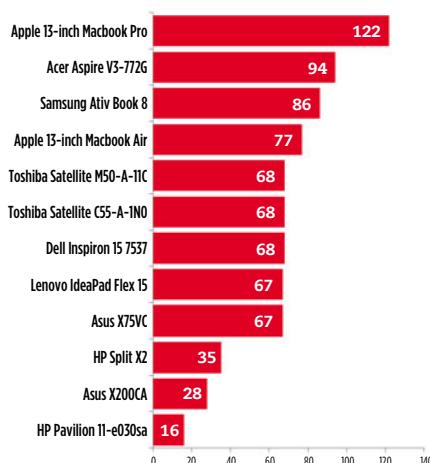
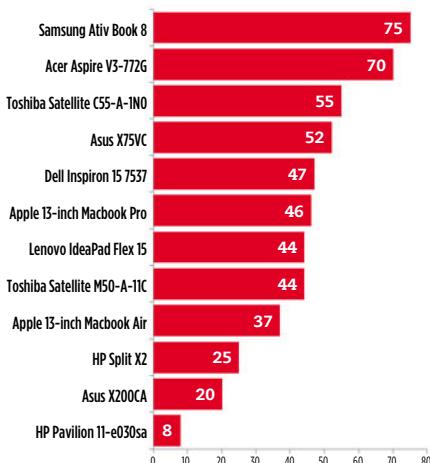


Image editing



Video encoding



Our benchmark suite allows us to compare Windows, Mac OS X and Linux PCs. The tests use open-source applications to gauge a laptop's performance, and comprise image-editing, video-editing and multitasking elements. These scores are added to produce the overall score.

Our reference PC is fitted with an Intel Core i5-3570K processor and 4GB

of DDR3 RAM. We have normalised all its results to 100, which makes it easy to draw comparisons. We use the same tests in all our reviews.

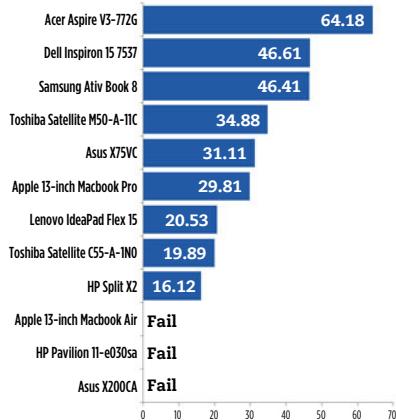
You can download the tests for free from <http://bit.ly/shopperbenchmarks>.

SETTINGS We run our application tests at native resolution and in 32-bit colour

WEB <http://bit.ly/shopperbenchmarks>

3D performance

Dirt Showdown

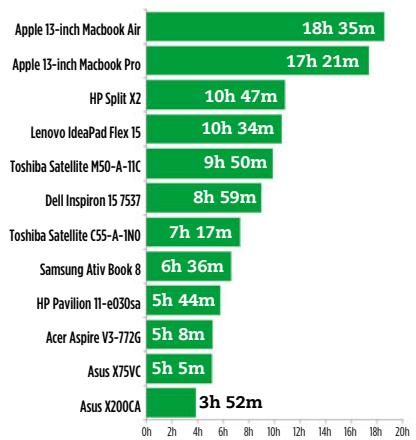


Our laptop Dirt Showdown test shows how well a laptop copes with gaming at 720p.

Settings 1,280x720 resolution, 4x AA, high detail

Battery life

Light-usage test (hours)



Our battery test involves light browser use with the screen at its medium brightness setting.

Settings Native resolution, screen at half brightness

VERDICT

If you want the best laptop money can buy, you can't do much better than Apple's 13in MacBook Pro. With its beautifully slim chassis, great battery life and powerful hardware, it's our Ultimate award winner.

For those looking for a great value mid-range laptop, the 13in MacBook Air is

an excellent alternative for Mac fans, while the Acer Aspire V3-772G is the perfect desktop replacement for Windows 8 users, with its quad-core processor and dedicated graphics chip. Both win Best Buy awards.

If your budget doesn't quite stretch that far, the Toshiba Satellite C55-A-1NO is one

of the fastest laptops we've seen for less than £500. It also wins a Best Buy award.

At the other end of the scale, the Asus X200CA is the clear winner in our budget category thanks to its fast processor and responsive touchscreen. It wins a Budget Buy award. □

ACER

Aspire V3-772G



APPLE 13-inch MacBook Air



APPLE 13-inch MacBook Pro



ASUS X200CA



TOSHIBA Satellite C55-A-1NO



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BLUETOOTH SPEAKERS

With their superior sound quality and prices starting from just £30, these 10 portable Bluetooth speakers will pump up the volume wherever you are

IF YOU HAVE a smartphone or tablet, you'll have access to your music wherever you are. Unfortunately, headphones don't cut it when it comes to sharing your favourite sounds with your friends, and playing music through your phone's built-in speaker does no favours to either the music or your popularity. This has led to an explosion in portable speakers.

Bluetooth technology and the speakers themselves have improved hugely in recent years. Big names such as Sony and Samsung have moved in, while others have focused on packing the best possible audio quality into something that fits in your pocket.

ALL THE SMALL THINGS

All the portable speakers here have a built-in battery. They range from one that's about the size of a doorknob to several the size of an old portable radio. Price is roughly proportional to size, with larger speakers typically costing more than more compact ones. The smallest speakers tend to have a single driver, while the larger models are usually stereo speakers, often with a bass port or passive radiator (like a speaker cone without a magnetic driver) to help create a broader low-end sound.

More expensive speakers also tend to have a wider range of features. NFC (Near Field Communication) lets you pair your speaker to a phone at a touch, while USB ports let you charge other devices. Some top-end speakers support the high quality aptX audio codec as well as the standard SBC codec.

Standard Bluetooth audio uses the SBC (Low Complexity Subband Coding) codec. This lossy audio codec was designed to produce reliable audio transmission even at low or variable bandwidths. It's fairly low latency and doesn't require much processing power for on-the-fly encoding, but doesn't produce optimal audio quality. Most notably, sound frequencies above 16kHz are cut out, resulting in restricted treble reproduction.

Fortunately, SBC isn't the only Bluetooth audio codec. The main alternative is CSR's proprietary aptX codec. Unlike SBC, aptX uses a fixed bit rate and has a sound frequency response of 10Hz to 22kHz. In practice, this results in perceptibly better sound, particularly when it comes to treble detail on orchestral recordings, cymbals and so on.

Because of the limitations imposed by the size and construction of portable speakers, the sound quality difference between SBC and aptX isn't as audible as it would be on, say, a pair of good-quality headphones. This means that smaller portable speakers in particular can get away with just using SBC without any perceptible loss in audio quality. It's perhaps for this reason, as well as the requisite licensing fee and the fact that only a minority of phones and tablets support aptX, that only one of the speakers in this group supports the standard. Read our reviews to see how we rate each speaker's audio performance.

If you do buy an aptX speaker, bear in mind that not all smartphones and tablets support

the codec, while PC users will have to use an aptX-compatible Bluetooth dongle. Samsung, HTC and Motorola all include aptX support in their high-end phones, and Sony has begun using the codec in its Xperia Z1. Apple has so far opted not to include aptX support in its devices, favouring AAC and its own AirPlay wireless standard over Bluetooth. Sadly, AirPlay isn't supported by any of this month's speakers.

ROCKING ALL NIGHT

If you're going to be using your speaker on the move, it's essential that it actually lasts long enough to keep your entertained. If you're just popping out to do a bit of gardening, you may need only a couple of hours of battery life, but if you're planning a cross-country cycle trek or going to a festival, you'll need a bit more durability. Most of the speakers we tested managed to keep playing for around 12 hours at a volume loud enough to fill a large room. A couple lasted more than a day. Our graph on page 106 shows you how long each speaker lasted in our tests.

Also consider the conditions in which you'll be using the speaker. If it's just going to move around your home so you can keep listening to your favourite tunes or audiobook while cooking dinner or lounging in bed, then size and durability aren't major issues. If, however, you want to take the speaker outdoors or listen in the shower, you'll want a water-resistant model with rubber or silicone covers to protect the speaker's ports.

BOSE SoundLink Mini



£170 inc VAT • From www.currys.co.uk

VERDICT

Stylish, with plenty of bass, but more expensive than more capable alternatives

YOU KNOW PORTABLE Bluetooth speakers have become mainstream when big names such as Bose get in on the action. The Bose SoundLink Mini is about half the size of a brick, and surprisingly weighty. Its brushed aluminium finish looks brilliant and even feels great when you run your fingers across it. At the top of the speaker is a bank of controls: power, mute, volume, Bluetooth pairing mode and an auxiliary input switch. The 3.5mm stereo input is on the right, just above a power connector. At the bottom is a USB port, but this is just for firmware updates.

As well as a charging port, the SoundLink Mini has a charging cradle. Drop the speaker into place, and it will be charged through the contacts on its base. This means you can just pick the speaker up and take it around the house without having to worry about unplugging anything. However, we were surprised to find that this relatively expensive speaker supports neither NFC pairing nor the high-quality aptX Bluetooth audio codec.

Speaker configuration is similar to most compact stereo Bluetooth speakers, with two speaker drivers and a passive bass radiator that helps to round out the sound's low end. The SoundLink Mini has the most powerful bass we've heard from a portable speaker.

Its lower mid-range sounds smooth and well rounded, too, but although its audio characteristics lend themselves to hip hop, dance and some metal, the speaker is not the all-rounder we hoped for. High-frequency sounds, particularly the upper registers of strings, brass and woodwind in chamber and orchestral music, sound a little harsh and are uncomfortable to listen to for an extended period. The bass also sounded artificially loud in these test tracks and is the first thing to distort when you push the volume up past the 80 per cent mark. Despite these complaints, the SoundLink Mini is perfectly fine for most forms of music, goes up to satisfyingly loud volumes and really lends itself to some musical genres in particular.



However, performance in our battery life test was among the worst we've seen. Bose quotes a seven-hour battery life, but at the same volume levels we use to test other portable Bluetooth speakers, the SoundLink Mini lasted just five hours and 20 minutes.

It produces a rich, room-filling sound, but that kind of battery life is only suitable for a speaker you want to move around the house, rather than take out and about. Between this and the absence of convenient features such as NFC, the SoundLink Mini seems distinctly overpriced, despite its beautiful styling.

SPECIFICATIONS

SPEAKER CONFIGURATION 2.0

POWER RATING 40W RMS

CONNECTIONS 3.5mm stereo, Bluetooth (SBC) inputs

WARRANTY One-year RTB

DIMENSIONS 51x180x580mm

WEIGHT 670g

PART CODE 359037-1300

DETAILS www.bose.co.uk

CAMBRIDGE AUDIO Minx Go



£100 inc VAT • From www.richersounds.com

VERDICT

Good sound quality, a big battery and a very reasonable price make this the portable stereo speaker to buy

CAMBRIDGE AUDIO HAS a reputation for producing good-quality audio kit that costs less than similar gear from its rivals. Indeed, the Minx Go portable Bluetooth speaker is cheap for its size and specification. Chunkier than most portable speakers, it's designed to be used around the house, but is still small enough to slide into a backpack or bag.

The speaker has just three buttons: up and down volume and a power button. To start Bluetooth pairing, you double-press the Minx Go's power button. There's a 3.5mm stereo input on the back of the speaker, just above the power connector and below a USB port. The USB port is for charging a mobile device rather than playing back audio.

The Minx Go only supports the SBC audio codec, rather than the less lossy aptX standard, but we didn't perceive differences in audio quality whether we played music via Bluetooth or the 3.5mm input.

The speaker's bass port gives electronic tracks and synth-heavy pop substantial

presence, and we were impressed with the wide, spacious sound emanating from the compact speaker. Rock tracks filled the room with pulsing bass and balanced mid-range, providing clean vocals with a very natural tone and timbre. Even busy tracks with harsh vocals sounded good, but we couldn't discern some details, such as the reverberating slap of drum skins. The only flaw we noticed was a slightly harsh resonant edge affecting the upper mid-range, which produced slight distortion that was audible when listening closely to some acoustic tracks.

Despite this, the Minx Go is a very good speaker. It puts out a surprising amount of volume without distorting, although it does start to boom as you approach maximum volume. At mid to lower volumes it has decent bass levels for a 2.0 system and produces a spacious sound that's easy on the ears during even extended listening sessions. Better yet, the Minx Go proved to have an impressive battery life of 20 hours and 48 minutes in our



test, which we carried out at a volume that comfortably filled our testing room.

The Go has excellent battery life, is cheaper than many rivals and sounds as good if not better than almost all of them. When we first reviewed it, we gave the Minx Go a Budget Buy award, but its performance in tests against other speakers has earned it an upgrade. It may have few frills compared to more expensive rivals, but its sound quality is uncompromised despite its low price.

SPECIFICATIONS

SPEAKER CONFIGURATION 2.0

CONNECTIONS 3.5mm stereo, Bluetooth (SBC) inputs, USB charging dock

WARRANTY One-year RTB

DIMENSIONS 123x237x60mm

WEIGHT 1.1kg

PART CODE C10647

DETAILS www.cambridgeaudio.com

DIVOOM Bluetune-Solo



£33 inc VAT • From www.amazon.co.uk

VERDICT

It doesn't cost much, but you can get better sound quality for the same price elsewhere

MANY PORTABLE BLUETOOTH speakers under £100 sound little better than the tiny speaker built into your phone. The Divoom Bluetune-Solo, which comes with X-Bass branding stamped across its speaker grille, is an attempt to buck this trend.

It's barely larger than a tennis ball, but is still surprisingly hefty. The blue lights that shine out of its base may divide opinion, but the cylindrical design is otherwise easy on the eye. Once you flick the power switch, the speaker automatically enters pairing mode, letting you quickly connect whatever Bluetooth gadget your music is stored on.

The speaker points upwards rather than outwards, so you need to listen from above to get the best effect. Our test tracks bore this out, revealing a somewhat tinny sound that improves slightly if you're sitting right above the speaker's driver. Bass is marginally better than other entry-level speakers, but only just, and only when the speaker is at around half volume. Crank it up to three-

quarters or beyond and the entire sound quickly distorts.

If someone calls while you're listening to music, the Bluetune can also act as a speaker-phone. The Bluetooth pairing button on the top of the speaker will accept an incoming call. In a quiet room, we had no trouble making ourselves heard clearly from several feet away, and our caller's voice was also loud enough. The built-in battery charges over Micro USB and lasted for around five and a quarter hours in our continuous playback test.

The speaker doesn't support the high-quality aptX codec, but that wouldn't make a difference on a small speaker with this standard of audio quality, and while NFC for one-touch Bluetooth pairing would have been nice, it would also have added to the cost. The only extra you get here is a 3.5mm audio output which you can connect to any speaker with a suitable input, thus either using the Bluetune as a Bluetooth audio bridge or



daisy-chaining Bluetune speakers together to increase the volume. For just £33, the Bluetune-Solo

is certainly reasonably priced, and we like the fact that it's also available in black, white, blue, orange and red. Unfortunately, its lack of integrated volume controls and sound distortion if your source volume is at more than 50 per cent make it a mediocre buy compared to similarly priced speakers such as the NudeAudio Move M.

SPECIFICATIONS

SPEAKER CONFIGURATION Mono

POWER RATING 4W RMS

CONNECTIONS Integrated microphone, Bluetooth (SBC) input, 3.5mm output

WARRANTY One-year RTB

DIMENSIONS 69x61x61mm

WEIGHT 286g

PART CODE 90100052002

DETAILS www.divoom.com

JAWBONE Mini Jambox



£150 inc VAT • From www.selfridges.com

VERDICT

Incredibly stylish, but not the best sound quality you can get for the money

WHILE MANY PORTABLE speakers look a little cheap and tacky, Jawbone's blocky little speakers ooze style. The Mini Jambox feels well made. The silver metal finish and dimpled decoration of the version we reviewed is particularly attractive. Inside is a stereo pair of drivers and a passive bass radiator to help round out the bottom end of the sound.

On the top are a play/pause button that controls your Bluetooth audio source remotely, and the volume controls. On the right are a power switch, Bluetooth pairing buttons, Micro USB charging input and a 3.5mm input. There's a built-in microphone, too, so you can make hands-free calls. Its Simultaneous Multipoint connection feature means you can connect two devices to it: one for music streaming and the other for calls.

Configuration is via Jawbone's Updater program. This tool also lets you update the firmware and enable LiveAudio virtual surround sound, which is designed to make games and films more immersive. As far as

surround sound goes, it's not particularly impressive, but it's notable that such a tiny speaker manages to produce any impression of directionality at all.

When it comes to music, the Mini Jambox sounds surprisingly harsh, with an over-prominent treble and upper mid-range that made the speaker tiring to listen to. This was particularly noticeable on orchestral music and tracks dominated by a piano or church organ, but other test tracks were also affected, with high notes that sounded too pronounced in the mix. Acoustic percussion didn't fare too well either, with drums sounding flat and distant.

This flatness was shared by rock and metal with a strong bass or midrange emphasis, although we were pleased that overdriven guitars didn't suffer the same harshness as our orchestral recordings. The speaker does best with pop and dance, with its bright treble complementing the aggressive synths of our hard dance test tracks.



Lasting for a little over 11 and a half hours in our tests is good for a speaker this size. It'll certainly keep you entertained for a day, if not a weekend.

The Jambox Mini looks fantastic, is small enough to fit in a coat pocket and has some interesting features, but its sound quality doesn't match its rivals'. It's also expensive, so you're definitely paying a premium for the Jambox's design. If you need a highly portable stereo speaker, the Scosche BoomBottle is nowhere near as pretty, but it's tough, sounds good and has a battery that lasts for ages.

SPECIFICATIONS

SPEAKER CONFIGURATION 2.0

CONNECTIONS 3.5mm stereo, Bluetooth (SBC) inputs, integrated microphone

WARRANTY One-year RTB

DIMENSIONS 40x151x57mm

WEIGHT 255g

PART CODE J2013-01-A

DETAILS www.jawbone.com

NUDEAUDIO Move M

**COMPUTER
SHOPPER**
BUDGET BUY



£39 inc VAT • From www.gear4music.com

VERDICT

This excellent splash-proof speaker has sound quality that belies its small size

THE NUDEAUDIO MOVE M looks like a soap-on-a-rope thanks to the piece of string tied through a couple of holes at one corner. It's about the diameter of a CD, is around an inch and a half thick, and its rounded shape rests comfortably in your hand.

The bottom half is covered with a flexible rubbery silicone sleeve. Unlike most splash-proof speakers, the Move M has an easily removable sheath. However, the speaker is useless without it, as the buttons are on the sheath itself and slip into the main body of the speaker when the two are joined. We'd have felt happier with a more secure join between speaker and cover, but didn't experience any problems with the sheath slipping off or the buttons failing to work.

On one side are four buttons for power, volume up and down and a Bluetooth button that can also be used to answer calls, putting the speaker into hands-free talk mode. Next to this is a tiny hole marking the presence of the built-in microphone. Turn the speaker

round and you'll find a Micro USB port and a 3.5mm auxiliary input for non-Bluetooth devices. The Move M supports only standard SBC Bluetooth audio, but a speaker of this size isn't high enough quality for you to notice compression artefacts from a lossy codec.

The Move M is larger than most budget portable Bluetooth speakers, and the manufacturer claims this makes for a larger acoustic chamber, giving sound greater space in which to resonate, thus producing a more emphatic bass than you'd expect from a portable mono speaker. To our surprise, this claim proved to be entirely correct. Even our heaviest hard bass and most bass-heavy hip-hop tracks kept some of their punch, while busy, range-spanning metal and orchestral tracks sounded rich and balanced.

Of all the ultra-compact mono speakers we've tested, the Move M has the best battery life, clocking up a massive 20 hours and 48 minutes in our tests. Things distort a little if you push the Move M up to maximum



volume and it's not massively loud, but it had more than enough volume to keep us entertained outdoors and around the house.

Among the compact mono portable Bluetooth speakers we've reviewed, the Move M provides the best sound across everything from folk to chart pop music. It's a little larger and slightly more expensive than most of its sub-£50 rivals, but its smooth sound is hard to beat when it comes to sheer quality. It wins a well-deserved Budget Buy award.

SPECIFICATIONS

SPEAKER CONFIGURATION	Mono
CONNECTIONS	3.5mm stereo, Bluetooth (SBC) inputs, integrated microphone
WARRANTY	One-year RTB
DIMENSIONS	100x100x35mm
WEIGHT	281g
PART CODE	PS0002MTG
DETAILS	http://nudeaudio.com

QDOS Q-BOPZ



£30 inc VAT • From www.qdossound.com

VERDICT

This tiny and colourful speaker has plenty of character and performs well for its size

THE QDOS Q-BOPZ is the smallest Bluetooth speaker we've seen, resembling nothing so much as a brightly coloured doorknob. It comes in a variety of shades, including green, blue, red, orange, white and black.

At the base of the speaker is a suction cup. This lets you stick the speaker to the back of your smartphone to stand the phone upright on flat surfaces, to help when watching a video. You can also stick the speaker to other smooth surfaces such as a car dashboard.

A rubberised finish helps to make the speaker splash-proof, which is great if you want to use it in the bathroom, in the garden or on a picnic. One side of the speaker has three control buttons for volume and Bluetooth pairing. Nearby is a tiny hole for the speaker's built-in microphone, allowing you to use it to make hands-free phone calls.

On the other side of the Q-BOPZ is a Micro USB port and a power switch, protected from the elements by a rubber flap. An LED at the bottom of the speaker shines

through the suction cup to show you when the speaker is in pairing mode or charging.

Unsurprisingly for a £30 speaker that fits in the palm of your hand, the Q-BOPZ doesn't have a lot of extra features. If you're after stereo sound, bass ports, NFC, aptX and other bells and whistles, you should look elsewhere. If you're after something very small, portable and convenient, however, it's ideal.

The rechargeable battery lasted 12 hours and eight minutes in our test. If you set both the speaker's volume and your source's volume to maximum, then you'll burn through the battery a lot faster, but for indoor listening at comfortable levels you'll be able to squeeze plenty of listening time out of the Q-BOPZ.

The speaker's sound quality is impressive considering its small size and single driver. There's not much bass to speak of, and the slightly brittle treble becomes harsh once you push it past three-quarters of its maximum volume, but the sound is generally clear and even. It does best with simple, punchy genres



such as speed punk and house music. It also copes well with soft classical, folk and ambient tracks, while its failings become more apparent on bombastic orchestral pieces, bassy dubstep and fast, complex metal tracks.

Its small size, low price and good battery life make the Q-BOPZ a worthwhile buy if you're after a simple and highly portable speaker. However, unless you really need something this tiny, a little more money will buy you the NudeAudio Move M, which sounds better and has a longer battery life.

SPECIFICATIONS

SPEAKER CONFIGURATION	Mono
POWER RATING	3W RMS
CONNECTIONS	Bluetooth (SBC) inputs, integrated microphone
WARRANTY	One-year RTB
DIMENSIONS	62x59x59mm
WEIGHT	82g
PART CODE	QD-015-G
DETAILS	https://qdossound.com

SCOSCHE BoomBottle



£96 inc VAT • From www.lambda-tek.com

VERDICT

This tough, long-lasting speaker is the perfect companion if you can't get enough of the great outdoors

THE SCOSCHE BOOMBOTTLE is built to slot into a bicycle water bottle holder, and is rugged, water resistant and available in a wide range of colours, including a variety of bright tones that will be easy to spot if it accidentally rattles out into the mud. Fortunately, that's not a very likely scenario, as the BoomBottle fitted very securely into our bottle holder and comes with a karabiner to secure it in place.

Silicone covers protect the controls, while a flap at the back protects the USB charging port and 3.5mm stereo input. The speaker drivers, protected by dust-proof covers, are at either end of the tubular BoomBottle. You can position the speaker either horizontally or vertically, but it's more stable upright.

Like most portable Bluetooth speakers, the BoomBottle uses the standard SBC audio codec rather than aptX. However, given that this is a small stereo speaker designed to be heard while rattling down mountain bike trails, SBC's sound quality is more than good enough for its intended purpose.

The BoomBottle is at its best with music that has a fairly compressed dynamic range, which is most modern pop and dance. It has a strong, if not particularly detailed, mid-range, and there's even a bit of bass, thanks to a passive radiator. Complex metal and orchestral tracks lost some detail, particularly on high frequencies, but vocal harmonies were warm and pleasing to listen to. The only distortion we found, even at high volumes, affected occasional high notes in some overdriven guitar solos, but this cropped up rarely.

Using the BoomBottle is a much safer alternative to the reckless practice of cycling with headphones on. It's loud enough to be audible without drowning out the sound of your surroundings, although on a fast downhill section you'll find that the wind drowns out the speaker. The BoomBottle is worth having even if you never go near a bike. Its sturdy, shock-absorbing design makes it well suited to all kinds of high-impact activity,



so it's a good option for campers and festival-goers, too, while its practical shape will fit into the water bottle holder found on many backpacks.

Battery life is astonishing. It clocked up an unprecedented 33 hours and 24 minutes in our audio playback test. In combination with its tough but lightweight design, that makes the BoomBottle our first choice for an outdoor speaker. If you do most of your listening around the home, Cambridge Audio's Minx Go is less resilient but sounds better.

SPECIFICATIONS

SPEAKER CONFIGURATION 2.0

POWER RATING 6W RMS

CONNECTIONS 3.5mm stereo, Bluetooth (SBC) inputs, integrated microphone

WARRANTY One-year RTB

DIMENSIONS 245x114x121mm

WEIGHT 821g

PART CODE BTBTLG

DETAILS www.scosche.com

SIMPLE AUDIO Go



£84 inc VAT • From www.morecomputers.com

VERDICT

If you need plenty of volume in a tiny package, this speaker's for you, but its raw sound quality is mediocre

MANY PORTABLE SPEAKERS are designed to stand out, with bright colours and weird designs, but the Simple Audio Go looks like a compact centre speaker from a home cinema system. The twin-speaker unit is about the size of a pack of Hovis biscuits. It feels quite sturdy, although it's not as rugged as some alternatives such as the Scosche BoomBottle.

At the back you'll find a 3.5mm stereo port to connect non-Bluetooth audio sources, a Micro USB charging port and an on/off slide switch. This is handy if you're planning to stick the Go into a bag and cart it around with you, as it's less likely to be accidentally turned on than a push-button power control. At the top are volume controls and a Bluetooth pairing button. The Go's connection status is indicated by a light behind the speaker grille.

Many portable Bluetooth speakers are designed to emit sound across as broad an area as possible, often using an upward-facing speaker driver to help. By contrast, the Go is directional, with forward-facing speaker

drivers. It's obviously designed to sit on a desk, and a pair of rubbery feet help to keep it from slipping or being nudged out of position.

When you power the speaker on, it chimes to tell you it's awake. It's not the best first impression, as the pre-recorded chime is hissy. That seems to be a characteristic of the recorded alert sounds, but listening closely, we could hear a little hiss in the background when we listened to acoustic tracks. It's usually drowned out by the music, though.

The Go is remarkably loud for its size. Even from across a large room, its maximum volume setting was loud enough to require us to raise our voices to speak over it. To get the best out of the speaker, you do need to play music quite loud; mid-range and bass tones sound subdued once you go below half volume. Overall, the speaker's sound is a little brittle, with a slightly harsh edge to high frequencies and not a great deal of detail on bass sounds. Our trance and speed punk test tracks sounded good, but anything with more



detail or subtlety suffers.

The Go uses the standard SBC audio codec, which is entirely adequate for a speaker of this size. The Go is more expensive than most miniature Bluetooth speakers and, while it puts out plenty of volume, it doesn't sound much better. NudeAudio's Move M isn't quite as loud but has a smoother sound and costs half the price, while Cambridge Audio's Minx Go is less portable but more capable.

SPECIFICATIONS

SPEAKER CONFIGURATION 2.0

CONNECTIONS 3.5mm stereo, Bluetooth (SBC) inputs, integrated microphone

WARRANTY One-year RTB

DIMENSIONS 60x125x65mm

WEIGHT 282g

PART CODE SP-90B0001-EU

DETAILS www.simpleaudio.com

SONY SRS-BTS50



£125 inc VAT • From www.stoneaudio.co.uk

VERDICT

This compact speaker is feature-packed, easy to use and pleasingly portable

THE SRS-BTS50 IS Sony's smallest portable Bluetooth speaker to include support for the high-quality aptX audio codec. AptX is only available on some phones (see <http://tinyurl.com/aptxdevices> for a list) but can provide less lossy audio compression than SBC.

The softly angular shape and fabric cover make the SRS-BTS50 look like an impractically small purse. It's splash-proof, sturdy and has a metal loop so you can clip it to a backpack or belt. No karabiner or strap is included, though.

In its upright position, the sound from the pair of drivers is directed upwards and outwards to fill the room. You can also put the SRS-BTS50 on its side, but we preferred the sound when it was upright. A built-in microphone means you can use the speaker for hands-free calls, and an answer button makes it easy to pick up your call.

Other buttons control the volume, enable manual Bluetooth pairing and let you check battery life. There's also a sliding on/off switch. An NFC pairing point lets you pair any

compatible Android device at a touch, as long as you've installed Sony's NFC Easy Connect app. This is highly convenient, making it easy to share the speaker between multiple users and devices. We had no problems pairing the speaker with our test phones, but none of our test laptops' older Bluetooth chipsets and drivers was able to pair with the speaker.

A silicone cover protects two 3.5mm stereo ports, one for auxiliary audio sources and the other for a pair of headphones or an external speaker. The speaker's mains power connection is also under the flap; there's no USB charging option. The SRS-BTS50 lasted over 15 hours in our battery tests, which is impressive for something so small.

The speaker tries to sound bigger than it is and generally succeeds, although many tracks sounded echoing, with a booming effect that impacted both bass and mid-range. There's a fair bit of bass presence, but this doesn't overwhelm the midrange or treble. In fact, more subtle treble details could be heard on



this speaker than on most comparably sized models. It suited goth, folk bands and modern dance pop, as well as simple combinations of piano and vocalist. However, the slight echo effect was noticeable on hip-hop and metal.

The SRS-BTS50 has a great range of features for the price. It's not as large or loud as Cambridge Audio's Minx Go, but it's more portable and supports NFC and aptX. You're paying for that convenience, rather than sound quality. Also, bear in mind you may not be able to get your laptop to connect to it.

SPECIFICATIONS

SPEAKER CONFIGURATION 2.0

POWER RATING 5W RMS

CONNECTIONS 3.5mm stereo, Bluetooth (SBC, aptX) inputs, integrated microphone

WARRANTY One-year RTB

DIMENSIONS 70x175x65mm

WEIGHT 400g

PART CODE SRSBT50R.CEK

DETAILS www.sony.co.uk

ULTIMATE EARS UE Boom



£170 inc VAT • From www.pcworld.co.uk

VERDICT

A robust portable speaker that may not sound fantastic, but it won't fizz out in the rain

THE ULTIMATE EARS EU Boom, made by the prestigious audio company bought out by Logitech in 2008, is a consumer-friendly portable speaker that's made to go with you wherever you want to take your tunes.

Built from shock-absorbent plastic and water-resistant armour, the cylindrical Boom is made to take some punishment. It's able to withstand a drop from several feet on to hard concrete, keep playing in a downpour and even shrug off mud or spilt drinks thanks to a stain-resistant treatment, so it could be the ideal speaker for a festival. The built-in karabiner clip lets you hook the Boom to your rucksack, or it will just as easily fit in a car cup holder or bicycle bottle holder.

Inside are two 2in drivers and two passive radiators that point outwards at different directions to surround you with sound. The speaker works well outside and when there are no walls for audio to bounce off, especially compared to more traditional directional speakers. The Boom produces impressively

loud audio, which has a fairly clear mid-range but a slight lack of bass. We've seen similarly sized speakers with more rumble than this.

The mesh material covering the speaker drivers is acoustically transparent, so it doesn't muffle the sound, but we would have liked a crisper high end; some of the detail gets lost during hectic electronic and rock songs. The speaker uses the SBC Bluetooth codec, which is lossier than the higher-quality aptX codec, although the difference is rarely perceptible in small portable speakers. There's no analogue input for non-Bluetooth sources.

Support for NFC makes it much easier to pair your smartphone to the speaker: you just have to touch the two together. If you or a friend has an additional Boom, you can pair them up using the iOS or Android app and run them in stereo mode. The app detects the colour of each Boom so you can arrange them correctly, and gives you control over volume.

UE says the Boom should last up to 15 hours on a single charge. In our playback



tests, we saw a huge 26 hours and 18 minutes; almost enough to get you through a weekend.

The UE Boom isn't cheap, but it does have an extensive list of features. NFC is quickly becoming a must-have for easy pairing, and the speaker's incredibly tough construction makes it ideal for taking outside the house. The Boom's sound quality isn't outstanding, but the 360° design means everyone can hear your music regardless of where they stand. However, if you can live without NFC, Scosche's BoomBottle is similarly tough, costs less and has even better battery life.

SPECIFICATIONS

SPEAKER CONFIGURATION 2.0

POWER RATING 18W RMS

CONNECTIONS 3.5mm stereo, Bluetooth (SBC) inputs

WARRANTY Two-year RTB

DIMENSIONS 180x65x65mm

WEIGHT 538g

PART CODE 980-000678

DETAILS www.ultimetears.com

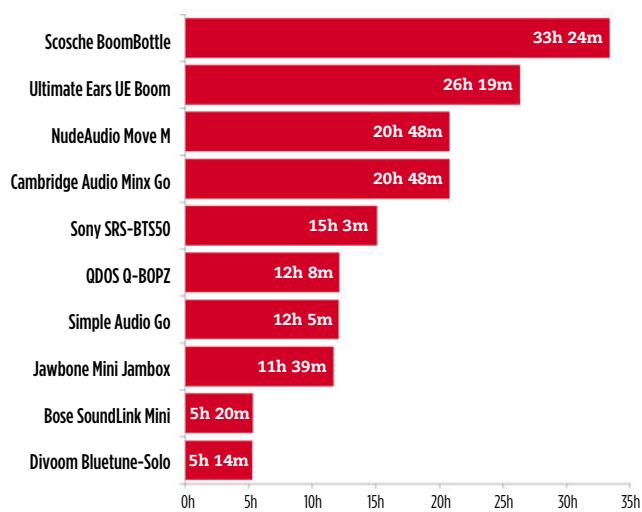
PORTABLE BLUETOOTH SPEAKERS

		BEST BUY		BUDGET BUY						
Manufacturer	BOSE	CAMBRIDGE AUDIO	DIVOOM	JAWBONE	NUDEAUDIO	QDOS	SCOSCHE	SIMPLE AUDIO	SONY	ULTIMATE EARS
Model	SoundLink Mini	Minx Go	Bluetune-Solo	Mini Jambox	Move M	Q-BOPZ	BoomBottle	Go	SRS-BTS50	UE Boom
Rating	★★★	★★★★★	★★★	★★★	★★★★★	★★★★★	★★★★★	★★★	★★★★★	★★★
Speaker configuration	2	2	Mono	2	Mono	Mono	2	2	2	2
POWER										
RMS power output	40W	Not disclosed	4W	Not disclosed	Not disclosed	3W	6W	Not disclosed	5W	18W
FEATURES										
Analogue inputs	3.5mm stereo	3.5mm stereo (via proprietary 3.5mm-to-USB cable)	3.5mm stereo, integrated microphone	3.5mm stereo, integrated microphone	3.5mm stereo, integrated microphone	Integrated microphone	3.5mm stereo, integrated microphone	3.5mm stereo, integrated microphone	3.5mm stereo	3.5mm stereo, integrated microphone
Digital inputs	Bluetooth (SBC)	Bluetooth (SBC)	Bluetooth (SBC)	Bluetooth (SBC)	Bluetooth (SBC)	Bluetooth (SBC)	Bluetooth (SBC)	Bluetooth (SBC)	Bluetooth (SBC, aptX)	Bluetooth (SBC)
Dock	None	USB charging	None	None	None	None	None	None	None	None
Headphone output	None	None	3.5mm	None	None	None	None	None	3.5mm	None
Controls location	Main unit	Main unit	Main unit	Main unit	Main unit	Main unit	Main unit	Main unit	Main unit	Main unit, app
NFC	No	No	No	No	No	No	No	No	Yes	Yes
Size	51x180x580mm	123x237x60mm	69x61x61mm	40x151x57mm	100x100x35mm	62x59x59mm	245x114x121mm	60x125x65mm	70x175x65mm	180x65x65mm
Weight	670g	1.1kg	286g	255g	281g	82g	821g	282g	400g	538g
Battery life	5h 20m	20h 48m	5h 14m	11h 39m	20h 48m	12h 8m	33h 24m	12h 5m	15h 3m	26h 19m
BUYING INFORMATION										
Parts and labour warranty	One-year RTB	One-year RTB	One-year RTB	One-year RTB	One-year RTB	One-year RTB	One-year RTB	One-year RTB	One-year RTB	Two-year RTB
Price inc VAT	£170	£100	£33	£150	£39	£30	£96	£84	£125	£170
Supplier	www.currys.co.uk	www.richersounds.com	www.amazon.co.uk	www.selfridges.com	www.gear4music.com	https://qdossound.com	www.lambdatek.com	www.morecomputers.com	www.stoneaudio.co.uk	www.pcworld.co.uk
Details	www.bose.co.uk	www.cambridgeaudio.com	www.divoom.com	http://jawbone.com	http://nudeaudio.com	https://qdossound.com	www.scosche.com	www.simpleaudio.com	www.sony.co.uk	www.ultimateears.com
Part code	359037-1300	C10647	90100052002	J2013-01-A	PS0002MTG	QD-015-G	BTBTLG	SP-90B001-EU	SRSBTS50R-CEK	980-000678

Prices correct at time of going to press

BATTERY LIFE

Battery life



This graph shows how long each speaker lasted from a full charge when playing audio loud enough to fill a room at moderate volume.

VERDICT

Recent developments and improvements to the Bluetooth standard means there's nothing to touch it for wireless audio convenience, and all the speakers we've tested this month make a great job of freeing your tunes from your smartphone.

A few stand out, however. If you want a home speaker that sounds great and doesn't cost a fortune, look no further than our Best Buy winner, the Cambridge Audio Minx Go.

Those in search of great sound on the move will love the low-cost and compact NudeAudio Move M, our Budget Buy winner. Meanwhile, if you want something ultra-durable to take with you while exploring the great outdoors, the durable Scosche BoomBottle's huge battery life won't let you down. □

CAMBRIDGE AUDIO

Minx Go



NUDEAUDIO

Move M





For car buying advice, would you go to petrolhead Pete?

No, for real-life, no-nonsense, buying advice go to Carbbuyer

We won't just tell you what it is like to drive a car, we'll tell you what it is like to own. We'll reveal the running costs, explain what might go wrong and you can find out what existing owners think. So for information that'll help you buy your perfect new car, there's only one place to go.

carbuyer
.co.uk

Trusted reviews Owner opinion Expert advice



Don't relegate your music, video and photos to the spare room where the PC is. With media streaming you can enjoy your digital media anywhere in the house, as **David Ludlow** explains



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The digital age has brought unprecedented levels of convenience and control. We can now shoot thousands of photos and edit them as we please, and create a vast library of music and videos without filling an entire room with CDs and DVDs. The way we use our media has also changed, however, and not always for the better.

In the past we had photo albums on our shelves, and CDs and LPs made it easy to browse and choose what we wanted. Today, everything's locked up on hard disks or NAS devices, making it harder to browse or even use without a PC. With network media streaming you can free your media from the confines of the hard disk and the computer screen. Using this technology you can view your photos on your TV, listen to music in any room in the house and put your home videos on your projector. In short, you can watch what you want where you want.

In this feature we'll tell you everything you need to know to get started, from choosing the right kit to setting up a media server and controlling everything from your phone or tablet. We'll even show you how to convert your videos to an appropriate format. Before you start, though, have a closer look at your TV, Blu-ray player or games console, as many have media streaming built in, while most NAS devices can act as media servers. You may already have all the kit you need to get started. Whatever your needs, give it a try and you'll never look back.

Media streaming explained

MEDIA STREAMING TECHNOLOGY allows you to send photos, videos and music over your network so you can play them on other computers and devices such as your TV. In the next few pages we'll tell you everything you need to know about playing, managing and sharing your media, but first we'll take you through all the technologies and information you need to know about.

STANDARDS

There are many different ways to share media over your network, depending on the kit you buy. For example, the Sonos multi-room audio system uses its own proprietary network and control system. For most people, however, home media sharing is achieved using various devices that conform to guidelines set down by the Digital Living Network Alliance (DLNA).

DLNA devices use a protocol called Universal Plug and Play (UPnP). The technology behind these acronyms allows network devices to discover media servers and play media files from them. DLNA is built into a surprising number of devices, from brand new TVs to the Sony PlayStation 3.

Roughly speaking, DLNA devices can be split into three categories, depending on their abilities. DLNA servers can share the media stored on them with other devices, while DLNA players can play content from servers, and DLNA renderers are able to play content beamed to them directly from other devices, such as a smartphone.

Most DLNA devices offer a combination of the above capabilities. So, for example, a

FORMATS

Whichever type of player you have (whether it's a renderer or just a player), DLNA devices can only play the file types they're designed to support. This means that if you buy a wireless music streamer, for example, it will

“ Any decent home network should have a media server for sharing files. A Windows PC will do the job, but a better choice is to use a NAS device ”

DLNA renderer will also be a basic player, while many servers can also play video files. Unfortunately, it's not always easy to find out what a specific device supports. Many networked devices, such as media players, TVs and Blu-ray players, may be labelled as supporting DLNA but most of them won't work as renderers.

only play audio files, and only files in the specific formats it supports. This isn't usually a problem with audio, as audio streamers tend to support the most popular audio formats, such as MP3 and Apple's AAC. Photos are similarly easy to deal with, as most players support all the common image file types, including JPEG, PNG and TIFF.



↓ Sonos gives you multi-room audio, streaming music over your network, although it uses a proprietary networking technology



As well as being a games console, the PS3 can stream music, videos and photos from DLNA servers

Video is more of a problem, as it comes in a wide range of formats, such as MPEG2 and H.264, not to mention DivX and MKV. To make matters even more confusing, there are different 'container' files, so a video file with a .AVI extension might actually be an MPEG2 file or an H.264 file.

Most media players will happily play most video files, but you may find some formats that won't play. This is particularly true if you want to use Apple's video streaming technology, which has extremely limited support. We'll look at streaming on Apple

devices in more detail on page 123 and show you how to convert your video files into supported formats on page 121.

SERVERS

Any decent home network should have a media server for sharing files. A Windows PC will do the job without additional software, but you need to leave it switched on to access its files. A better choice is to go for a NAS device, which uses far less power.

In the next few pages we'll show you how to set up a server on a PC, Mac or NAS device.



Organise	Stream	Create playlist									
David Ludlow											
Playlists											
Music	3 Colours Red	Revolt	1	This Is My Time	3:46	3 Colours Red	Pete Vuckovic	8.9 MB			
			2	Pirouette	4:13	3 Colours Red	Chris McCormack; Pete ...	9.9 MB			
			3	Beautiful Day	4:18	3 Colours Red	Pete Vuckovic	10 MB			
			4	Song On The Radio	4:07	3 Colours Red	Chris McCormack; Pete ...	9.6 MB			
			5	Calling To The Outside	3:37	3 Colours Red	Chris McCormack; Pete ...	8.5 MB			
			6	Intermission	4:21	3 Colours Red	Pete Vuckovic	10.1 MB			
			7	Paralyse	3:19	3 Colours Red	Chris McCormack; Pete ...	7.8 MB			
			8	Cancel The Exhibition	3:43	3 Colours Red	Chris McCormack; Pete ...	8.7 MB			
			9	Paranoid People	3:09	3 Colours Red	Pete Vuckovic	7.4 MB			
			10	Back To The City	4:01	3 Colours Red	Chris McCormack; Pete ...	9.4 MB			
			11	Be Myself	2:50	3 Colours Red	Chris McCormack; Pete ...	6.7 MB			
			12	Age Of Madness	2:21	3 Colours Red	Pete Vuckovic	5.6 MB			
Other Libraries											
Ready/DLNA: WNDR-											
192.168.0.10 - Sonos											
192.168.0.95 - Sonos											
192.168.0.21 - Sonos											
192.168.0.15 - Sonos											
homeshare											
192.168.0.33 - Sonos											
Aerosmith	Hi-Fi Serious	A Rock	1	Nothing	3:43	A		8.5 MB			
			2	Something's Going On	2:58	A		6.8 MB			
			3	6 O'Clock On A Tube St...	3:14	A		7.4 MB			
			4	Going Down	4:09	A		9.5 MB			
			5	Took It Away	3:29	A		8 MB			
			6	Starbucks	3:18	A		7.6 MB			
			7	The Springs	4:28	A		10.2 MB			
			8	Shut Yer Face	3:43	A		8.5 MB			
			9	Pacific Ocean Blue	3:27	A		7.9 MB			
			10	The Distance	3:37	A		8.3 MB			
			11	W.D.V.C.A.J.	3:27	A		7.9 MB			
			12	Hi-Fi Serious	5:57	A		13.6 MB			
Aerosmith	Big Ones	Big Ones	1	Walk On Water	4:56	Aerosmith	Jack Blades; Joe Perry; S...	11.3 MB			
			2	Going Down/ Love In A...	5:21	Aerosmith	Joe Perry; Steven Tyler	12.3 MB			
			3	Rag Doll	4:24	Aerosmith	Holly Knight; Jim Vallan...	10.1 MB			
			4	What It Takes	5:10	Aerosmith	Desmond Child; Joe Per...	11.9 MB			
			5	Dude (Looks Like A Lady)	4:24	Aerosmith	Desmond Child; Joe Per...	10.1 MB			
			6	Janie's Got A Gun	5:30	Aerosmith	Steven Tyler; Tom Hami...	12.6 MB			

Windows Media Player is a DLNA server, renderer and player

Network components

YOUR HOME NETWORK will consist of a wide range of devices. The illustration on the right shows an example configuration, but you can add and remove components as you see fit. Here we'll consider the key devices and concepts you need to understand when setting up a home network.

NAS DEVICE

As we explained in the previous section, the beauty of NAS devices is that you can leave them switched on as they draw far less power than a PC, so all the files on their disks can be accessed from any computer on the network at any time. Most NAS devices, such as the Budget Buy winning Synology DiskStation DS213j, which is £160 from www.dabs.com, have media streamer servers built in. Remote access is usually possible too, so you can access your files from anywhere with an internet connection.

The cheapest NAS devices have only a single disk, but more expensive models can house two or more, so you can keep duplicates of your data for extra protection. This blend of features makes a NAS device incredibly useful.

MEDIA STREAMER

If you want to view your digital photos, listen to your music or watch your video files from anywhere in your home, you'll need a media streamer. Many new TVs will have one built in, but you can buy separate products that connect to any TV.

For music, a dedicated player makes sense. A wireless device is a good choice, as you can carry your player anywhere within range of your network, such as in the garden, and still listen to music from your digital library.

PRINTERS

There's no need to buy more than one printer when you can share one over your network. Some printers connect to your network directly (either wirelessly or through an Ethernet cable), but even USB models can be shared once they're connected to a NAS device.

FILE SHARING

A NAS device lets you share your files over a network, but you can also share them directly from your computer. You can do this with Windows, Mac OS X and Linux machines.

This illustration shows how a network can be used to share files and printers, as well as for streaming media all over your home

Bedroom

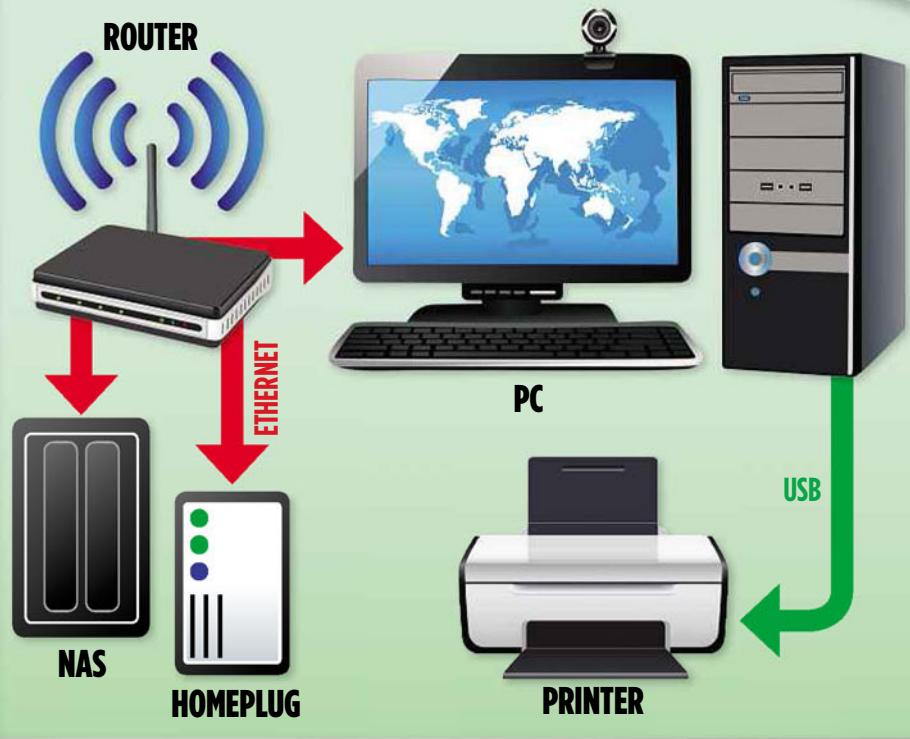


Kitchen



WIRELESS MUSIC STREAMER

Office



Lounge



Choosing a Media streamer

MEDIA STREAMING IS now a common feature of mid-range TVs and Blu-ray players. Integrated streaming is fine if you want to look at a few JPEG photos or listen to the odd MP3 stored on your PC, but it can't compare with the flexibility and format support of a dedicated streaming multimedia receiver.

Until recently, format support was the key concern when buying a streamer: would your hardware be able to handle all the files you wanted to play on it? Now, as almost every streamer can handle a massive range of video types at resolutions of up to 1080p, the main question is one of usability and extra features.

MAKING A CONNECTION

Most modern multimedia streamers have at least an HDMI port to plug in to your TV and a 10/100Mbit/s wired Ethernet port to connect to your network. Most also have composite and component video outputs, which are handy if you have an older TV or you run out of HDMI inputs, as well as stereo phono outputs for analogue audio or digital S/PDIF audio outputs.

Most streamers have at least one USB port, and a few also have eSATA ports and memory card readers. Ports like these allow you to connect external hard disks, flash drives and memory cards, and play media stored on them directly. This can be particularly handy if a friend comes round with their holiday photos or a video clip, as you'll be able to view them immediately without having to copy them to your PC first.

Wired Ethernet is the networking standard of choice for media streaming, as it ensures a fast and consistent connection even in places where wireless networking may suffer from interference or a weak signal. If you'd rather not run a network cable into your sitting room and don't want to buy HomePlug adaptors, wireless is still an option. However, while most streamers have built-in wireless adaptors, some require an optional dongle. Signal strength is a factor when it comes to wireless streaming; a poor Wi-Fi signal will create problems when viewing HD video, which needs more bandwidth to play smoothly.



▲ Apple TV will play all Apple's files and movie downloads, but otherwise it's a bit limited

FORMAT WARS

Video and audio format support among media streamers is now uniformly excellent. Almost every player can handle all the usual codec and wrapper formats, such as MPEG4, AVI and WMV, and even more unusual formats such as Matroska (MKV) and DVD ISO files. However, it's still important to choose a device that can handle your favourite file types: for example, the Apple TV is the only streamer that can play Apple's Protected AAC files and Audible's proprietary audiobook format, but it plays only a limited range of other audio and video file types (MPEG4 and H.264 video, as well as MP3 and AAC audio).

HD video is usually encoded in MPEG4, H.264, MKV and WMV-HD formats, so make sure your player supports these. For the best quality, it should also support 1080p video.

STREAMING SERVICES

If you've signed up for an online streaming service or you want to watch on-demand TV, ensure your media receiver supports the services you use. If you can't find one that does, make sure your Blu-ray player or TV offers support instead.

PORT OUT

The quality of video you can watch is limited by the type of connection you use. For Full HD (1080p) video, you'll need both a media streamer and a TV with HDMI ports. If you have an older TV, you may be limited to lower-quality video. A component connection can output HD footage up to 1080i, but coaxial outputs are limited to poor-quality standard-definition video.

In most cases, HDMI is the best choice. HDMI can also output audio, so you can connect your media streamer to an A/V receiver, although not all media streamers can deliver the full range of surround-sound formats you'd find on DVDs and Blu-ray discs. Check the formats your media streamer supports before you buy. If your A/V receiver doesn't accept HDMI inputs, or you simply want to hook up a pair of speakers, look for a receiver with an S/PDIF output (coaxial or optical) or stereo phono outputs.

SERVING TIME

Although several multimedia streamers have, or can be fitted with, hard disks that allow them to store and share files independently, their defining feature is the ability to play files stored on a server. Many NAS devices can act as media servers – usually as iTunes and Universal Plug and Play (UPnP) servers – but it's easy to use your PC or laptop to serve music and video across a network.

Some receivers come with server software, but most work with UPnP or Server Message Block (SMB) network file sharing. You may already have UPnP media server software on your PC in the form of Windows Media Player 12 or via your NAS (see page 116).



▲ Make sure your media streamer has all the outputs you need

Choosing an Audio streamer

WHETHER YOU HAVE a huge library of MP3s, a few well-worn albums or you like to stream music from the internet, the computer is probably the centre of your musical world, even if it isn't the ideal place for enjoying it.

With an audio streamer you can send your music from your PC to your living room or anywhere else you can fit a speaker. There's a wide range of audio streamers available, from entry-level iPod docks with integrated AirPlay to full multi-room systems that give you complete control of the audio in as many rooms of your house as you can add speakers.

When looking for an audio streamer, there are more things to consider than how many rooms you'd like to supply with music. There are several competing wireless standards that only work with specific devices, so we've explained what to look out for below.

IN THE AIR TONIGHT

Basic audio streamers should support Wi-Fi, but some iPod docks use AirPlay instead. This proprietary standard is built into Apple's iOS and works over a local network, but non-Apple devices typically can't use it. There are, however, several Android applications that can spoof the AirPlay protocol, letting you use your phone or tablet to stream music.

As most AirPlay-compatible docks and streamers are designed specifically for Apple products, you won't be able to use them to charge your non-iOS devices. If you have an iPhone or iPad, though, AirPlay speakers are brilliant, and you can send audio to up to six of them at the same time, allowing you to build a multi-room system.

If you don't own any Apple products, check that your chosen audio streamer supports DLNA. This wireless protocol is used much more widely, so you should have no trouble playing music files from a smartphone or tablet. However, these systems aren't as easy to control, and building a multi-room system with them isn't quite as simple.



► An audio streamer lets you enjoy your music away from the computer

If you want full flexibility and the ability to play the same music in every room, or different tracks in different rooms, a proprietary multi-room system is a must. Some systems let you control everything from a smartphone app and are very easy to use, although they tend to be more expensive.

FORMAT: Y/N?

You also need to think about format support. Most audio streamers should happily play the popular audio file formats, but some lossless formats may not be supported. Common formats such as MP3, WMA, AAC and Wav should be fine, but some players may struggle with lossless FLAC and OGG files. No single streamer is guaranteed to play all media formats, so your best option is to buy one that supports your favourite format and use software to convert any unsupported files.

CUT THE WIRES

Audio streamers are perfectly suited to wireless networking because the amounts of data involved are so small, and you can use them just about anywhere because most have built-in speakers. The majority of streamers will connect to an existing Wi-Fi network, but in most cases you'll only be able to place your streamer within the limits of your network. If you can't connect to your Wi-Fi in the garden, you won't be able to stream music to it.

Sonos's unique ZonePlayer system creates its own secure wireless mesh network that's

separate from the Wi-Fi signals used by other devices, and it only needs one piece of Sonos kit to be connected to the internet. Almost all streamers include an Ethernet cable if you prefer to use a wired network.

YOU GOT SERVED

Although many audio streamers have built-in storage that allows them to store and share files independently of a PC, their defining feature is the ability to play files stored on a server. Many NAS devices can act as media servers (usually as iTunes and UPnP servers), but it's easy to use your PC or laptop to serve music files across a network.

Some receivers come with their own server software, but most work with either UPnP or Server Message Block (SMB) network file sharing. You may already have UPnP media server software on your computer in the form of Windows Media Player 12.

SERVICE NOT INCLUDED

As well as streaming your own music, many audio streamers provide access to internet radio stations and music services such as Last.FM, Spotify and Napster. These usually require an extra monthly subscription in order to play music, so you should factor in this cost if you plan to buy an audio streamer specifically for one service. Every product has a different range of available services, so make sure you check to see if your favourites are included before you buy.



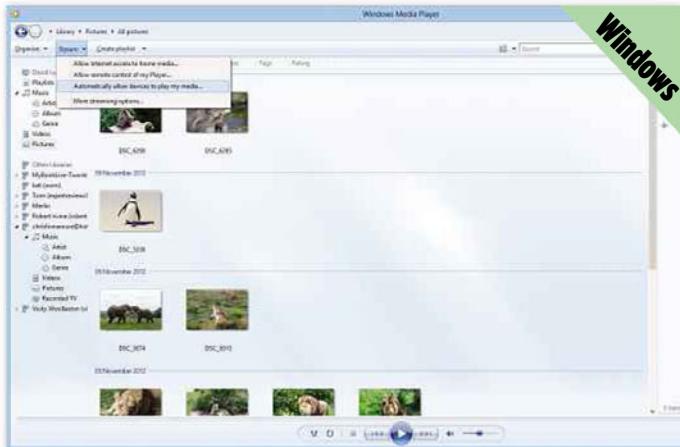
► UPnP speakers will work with most smartphones or computers



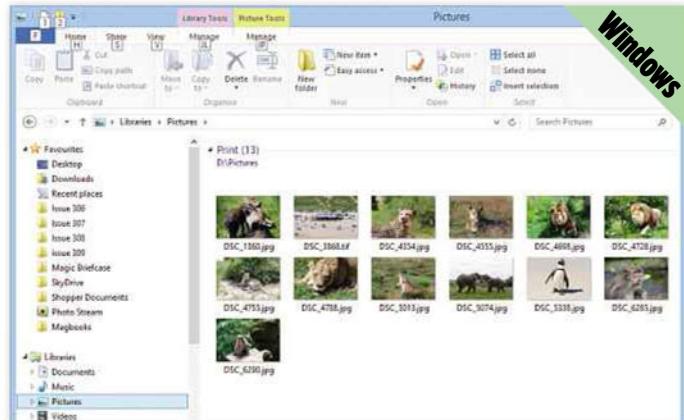
Setting up a media server

A MEDIA SERVER lets you share your music, photos and videos with your entire network. Configuring a media server is really easy. If you have a PC or a NAS device, the chances are that you already have the technology you need built in. With Mac OS X it's a little harder, as the operating system supports only Apple's streaming out of the box; however, there are free add-ons available that you can use.

Here we'll show you how to get a media server up and running, whether you're using a Windows PC, Mac or NAS device. Using a NAS device such as the Synology DiskStation DS213j is the best option, as you can leave it on all the time. However, the other methods will do the job.



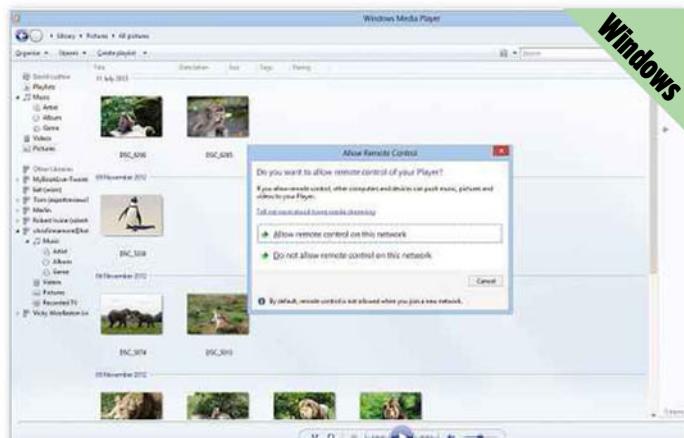
1 Start Windows Media Player from your computer and it will load, letting you play all your media files. The software isn't configured to share anything, so you need to turn on media sharing. At the top of the screen, click Stream, then select 'Automatically allow devices to play my media'. On the next screen click 'Automatically allow all computers and media devices' to turn on media sharing.



2 Windows Media Player will now share all your media files, but you need to make sure they're stored in the correct folder. Media Player uses Windows Libraries and, by default, looks in the Music, Videos and Pictures Libraries for your files. You can access these by opening a Windows Explorer window and selecting the relevant Library under Libraries, in the left-hand panel. Make sure your media files are stored here.



3 If you'd rather keep files in different folders, you can change where Libraries look for files. In Media Player, right-click Music, Video or Pictures and select 'Manage <name> library'. In the next screen you'll see a list of folders. Click Remove if you don't want to use a folder any more. To add a folder, click Add, browse to it and click Include Folder. Click OK when you're done and repeat for any other Library you want to change.



4 With all your files in the right folders, Windows Media Player is now sharing your folders, provided the software is running and your PC is turned on. Before you move on to trying to play media, if you want to be able to send files to your PC, click Stream, 'Allow remote control of my player'. On the next screen, click 'Allow remote control on this network'.



1 Connect to your NAS device's web-based management page. The steps for this differ for each manufacturer, although they're roughly the same for all devices, so check your manual for the exact steps. Look for the media server option and turn it on.



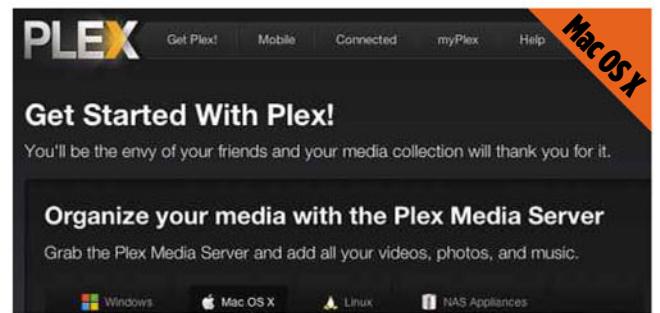
2 You'll need to configure which shared folders are set up for media sharing. Some NAS devices create dedicated folders for photos, videos and music; other NAS models let you choose which folders are for media sharing. Check your device's configuration to see which type you have and turn media sharing on for some folders.



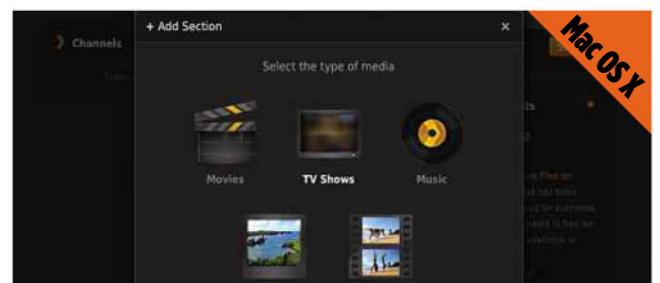
3 Once you've configured the shared folders that will contain your media, copy the files over the network to the server. This may take a while to complete, depending on the size of your media collection.



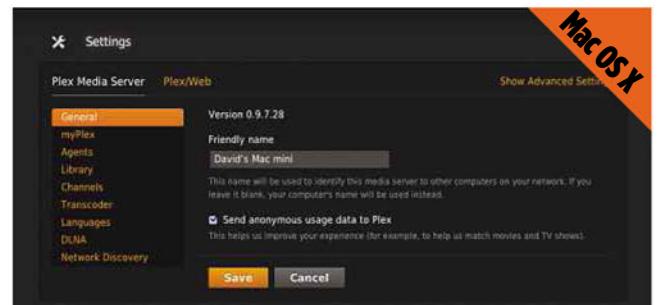
4 Your media files should be ready to play immediately, but sometimes it can take a while for your NAS to index them. In this case look for the option to Rescan, which will detect new files. If you're having real problems, a Rebuild option will force your NAS to rebuild its media index from scratch.



1 Mac OS X doesn't have a UPnP server built in, so you need to download one. We recommend the excellent Plex (www.plexapp.com), which is also available for Windows and Linux. Go to www.plexapp.com/getplex and download the Plex Media Server. When the file has downloaded, run it and copy the app to your Applications folder. Then run the media server.



2 The first time you start Plex, you'll be taken to a web page that lets you configure the software. The first thing to do is add media to your server. Click the '+' icon under My Library, then select a type of media. Next, click Add folders and browse to where your files are stored and click Add. In OS X the default media folders are in Users/<your username>. Once you've done that, you'll be taken to a web page dedicated to the new section.



3 Back on the main page you can click the settings icon – a spanner – to change how the server works. You shouldn't need to change much here, but you might want to change the name of your server and to disable 'Send anonymous usage data to Plex'. Click Save when you're done.



4 Go back to the main page and you can add Channels. Click the '+' icon under Channels and you'll see a list of online services, such as Apple Movie Trailers and TED. Installing these will let your media players access them. Click on the ones you want and click Install.

Streaming media

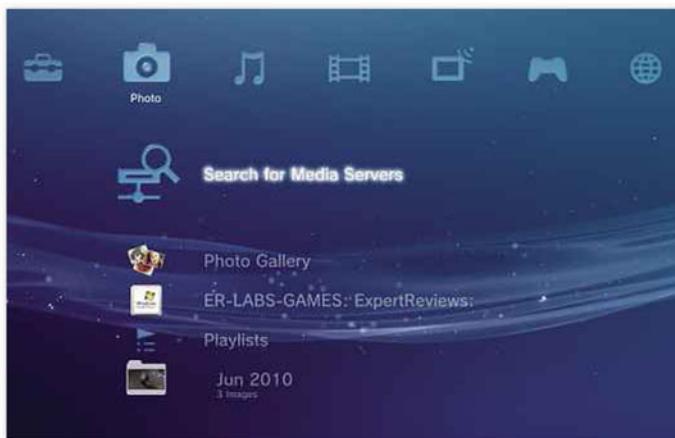
ONCE YOUR MEDIA server is up and running on your network and you've loaded it with all your files, you need a method of playing them. This is where a media player comes in. A media player can be anything from a TV with a built-in DLNA client – which a lot of modern smart TVs have these days – or a dedicated media player.

Players can be audio-only or multimedia, which means they'll also play video files. Typically, audio players have their own individual setup routines and can be controlled through a dedicated smartphone



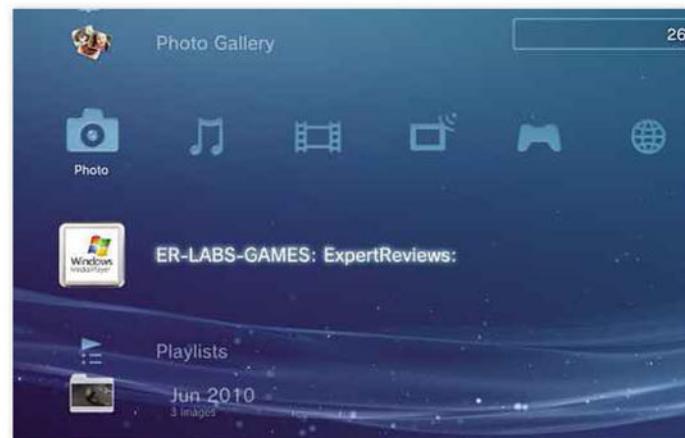
app, so this guide focuses on how to use a multimedia streamer. However, the following instructions may be useful for when you first set up your audio player. We're using a Sony PlayStation 3 in our walkthrough, but the instructions and prompts will be roughly similar for all devices.

Before you begin, make sure your media server is turned on and running, and that your media player is on and connected to the same physical network.



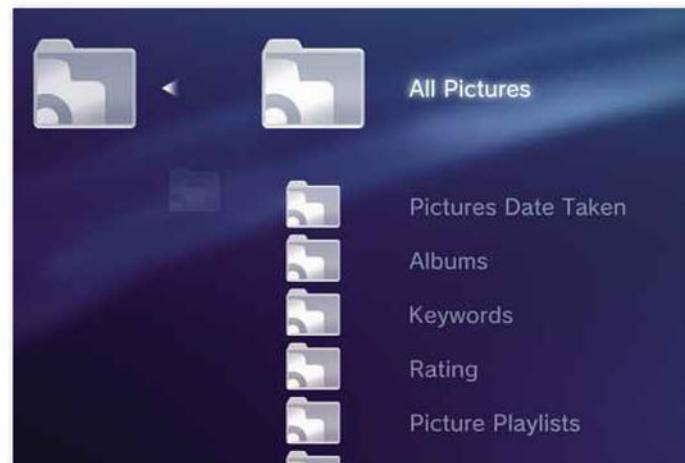
1 FIND SERVERS

Some media players will automatically find and connect to media servers on your network, but some require you to search for servers first. If your player has this option, it will scour the network looking for any media sources. This can take a few minutes to complete. Your media player should then list your media server.



2 CONNECT TO SERVER

Most media players split media into three categories: photos, videos and music. Each one defines the type of media the player will find. We'll start with photos; select your player's photos category, then select your server; alternatively, you may need to select your server first, then select photos.



3 VIEW PHOTOS

When looking for your photos you'll probably be presented with a list of folders you didn't create, such as All Pictures, Pictures Date Taken and so on. These folders are created by the media server, which categorises your photos automatically so you can view them in any order. However, you can also select folders and browse through them in the order in which you stored them originally.



4 SLIDESHows

Once you've chosen your folder, you can browse through the list of thumbnail pictures and select the one you want. Look out for an option to start a slideshow. You can usually also skip between photos by using the direction pad or chapter-skip buttons on a remote control. Be careful, as photos can be quite large, so they may take a while to appear on a TV.



6 PLAYLISTS AND MORE

Once you select a track, it will start playing. You can use the normal playback controls to pause and fast-forward or rewind, while track-skip controls will move to the next or previous track. Look for advanced options to create playlists, although not all media players support this. Typically, while music is playing you can go back to photos and browse through your picture collection.



8 CHOOSING A FILE

Video files will sometimes have a thumbnail preview, but this is by no means universal. With video files, more than with any other file type, you'll find some files that won't play or are listed as unsupported. That means your media player doesn't support the video's file format. You'll need to convert the files to a different format by following the instructions on page 120.



5 LISTEN TO MUSIC

Follow Step 2, but this time choose the music option. As with photos, you'll find you can browse your music by a variety of different methods, such as genre, artist and album. This information is pulled from the music track by the media server automatically, in much the same way an iPod does. Browse through your music until you find the album or track you want to listen to.



7 WATCH A VIDEO

Follow Step 2, but this time select videos. Again, you'll see a list of folders that you didn't create, such as Video Genres and Video Actors. This is created by your media server using information built into the video files. However, we find this an unreliable method, as information is often missing from the files. It's usually easiest to select folders and simply browse through your videos.



9 PLAY A FILE

Simply select the video you want to watch in order to play it. When playing a video you can use the normal playback controls, just as you would when watching a DVD. However, the chapter-skip buttons won't work properly unless your video file has embedded tracks. Many don't, which means this feature often isn't very useful.

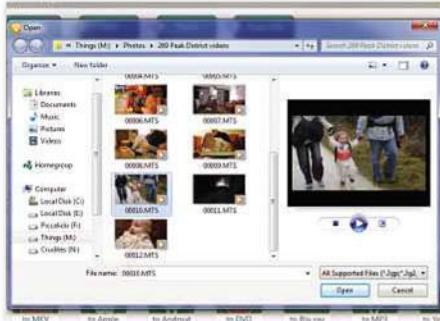
Convert videos for free

TODAY'S COMPUTERS ARE bursting with videos, but a PC monitor isn't always the best place to view them. Transferring videos to a media player connected to a TV or sending them to a phone, MP3 player or tablet PC means you can watch your videos on a bigger screen or while travelling and share them with friends and family.

The downside is that some media players, especially portable devices, are fussy about which types of file they can play. That's hardly surprising when you consider that a video file has around a dozen encoding parameters. Even for the more flexible players, it's important to use settings that deliver high quality in efficient file sizes. Video files are big, and choosing the wrong format can waste gigabytes of valuable space on your player.

We've tried lots of video-conversion utilities, and one of the best tools happens to be free. Freemake Video Converter can import and export a massive range of video formats, and converting is usually a simple matter of choosing the template for your player. Best of all, Freemake chooses export settings that are not just compatible with the player but are also sympathetic to the source material. Unlike many conversion utilities we've seen, it won't arbitrarily change the frame rate, and while it happily reduces the resolution to match your portable player's screen resolution, Freemake won't needlessly boost the resolution of smaller source videos.

Download the Freemake Video Converter utility from www.freemake.com and install it before following the steps below.



1 Importing videos couldn't be simpler: just drag and drop files from Windows Explorer on to the central window in Freemake Video Converter, or drop a folder to import its entire contents. Alternatively, you can drop a file or folder on to the software's desktop link and it will launch automatically with the files ready to convert. If you prefer to do things the old-fashioned way, click the +Video button at the top of the screen and browse to the files you want in the dialog box that appears. Hold down the Ctrl key to select multiple files, or hold Shift and click the first and last files to select a sequence.



2 The software isn't limited to converting videos. Import a collection of photos, for example, and it will turn them into a video slideshow. Audio files can be converted to a suitable format for your media player, too. Import a folder of DVD files and Freemake will present a list of the disc's contents, allowing you to choose just the main feature and omit any extras (Freemake won't circumvent the CSS encryption used on commercial discs).



3 It's even possible to import videos directly from YouTube, Facebook, Vimeo and many other online video-hosting sites. Simply navigate to the video you want to import via your web browser, select the page's URL in the address bar and type Ctrl-C to copy it. Back in Freemake Video Converter, click Paste URL and the video should appear in the imported media list. When you come to convert it, the software will download the video at the highest available quality before converting it to your desired settings.



4 Each entry in the imported list includes various information, plus options to change to a video's alternative soundtrack and to include subtitles, if available. The edit button to the right of each video reveals controls to trim out unwanted sections. Use the transport controls to identify a cut point, and use the buttons in the Cutting section to define the Start Selection and End Selection points. Click Cut Selection to remove that section. Click OK to return to the main window. Consider whether you want to enable the Join files option at the top-right of the screen, which strings all the imported media together into a single exported file.



5 Now it's time to export your videos. Export templates for most portable players are ready and waiting, arranged in various categories across the bottom of the screen. Choose Apple, for example, and you'll see a list of presets including iPad and various generations of iPhone and iPod. Android presets are sorted by screen resolution; a quick Google search will confirm your phone or tablet's screen resolution. Use the scroll button to see further export template groups, such as Sony PSP and 3GP (for older phones). When you've found a suitable template, choose a destination on your hard disk to save to and click Convert.



6 Freemake Video Converter makes sensible choices about bit rates, but if you would prefer a cleaner picture at the expense of bigger files, try increasing the bit rate manually. Import files one at a time, choose a preset as before, but before clicking Convert, increase the predicted export file size by around 50 per cent. Choosing Two-pass encoding can also boost quality a little, but it doubles the encoding time. Other options include CUDA encoding, which uses the processor on an Nvidia graphics card to encode the file, and Export to iTunes, which means your videos will appear in iTunes, ready to transfer to your player.

Convert video files for Apple devices

APPLE'S STREAMING MEDIA players require very specific file formats, but converting videos is easy thanks to the free HandBrake app (<http://handbrake.fr>).

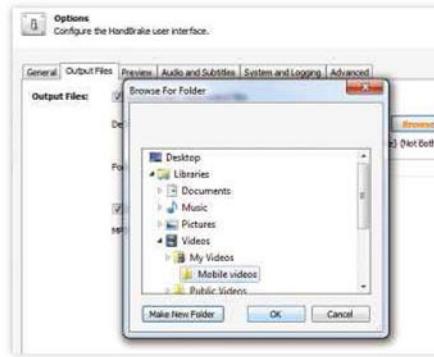
It's always best to watch video at the maximum resolution supported by the playback screen, but on a smartphone or tablet this could be smaller than the original. While many devices can scale video

on playback, you'll get the best quality and use less storage space if you convert to the right resolution before copying it to the device.

You'll have to convert a video if it's in a format that the destination device doesn't support; AirPlay streaming to an Apple TV requires H.264 encoding, for example. Here we'll show you how to do the job easily with HandBrake, the free video transcoder.



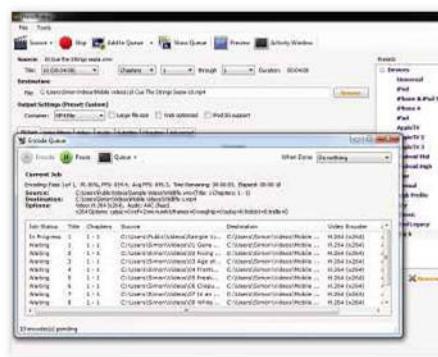
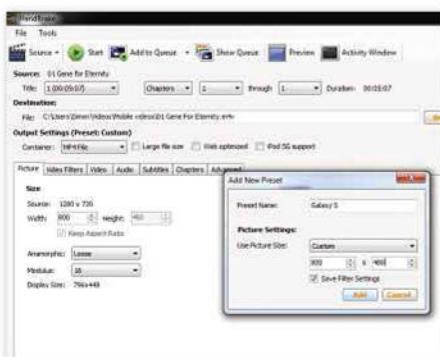
1 Visit <http://handbrake.fr>, click Download and choose the relevant installer. HandBrake will run on Mac OS or Ubuntu Linux, but we'll focus on installing it on a Windows PC for this guide. Whichever version of Windows you have, be sure to download the correct 32- or 64-bit installer. Run the downloaded file, agree to the licence terms, choose an installation location and click Install. Once this has finished, start the application by double-clicking on the desktop icon.



2 When HandBrake starts, click the Tools menu, select Options and click the Output Files tab to specify a location for your converted video files. In most cases these will be at a lower resolution than the original file, or at least they will have been transcoded from the source file with a small loss of quality, so we'd recommend that you create a specific folder such as 'iPad videos' so you can store them separately from the originals. Click Browse, navigate to the folder you want and click OK, then click Close to dismiss the Options dialog box. Once you've done that, click the Source button and choose either a video file or folder.

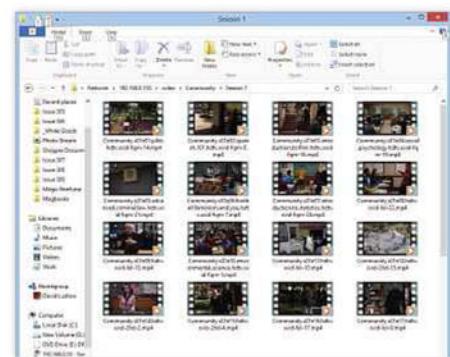


3 For optimal video quality on your mobile device, it's important to choose the right settings. HandBrake comes with useful presets for popular devices such as the iPhone and iPad. If your device appears on the list, simply click to select it. If it's your only device you may also want to set it as the default by clicking the Options button beneath the list and choosing Set Default. With this done, move on to Step 5. If your device isn't on the list you can create a new preset, although you may first want to check the settings in the Picture tab as these can be saved with the preset. We'd recommend selecting Loose in the Anamorphic setting box.



4 Click Add under the Presets list to create a new preset. Give the new preset a name, select Custom from the Use Picture Size box and enter the screen resolution of the device, which you can usually find on the manufacturer's page or by simply searching the web. Remember that the resolution of a mobile device is usually given with the smaller number first (in other words, in portrait orientation). In most cases you'll want to watch videos in landscape orientation, so simply swap the two numbers if necessary. Make sure Safe Filter Settings is ticked then click Add to save the preset, which should appear at the foot of the list.

5 Once you're happy with the settings, click Start to begin transcoding a single file or, if you're transcoding a folder, click Add to Queue, then drop down the Title box and move through the folder's other files, checking the settings and adding each to the queue. When the queue is complete, click Start to begin the transcoding. Transcoding is an intensive process that will work your PC hard, typically causing an increase in fan noise; transcoding feature-length content may take several hours. It may be best to perfect the settings on a single file, then transcode a batch of files and leave them to run overnight.



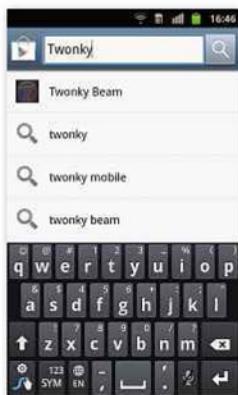
6 With your files converted to the right format, you can copy them back on to your media server. You may want to delete the original files, so you don't have two copies of each video, but you can always move them somewhere else for backup. You will now be able to play your videos on any Apple device.

Beaming files from your smartphone

WATCHING MOVIES ON a smartphone is great while you're out and about, but it's not so great to be stuck with its small screen at home. You can copy unprotected media to a PC and watch it there, but there are apps that let you stream almost anything directly from your phone to a computer or to another UPnP device, such as a games console.

1 You can only beam media from your phone if it's connected to the same network as a suitable UPnP device, so while you're at home make sure Wi-Fi is enabled on your device. Once the phone is on the network, Android users should open the phone's Applications menu and tap Play Store, then tap Apps.

Search for Twonky and tap Twonky Beam in the results. Tap Install, review the permissions and tap Accept & download. When the app has installed, tap Open to run it for the first time, or find it in the Applications menu and tap its icon from there. Those with an iPhone should search for Twonky in the App Store, select Twonky Beam in the results and tap Free, then Install to install it, providing your Apple ID password if prompted. Click OK at the age-restricted content warning. Tap Twonky Beam to start the app.



2 Once the app has started, review and agree to its terms of service, unticking the 'share information' option if you want before tapping OK. Tap Next and Dismiss to clear the startup tips. Before you beam content, you'll need to visit the Settings menu by tapping the gear wheel icon in the bottom right-hand corner of the screen, then tapping Settings. On the Settings page you need to tick the box next to Device Access Settings, then tap Configure Media Sharing Settings. On the next page, give your phone a device name and select which media types you want other devices to access. You can also tell Twonky Beam to remember your settings for your network.

Tap Back to return to the Settings menu, then choose a bandwidth setting. We recommend trying High initially, but be prepared to try a lower quality if you experience dropouts or stuttering playback. Tap Back twice to return to the app's main screen. Your phone should now be sharing its media content over your network.



On these pages we'll show you how to use Twonky Beam to watch movies from your iPhone or Android phone on your TV. For this to work, you'll need a DLNA renderer on your network (see page 110). If you have one it will appear in the App's beam menu; if you haven't, you'll need to use standard streaming



3 As a UPnP server, Twonky Beam should work with any compatible player. In Windows Media Player, for example, switch to the Library view and the server should appear in the list to the left. Double-click to open it and browse its contents as you would any other source, and double-click to play a file. If playback is sketchy, move the phone near the router, or reduce the bandwidth setting as described in the previous step.



4 Twonky Beam can also beam content to a playback device. To choose your playback device, swipe in from the right to bring up the Beam menu. Select your playback device. Use the app's icons to navigate for content on sites such as YouTube and, if it's supported, tap Beam and select a display device. Tap Beam again and the device should begin showing the content automatically. Scroll through the icons at the bottom of the app to access the playback and volume controls.



5 Twonky Beam can send video from your home network's media server, too. Tap the My Media icon at the top of the home screen (it looks like a house with a wireless signal in it) to bring up a list of all the servers on your home network. Browse to the media you want, then tap it to beam that media to your chosen device. You can also select Beam All to send all media, such as a collection of photos, although you'll get a prompt asking you to turn the Beam Queue on first.



6 You can also beam files directly from Windows. Just browse to the folder containing the files you want and select those you want to send. Right-click them and select Play to <device you want to send them to>. You'll see a playback window with the list of files you're sending. You can use the playback controls to pause, play and skip through files, and drag and drop new files to the list. Existing files in the list can be removed by selecting them and hitting the Delete key.



How to stream files using an iPhone or iPad

APPLE LIKES TO do things its own way, which typically means you have to use Apple kit and Apple-supported file formats to view and play your media. That's not always very convenient, though, particularly if you have a large collection of videos or music saved in a format that your player doesn't support. In this walkthrough, we'll show you how to play anything on your iPhone or iPad using the 8Player app (<http://tinyurl.com/8player>), which costs £1.49 from the App Store.



1 DOWNLOAD 8PLAYER

Our favourite media-playing app is 8Player. This app costs £1.49, but it's worth every penny. It plays practically any file format, connects to media servers on your home network and has AirPlay built in, so you can send what you're watching to your Apple TV or AirPlay speakers.



2 PLAY MEDIA

The 8Player home screen is split into three main categories: Music, Movies and Pictures. Tap the one you're interested in and you'll see a list of media servers on your home network. Select the one you want, such as your NAS, to browse through its files. You can just tap the file you want to start playing the file. You can stop at any point and, by selecting the same file again later, resume where you left off.



3 SAVE FILES

Press and hold down on a file to bring up an options menu. Play does as you'd expect, while Download saves the file to your local device. Downloaded files appear in the Download folder when you select Music, Movies and Pictures, with each having its own folder. This feature lets you save files for offline watching.

4 STREAM FILES

To stream a file, start playing it and tap the AirPlay icon in the play window. You can then select the device to which you want to send the content. To use AirPlay properly, you'll need to convert your media files to an Apple-supported format. However, 8Player supports AirPlay mirroring, so you can play any video format, although you'll have to leave your iOS device turned on while the media is playing.



5 DLNA

8Player can also send media to DLNA renderers, such as some modern TVs and wireless speakers. Tap the Orange icon at the bottom of the screen to expand the Settings bar, then click the icon that shows your current device (iPad or iPhone). You'll see a list of DLNA renderers on your network: tap the one you want. You'll have to stop playback and then resume it to send it to your chosen renderer.

6 SETTINGS

Also on the Settings bar, you'll see a 'Sort by' menu. This allows you to change the way media is organised. The default option is Auto, which sorts music tracks by name rather than by track number. To change this, tap the list and select Track N. This will sort your music by track number so that files appear in the correct album order.

7 SHORTCUTS

You can also use the Settings bar for shortcuts. The first icon lets you jump straight to the current playback; the second shows you current downloads; the third takes you to the home screen; and the fourth icon jumps straight to files you've downloaded. When you've finished with the bar, you can just tap the orange icon to close it.



8 SETTINGS

Back on the home screen is a main Settings menu. This offers some advanced control settings, but the defaults are generally fine. However, you can use Settings to change the look and feel of the app. You can alter the icon style, and change the background so that the app uses a photo stored on your iPhone or iPad.

Introduction to Apple TV

NO-ONE EXPECTS APPLE to follow everyone else's lead, and the company has certainly gone its own way with the Apple TV. It's like no other media streamer. In fact, the interface offers no way to stream content from your home network. Before you write the device off, however, it's important to understand that Apple TV is different for a reason, and it's actually rather a good device. For starters, the box is tiny and it costs just £99, making it one of the better-value media streamers available. It's also extremely easy to use, as you'd expect from an Apple device.

Apple has focused on bringing you content using iCloud, which means you don't even need to have a server in your house. The iCloud service enables you to access and stream movies and TV shows you've bought or rented from the iTunes store. You can also buy or rent content from your Apple TV and view it on an iPad or iPhone later.

Apple has done a great job of making content easy to find. You can browse films and TV shows according to a number of criteria, including those you've bought, top programmes, genres and networks, as well as searching for specific content. It also has Genius built in, which recommends content based on the films and programmes you've already bought or rented.

In terms of content, there's a lot on offer, with many of the latest films available to buy or watch. TV programmes are also up to date, and there are even programmes available to buy that are currently

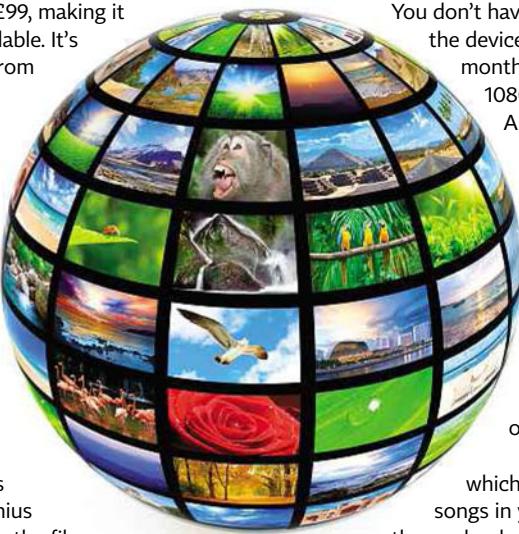
being shown on TV. The only restriction is that the iTunes version is delayed by at least a day. We like the Series Pass, which lets you buy an entire series before all the episodes have been aired, so each week you get a new episode to watch.

Flix and Pics

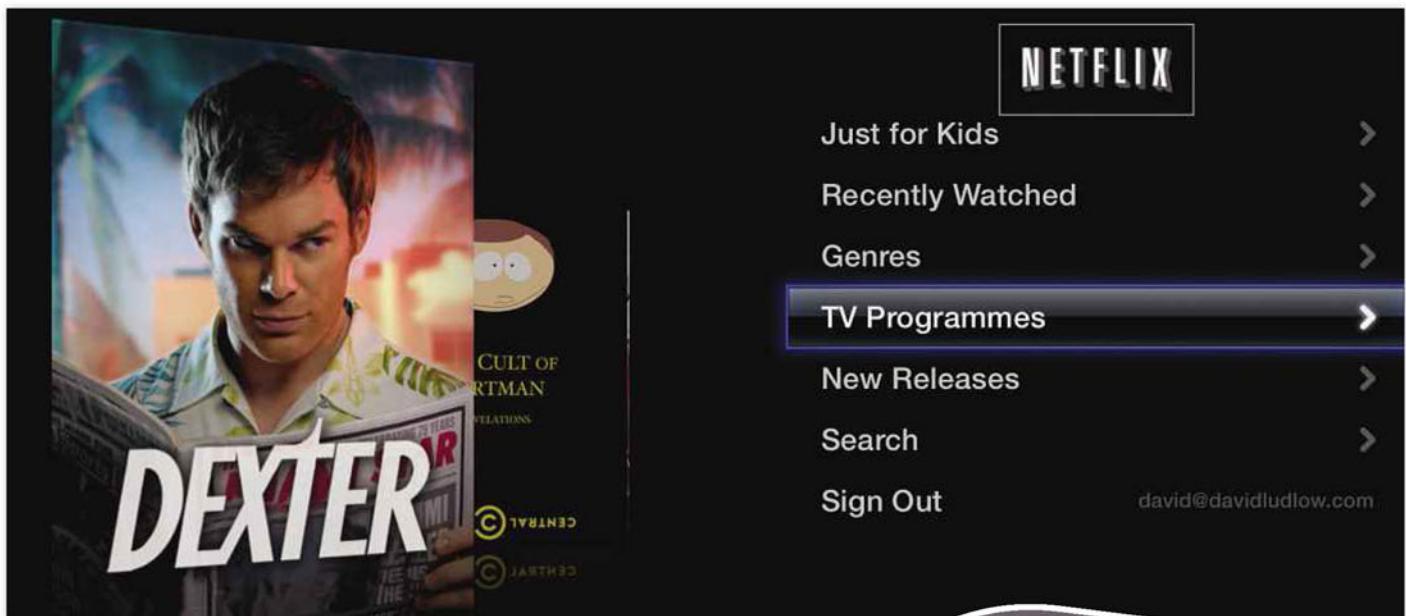
You don't have to rely purely on Apple content, though, as the device comes with Netflix built in too. If you have a monthly subscription to this service, you can stream 1080p movies and TV programmes direct to the Apple TV. Apple has designed its own Netflix interface to match Apple TV's, which is a great idea, as it ensures that the interface is consistent across every part of the system.

Photo Stream is also built in, and pulls in all your photos stored in iCloud. It's very smooth, as it pulls down an entire set of photos at a time, so there's no delay when moving between them and it feels more as if you're accessing local storage. There's also a Flickr app, which you can link to your online account.

To use the Music app you need iTunes Match, which costs £22 a year. This service determines which songs in your collection are available from Apple, and then uploads only the songs in your library that aren't. Once it has completed the process, your entire music collection can be streamed using 256Kbit/s AAC files, so you don't need to have a PC turned on to share your music. Podcasts and Internet Radio apps are also built in.



▲ The interface is easy to use and puts all your media, streaming services and other sources of entertainment within easy reach



▲ The streaming media platform Netflix is built into Apple TV

One of the advantages of a media streamer is its ability to play content stored locally on your network. On Apple devices, the Computers app pulls in content from computers running iTunes with Home Sharing enabled.

To do this, start iTunes on your computer and select Home Sharing from the drop-down menu under the playback controls. Enter the same Apple ID and password you used to log in to your Apple TV and select Turn On Home Sharing. All the music, videos and photos you have in your iTunes library will now be accessible from your Apple TV.

THE DRAWBACKS

Sadly, Apple TV won't work with any type of media server, such as one running on your network, and won't even work with media servers that have iTunes media sharing (this is different to Home Sharing). Its file support is extremely limited too, as H.264 is your only option for video. However, if you've bought all your content through Apple and you use iTunes to store your files, none of this is a problem, and Apple TV works brilliantly.

What's more, the restrictions become less of an issue if you also have an iPad or iPhone, thanks to AirPlay. AirPlay is Apple's way of sending audio and video from one device to another. So if you're watching a video on your iPad, for example, you can send it to Apple TV and watch it on the big screen. There are limitations, however, and you can only play video formats supported by Apple TV over AirPlay. This means that a DivX video playing in an app on the iPad can't be sent to Apple TV, but a QuickTime video can.

AIRPLAY ADVANTAGES

AirPlay becomes really useful when you want to use a UPnP server on your network, such as one included with your NAS. With your iPad or



▲ The Apple TV is a tiny device measuring just 98x98mm and 28mm high, so it certainly won't look obtrusive under your TV

iPhone you can use a media player app that supports UPnP to stream content from your server, which you can then send to Apple TV over AirPlay. In effect, it turns your iPhone or iPad into a giant remote control (see page 126).

One of the beauties of AirPlay is that once you send the content from one device to another, you can carry on using it for other things. If you have an iPad, for example, you can send a video to Apple TV and then continue browsing the web.

Any app can support AirPlay, and an extra icon should appear on your iPhone or iPad screen to let you choose to output to your Apple TV. Some apps don't do this, but you can manually set your iOS device to send video to the Apple TV by default (see page 126).

There's no doubting Apple TV's slickness, quality and ease of use. With 1080p support and access to your iTunes TV shows, plus Netflix built in, it's an attractive proposition for the price. If you have an iPhone or iPad, it's even better, as AirPlay lets you send your content directly to Apple TV, thus overcoming quite a few of its limitations.

▲ You need to turn on Home Sharing if you want to stream music, videos and photos from your iTunes library to a PC or Apple TV

“Apple has focused on bringing you content using iCloud, which means you don't even need to have a server in your house **”**

How to use AirPlay

WHEN IT CAME to providing a way to play music, videos and photos over a network, Apple didn't want to use UPnP like everyone else, so it came up with AirPlay. The idea behind it is simple: you beam data from one device to another, so you can watch or listen to whatever you like on the device of your choice.

For AirPlay to work, you need two things. The first is an AirPlay-compatible device to do the beaming. This can be an iPhone, iPod Touch or iPad, although Macs also support the technology. Windows devices offer poor support for AirPlay, although iTunes supports it. For Android devices, you need an AirPlay-compatible app, such as doubleTwist (<http://tinyurl.com/doubletwistandroid>). Note that Android apps only let you play media you own and don't add AirPlay into other apps, such as those for catch-up TV.

Next, you need a receiving device. This can be a device that handles video, such as Apple TV, or audio, such as AirPlay-compatible speakers. You can use up to six AirPlay speakers from one device at a time, giving you multi-room capabilities.

THE X FILES

AirPlay only works with files in Apple-supported video formats (such as QuickTime) and Apple-supported audio formats (such as AAC and MP3). The media provider must also allow AirPlay; if it doesn't, you may find that you get sound but no video, or simply nothing at all.

Rights owners can also disable AirPlay support, preventing you from beaming content to a device. For example, some catch-up TV services only allow you to watch on your mobile device and disable AirPlay streaming. If this is the case, for video content you'll see a message on your TV telling you that the content isn't supported.

Three modes are available. The first, In-app AirPlay, lets you send whatever you're currently listening to or watching to a compatible device. This is the purest mode, as you can carry on doing something

else or even turn off the screen on your iOS device. In this way, you can use your iOS device as a kind of remote control to select the media you want and control playback.

Second, all iOS devices have a system-wide setting that sends any media to a compatible device, regardless of the app. You can think of this as an override for applications that don't have built-in AirPlay support. For example, the BBC iPlayer app used to support AirPlay but didn't have support built in (the new version has fixed this), so you could use the override setting instead.

Finally, there's AirPlay mirroring for iOS and Mac OS X, which lets you send whatever you have onscreen to an Apple TV, with sound. This means you can use your TV to show everything that's going on,

“In-app AirPlay, lets you send whatever you're currently listening to or watching to a compatible device **”**

such as the game you're playing. This mode can let you watch video content from apps, whereas using the other methods only provides audio. However, content owners can disable it.

The latter two modes require you to keep your devices switched on, and you can't use them for anything else, as it interrupts playback. This means your device must also have its screen switched on, which adversely affects battery life, too.

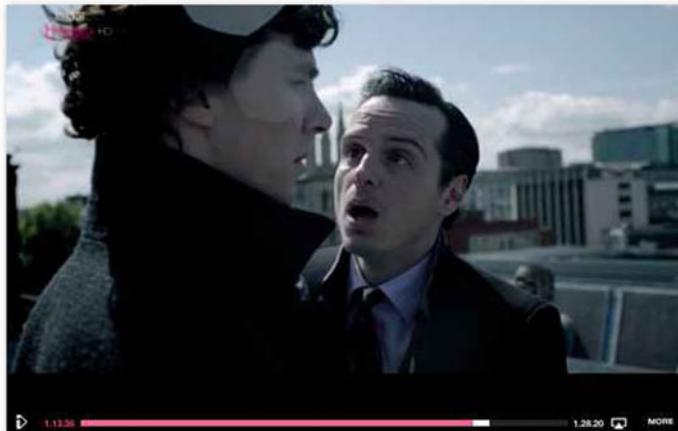
Now that we've explained how AirPlay works, we'll show you how to use it. We're using an iOS device but the process is roughly the same for Mac OS X, which uses the same icons and options.





1 LOOK FOR THE ICON

First, connect your playback device to the same network as your AirPlay device. Then, when you play any media using an app, look for the AirPlay icon. It will usually appear at the bottom of the screen next to the play controls and status bar. You may have to tap the screen to make the bar appear. If you don't see an AirPlay icon, the app doesn't support the technology (skip to Step 4).

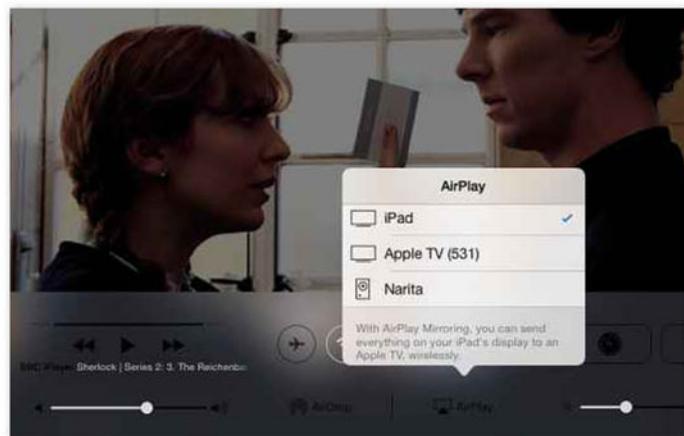


3 PLAYBACK CONTROLS

With your content playing, you can use your playback device as a remote control, pausing playback and using the status bar to scroll through the media to select a specific point (this is often quicker than using the fast-forward or rewind buttons). You can also carry on using your device for any other task, and use the AirPlay device's remote to control playback.

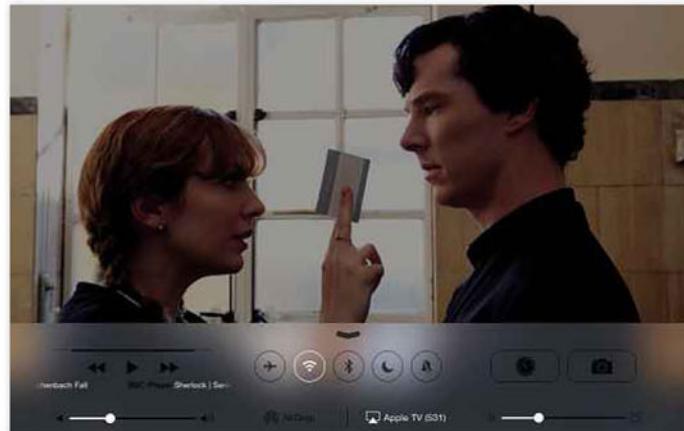


AirPlay



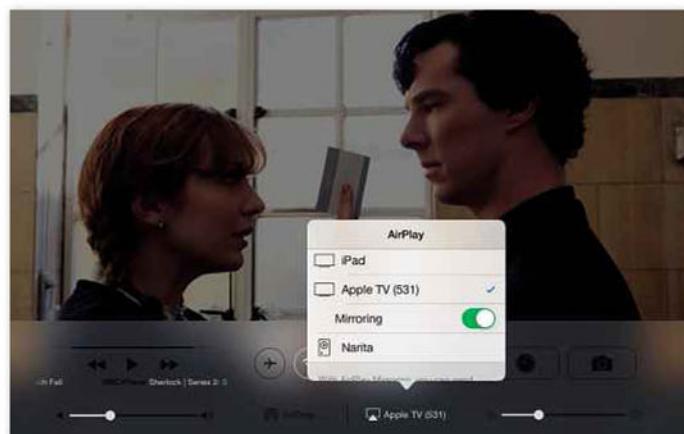
2 CHOOSE AIRPLAY DEVICE

Hit the AirPlay icon to see a list of AirPlay devices. Each AirPlay device can be renamed by following the manufacturer's instructions. If you haven't changed anything, you'll see the default name, such as Apple TV. Your media will start playing on the selected device. If you've selected an Apple TV and can't see any video, the content you're playing isn't supported, but you can try Steps 4 and 5.



4 SELECT SYSTEM WIDE

If an app has no AirPlay controls, bring up the Task Switcher by double-tapping the Menu button. Scroll left until you see the AirPlay icon. On iOS 7 devices, swipe up to access Control Centre. Tap the icon and select your playback device. All apps will now send their audio and, where supported, video to the selected AirPlay device. If video still isn't working, skip to Step 5.



5 SELECT MIRRORING

Go to the AirPlay icon on your iOS device, as in Step 4. Select your Apple TV and select Mirroring. You can do the same in Mac OS X using the AirPlay menu at the top of the screen. You'll now see your device mirrored on your Apple TV. Some video might be barred from playing, but most things will work. ☺



XBOX ONE

U

PS4™

THE NEXT-GEN CONSOLES ARE FINALLY HERE AND READY TO SLUG IT OUT TO REIGN SUPREME. SETH BARTON AND TOM MORGAN ARE YOUR REFEREES IN THIS HEAVYWEIGHT GAMING GRUDGE MATCH. SO LET THE (VIRTUAL) FISTICUFFS BEGIN!



Xbox One and PlayStation 4. We've lavished more coverage on Microsoft's and Sony's next generation of games consoles than on any other pair of devices in our collective memory. However, there's good reason for it.

It's not just that these are the successors to devices originally launched seven years ago, mind-blowing in a technology market now used to annual updates, and unusually long even by games console standards. Or that these new consoles are entering a world that has been irrevocably changed by the likes of Facebook and Twitter, by iPlayer and Netflix, and by tablets and smartphones.

It's not just that the two behemoths of gaming are going head-to-head, releasing the consoles across the globe within a week of each other, or that the two hardware

specifications are so tantalisingly similar, yet each tempered by its parent company's own take on the next-gen.

It's not just that both new consoles use PC technology. Processor cores and GPUs from AMD are hidden away inside each box. Add in the fact that the Xbox One runs a Windows operating system kernel, and you have the most PC-like games consoles ever.

It's not even that the failure of these devices would mark a huge, possibly fatal, blow for either of these huge companies. Both are struggling in other areas and consider their gaming arms to be their crown jewels. There's even been speculation that Microsoft might spin off Xbox into its own business.

No, the real crux of the matter is that playing games is just the start. Microsoft and Sony may be launching gaming powerhouses

today, with prices that many will baulk at, but their long-term aims are more comprehensive. These devices are designed to become the primary gateway between your internet connection and your TV, the boxes through which all your entertainment will flow.

This isn't just a war between two devices, as neither of these high-tech lounge dwellers is guaranteed to succeed. With smart TVs, mobile devices, cloud-based gaming services and the likes of Apple and Google arrayed against them, the Xbox and PS4 may well be the last of an endangered breed.

Enough of the future, though: what of the present? We have had both consoles in our labs for weeks and we've played every game, tested every feature, browsed every menu. So here's our definitive opinion of the next-gen consoles: Xbox One v PS4.





XBOX ONE



Microsoft wants the Xbox One to be more than a games console, having invested a huge amount of resources into its multimedia features. It's difficult to say if the company has delivered on its promise of a machine that will become the centre of your living room until you look closely at what's new, and what's oddly absent.

THE MONOLITHIC ONE

There's no escaping it: the Xbox One is huge. It dwarfs the PlayStation 4, as well as both previous-generation systems. The angular lines and glossy plastics give it an imposing, almost monolithic, appearance.

It leaves plenty of room for the internal components to breathe; after the notorious Xbox 360 Red Ring of Death, Microsoft has taken no chances. An oversized CPU heatsink and fan directly below a massive exhaust vent should ensure the console doesn't overheat nor make a racket; it's practically inaudible even after hours of gaming.

Both the Xbox One and PS4 use AMD Accelerated Processing Units (APUs) instead of custom processors. Microsoft has paired two quad-core 1.75GHz Jaguar processor modules with 8GB of DDR3 memory, which should be significantly easier to program for than the Xbox 360's PowerPC-based CPU.

The biggest difference between this and the PS4 is graphics memory. The Xbox One relies on 32MB of fast-access ESRAM to buffer textures from the slower DDR3 memory, which according to developers is more complex to program than the PS4's faster GDDR5 RAM. There's a resolution and quality disparity between the two consoles in certain games, but we expect the gap to narrow as developers get used to the Xbox One's quirks.

A Blu-ray optical drive is a logical upgrade to the 360's DVD drive; the extra capacity lets developers make bigger games without spilling on to multiple discs. Every game gets installed to the 500GB internal hard disk before you can play it, but with some games approaching 50GB it won't be long until that disk (which isn't user-replaceable) is filled. Game progress is saved to the console and to the cloud automatically.

Microsoft has dropped analogue outputs altogether for the Xbox One, opting only for HDMI video and optical S/PDIF audio. There

are actually two HDMI ports: one outputs video to your TV and the second receives pictures from a set-top box. You'll also find a proprietary Kinect port and an IR blaster input. This is a backup, as the Kinect camera has its own powerful IR emitter that turns on your TV and controls your set-top box. There are two rear USB3 ports and a third on the side, which isn't as convenient as the Xbox 360's front-facing ports.

You have the choice between wired Ethernet and wireless 802.11n Wi-Fi for getting online; you'll need to pick one, as the console is useless without a day one update from Microsoft's servers.

CONTROL ISSUES

Microsoft has sensibly avoided making any radical changes with the Xbox One controller, as the Xbox 360 pad is almost universally loved. It has the same offset analogue sticks, four face buttons, two triggers and two shoulder buttons, but Start and Select have been renamed Menu and Multitasking respectively.

The battery compartment is now recessed. It still holds AA batteries rather than a built-in rechargeable pack. Otherwise, the controller feels superior in almost every way. The new four-way directional pad is more precise than the eight-way 360 D-pad, which was arguably its weakest feature. Individual rumble motors in the new 'impulse triggers' add force feedback directly to your fingers. A smaller dead zone and greater resistance to movement make the analogue sticks feel incredibly responsive.

KINECTIC FORCE

The Kinect depth-sensing camera is integral to the Xbox One and is the first thing you see on opening the box. It detects how many people are in a room, signing in profiles as it recognises faces, and redeems QR codes, which is easier

than typing in the Xbox 360's 25-digit codes. RGB and infrared cameras monitor details such as flushed cheeks to estimate your heart rate in the Xbox Fitness app.

It's more than just a camera, though. Kinect's microphones isolate your speech from across a room, even with game audio in the background. We still got a little in-game feedback when playing online, but for the most part speech was clear and of a much higher bit rate than the Xbox 360.

Most launch games support Kinect. Forza 5 moves the in-car view as you lean left and right, voice commands order legionaries in Ryse: Son of Rome, and shouting at zombies in Dead Rising 3 distracts them from your fellow survivors. Basketball game NBA 2K14 will actually penalise you with a technical foul if Kinect hears you swearing over a bad call.

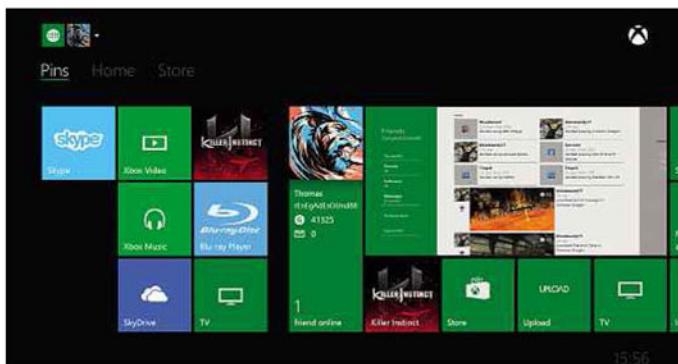
SPEAK YOUR MIND

It takes well over a minute for the Xbox One to boot until you activate Instant On, which lets it resume from an energy-friendly deep sleep in around six seconds. The tiled home screen takes several cues from Microsoft's Windows 8 operating system, with simple yet colourful icons and a grid-based layout that's ideally suited to big-screen TV sets. Kinect voice commands are heavily integrated, letting you load games, open apps or search without reaching for a controller.

Saying 'Xbox' at any time highlights voice commands in green. Most make sense: 'Xbox snap' splits the screen to run one app in the background while playing a game or watching TV, while 'Xbox record that' saves the last 30 seconds of gameplay as a video clip to share with your Xbox Live friends. Others are slightly more obscure. 'Xbox on' wakes the console from standby, but only 'Xbox turn off' will power it down again. Kinect also can't



↑ The HDMI input is perfect for your Sky or TiVo box, but is too laggy for a PC or other games console feed



▲ Logging in to your Xbox Live account takes just a few seconds with Kinect, and the first thing you see is the home screen

understand shortened names, so it's 'Forza Motorsport 5', not 'Forza 5'. Once learned, voice commands are often faster than using a controller, as Microsoft has buried some apps and settings in counter-intuitive places.

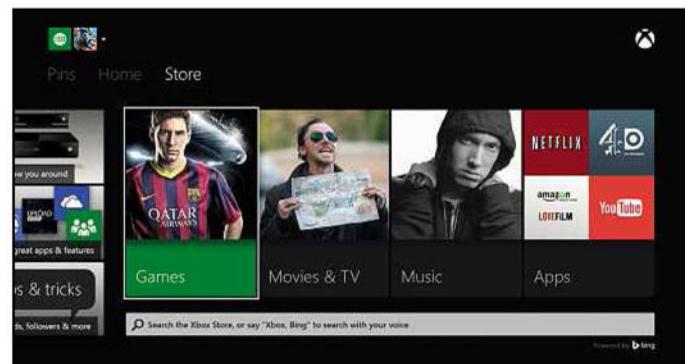
Installed games and apps are listed in two horizontal rows, which quickly fills the screen. You can pin your favourites to the home screen, but when almost everything has its own app it's a struggle to find something specific. Blu-ray films launch their own app, which is separate from the Audio CD app. Both seem unnecessary when there's a dedicated disc tray tile on the home screen.

There's also no native DLNA client, so you can't browse for files on your network like you could with the Xbox 360. You'll have to push

files to the console with a DLNA client instead, which then switches between Xbox Video and Xbox Music depending on your content. It's a confusing backwards step considering Microsoft's insistence that the Xbox One is a hub for all your content.

GUIDED MISSILE

Arguably the Xbox One's killer non-gaming feature, you can overlay the console UI on top of your Sky, Virgin or YouView set-top box by plugging it into the console's HDMI input. Once connected, Xbox Live notifications and game invites will appear over live TV. Unfortunately the OneGuide unified program guide, which will let you browse TV listings on the Xbox One itself, isn't supported in the UK yet.



▲ The Xbox Store has got off to rather a slow start, especially where on-demand video apps are concerned

There's currently only a limited choice of on-demand content too. Netflix, LoveFilm and 4OD are present, but not BBC iPlayer, Sky Go, Demand 5 or BlinkBox. You can't abandon your remote control for an Xbox One controller or Kinect voice commands yet, but if it all comes together, it will be an incredible, integrated hub to access all your content.

NERDY SPECS

SmartGlass made its debut on the Xbox 360, but was slow and few games used it. The Xbox One was built with second-screen gaming in mind, using Wi-Fi Direct to create an uninterrupted and lag-free connection to your iOS, Android or Windows Phone mobile or tablet. SmartGlass lets you see your Xbox Live friends, track achievements and send messages remotely, which is easier than typing messages onscreen with a controller.

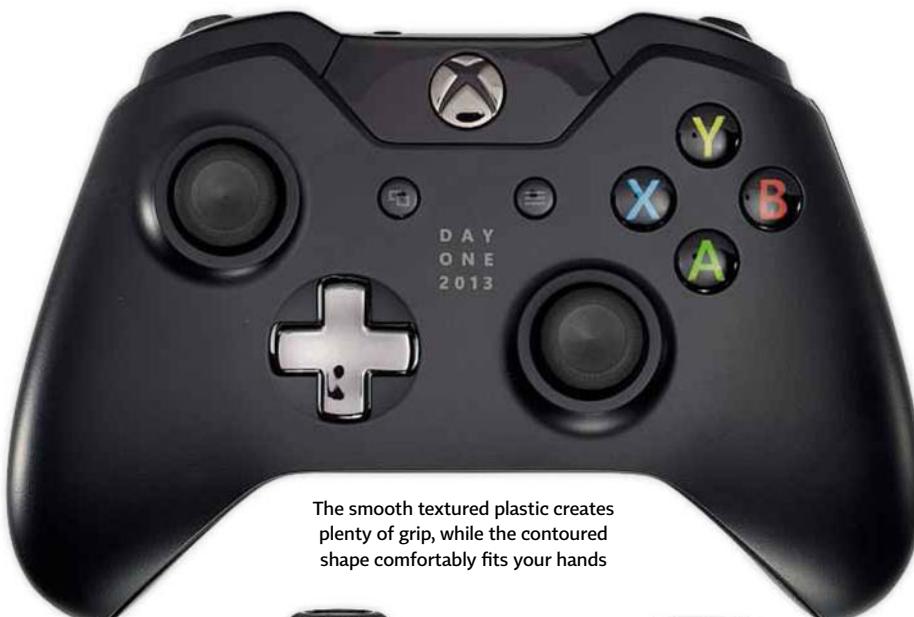
SmartGlass becomes indispensable in games, where it becomes a companion app that provides information not available to anyone playing on a single screen. Dead Rising 3 is the best current example, routing in-game calls to your smartphone, putting a map in your hand and letting you call in SmartGlass-only drone strikes.

VERDICT

There's no escaping the fact that the Xbox One costs significantly more than the PS4. Including Kinect has forced Microsoft to bump the price by £80, and £430 is a lot to ask for a console with a few new games. You'll also need an Xbox Live Gold subscription to use the Skype, Netflix and Xbox Music apps.

The console is an evolution over the Xbox 360 that, at least in the UK, is missing key features Microsoft promised in the run-up to launch. Until set-top box support and more on-demand services arrive, you're buying a system that has few killer exclusives, is technically less powerful than its rival and has fewer multimedia apps than its predecessor.

It's early days, with Microsoft promising to add more apps, support set-top boxes and release more games in 2014. Therefore, if you can wait, you probably should. You'd need plenty of faith in Microsoft delivering quickly on its promises and be keen to play prettier-looking multiplatform games now in order to justify spending £430 on an Xbox One today.



The smooth textured plastic creates plenty of grip, while the contoured shape comfortably fits your hands





PS4

Six years and eight months after the PS3 launch, and with 80m consoles sold worldwide in the interim, the new PlayStation is finally here. Sony has positioned the angular PS4 as a purebred gaming machine, with powerful hardware and few multimedia fripperies in sight. There's no camera peripheral, and only a bare minimum of ports on the back. It's neat, compact and powerful-looking, but can it deliver on Sony's promises to take gaming to the next-gen?

IF LOOKS COULD KILL

The PS4 is an incredibly sleek piece of kit. The raked front and back make it seem like a solid slab of technology hewn from a larger piece. The mix of matt and gloss areas succeeds in looking classier than either an all-matt or all-gloss finish would have. As plastic boxes go, this is among the best looking we've seen.

A recessed central gully contains the slot-loading drive and twin front USB3 ports, while a line bisecting the console the other way integrates the power and eject buttons plus a strip of light that lets you know the console's power status. Around the back is the HDMI output, Ethernet port, S/PDIF output and an Aux port for the PlayStation Camera peripheral. Power is provided by plugging in a typical figure-eight power lead and it draws from 80W idling, up to 140W in-game.

The PS4 is practically silent when idling, which is good for Blu-ray playback or streaming TV. However, the noise does pick up considerably when playing a game, and even more so when navigating the main menu while a game ran in the background. It's notably louder than the Xbox One and we couldn't help but be a little disappointed; you'll want to keep the PS4 as far away from you as possible when gaming.

Inside, Sony has used similar components to Microsoft, with a powerful AMD chip at the PS4's heart. This single integrated chip contains both an eight-core CPU and a GPU with 18 compute units. That's 50 per cent more compute units than the Xbox One, providing a significant advantage in graphical horsepower, which can also be turned to use in special effects and advanced physics simulation if preferred (as seen in Knack, page 134).

The PS4's memory system consists of a single large pool of 8GB of super-fast GDDR5

memory – more than we've seen on even the most expensive PC graphics cards. The Xbox One by comparison uses the same amount of slower DDR3 memory, with a super-fast 32MB cache to help make up the difference.

At present, the PS4's simpler memory architecture and superior GPU has proved easier for developers to get to grips with. The PS4 has smoother frame rates and higher resolutions in demanding multiplatform shooters such as Battlefield 4 and Call of Duty: Ghosts. With time, the Xbox One may be able to close some of this disparity, but the PS4 is undoubtedly the more powerful console.

SHOCKINGLY GOOD

The DualShock 4 is a huge improvement over its predecessor. Though still recognisably a PlayStation controller, the new model is larger and more comfortably rounded. The back has a non-slip micro-texture and the front is dominated by a light that reacts to in-game events and allows the optional PlayStation camera peripheral to track its movements accurately. Its convenient built-in battery

"THE PS4 HAS SMOOTHER FRAME RATES AND HIGHER RESOLUTIONS IN DEMANDING GAMES"

charges over a Micro USB connection, but its limited battery life of eight hours means you'll want to leave it charging when you're not playing.

The analogue sticks are firm, precise and have small deadzones before they react to your inputs; they're also further apart, so your thumbs never touch. The D-pad is responsive with good feedback, though the face buttons could click more positively. The triggers are good, too, but lack the vibration feedback of the Xbox One's. The new gamepad also adds a

touchpad, so you can execute swipes and other gesture-based commands.

We love the DualShock 4's microphone port. As well as using it to add a chat headset for multiplayer games (a basic one is bundled), you can also output stereo audio from the PS4. It's brilliant for late-night sessions with headphones without disturbing anyone else or running cables across your living room.

DOLCE VITA

The PS4 is keen to talk to other devices and we quickly connected our PS Vita handheld console to it. The Vita mirrors what you see (and hear) on your TV. You can then turn off the TV and continue playing on the Vita alone. We could play games while sitting in bed upstairs, or anywhere we had Wi-Fi.

You can even boot the PS4 from the Vita over the network, so you can start playing without even going to turn it on. This also enables you to control the PS4 remotely over the internet, though playing games this way requires a responsive low-ping connection, as the lag will otherwise spoil your fun.

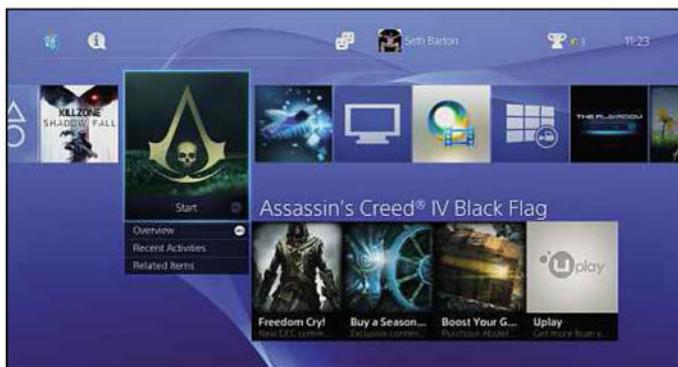
Equally easy to connect, but not yet as impressive, is the PlayStation app for Android or iOS devices. You can access your PS4 and PSN account, check on what friends have been up to and make purchases to be downloaded to your PS4. It also acts as a second screen, in much the same way as Microsoft's SmartGlass, providing additional information, maps and inventory access. Sony has yet to utilise this fully.

The PS4 boots from cold in around 15 seconds, at a press of the button on the DualShock 4. It will rarely be switched off, though, instead entering a low-power standby mode it can recover from almost instantly.

The menu is easy to get the hang of and simple to navigate. There's a long line of tiles



▲ There's not much in the way of ports at the back, but there's plenty of venting



↑ The PS4's main interface has notifications at the top, the main menu in the centre and updates and options shown below

for all your games, plus some grouped apps, such as catch-up TV and streaming video services. As you select each one, additional details load below it. Pushing down from the main menu accesses those additional options and the screen themes itself appropriately, with a background to match the content.

Above all this is a notification bar, which alerts you to messages, friends online and trophies won. Pushing up gives you all the options and settings you need to react to these. There's a lot less advertising on show than on the Xbox One, with that kept largely tucked away in the PlayStation Store, itself a tastefully small icon on the settings menu.

It's quick to switch back and forth between tasks, and you can access the menu instantly from a game, but it will take a couple of seconds for a game to go into suspend mode before you can switch to an app, such as

iPlayer. You can switch back to a game in an instant, though, straight to where you left off.

Put in a game disc and it starts installing automatically. Killzone Shadow Fall (see page 134) was playable after just 20 seconds, but it continued to install 39GB as we were blasting away, blissfully unaware. At present you can't put your game and the PS4 into standby mode and then jump back into the game exactly where you left off, but Sony is looking to add this to the PS4 in the future, according to the company blog.

SHARE OPTIONS

The PS4 is built with social media in mind. Simply push the Share button on the controller and you can upload recorded video clips (the PS4 maintains a constant 15-minute buffer) to Facebook; there's no YouTube support yet. You can also upload screenshots

to Facebook or Twitter and comment on them, though ideally you'll want to hook up a Bluetooth keyboard. You can also livestream to the web, via either Twitch.tv or Ustream, so others can watch you play.

If you prefer watching broadcasts to making them, the PS4 is well equipped from day one. There's BBC iPlayer, Demand 5, LoveFilm and Netflix for watching TV and movies, though no Sky Now TV, ITV Player or 4OD. There's also a built-in Blu-ray drive that's as easy to use as popping in a disc.

Surprisingly, though, the PS4 will not do many things you might expect. That disc drive won't play CDs, for reasons we can't fathom, and there's no playback of media files, either, be they from USB devices or over a network from a server. Sony has mooted adding such features later, but there's no timescale.

FUTURE SAILORS

So which ship should you pick if you're keen to get in early on the new consoles? Next-generation gaming should be about so much more than just prettier graphics, but at the same time a certain amount of eye candy is required. The PS4 certainly delivers on that front: the specifications indicate that the console is a step ahead of its rival, and it shows onscreen in games, too.

Other innovations are spotted around the console and have great potential. The new controller is excellent, and while some features haven't been fully utilised yet, the headphone output is instant genius. Remote Play on the PS Vita is a technical tour de force, though only if you invest in that device.

VERDICT

We prefer the PS4's interface. It's easy on the eye and easy to navigate. At launch, there's better social media sharing and a better range of catch-up TV apps. Despite the multimedia boasts of the Xbox One, the PS4 is the better box to have below your TV today.

It's early days, but for us the PS4 is more convincing and wins round one. If you're spending big money on a new console you want something that both looks good today and has a long lifespan. The PS4 delivers both, as it's the better device to play multiplatform titles on today and its more powerful hardware should give it a good innings, too.



The new controller is more comfortable to hold, has more precise controls and a couple of next-gen features, too: it's a fantastic evolution of previous DualShock controllers



**DEAD RISING 3 (£45) ★★★**

Being stranded in a city overrun with the shuffling undead might not be your idea of fun, but Dead Rising 3 manages to turn the impending apocalypse into a laugh riot with ludicrous combination weapons built from everyday objects. A car battery and a traffic light become a terrifying lightning staff that Gandalf himself would be envious of, and that's just the start. It puts the Xbox One's hardware to good use by drawing thousands of zombies onscreen at once.

**FORZA MOTORSPORT 5 (£45) ★★★★**

Microsoft's near photo-realistic racing simulation has some of the best force feedback ever seen (or felt) in a game. The Xbox One controller's Impulse Triggers let you feel when traction control kicks in, tyres spin out and brakes lock up in the corners. The heavy focus on micro-transactions and the limited number of racetracks is disappointing, but the actual driving is as close to being behind the wheel as it's possible to get from the comfort of your sofa.

**BATTLEFIELD 4 (£48) ★★★★**

With its massive levels and map-altering 'Levolution' destructible environments, Battlefield 4 was one of the best-looking games on the current Xbox 360 and PS3 consoles, but developer DICE has dialled up the resolution and doubled the number of players that can fit on a single multiplayer server for the PS4 and Xbox One. There's a huge number of weapons and upgrades to unlock, and that's before you attempt to master flying jets and helicopters.

**NEED FOR SPEED: RIVALS (£48) ★★★★**

The Need for Speed series might have left the Max Power generation behind, dumping souped up Vauxhall Corsas in favour of Ferrari, Porsche and a whole garage of other expensive supercars, but Rivals hasn't forgotten the thrill of racing. Pitting racers against cops on over 100 miles of open road is a lot more fun when the cars are being driven by other players – and you're dropped straight into a multiplayer session automatically.

**KILLZONE SHADOW FALL (£46) ★★★★**

It's immediately apparent this is a next-gen game, easily matching the best high-end PCs have to offer. There's complex geometry in rock formations, while detailed trees blow softly in the wind. Character models are detailed, move smoothly and have realistic-looking skin.

The shooter itself is solid stuff, with far more tactical variation and space to manoeuvre than Call of Duty. It's no classic, but it's a technically capable game you'll want to see through to the end.

**KNACK (£45) ★★★**

The only other full-priced PS4 exclusive is Knack, a promising-looking platform game, which unfortunately turns into a bit of a trudge. It does, however, showcase the PS4's flexibility, using the GPU to great effect in realising the titular character, who is made up of numerous shards of material. While the particle and physics effects are impressive, the characters don't live up to similar Pixar-esque standards and the gameplay is a bit single-paced.

**KILLER INSTINCT** (£16) ★★★★

Microsoft resurrected this combo-heavy fighting game series, last seen on the Nintendo 64, to test a new free-to-play payment model for the Xbox One. Everyone can download the free demo and try a single character, either offline against AI or online against human opponents, then decide whether to buy the remaining seven cast members. The screen-filling particle effects look stunning and the combos might be flashy, but it's surprisingly easy for newcomers to pick up and play.

**RYSE: SON OF ROME** (£45) ★★★

Ryse developer Crytek is best known for its futuristic Crysis first-person shooters, but it has taken a completely different direction for its debut Xbox One title. This third-person brawler looks phenomenal, with fully motion-captured characters and gorgeous lighting, but the basic gameplay gets repetitive quickly and the campaign isn't particularly long. It's a great demonstration of what the Xbox One is capable of, but it's far from a must-have launch title.

**ASSASSIN'S CREED 4: BLACK FLAG** (£48) ★★★★★

Despite its title, this is the sixth Assassin's Creed game. Much of it will be familiar, with free running, stealth kills and a lovely historical setting. Set in the Caribbean in piracy's golden age, this outing adds a largely open world, with ships to sail, merchants to plunder and forts to raid, alongside urban free-running. It's a huge return to form for the series, and on next-gen consoles you get sharp, high-res images, though the PS4 is noticeably crisper than the Xbox One with a Full HD resolution.

**CALL OF DUTY: GHOSTS** (£48) ★★★

The latest iteration of the long-running military shooter has one of its weakest single-player campaigns to date. Online multiplayer remains its strong suit, with the usual run-and-gun gameplay. Sadly, neither next-gen version stands out in terms of graphics. The PS4 runs at a crisp Full HD resolution, but isn't as super-smooth as we'd hoped, while the Xbox One runs at just 720p and has been oversharpened to compensate, creating a noisy-looking final image.

**RESOGUN** (£13 OR FREE WITH PS+)

Also of note is the exclusive arcade-shooter Resogun. With its razor-sharp graphics and frenetic pace it has become an instant favourite, and it's free with a PS+ subscription. It's clearly related to arcade classic Defender, with you piloting your ship around a looped, closed level, destroying alien waves and saving imprisoned humans. The graphics are remarkable, being built out of thousands of tiny cubes (voxels) that shower the screen as things explode.

COMING SOON TO A CONSOLE NEAR YOU**XBOX ONE****QUANTUM BREAK** (2014)

Blending live action video with gameplay, this shooter has numerous story threads to explore.

TITANFALL (11th MARCH)

From the Call of Duty stable, this shooter mixes infantry and robot-tank combat in a fast-moving urban firefight.

MULTI-PLATFORM**THE WITCHER 3: WILD HUNT** (2014)

Gritty fantasy RPG in a huge open world; violent, adult, complex and great-looking.

THE DIVISION (LATE 2014)

Set in post-pandemic New York, this tactical shooter blends single- and multiplayer gameplay into one. Also, it looks incredible.

PS4**DRIVE CLUB** (EARLY 2014)

Road-racing game with team elements. A version is to be given away to PS+ subscribers.

THE ORDER: 1886 (2014)

Fight monsters with steampunk weaponry in this luscious-looking action shooter, set in an alternative Victorian-era Europe. ☺



CAN YOU HEAR IT?

Kat Orphanides investigates the rise of high-resolution audio and asks if it's the next big thing for music downloads

Audiophiles have been banging on about so-called high-resolution audio for years, but it hasn't made much of an impact on normal music fans. The term is a bit of a catch-all, referring to audio files with above-CD sample rates and bit depths that are closer to the original recordings. A high-res file is approximately 12 times the size of a typical MP3 download.

Until now, the equipment to play such files has been arcane, expensive and resolutely tied to the sitting room hi-fi or, at best, a USB device for your PC or laptop. That leaves your average listener, using an old iPod or their smartphone, out in the cold. The vast majority of such devices don't support high-resolution files, but more that do are on their way.

Sony, which sells both audio hardware and music, has recently launched a major push on high-resolution sound. Carrying the flag are the Sony NWZ-ZX1 and NWZ-F886 MP3 players, which support audio bit depths of up to 24-bit and sample frequencies of 192kHz, compared to an MP3's typical 16-bit, 44.1kHz.

Others who have taken up the high-res standard include Samsung and LG. The Galaxy Note 3 and G2 smartphones both support sample rates of up to 192kHz and bit depths

of up to 24-bit. We expect to see a lot more smartphones with such support in the future.

Big home hi-fi brands such as Pioneer and Denon are in the game, and there's also plenty of support among early adopters and audio brands such as Naim, Linn, Arcam and Meridian. On the music side, Sony Music, Universal Music Group and Warner Music Group are all putting out high-resolution releases, as are many independent labels.

So high-resolution is certainly popular with the electronics and music publishing industries, but should you lend it an ear?

State of play

CD revolutionised high-quality home audio, and is still the standard to which all else is compared. CD-quality audio has a respectable sample frequency of 44.1kHz and a bit depth of 16-bit, but more importantly it's lossless, so no audio data is thrown away in the process.

However, it's then often converted to MP3 format. MP3 is a lossy audio codec, which means elements of the sound are thrown away during the encoding process. Although this is done very carefully, using software models that are designed to remove only sounds that would be masked by other tones, it's by no means infallible. Even 320Kbit/s MP3s can suffer audible compression artefacts, which are particularly noticeable on fast, largely random sounds such as applause.

A number of high-resolution digital formats have been launched in the wake of CD, such as Super-Audio CD (SACD) and DVD-Audio (DVD-A) discs. Both are roughly equivalent to today's high-resolution audio files, but neither physical format has gained much traction with consumers.

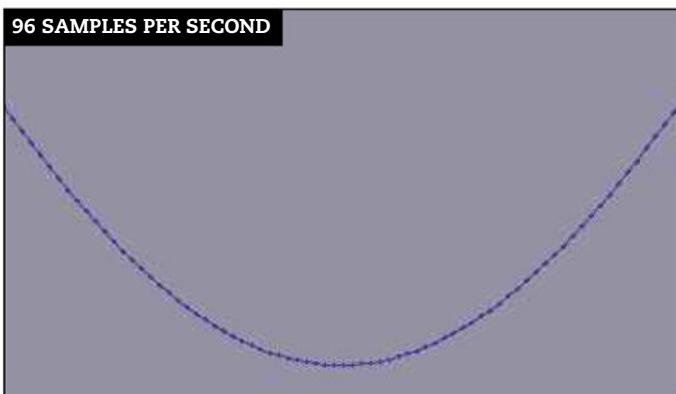
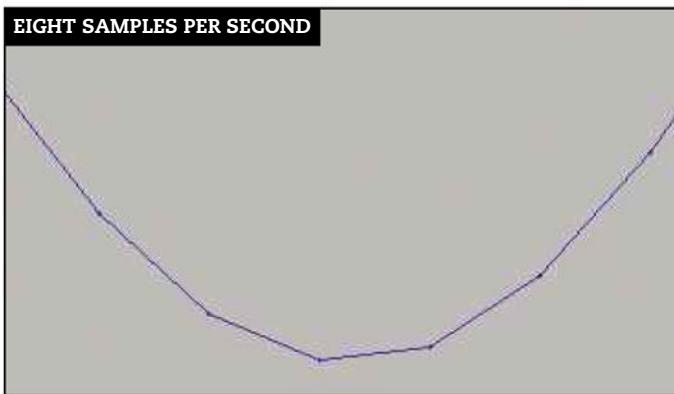
Blu-ray audio also has high-resolution capabilities (with a 192kHz/24-bit specification), and can use this quality for each channel in a 5.1 audio recording, rather than just stereo. Many Blu-ray players and AV receivers can output high-res audio.

Define your terms

The term 'high-resolution audio' is commonly used to refer to any audio file that's above standard CD quality of 44.1kHz and 16-bit; it's also called 'HD audio'. The most frequent combinations are 88.2kHz/24-bit, 96kHz/



↑ High-res ready:
Sony's Walkman NWZ-F886



▲ At 8kHz, there are fewer points of data available to reconstruct the sound from, making it a less accurate reproduction of the original analogue waveform

24-bit and 192kHz/24-bit. Those figures refer to the sample frequency and bit depth of the digitised pulse-code modulation (PCM) audio.

Bit depth is a measurement of how much data is used to encode the digital signal. The bit depth of a digital audio recording is similar to the bit depth of a scanned image. The higher the number of bits (the 1s and 0s used to encode the data), the more accurately the original sound is reproduced, in the same way that high bit-depth images have more precisely rendered colours.

Bit depth shouldn't be confused with bit rate, which is a measurement of data throughput in time, usually expressed in bits or kilobits per second, such as 320kbit/s or 128kbit/s. This tells you how much data is used for each second of audio and determines the quality of MP3s and other lossy audio codecs, where the amount of audio data has been crunched down to a specific size.

Sample frequency, or sample rate, refers to the number of slices into which an analogue waveform is divided when it's recorded digitally. The more slices that each second of digitally recorded sound is divided into, the more closely it will resemble the smooth analogue waveform it reproduces.

Frequency in sound most commonly refers to the number of vibrations a sound wave makes every second. This determines the pitch: slower vibrations create lower tones, faster ones make high-pitched sounds. Middle C has a fundamental frequency of 261.63Hz, some pipe organs can produce sounds as low as 32Hz and as high as 5kHz, and a piccolo's highest frequency is 4kHz. Many instruments produce higher and lower frequencies, but sounds at the bottom end of the frequency spectrum are more felt than heard, while higher frequencies are often overtones and harmonics, contributing to the overall impression of the sound but harder to pinpoint as a part of the melody.

The bottom threshold of human hearing is about 12Hz, but in practice is more realistically put at around 20Hz, and the upper threshold is at around 20kHz, although this varies somewhat between individuals, and younger people can generally hear higher frequencies.

A critical point about high-resolution audio is that it uses lossless audio codecs such as FLAC and ALAC, rather than lossy MP3 or AAC formats. Even standard CD-quality audio, encoded losslessly, will benefit by not having data thrown away during the compression process.

On the downside, lossless compression results in larger files, which take up more disk space and require more time to download if you buy them online. This problem is multiplied when they contain high-resolution audio recordings. A typical high-resolution audio file weighs in at a whopping 112MB, so you'll need a lot of storage space.

Sound reasoning

So, if the highest frequency audible to the human ear is 20kHz, why would you want to reproduce frequencies above that? Well, for technical reasons we won't delve into here, your sample rate must be twice that of your highest frequency, so a CD's 44.1kHz sample rate means that its recording can include frequencies of up to 22kHz. But that only covers sample rates up to CD or MP3 quality, so why go as high as 192kHz?

The simple reason, which has been enough to convince audio purists, is that higher sample frequencies produce something that's closer to the original analogue waveform, and

it's always better to avoid any more data loss than absolutely necessary. Those releasing high-resolution music are quick to point out that high-res audio brings all the qualities of the original studio master to your home, including sounds left out when converting the studio master into a CD master.

However, there's no conclusive scientific research to support claims that humans respond to ultrasonic frequencies, while double-blind tests have found that even a trained ear can't distinguish between 44.1kHz and higher sample rates.

Even if the benefits of high sample frequencies are still up for debate, however, there's no argument about the advantages of an increased bit depth. The more bits used to represent each section of sound, the more accurately it will be reproduced, just as a 16-bit image reproduces colour far better than an 8-bit image.

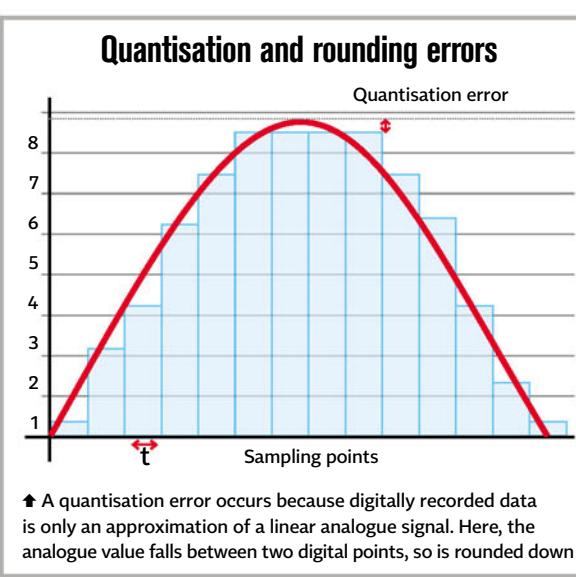
The available bit depth determines the dynamic range that a recording can have, as well as its signal-to-noise ratio (SNR). When there isn't enough data being recorded (in other words, enough bits to reproduce the original signal accurately), you get quantisation errors, which commonly manifest as distortion.

Low bit depths are prone to quantisation errors. If you're converting an analogue signal to a digital one, a quantisation error is the difference between the real analogue value and the digitised value. Think of it as a rounding error.

There are plenty of techniques used to minimise quantisation noise. Dithering is intentionally introducing noise across the audible spectrum so that the noise introduced by the error becomes unnoticeable to the human ear. The other key technique is noise shaping, which uses complex algorithms to spread error noise unevenly into frequencies that are inaudible to the human ear.

Lessons in reproduction

Now we've established what high-resolution audio is and how it can improve your listening experience, we'll take a look at how you can go about getting the hardware and music to try it out for yourself.



HARDWARE

As we've discussed, not all hardware supports high-resolution audio. Although portable digital media players have helped to make music more accessible and readily available than it's ever been before, many of them have surprisingly poor audio quality. The majority of music player manufacturers have opted for low-cost digital-to-analogue conversion solutions that sound good enough.

The high-res MP3 player market is set to heat up in 2014, though. The Sony Walkman NWZ-F886 is the first big-name MP3 player with high-resolution audio support to hit the UK. This Android-based player, reviewed on page 50, supports all the major high-resolution formats at up to 192kHz/24-bit.

There's also a lot of hype surrounding Neil Young's Pono, a proposed music download service and player. It's set to support high-resolution audio, although technical details are thin on the ground. What isn't in doubt is the support of the big music labels.

Headphones

Most headphone drivers are designed to output sound frequencies between 20Hz and 20kHz. In-ear headphones, and even high-end in-ear monitors, tend to have less high frequency reproduction than over-ear headphones, despite high frequencies often sounding more pronounced through them.

On-ear headphones, particularly high-end cans, are more likely to have a wide frequency

response, and some are specifically designed to work with high-frequency audio sources.

Any set of headphones can benefit from the extra detail provided by high bit depths, but if you want the full high-frequency audio experience, you'll need headphones with a wide frequency response. This information is published by retailers and manufacturers and always appears in our reviews.

The Sony MDR-10RC headphones are specifically sold for use with high sample-rate audio sources and have drivers with a frequency response of 5Hz–40kHz. They're among the smallest and most portable high-frequency response headphones we've ever tested and sound fantastic.

Beyerdynamic's Custom One headphones are a proper set of cans with generally excellent audio quality and a frequency response of 5–35,000Hz. At £155, though, they're rather expensive, but their 16 ohm impedance means that you can use them with a portable media player as well as a home hi-fi, despite their size.

Home hi-fi

Like headphones, getting speakers with a wide frequency response means that you'll be spending quite a while studying spec sheets. Generally speaking, only speakers with supertweeters can produce frequencies above 20kHz, and it's usually only very high-end speakers that have these dedicated high-frequency drivers.



▲ Sony's new MDR-10RC headphones are sold on the strength of their 5Hz to 40kHz frequency response

When it comes to pricing that's a bit friendlier to your average man in the street, Sony's £499 SS-HA1 high-res speakers include supertweeters and have a frequency response of 48Hz–50kHz. Alternatively, the Sunfire HRS-SAT4, at around £700 for two, have tweeters that have been designed for high frequency performance and a frequency response of 95Hz–30kHz.

Home hi-fi was the first place where high-resolution audio really took hold, albeit starting with the ultra-premium end of the market. If money's no object, it's easy to spend tens or even hundreds of thousands of pounds on speakers.

Scottish high-fidelity audio specialist Linn has been supporting high-resolution music formats and producing the hardware to play them for years. We went to see and hear the company's latest £50,000 Klimax Exakt 350 DSM and loudspeaker combination. For that, you get a pair of massive speakers with a frequency range of 20Hz to 33kHz, six individual drivers, including supertweeters, each of which is fed by its own audio channel, DAC and power amp. Meanwhile, the Exakt 350 DSM network music player is built to provide exactly the signals the speakers need and can take sources from your network or nine different external inputs.

Fortunately, as is always the case, technology from premium products has filtered down to home hi-fi systems that are within the grasp of the average consumer. The Sony HAP-S1 hard disk player, reviewed on page 51 of this issue, isn't exactly a budget model as it costs £799, but it is far more attainable than the multi-thousand pound systems mentioned above.

Even cheaper, the £400 Denon Ceol Piccolo streaming audio receiver, which won our Best Buy award a few months ago, supports FLAC and Wav files at up to 192kHz/24-bit. Note, though, that the SC-N5 speakers it comes with only have a frequency response of 60Hz–20kHz, so you'll need an alternative pair of headphones or speakers to get the most out of its high-resolution output.

WHERE TO BUY: GETTING HOLD OF HD AUDIO

While high-resolution disc formats are available in the form of audio DVDs, Blu-rays or Super Audio CDs, it's far easier to buy high-resolution music online. High-resolution copies of albums or individual tracks are typically more expensive than standard resolution versions, but not always by a great deal.



www.hdtracks.com

HDtracks is an American retailer that specialises in high-resolution audio, including lots of blues, classical and Americana. The only catch is that not all of its catalogue is available to buy if you're in the UK. Regardless of where you live, you can get a rather good free sampler just by clicking through to the Hi-Res store and signing up.



www.qobuz.com

This French distributor has a wider range of music than most high-resolution specialists, but bear in mind that not all of its content is high-res. Fortunately, studio master quality records are tagged accordingly and you can refine your search results by selecting the bit rate and sample frequency you want. With over 2,000 albums available at 96kHz or 88.2kHz, there's a wide range to choose from, including big-name artists such as Muse, Daft Punk and David Bowie, and high-resolution albums cost only a couple of euros more than their standard equivalents.



www.linnrecords.com

As well as producing insanely high-end audio hardware, Linn has a record label. The reasoning behind this is that the company wished to make available recordings that really took advantage of the equipment it made. It was one of the first to sell high-resolution audio online and goes out of its way to license and distribute studio master recordings. Much of its small but carefully chosen catalogue is made up of jazz and classical music, with a bit of classic rock on the side, but you'll find the occasional album from artists as diverse as Katy Perry and Bob Marley.

PC audio

If you want to listen to high-resolution audio files on your PC, which is probably where you'll be storing them, you're in luck. We're not fans of the way motherboard or laptop audio sounds compared to a dedicated sound card, but many onboard Realtek chips, such as the ALC889, support high-resolution sound. See the 'Hear the difference for yourself' box (right) to find out how to take advantage of equipment you may already have.

Most modern internal sound cards are capable of high bit depths and sample rates, and use higher-quality components that sound better than onboard audio. The same applies to many external sound cards, too, and all music production-oriented audio devices. If you're going for the USB option, you may be best off with a dedicated digital-to-analogue converter (DAC) unit. Lacking the recording and audio processing capabilities of multipurpose sound cards, USB DACs are pure high-quality output devices.

The award-winning Arcam rPAC is a good place to start. At £150, it's more expensive than most sound cards, but not painfully so. It supports files of up to 96kHz/24-bit and can output sound via either a headphone port or a pair of stereo phono connectors. It's well made and provides great audio quality at every level. Bear in mind that, to get the most out of a high-resolution audio device, you'll have to configure your operating system's settings appropriately, as explained in the 'Hear the difference for yourself' box.

SOFTWARE

If you're going to be using your PC to rip or listen to high-resolution audio, be aware that not all media players can handle all the formats used to encode it. iTunes is massively popular, but the only lossless file types it can read are Wav, AIFF and ALAC; if your music is in FLAC format, you're out of luck.

Windows Media Player can be made to support FLAC by installing the Media Foundation FLAC Codec (<http://sourceforge.net/projects/mfflac>) and WMNP Tag Plus (<http://bmproductions.fixnum.org/wmptagplus>), but it's easier to use a media player with built-in FLAC support, such as XBMC, MediaMonkey and VLC, all of which you can find online.

If you like to control every aspect of your audio processing and encoding, Foobar2000 (www.foobar2000.org) is an open-source media player for Windows that's designed to be expandable through components. It plays FLAC, and a huge range of other formats, natively. If you want to rip high-resolution audio files from a disc, you'll need to download the free Foobar2000 encoder pack from www.foobar2000.org/

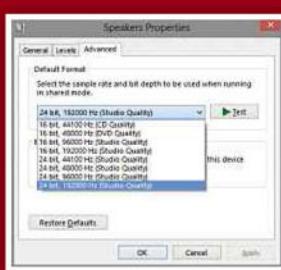
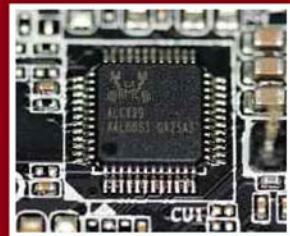


► Arcam's rPAC is one of our favourite USB DACs

HEAR THE DIFFERENCE FOR YOURSELF

It's all very well reading about high-res audio, but it's far better to have a listen and judge for yourself. Many PC users have the tools they need already at their disposal. The only kit you're unlikely to have lying around is a pair of headphones or speakers with a wide frequency response. However, any decent pair of headphones, such as our recommended £35 SoundMagic E10 in-ear pair, will show up the advantages of higher bit depths. Check your headphones' or speakers' frequency response on the manufacturer's website.

1 See if your sound card, whether a dedicated model or the audio codec chip in your motherboard or laptop, supports high-resolution audio. The easiest way is to check the spec sheet, but you can find out by trial and error. You'll get better quality sound from a dedicated sound card than from motherboard audio, but as Windows defaults to the lowest common denominator when it comes to sound settings, simply making sure this setting matches your sound card's capabilities will improve your system's audio potential.



3 Get some free high-resolution music. There's a free sampler album at www.hdtacks.com, and you can also get free high-res tracks at www.2l.no/hires/index.html and www.lessloss.com/high-resolution-audiophile-recordings-c-68.html.



encoderpack and a decoder for your original disc, such as the DVD-A Audio Decoder (<http://sourceforge.net/projects/dvdadecoder>).

Trick or treat?

High-resolution audio is hailed by some as a development that will revolutionise music, while others regard it as snake oil to sell overpriced audio hardware. The truth is somewhere in between.

High sample frequencies continue to be of debatable use.

While there's evidence that high-frequency sound reproduction doesn't make any perceptible difference, those with sensitive hearing nonetheless consistently report improvements because of it.

Others hold that accurately reproducing the acoustic effects

that high frequencies have on lower frequencies – a form of intermodulation distortion – gives the listener a more realistic picture of how the music was meant to sound.

There's no such debate when it comes to high bit depths; 24-bit audio unquestionably improves the quality of audio, simply because, with more data to work with, the measures required to make quantisation errors less perceptible to the human ear are more subtle.

It's a safe rule of thumb that a more accurate re-creation of the original recording is always better. The use of lossless digital music encoding means all music, regardless of resolution, doesn't suffer the data loss inherent in formats such as MP3. Finally, to make the most of and popularise high-resolution audio, manufacturers are making better audio equipment that's now more accessible and affordable than ever. High-resolution audio is set to make the world of music better, even if it's not always for the reasons that some enthusiasts may claim. ■

Business Help

If you have databases, office applications and macro issues, **Kay Ewbank** can help. Send your problems to businesshelp@computershopper.co.uk

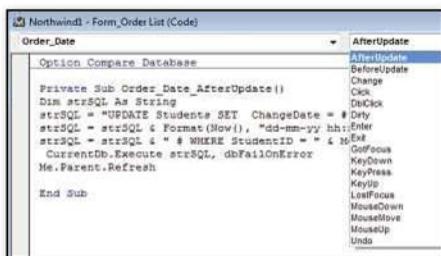


Updating dates in Access



In my Access database I have a subform contained in a main form.

The main form has a date field that is used to indicate when the data on the form was last changed. The control is called



```
Private Sub Order_Date_AfterUpdate()
    Dim strSQL As String
    strSQL = "UPDATE Students SET ChangeDate = #"
    strSQL = strSQL & Format(Now(), "dd-mm-yy hh:nn")
    strSQL = strSQL & "# WHERE StudentID = " & Me!StudentID
    CurrentDb.Execute strSQL, dbFailOnError
    Me.Parent.Refresh
End Sub
```

↑ Use a SQL statement to update a field on the main form from a subform in Access

ChangeDate, and I have code that updates the value to the current date using the Before_Update event. However, the date should also be updated if changes are made to the data on the subform, so I know when things have been altered overall. I assume I should be using the subform's Before_Update event, but I don't know how to go about it.

John Saunders

A We'd use the After_Update event on the subform. Write an SQL statement to update the current record on the main form. If your main form contains records from the table Students and your subform contains StudentDetails, linked on the field StudentID, you might use code such as:

```
Dim strSQL As String
strSQL = "UPDATE Students SET
    ChangeDate = #"
strSQL = strSQL & Format(Now(), "dd-mm-yy hh:nn")
strSQL = strSQL & "# WHERE StudentID =
    = " & Me.Parent.StudentID
CurrentDb.Execute strSQL,
dbFailOnError
Me.Parent.Refresh
```

This creates a string along the lines of 'UPDATE Students SET ChangeDate=#28-11-13 10:30# WHERE StudentID=1023'. We've assumed you do need the time as well as the date; if the only thing that matters is the date, you could use Date() instead.

Disappearing links in Excel



I'm having problems with Excel 2010. If I email a table from Excel that contains hyperlinks, and paste the table into Outlook, the path data in the link disappears. Also, I have Excel spreadsheets that contain many hundreds of links to other documents on our server. The links work to begin with, but over time they get shortened without me changing them. Say I have a link such as \\SalesServer\Products\SalesData\Shopfile.xls. On some spreadsheets the link changes to \\SalesServer\Products\. In the large spreadsheets, not all the links are lost, just some. On other spreadsheets, the link changes to Shopfile.xls. What is going on?

Emma Lawson

A Excel 2010 is notoriously bad at storing hyperlinks. We think the problem you're experiencing when the path disappears is happening because the spreadsheet and the file it's linking to are in the same directory. In this case, Excel stores the path as a relative path. As the relative path is the same directory, there's no need to keep the path. You could store the linked files in a different directory, but that's not a very satisfactory solution.

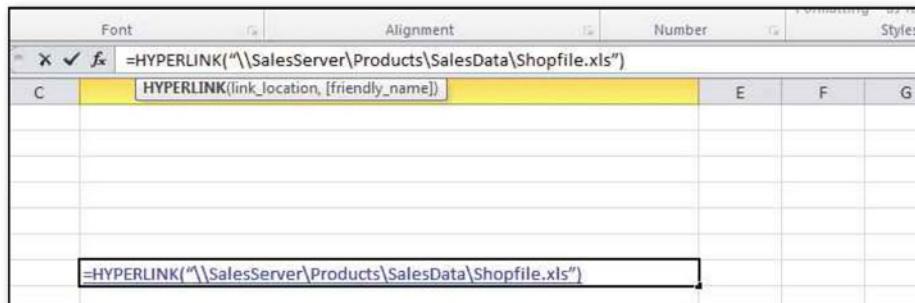
If you know the links shouldn't be updated once entered, you can set up Excel to prevent this happening. In the File menu click Options, and in the dialog that appears, click Advanced. In the General section, click the Web Options

button. In the Files tab, untick 'Update links on save'. This will leave links as you enter them.

If you're still having problems, there's another setting you can change which is set on a spreadsheet-by-spreadsheet basis. From the File menu, choose Info. In the dialog that appears, click on 'Show all properties'. This is located on the right-hand side of the page. In the list that appears, click on Hyperlink Base. Set this to a folder you're never going to use, possibly even a folder that doesn't exist. You might choose \\FakeServer\FakeFolder\ as the non-existent folder. This is the default start added to a link where you don't specify the full path, and it shouldn't have any effect if you've entered the full path, but it does sometimes solve the problem you reported.

However, our final suggestion works no matter how Excel is set up. Basically, Excel has a function called =Hyperlink(). If you want to open a file located in C:\data, you'd type =HYPERLINK("C:\data\house proj.xls"). For your example, you'd use =HYPERLINK("\\SalesServer\Products\SalesData\Shopfile.xls").

The advantage here is that the link is entered as static text, and Excel interprets it anew each time from that static text, so there's no chance of the link being shortened due to Excel trying to be clever.



Font	Alignment	Number	Styles
x ✓ f =HYPERLINK("\\SalesServer\Products\SalesData\Shopfile.xls")			
C	HYPERNLINK(link_location, [friendly_name])	E	F G
	=HYPERLINK("\\SalesServer\Products\SalesData\Shopfile.xls")		

↑ Use the Hyperlink function to prevent Excel altering links

Strange handling of contacts in Outlook

Q I use Outlook 2010, and there's one thing about it that really irritates me. Why do some email addresses have single quotes added to them by Outlook, yet others don't? Also, why are contacts listed in different ways, so you end up with 'John Smith', 'Smith, John', John Smith and Smith, John. If I want to sort my Sent folder by the name of the recipient, I have to look in three or four places to find the email I'm looking for. Is there a way to remove the quotes?

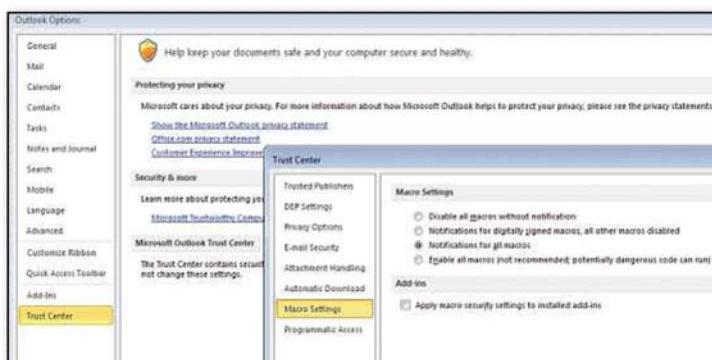
Bill Scott

A This is a well-known complaint about Outlook, but it's not entirely Outlook's fault. The argument from Microsoft is that the format of email addresses is set by the sender, and Outlook is just showing you how the email address was formatted when the email was sent. However, it isn't as simple as that.

If you send an email to someone whose name isn't in your Contacts folder, Outlook will add quotes. So you could just add the address to your Contacts folder before you send them an email, although this would probably clog up your Contacts list with people you're never going to contact again. In our experience, the most irritating thing is when you exchange emails with someone, decide the contact is worth adding and end up with emails to that person both with single quotes (those you sent before adding the contact) and without (those sent after you added the contact).

You could try an Outlook field called E-mail Display As. This lets you specify how an email address should be organised in terms of first name, last name. Although this option is hidden in Outlook 2010, it is present. You can add it to the current view from the View menu. Choose Add columns, then look in All Contact fields for Emails Display As, and add it to the view.

If you really want to get rid of the quotes, you can use a VBA macro, as long as your company allows you to do so. To do this, you



► Enable macros in the Outlook Trust Center in order to run the macro to remove quotes round email addresses

must first enable macros, as Outlook blocks them by default. From the File menu, choose Options, then choose Trust Center, Trust Center Settings, Macro Settings. The setting you want is 'Notifications for all macros'. Once you've run the macro, go back into Trust Center Settings and choose one of the more secure options. Next, customise the Office Ribbon to add the Developer Tab, using File, Options, Customize Ribbon and tick the Developer item.

On the Developer tab, click on VBA Editor and enter the following code:

```
Private WithEvents SentItems As
Outlook.Items
Private WithEvents Inbox As Outlook.
Items

Sub Remove_Quotes()
Dim olApp As Outlook.Application
Dim nNamespace As Outlook.NameSpace
Dim curfolder As MAPIFolder
Dim Itm As MailItem
Set olApp = Outlook.Application
Set Inbox = GetNS(olApp).
GetDefaultFolder(olFolderInbox).Items
Set SentItems = GetNS(olApp).GetDefault-
Folder(olFolderSentMail).Items
Set nNamespace = Session.Application.
GetNamespace("MAPI")
Set curfolder = nNamespace.
```

GetDefaultFolder(olFolderInbox)

```
For Each Itm In curfolder.Items
If InStr(1, Itm.To, "", vbTextCompare) > 0 Then
    Itm.To = Replace(Itm.To, "", "")
    Itm.Save
End If
Next
```

```
Set curfolder = nNamespace.GetDefault-
Folder(olFolderSentMail)
For Each Itm In curfolder.Items
If InStr(1, Itm.To, "", vbTextCompare) > 0 Then
    Itm.To = Replace(Itm.To, "", "")
    Itm.Save
End If
Next
End Sub
```

```
Function GetNS(ByRef app As Outlook.
Application) As Outlook.NameSpace
    Set GetNS = app.GetNamespace("MAPI")
End Function
```

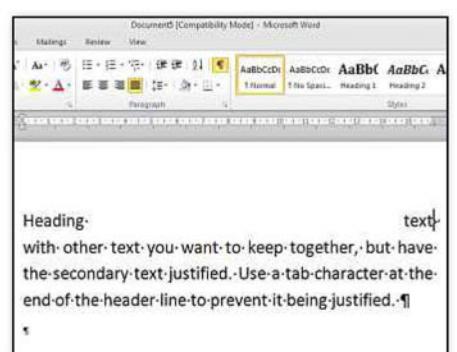
Once you've entered the code, save it and run the macro Remove_Qualities. The single quotes in your Inbox and Sent folders will be removed.

Why can't I justify text in Word?

Q I'm writing a document in Word, and I have several pages that contain lists. These lists come in the form of a heading with the list items on the next line. I keep the details with the headings by using a line break that I insert using Shift-Enter. All is fine, apart from the fact I can't set the style I use to include justified text, because that also justifies the heading as part of the same paragraph. This looks horrible, as the text of the heading is spread right across the line. Is there a list format that would let me do what I want?

Ian Stevenson

A There are several ways to do what you want, all of which have some advantages and drawbacks. You could use a table layout instead of a list, then you can justify the detail row and not the header row. If you want to stick with lists, you can create two paragraph styles, one for the heading and one for the rest of the list, with all the other details being the same. You then choose the appropriate style for the different parts of the list. Another neat option is to add a tab character to the end of each of your heading lines before you press Shift and Enter. You can then justify the heading line without the text being spread across the line. □



► Add a tab character to a heading line to prevent erroneous justification

Helpfile

Whatever your general PC, hardware and software woes, **Simon Handby** is here to help. Send your problems to help@computershopper.co.uk



Kaspersky slows down my internet access

Q I am a long-time subscriber to your magazine, and following your rave reviews of Kaspersky Internet Security I bought a three-PC licence of the 2012 version. Before installing it, I removed my BT NetProtect Plus (provided by McAfee) due to the poor protection you've said it offers. Since then, I've been having huge problems with very slow connection and download speeds on my two PCs and laptop.

I struggle with my broadband connection. I don't have the most impressive broadband speed anyway, with downloads of 1.63Mbit/s. But using the BT Wholesale broadband speed test program, the speed I now get on the computers with Kaspersky running can be as low as 20kbit/s, and is usually 300-500kbit/s.

When I paused Kaspersky protection, the speed leapt to 1.25Mbit/s, but unpausing the protection caused it to drop again, so I think the software is the problem. I'd be interested to hear if you found similar problems when you reviewed the product, because I don't recall you mentioning it.

Tony Woodroffe,
ajwoodroffe@btopenworld.com



↑ We couldn't reproduce any download speed issues with the latest version of Kaspersky Internet Security

A We haven't previously noticed any impact on download speeds with Kaspersky or other anti-virus software, although we usually test on much faster broadband connections than yours, where a small performance impact wouldn't be as significant or easily noticed. In theory, it's quite possible that anti-malware software could slow down internet access, as it must intervene in the internet connection and test incoming files before allowing software to access them. Any delay in this scanning might slow down internet access.

With this in mind, we tried to recreate your issue by artificially restricting a computer's broadband connection to about the same speed as yours. Using Kaspersky Internet Security 2014 (see our anti-virus group test in Shopper 312), we measured download and upload speeds using both the BT Wholesale speed tester and our favoured speedtest.net test, repeating tests with protection enabled and paused. In all cases, the speeds we measured were comparable, with no noticeable performance drop when Kaspersky was active. You weren't specific about your broadband issues, but we tried throwing in some packet loss to simulate a poor quality connection; the measured broadband performance was unaffected by whether Kaspersky was active or not.

We couldn't recreate your problem, but we found a few complaints on the Kaspersky forums about slow web browsing with Internet Security 2012. Given that the software is a couple of years old, it's worth upgrading it if you have a current subscription, or renewing your subscription if you don't; a dated malware-threat database offers little protection.

Staying focused in Windows

Q I am becoming increasingly annoyed by Windows 7 processes that appear to steal the focus while I'm trying to type an email or letter. I can be typing away only to look up to see that the cursor has disappeared and much of what I have typed is not there. It is mainly a problem shortly after booting up, when there seems to be some hard disk and internet activity going on.

I have opened Task Manager to see if I can identify a culprit application, but there is no other application running and the processes list tells me nothing. I must repeatedly click on the document to return the focus to the application I want to use. Typing this letter in Word, I have had to do this about eight times so far! This problem can also happen in my email client or while renaming a file or folder.

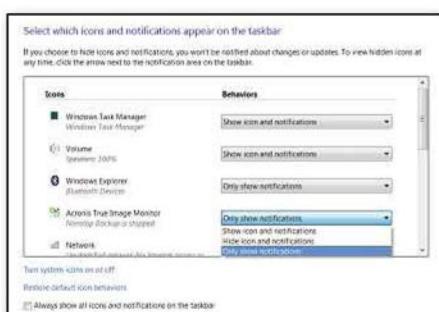
Clearly, there is some piece of software that thinks it is more important than anything I want to do on my computer, and

it's extremely annoying. Can you help me fix the problem?

RG Willis, rg.willis@btopenworld.com

A We've all had this problem from time to time, although it became much less common from Windows 7 onwards. When it happens now, it's usually down to a particular program starting up or trying to alert you to an issue. Using Task Manager can be a good way to track down the culprit. Select the Processes tab, click the button at the bottom to show processes from all users, then click the CPU heading to sort by the most active process. Then keep an eye out for any process that suddenly becomes active just as you lose focus – if one stands out, try disabling or uninstalling the software.

Although you may not be aware of other applications being open, there are probably plenty of processes set to start with each



↑ Windows 7 makes it easy to reduce distractions, but it's best to uninstall unwanted software

boot. Click the up arrow in the Notification Area of the taskbar and check for icons relating to programs you don't need. Even when you need a program such as a graphics driver, you may not need its Notification Area icon; right-click it and look for an option to disable it, or click Customize and change the icon behaviour so only notifications are shown. It's a good idea to occasionally review the software you have installed and uninstall anything you don't use.

Is my Windows 8 broken?

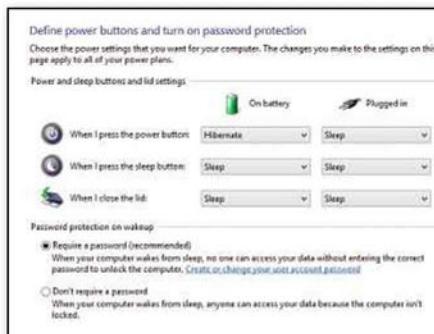
Q I'd just got used to the Windows 8 interface when Microsoft released Windows 8.1 and kept nagging me to install it via the store. Everything seemed to go smoothly with the update. However, a couple of days later, my Dell laptop started failing to shut down, reporting that my PC had run into a problem and needed to restart. Each time, the fault seemed to lie in a different module or component. On restarting, Windows 8 sometimes loaded normally, but increasingly frequently the computer would encounter an error and loop through several reboots until arriving at a Recovery screen offering me a button to 'See advanced repair options'.

If I click Restart my PC, this seems to load the OS normally, after which I'm prompted to send details to Microsoft about what went wrong. The problem now seems to happen whenever I restart. Can you help?

Tony Clarke

A We haven't heard many reports of problems with the Windows 8.1 upgrade, other than the issues that caused it to be withdrawn temporarily from availability on Surface RT. The random distribution of errors you're seeing doesn't shed much light on things, and we haven't been able to recreate a similar problem. With that in mind, there are three things we'd suggest. The first is to open the Start screen, type Power and click 'Change what the power buttons do'. At the bottom of the Settings screen, untick 'Turn on fast startup', save the changes and try shutting down and restarting.

If this doesn't work, re-trace your steps to re-enable the option, then re-open the Start menu, type CMD and right-click Command



▲ Turning off fast startup could prevent problems

Prompt and click Run as Administrator. In the Command Prompt, type 'SFC /scannow', hit Enter and wait for Windows to check and repair any problems it finds with the system files.

If this reports problems which were fixed, try shutting down and restarting. If you're still having problems, you must do something more dramatic. After backing up your PC, hold down the Shift key while you restart your PC; this should force it to display the boot options screen. Choose Advanced repair options, click Troubleshoot and then click the Refresh your PC button.

Refresh will return the OS to an 'as installed' state. Your data should be untouched, but you'll need to reinstall all apps and other software, repeat any changes made to Windows' default behaviour and apply available Windows updates. Once you've done this, the Windows 8.1 update should appear in the Windows Store and you can try to install it. Before you do so, though, run a virus scan and perform a memory test. You can perform a memory test by opening the Start screen, typing Memory, applying the Settings filter and clicking 'Diagnose your computer's memory problems'.

Toiling with tiles

Q I'm having trouble with Windows Explorer. Whenever I open My Music, the view is set to details, even though I keep setting it to tiled, which I prefer. It's driving me nuts. Please can you help me set it to tiles permanently?

Randolph Attarm, rmat29@aol.com

A You haven't said which version of Windows you're using, but this should be an easy problem to fix on Windows Vista or later. If you've got Windows 8, open a music folder, switch it to the tiled view and then open the View menu from the menu bar along the top of the window. Drop down the arrow below Options, on the right-hand side, and select 'Change folder and search options'. Click the View tab, click the Apply to Folders button near the top, and then click Yes when prompted if you want all folders of this type to match the view settings. In Windows 7 and Vista, the folder and search options settings can be found in the Organize menu at the top left of the Explorer window, but the settings are the same.

There's a similar option in Windows XP; it's called Folder Options... and it can be found via the Tools menu in Explorer. Unfortunately, this applies the change to all folders on the PC, not just to folders showing music. However, under the Advanced settings window, if you ensure that 'Remember each folder's view settings' is ticked, you should find that Windows remembers to show tiled contents when you open a music folder in which you've previously switched the view type.

Lacking storage in Android

Q I have a Sony Xperia J smartphone, which I do not use a lot. It doesn't contain any photos or videos except those it came with, and my music is stored on the SD card. Recently, when the phone downloads and tries to install updates after switching on, I get an 'Insufficient storage available' error. Today, this warning appeared for YouTube, Twitter, Google Play Music, Facebook and Chrome. The phone statistics show the total internal memory available as 754MB, with Apps that use 591MB leaving 120MB free. I don't have many apps on my phone; how do I stop this error occurring?

Keith Jonesm, senoj07-disp@yahoo.co.uk

A It sounds as though the figures you've given are for the phone's memory (RAM) rather than its storage, and that the error you're seeing relates to a lack of storage space for installing

and updating apps. There should be 4GB internally on the Sony Xperia J, which is fairly easy to fill on Android even if you've added extra space via a microSD card. Swipe down the status bar at the top of the homescreen, tap the icon at the top right, then tap Settings, scroll down and tap Storage. You'll see a breakdown of the phone storage used.

We suspect that the available storage will be close to zero on your phone. If so, you can work out where the bulk of the storage is going by looking at the space used by each category of data. Apps is likely to be the biggest culprit, and you can see which apps are using the most space by tapping Apps and viewing the list; those using the

most are at the top. Tapping a specific app will show you details of its storage use. Here you can recover space by tapping 'Clear data', but apps will generally need much of the data they've stored and may simply download it again.

Some Android phones have an option in the App summary to move the app and its data from the internal storage to the SD card. We didn't have an Xperia J handy to check, but we don't believe it supports this. If it does, applying the option to apps with high data demands should free up plenty of space on the phone storage. Remember that you'll lose access to an app and its data if you move it to the SD card and subsequently take the SD card out of the phone. ☐



▲ Android shows you what's using its internal storage

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Unshackling your PC from its OS with VirtualBox

Install Linux without risking data, test Windows updates, archive your PC or improve security: **Clive Webster** presents the flexibility of virtualisation



A VIRTUAL MACHINE (VM) is extremely powerful. A VM mimics a physical computer but runs in its own self-contained bubble within your current PC. You can do what you want to the virtual machine and it won't affect your main operating system, and when you don't want the virtual machine any more you can simply delete it like any other file.

Virtual machines allow you to do a whole host of things safely and effectively. You can try out new operating systems such as Linux without affecting your current Windows installation; see if you really get on with a new version of Windows before you upgrade; and download files you don't completely trust without risking infecting the host PC with any malware, to name just a few.

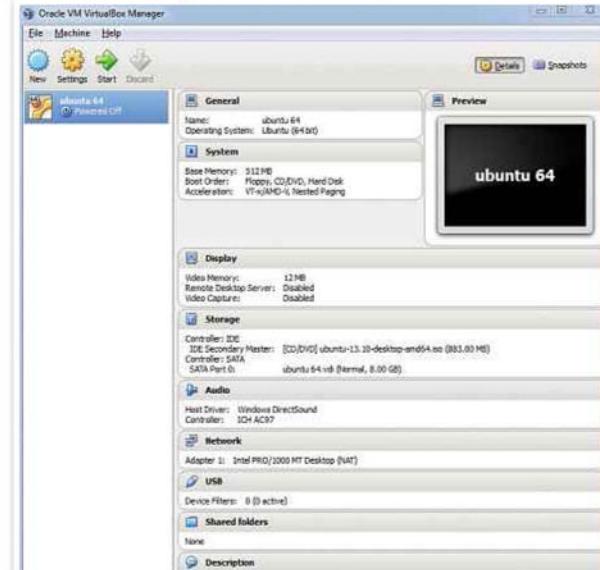
In this month's *Advanced Projects* we'll take you through using Oracle's free VirtualBox software to create and manage virtual machines, and how to use these machines for the purposes above.

VBOXING CLEVER

Download Oracle's VirtualBox and the Extension Pack from www.virtualbox.org/wiki/Downloads.

Once downloaded, launch the VirtualBox installer; unless you want to install the program in a specific place, you should just click Next on every dialog box of the installer. Be aware that VirtualBox will temporarily disable your network connections during installation, so make sure you're not downloading anything important at the same time.

When VirtualBox automatically launches, open the File menu and click Preferences. Click the Add icon on the dialog box that appears and navigate to the downloaded Extension Pack. Click on the downloaded file and then Open. A dialog box will ask whether you want to install the Extension Pack; click Install and then either carefully read the licence terms or just scroll to the bottom and click Agree. After the Extension Pack has installed, click OK and

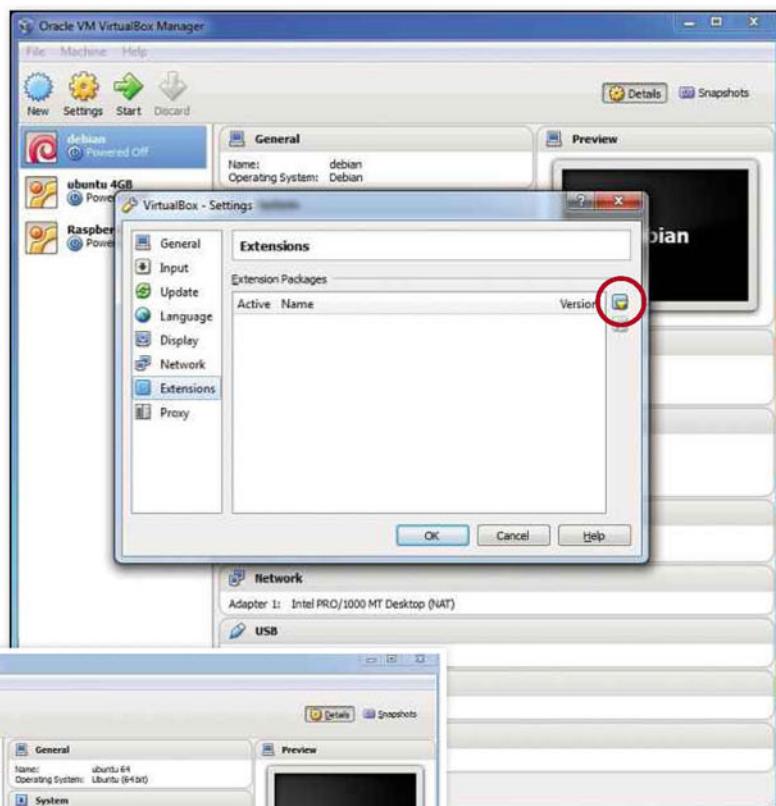


↑ The VirtualBox home screen clearly lists all your virtual machines and their settings in an easy-to-follow interface

OK again to go back to the VirtualBox home screen, currently bereft of virtual machines.

AN UBUNTU VIRTUAL MACHINE

We'll use the 64-bit version of Ubuntu 13.10 for our first example, so start downloading it from www.ubuntu.com/download/desktop.



← Add the Extension Pack (using the circled icon) to enable USB support, among other things

Now click on the New icon in VirtualBox. Give your new VM a name in the dialog box that appears – VirtualBox will guess the Type and Version of the operating system from the name you type, but remember that if you intend to use a 64-bit version of the operating system you need to select the 64-bit version in the drop-down Version menu. By calling our new VM Ubuntu 64 we avoided this potential slip-up.

There's very little need to change any of the other settings during the rest of the setup wizard. Even if you have loads of memory to spare, leave the memory at the suggested default (512MB for Ubuntu) as adding more doesn't particularly improve performance. Some people argue that the VMDK file format is more compatible than the default VDI, but we've found this is only an issue when sharing VMs with people that don't use VirtualBox.

We also left the suggested maximum hard disk allocation at 8GB, as that's plenty for Ubuntu and whatever applications we want

Transfer window: adding USB storage

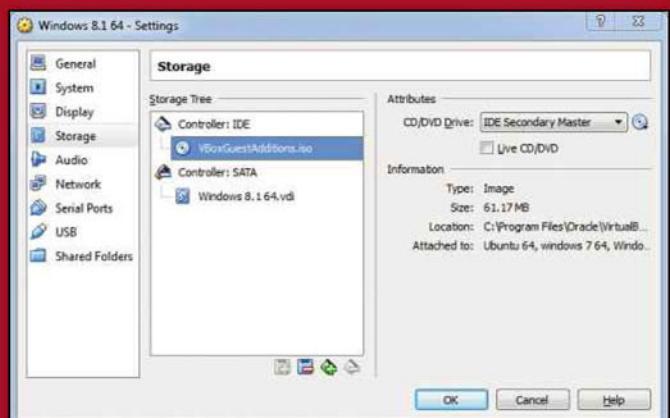
Whether you're mucking about with Linux, testing code on a VM or using a VM as a shield against malware, you'll find the virtual machine pretty limited unless you can transfer files between your host and guest OS. One of the easiest ways to do this is to use a USB storage device, such as a flash drive or external hard disk.

First, though, you'll need to enable USB support. Right-click on a powered-down VM from the VirtualBox main menu and then click Settings. Open the Storage section and click on the disc attached to the Controller: IDE device.

On the far-right-hand pane, click on the CD icon and then select Choose a virtual CD/DVD disk file. The VBox GuestAdditions ISO is stored in the same folder in which VirtualBox is installed, typically C:/Program Files/Oracle/VirtualBox. Select the ISO, click Open and then click OK on the Settings dialog box. The next time you launch the VM, the Guest Additions will install.

When the VM is running, you have several options in the Device menu. There's Bidirectional Drag 'n' Drop (to move files to and from a VM) and a bidirectional clipboard, and you can enable USB devices in the USB Devices menu. The latter is perhaps the most useful, theoretically letting your VM use peripherals plugged into your PC (though support is patchy) or take control of USB storage devices.

To take control of a USB storage device, you'll have to power the VM back down and enter its Settings menu again. Open the USB section of the Settings menu and make sure Enable USB Controller is ticked, as well as Enable USB 2.0 (EHCI) Controller. Now click on the



▲ You can access your USB device in your virtual machine's operating system

USB icon with the green plus symbol to add a filter, enabling the VM to use the device. You might have to add a filter for the USB hub to which the device is attached, even if that USB hub is integrated into your motherboard. Once you've created the filter for a USB device, you can access the device in your virtual machine's OS, but you will no longer be able to access it on the host machine. Once you shut down the guest virtual machine, you'll be able to access the flash drive in the host OS once again.

to mess about with. Increasing the maximum hard disk allocation has very few downsides, though, as the VM will use as little physical disk space as possible: if the VM contains only 2GB of data it will use only 2GB of hard disk space, whatever the maximum allocation, and will expand the virtual disk up to the limit as more space is required.

HOSTING THE MACHINE

Remember that what we have created is a virtual machine and, just as if you'd plugged a whole load of physical components into an actual motherboard to make a real machine, you'll still need to install an operating system on your new VM before it can do anything

useful. To do this, double-click the new VM to turn it on and you'll be asked to select a start-up disk. This disk will be the Ubuntu ISO file you previously downloaded, so use the folder icon to point this dialog at the downloaded file. Then click Start.

Click Restart and wait a few seconds for the DOS-like prompt to 'remove the installation media' to appear. You don't need to remove any installation media, so just press Return to reboot. For the first few minutes the VM might be sluggish, but after that it should run

“The VM uses as little disk space as possible: if it contains 2GB of data it will use only 2GB of space **”**

This is where things get a little odd, as you'll be installing a new 'guest' OS on a virtual machine that's running on your 'host' Windows installation on your physical PC;

getting your head around the terms will help when managing virtual machines. Just remember that anything that happens within the VirtualBox window is completely isolated from your Windows installation in all but the most trivial of ways, so muck around as much as you like and you'll be fine. When the installer asks whether you'd like to try Ubuntu or install it, you should select install. Similarly, select the Erase disk and install Ubuntu option when asked.

Once installed, Ubuntu will ask to be restarted to complete the installation.

pretty smoothly. You're now free to install applications, change the appearance and behaviour of the OS and do anything you're able to do with a full installation.

INSTALLING WINDOWS 8

Installing Windows 8 on to a VM is a bit trickier, as Microsoft doesn't provide trial versions of standard editions of its latest OS (as it did with Windows 7). Instead, you have to download an Enterprise Evaluation version from Microsoft's TechNet site at <http://tinyurl.com/tryingwin8>. Select the version (64-bit is best) and click the Get Started Now button. You'll be asked to log in to Windows Live and then to fill in a survey as to why your business wants to use Windows 8. Answer this however you like and you can download the ISO.

If you want to skip straight to Windows 8.1, go to <http://tinyurl.com/tryingwin81> and again log in to Windows Live and answer a questionnaire. However, rather than just downloading an ISO file, this time Microsoft insists you install Akamai NetSession Interface to manage the Windows 8.1 ISO



▲ Installing an operating system on top of an operating system may feel slightly strange, but it's completely safe

download. Install this application (you might have to allow it access through your firewall) and select the location to which you want to download the Windows ISO file. Akamai manages the download via the TechNet web page, and only when the download is complete will the file appear in the download location you specified.

Now that you have the ISO, you can set up a new VM and install Windows in the same way as we installed Ubuntu. As well as a few missing features, Enterprise Evaluation versions last for only 90 days before you'll need to install them again from scratch.

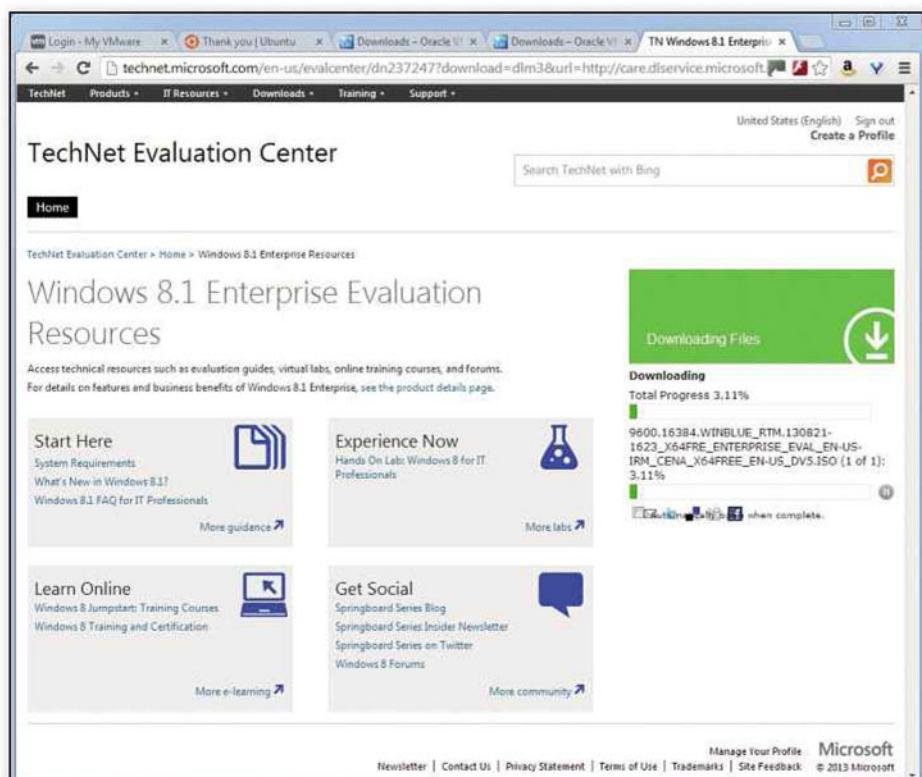
CLONING YOUR OWN PC

It's even possible to use virtual machines to create a virtual clone of a current PC. This can be useful if an old machine has programs that won't run on a new model, for example, or if you want to recycle a PC but still revisit it later for nostalgic reasons.

This process works fine for Windows XP PCs, but is trickier on Vista, 7 and 8 because of the way in which those operating systems handle boot information. To get a cloned Vista, 7 or 8 PC to work, you'll first need to use VirtualBox and a Windows installation DVD to repair the boot information; see <http://tinyurl.com/bcdfix> for details.

Download VMware's Converter for free (after registering) from <http://tinyurl.com/vmwareclone>. Unless you want to put the application somewhere specific, you can click Next on every step of the installer. When the application automatically launches, you'll need to click Convert Machine to start the cloning process.

On the next screen, select Powered on machine as the source and This local machine



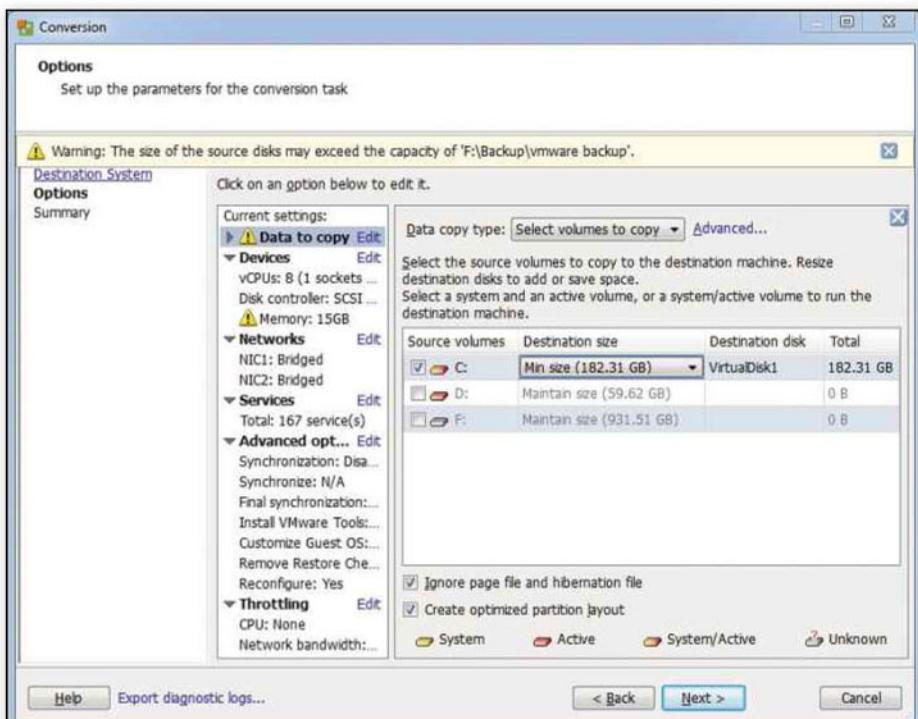
▲ Downloading a trial version of Windows 8.1 is almost suspiciously convoluted

as the specified powered on machine. Click Next and, from the Select destination type menu, select VMware Workstation or other VMware virtual machine. Under Select VMware product, choose VMware Player 6.0. Give your cloned machine a name and choose a destination for it using the Browse button; the cloned machine may come to hundreds of gigabytes, so we'd recommend using an external hard disk to store the cloned image.

The next screen is where things can get tricky. Converter will try to clone everything installed on and plugged into your system, which will cause serious problems unless you edit the settings. For a start, edit the Data to copy section so that only your system drive will be cloned (in some Windows versions there may also be a small 350MB partition left from when Windows was installed alongside your system disk, which you should deselect).

For each system disk, set the Destination size to 'Min size'. Next, edit the Devices section. Click the Other tab and reduce the CPU core count to one (otherwise the VM will gobble up all your CPU resources when you launch it) and the memory to the recommended level (so it doesn't eat all your RAM). When you click Next you'll be able to review the clone settings; this is worth doing, as the clone process can take hours once you click Finish.

When the clone process is completed, you need to set up a new VM for your clone in VirtualBox. However, this time all you need to do is select the Use an existing virtual hard drive file option on the Hard drive setup screen. Then navigate to the file that VMware Converter created and click Create. The first time you run the clone VM it will take a while to adjust to the new (virtual) hardware it's running on, but after that it should behave almost identically to your host PC. ■



▲ Clone your PC to trial how major updates might affect your operating system

NEXT MONTH

CREATE A SURVEILLANCE SYSTEM FOR YOUR HOME OR BUSINESS

Record video and send email or text alerts without shelling out thousands on CCTV.

Getting to grips with WordPress upgrades

Keeping WordPress up to date will help to keep you safe from hackers and will also give you plenty of new features, as **Nik Rawlinson** explains



THE GLOBALLY SCATTERED team behind WordPress strikes a very careful balance. On the one hand, it needs to respond to security threats while simultaneously introducing enough new features to keep its CMS ahead of the pack. On the other, it doesn't want to be rolling out so many incremental updates that we start to question whether the system is secure or, worse, ignore updates altogether.

Running outdated software is one of the biggest security threats to any online presence. Vulnerabilities in a CMS, which will be quickly disseminated through the online underground, can open you up to all kinds of attacks from the benign, such as using a hole in the code to directly inject links into your commenting system, to more serious issues, such as the installation of malware that could see your domain flagged within your visitors' browsers as a potential threat; this is a surefire way to send them scurrying off to one of your competitors.

Applying patches whenever they become available is therefore a must, and where

WordPress is concerned, the process is so simple and painless there's really no excuse not to do so.

As of WordPress 3.7, most sites built on the system can now apply minor upgrades in the background without any user intervention, or, in WordPress parlance, 'while you sleep'. Anyone who upgraded manually to 3.7 would probably have found that their server was running 3.7.1 by late October and wouldn't have had to perform any active upgrades until WordPress 3.8 shipped in mid-December. You can check whether you have automatic updates applied by appending /wp-admin/update-core.php to your domain and checking for the line 'You have the latest version of WordPress. Future security updates will be applied automatically' at the top of the page.

PERMISSIONS SLIP

Although modern versions of WordPress are almost embarrassingly easy to update, you can run into problems if you haven't correctly set up the permissions on your server or if they've become corrupted over time.



▲ Mis-set permissions often cause failures when upgrading WordPress. Temporarily set them to 777 for the wp-content/upgrade folder to remedy this

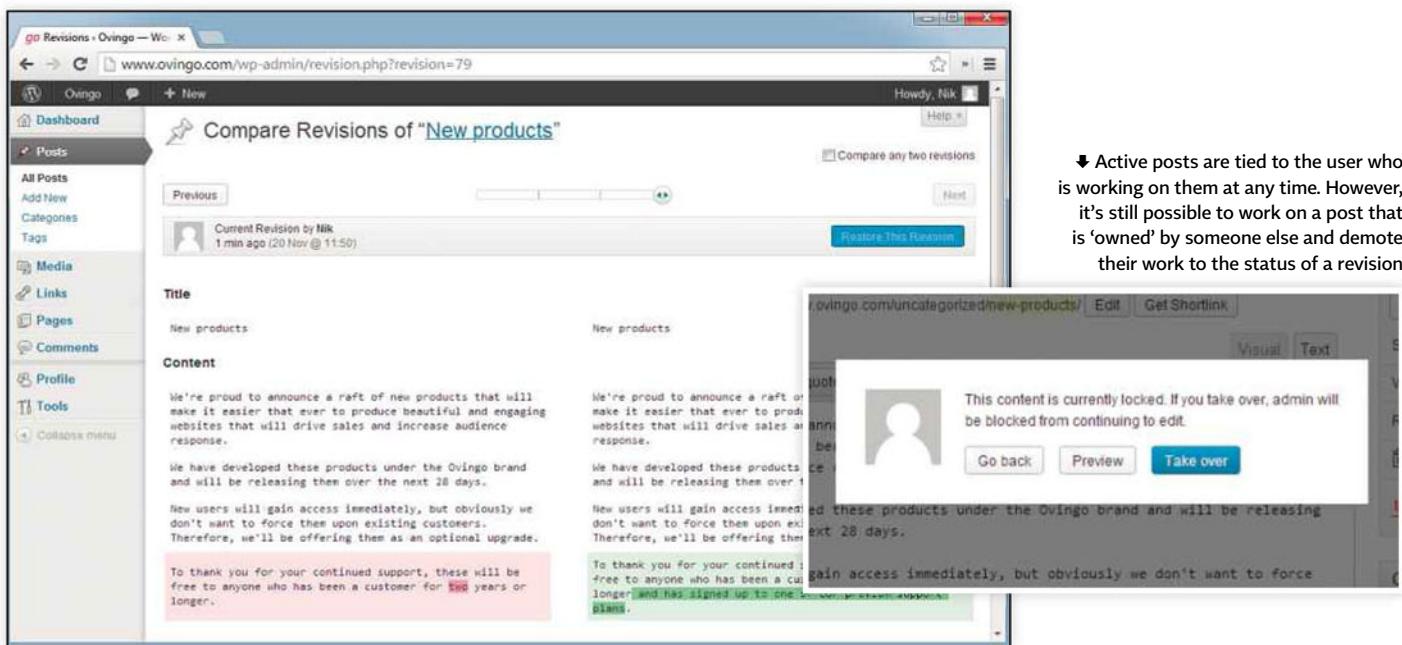
“Vulnerabilities in a CMS, which will be quickly disseminated through the online underground, can open you up to all kinds of attack**”**

▲ WordPress's notification bar will alert you to available upgrades. Anyone signed in as a site administrator can upgrade the CMS with a single click

One of the most commonly encountered barriers to a smooth upgrade is that the installer doesn't have sufficient rights to download the installation bundle to its temporary location on the server, from which it can be unpacked and executed. To fix this, use your FTP client to navigate to the wp-content folder on your server, right-click the upgrade folder inside it and select Permissions, Get Info, Info, CHMOD or a similar option from the context menu.

If your FTP client lets you set permissions numerically, enter 777 in the dialog box (this may be labelled Octal). If your client instead relies on you ticking boxes to enable read, write and execute access, ensure that all three are ticked for each of the three user types: Owner, Group and Others. Apply the change and close the dialog box.

You should now be able to upgrade WordPress using its built-in tools, after which you should change back the permissions on the upgrade folder to their original state.



▲ The improved Revisions feature introduced in WordPress 3.6 lets you roll back your posts to earlier versions and see what changes you have made to each one

The trouble is, when a platform such as WordPress makes it so easy to upgrade from point release to point release, it's also easy to overlook important new features and miss building them into your day-to-day use of the system. It's vital to keep on top of key new tools in the most recent couple of releases.

REVISION CONTROL

Some bloggers get it right first time, but for the rest of us the key to putting together an engaging and persuasive post is to work on it over time, producing a series of drafts. Even then, things can go wrong and you'll want to wind back to an earlier version, which is why

WordPress 3.6 introduced an improved Revisions system, which writes a new version of your post into the database every time you hit the Save Draft button. You'll see how many revisions you've created in the editing screen's Publish sidebar. Clicking the Browse link beside it lets you view revisions side by side, with the current version of your post on the right and its immediate predecessor to the left.

Amended sections are highlighted, with a heavy green for additions and a heavy red for deletions, so it's easy to see what's changed in each version. A slider at the top of the screen lets you move forwards and backwards between the various revisions until you find the one you

want to use, at which point clicking the blue Restore This Revision button rolls back your changes to that point in the editing process.

POSTS AND USERS

The Revisions tool is useful for blogs edited by multiple users, allowing collaborators to go back and see what changes were made to their work by another contributor and undo any damage. The system of assigning posts to users is also useful, letting each contributor to a multi-author blog see who is working on each piece of content at any time. However, this is a blunt instrument right now and something we'd like to see improved in future revisions.

Ahead of the crowd: WordPress versions

A new version of WordPress is compiled every day and made available for testing. These releases are designed to be used by plug-in developers, so they can work on new versions of their own extensions and ensure they're compatible with upcoming versions of WordPress. However, there's nothing to stop you using them to run your own blog. Just be sure to make frequent backups of your database, and don't panic if you encounter a minor glitch somewhere along the line (and it should only be a minor glitch, since the codebase will only change a little each day and therefore ought to be relatively stable).

You'll find the latest build of each version at <http://wordpress.org/download/nightly>. Once you're running the latest nightly build, you should also consider installing the WordPress beta tester plug-in from <http://wordpress.org/plugins/>

Nightly Builds

- [Stable Download](#)
- [Beta Releases](#)
- [Nightly Builds](#)
- [Subversion Access](#)
- [Download Counter](#)
- [Release Archive](#)
- [Source Code](#)

Development of WordPress moves fairly quickly and day-to-day things break as often as they are fixed. This high churn is part of our development process that aims to produce the most stable releases possible.

You can track changes on the web or through our SVN mailing list but many people choose to run the nightly builds to help us identify bugs. If you would like to be part of this process, please join the WP Testers mailing list and download the latest nightly build.

WP's automatic upgrade can be used to automatically upgrade to betas and nightly builds for the development branch or the latest stable branch. To get onto a development upgrade path, install the WordPress Beta Tester plugin.

[wordpress-beta-tester](#), which will download and install each nightly build as it becomes available to keep your site's underlying code on a rolling update.

The finalised WordPress 3.8 will be out by the time you read this column, and

WordPress 3.9 is slated to ship in 'early 2014', although at the time of writing an exact date had yet to be announced. You can find the current WordPress development schedule at <http://wordpress.org/about/roadmap>.

Opening the Posts section from the Dashboard sidebar calls up the list of current live and draft entries, with an extra line now appearing below each one that's actively being worked on, telling you who has access. You can still open the post in your browser, at which point you'll be warned that it's being edited by someone else, and given the option to take over editing the post in its current state.

The problem of authority hasn't yet been ironed out, as this function doesn't generally respect WordPress user levels. Administrators have complete control over all aspects of the site, but a contributor, who stands three levels down from an admin, below editors and authors, can take over the editing of a post that an admin user is working on, locking out the administrator.

Any user who is working on a post when someone else takes it over won't be writing in vain; any further changes they make will be saved into the Revisions system. However, the fact that they aren't warned in advance is an issue, as is the ability of junior team members to take over from their superiors like this. A simple fix such as the read-only option championed by Microsoft Office would overcome this problem.

MEDIA HANDLING

Not many blogs can get away with posting plain text any more; visitors expect video and audio. You can see as much from the growth of rival services such as Tumblr, which make it easy to share live media without embedding obscure blocks of code in each post. WordPress has followed a similar track; the core engine is now able to detect embedded media types and render them within a native player.

Take YouTube videos as a starting point. You can still copy the bespoke code from the YouTube listing, through which you can tailor the window size, border, whether or not the code includes embedded links and so on. Alternatively, just copy the video URL out of the browser address bar – <http://www.youtube.com/watch?v=R6MlUcmOul8>, for example – and paste it into your post without surrounding code. Take the second option, and WordPress recognises that you're calling a video, and embeds it in the post with a regular player window. This process works just as well with a video from Vimeo; try <http://vimeo.com/66929245>. WordPress strips out all the surrounding site furniture to grab just the embedded movie.

This doesn't just apply to videos. Paste in a link to an Rdio or Spotify playlist, such as <http://open.spotify.com/user/nikplus/playlist/5NAXsz4VDLcYuZaTWn5RHO>, and it's embedded as an



The WordPress development cycle

There's no big secret to the way WordPress is developed. Releases appear every 12 to 16 weeks, with new features voted in by users. You can propose your own ideas, see what's in the works and vote up the proposals you'd like to see incorporated into future releases by visiting <http://wordpress.org/ideas>. Some of the discussions there can get pretty technical, extending to the depths of the core code that makes the CMS tick. Still, even if you don't understand everything that's going on, this is the place to go if you want to champion a better media gallery, see closer integration with BBPress or propose an obscure language for an interface translation.

The developers document their progress at <http://make.wordpress.org/core>, which should be considered essential reading for anyone who uses WordPress in daily life.

audio player, complete with album artwork, listing and progress bar; ditto links to MP3s.

UNDER THE HOOD

Other improvements are less immediately obvious but version 3.6, a landmark release, also improved the handling of custom menus, while 3.7 introduced a revamped search

over more recent entries that include them only within the post body.

FUTURE PROOF

So where next for WordPress? That's not as simple to answer as the open development process might lead you to believe. There's talk of developing versions 3.9 and 4.0 in sync, so

“ As of WordPress 3.7, most sites built on the system can now apply minor upgrades in the background without user intervention, or ‘while you sleep’ ”

system that should deliver more relevant results to your users.

Previously, WordPress didn't much care where it found your keywords in an entry, and would list all hits in strict reverse-chronological order, believing that the most relevant would usually be the most recently posted items. That's probably true for many blogs that represent a stream of consciousness and in which recent updates likely supersede or build upon those that came before them. However, with WordPress increasingly being used as a regular CMS for hosting largely static sites, or as an application framework (which accounts for seven per cent of all installs, according to research published at 2013's WordCamp

San Francisco), that way of organising data is becoming irrelevant to the way your visitors want to work with your content.

From 3.7 onwards, then, results lists are drawn up with reference to context, so that posts that include the keywords in the post or page title, rather than just in the body, will be prioritised

they use an identical underlying framework to ensure that plug-ins developed for one version will work just as well in the other. WordPress 3.9 won't necessarily mark the end of the version 3 stream, since the appearance of a version 3.10 looks highly plausible. However, the distributed development teams are focused on WordPress 3.8, which should be available by the time you read this, and looking forwards towards 3.9 rather than beyond it.

To get the best idea of what 3.9 and 4.0 will encompass, keep an eye on the various development forums and blogs, bearing in mind that anything that doesn't appear at <http://make.wordpress.org> could include speculation. Also follow WordPress founder Matt Mullenweg at <http://ma.tt>; he gives an annual State of the Word address to WordPress developers outlining where the system is, how it's being used and where it's heading over the next couple of versions. ☎

NEXT MONTH

USE BBPRESS

In the next issue, we'll be taking a look at WordPress's closest sibling, bbPress, and showing you how to use it to add a flexible, stylish forum to your site.

Making more of your camera with lens filters

Lens filters are a crucial part of a photographer's arsenal, performing tricks that can't be emulated with digital effects. **Ben Pitt** rounds up the choices



THESE DAYS, THE word 'filter' usually refers to a digital effect, applied by the camera or in software. Many of these effects would previously have been achieved by placing a glass filter in front of the camera's lens.

In many cases, it makes more sense to apply these effects digitally. For example, you could use a blue filter to remove the yellow colour cast caused by household lighting, but it's much easier to adjust the white balance manually, or just let the automatic white balance function do its thing. The same applies to soft focus and various other special-effect filters, such as starbursts and diffracted multiple images. It can be fun to see these effects through the lens of an SLR, but there's no way to adjust or remove them once you've captured a picture.

However, some filters can't be emulated digitally because of the way they interact with the light. They give the photographer a strategic advantage rather than simply applying an explicit effect. It's these filters that we're exploring in this article. But first, let's deal with a few practicalities.

CHOOSING AND FITTING

Virtually all SLR and CSC lenses include a filter thread; some compact cameras do, too. This is a standardised screw-in attachment that means you can attach filters from a wide range of manufacturers. The thread comes in different sizes, though, so it's important that you buy filters that fit your lens. The thread size is stated in millimetres, and is usually written on the lens barrel, accompanied by a Ø symbol.

If you've got a collection of lenses with different thread sizes, you shouldn't need to buy multiple sets of filters. Stepping rings convert from one size to another. We use Kood stepping rings that cost around £7 each

and work perfectly well. You'll need to buy filters to fit your biggest lens and then use stepping rings to fit them to your smaller lenses – do it the other way around, and the filters won't cover the larger lens.

The filters themselves are widely available from specialist photography stores and websites. The leading brands include Hoya, Cokin, Tiffen and B+W, but there are many others. Prices vary widely, with nominally similar products costing anything from £5 to £80. More expensive filters come with the promise of superior optical performance, although in our experience, we haven't had any misgivings about filters around the £20 mark.

Each filter includes a filter thread of its own, which makes it possible to use more than one at a time. This has some interesting creative applications, as we'll see below, although stacking them compounds their

as we'll see later. The design is a little bulkier than conventional screw-in filters, though.

ULTRA-VIOLET

The most popular type of filter is ultra-violet (UV), which filters out ultra-violet light. This reduces the haziness that can affect distant landscape subjects, although the difference is pretty subtle. In practice, people tend to use UV filters precisely because they make very little impact on the photo. They're used more to protect the lens. After all, it's much better to scratch a £20 filter than a lens costing hundreds of pounds. This filter can stay permanently attached to the lens without any risk of it adversely affecting a photo.

POLARISERS

The other big sellers, according to distributor Intro 2020, are circular polarising filters. These

“ Certain filters give the photographer a strategic advantage rather than applying an explicit effect ”

optical imperfections and increases the likelihood of internal reflections, resulting in lens flares. There will also come a point where the corners of the frame will be obscured by the barrel of the outermost filter, causing heavy vignetting.

Cokin filters work slightly differently. The filters themselves are square rather than round and are available in four sizes. Up to three of these filters sit in a specially designed holder, which attaches to the lens using an adaptor ring. This system makes it quicker to swap filters in and out, and also to position a filter higher or lower; this can be very useful,

work using the same principle as the 3D glasses used in cinemas, whereby light can be filtered based on the polarity of light waves. Most light is randomly polarised, so you can't selectively filter it out with a polarising filter. However, blue skies and certain types of reflections are partially polarised, and computer screens are highly polarised, so it is possible to suppress them with a polarising filter.

Two types of polarising filter were once common: linear and circular. However, linear polarising filters can cause problems with autofocus systems so you're unlikely to find them on sale these days.





▲ No filters and 1/10s shutter speed at f/8



▲ An ND8 filter gives a one-second shutter speed, blurring the water a little



▲ For more blur, we added our circular polarising filter and set the aperture to f/11, giving a 10-second exposure time. Note the muted colours from the polarising filter



▲ Adding a graduated ND filter darkens the sky to avoid clipped highlights. Note the vignetting in the top corners, from using so many filters stacked on top of each other

A circular polarising filter comprises two elements, and rotating the outer element determines which polarity of light is filtered out. A 90° twist takes the filter from one extreme to the other, so it's quick to adjust by trial and error – you'll see the effect through the camera's viewfinder or LCD screen. You can even try a polariser out by holding it up to your eye, to check whether it's worth using before attaching it to the lens.

Darkening a blue sky with a polariser helps the clouds to stand out, and also avoids the common problem whereby the sky is too bright compared to the land. However, this trick works only when the lens and filter are facing roughly at right angles to the position of the sun. That's easy to achieve around midday in summer, but at other times you'll find that the benefit disappears when shooting away from or into the sun.

Polarisers also filter out reflections off shiny objects such as glass and water and, to a lesser extent, light reflecting off foliage and skin. They're perfect for avoiding reflections when taking photos through glass. They're also useful for taking photos of water, especially if you want to capture what's below the surface. However, their effectiveness depends on the angle of incidence. You'll need to be looking down on the water rather than across it for the effect to work.

► Up to three of Cokin's square filters sit in a specially designed holder. This one is a graduated ND filter

In general, polarising filters are great for reducing glare and washed-out skies when shooting on sunny days. However, they also tend to suppress contrast, so colours can look flat. Still, you can always restore contrast later using image-editing software. Shooting Raw and processing in software such as Lightroom will give lots of control over the balance of colours, while the polarising filter should ensure that your highlights aren't clipped.

Bear in mind that polarising filters reduce the overall strength of the light to around half. This shouldn't be a problem if you're shooting in sunlight, but it's worth bearing in mind.

NEUTRAL DENSITY

Sometimes reducing the amount of light is exactly what you want, and that's where neutral density (ND) filters come in. Think of them as sunglasses for your camera,

darkening the image by a factor of anything from two to 1,000.

Their strength can be described in three ways. The most common is to express the ratio as a single number: an ND8 filter will reduce the light to an eighth of its original strength, so you'll need to multiply the shutter speed by eight to compensate. Sometimes ND filters are referred to in stops. A single stop means half or double the exposure value, so an ND8 is a three-stop filter because it has halved the intensity three times (half, quarter, eighth). A few manufacturers refer to ND filters according to their optical density, which is the scientific measurement expressed as a logarithmic ratio. Here, 0.3 is equivalent to ND2, 0.6 is ND4, 0.9 is ND8, and so on. Search Wikipedia for 'neutral density' to see a table that compares the three measurement types.

ND filters are typically used in conjunction with a tripod when a long exposure time is desired to blur motion. Shutter speeds slower than one second are great for turning flowing water into wispy streaks of light.

Waves in the sea or ripples in a lake are smoothed over to give an ethereal sheen, and reflections in rippling water become hazy. A very long exposure will blur clouds, and transform a busy high street into a ghost town, complete with ghostly streaks of colour here and there.

ND filters aren't just for long exposures. You might want to use a specific shutter speed, such as 1/100s, to capture a small amount of motion blur, but





↑ The same scene without (left) and with (right) a circular polarising filter (JPEGs straight from the camera). With the filter, the sky is darker, revealing the cloud texture and also letting us boost the overall exposure to bring out the colours in the trees. Also, the sun's reflection in the railings is greatly reduced. There's less difference between the sunlit and shaded areas of the grass, because the reflections on the grass have been reduced, too

also want a wide aperture for a narrow depth of field. Using an ND filter lets you set the shutter speed and aperture for creative effect, and still control the overall exposure level. It may also come in handy when the camera's maximum shutter speed isn't fast enough.

The only drawback is that more powerful ND filters can cause problems for the camera's autofocus and metering, because there's not enough light for the camera to measure. There may be not enough light for you to compose the shot, either. For the strongest ND filters, rated at ND1000, there's no hope of composing the shot with the filter attached. The only option is meter and focus, attach the filter and adjust the exposure settings manually.

FADER ND

Rather than buying lots of ND filters at different strengths, you might want to go for a Fader ND filter. The strength can be varied from ND2 to ND400 simply by rotating the outer element. That's because these filters are actually two polarising filters. Line up their

graduated area in the middle to give a smooth transition from one to the other. The obvious use for this filter is to darken skies to avoid over-exposure when compared with the ground. However, you could use it in any shot, in any orientation, where a part of a photo is too bright.

Graduated ND filters vary in their strength and the size of the graduated section. Cokin's square filters are particularly useful, as they can be slid up and down in the holder to position the filter precisely. The holder can also be rotated to vary the angle, which is also true of screw-in grad ND filters. We tried out the Cokin ND Grad Kit, which comprises a holder and three filters rated at ND2, ND4 and ND8. The ND8 uses a gentler graduation to counterbalance its higher strength. For even stronger filtering, the Cokin holder makes it easy to combine multiple grad ND filters. You could use two in opposite directions to darken both the top and the bottom of the frame while leaving the middle clear.

If you shoot Raw and process your photos in Lightroom, you'll have the digital equivalent

sensible to include them here. A close-up filter is essentially a magnifying glass. It's a single-element lens that makes the image bigger and also lets the camera focus closer to the subject. It turns any standard kit lens into a macro lens.

Inevitably, a close-up filter can't deliver the same optical performance as a dedicated macro lens. In our experience, focus deteriorates heavily towards the edges of the frame; for more powerful filters, focus isn't too hot in the centre, either. Soft focus towards the edges isn't necessarily a terrible affliction. It can be quite flattering at times, drawing the eye to the centre of the frame. Heavy colour fringing doesn't look so good, but we were impressed with Lightroom's ability to remove much of this with its Defringe controls, located in the Lens Corrections module.

Our Hama set of close-up lenses include three strengths, rated at N1, N2 and N4. They allowed us to get closer and make subjects appear bigger in the frame. The N4 lens made subjects appear over twice as big. However, the fall-off in focus meant there wasn't much of a boost in detail. It might be just as effective to crop and resize the image in software. Still, there's something to be said for achieving the effect in the camera, and the soft focus effect does have a certain dreamy atmosphere that could be turned to your advantage.

“ If you've got a collection of lenses with different thread sizes, you don't need to buy multiple sets of filters. Stepping rings convert from one size to another ”

polarities and they act like a single polarising filter, but turn the outer one by 90° and together they cut out almost all the light. They start to display rippling effects at very dark settings, but there's a wide usable range. It's more cost-effective than buying lots of conventional ND filters, and having one adjustable filter is convenient, too. A Fader ND filter is also useful for video, providing an easy way to perform smooth manual exposure adjustments without having to mess around with the aperture and shutter speed controls.

GRADUATED ND

The graduated ND is another spin on the ND concept. It varies from one part of the frame to another, darkening one side of the frame while leaving the other clear. There's a

of grad ND filters at your disposal in the shape of the aptly named Graduated Filter. There's often more highlight detail in a Raw file than is shown at default processing settings, and invariably more than you get from shooting JPEGs. However, using a grad ND filter in front of the lens means it's far less likely that the brightest parts of the sky will be clipped. This means you can boost the exposure settings to ensure that you've captured plenty of detail in the darkest parts of the foreground.

CLOSE-UP

Close-up filters are different to all the others described here, as they bend the light rather than filter it. That technically makes them lenses rather than filters, but as they attach to an existing lens's filter thread, it seems

LIFE THROUGH A LENS

This is only a small selection of the filter types currently available. Head to www.cokin.co.uk or www.hoyafilter.com and you'll find dozens more, such as sepia tints, starbursts and soft focus diffusers. You might be able to achieve similar results in editing software, but there's something to be said for composing shots with these effects already in place. ☐

NEXT MONTH

CREATE AND CUSTOMISE FONTS

Are you sick of trawling through long lists of dreary fonts? We reveal how you can give them a new lease of life, and how to make your own from scratch.

Installing a free server operating system

Your budget for a server is probably modest, so why pay Microsoft for your OS? **Simon Handby** explains how to install the free Linux alternative



NOT EVERY SMALL business needs a server, but for those who do it's easy to stick with the familiarity of Windows and buy a Microsoft server operating system. This isn't necessarily a bad thing; we've covered Windows Server 2012 Essentials in depth (see *Shopper* 301 and 302), and it has many advantages beyond the familiarity of its Windows interface. However, it's not necessarily as simple to configure as you'd expect, and it may not be the most cost-effective choice for a small firm.

Fortunately, there's a credible alternative in the various Linux variants available. Several of these are free, but cost savings are only part of the attraction of Linux. It was written from the outset as a multi-user, multitasking operating system. Many of its component packages can be updated individually without affecting other components or requiring a server reboot, while many of its proponents argue that it's more secure and is less often the target of malware attacks than Windows. Linux generally has lower system requirements than an equivalent Windows system, too, which in turn could enable you to make savings by buying less-powerful hardware.

This month, we're looking at installing and configuring a computer using Ubuntu Server, which is a server-specific version of the popular Linux distribution. There are alternative distributions worth considering, such as the Community Enterprise Operating System (CentOS), which is compiled from the same source code as Red Hat Enterprise Linux, and Novell's SUSE distribution, which has an excellent reputation for stability and ease of use. However, we already cover Ubuntu regularly in our *Linux Expert* section, and its widespread popularity and refined software ecosystem make it one of the best choices around if you're relatively new to Linux.

The screenshot shows the Ubuntu Server download page. At the top, there are navigation links: Download, Overview, Cloud, Server (which is highlighted in red), Desktop, and Ubuntu桌面版. Below this, the main heading is "Download Ubuntu Server". A sub-section titled "For extended support, choose Ubuntu Server 12.04.3 LTS" provides information about the LTS release, mentioning long-term support until April 2017 and Havana availability via the Ubuntu Cloud Archive. To the right, there is a dropdown menu labeled "Choose your flavour" set to "64-bit (recommended)" and a large orange button labeled "Get Ubuntu 12.04 LTS".

▲ When it comes to servers, prioritise stability over the latest features

LONG-TERM RELATIONSHIP

Ubuntu Server has two significant versions: the latest, Ubuntu 13.10, and a more tried-and-tested 'Long Term Support' (LTS) version, for which updates are guaranteed to be available for five years after its release. For a server environment, we generally recommend opting for stability and support over the latest features, unless you specifically require a feature that's available only in the latest version. Here, we'll be using the most recent LTS release: Ubuntu 12.04 LTS. Download this from www.ubuntu.com/download/server. For a business server, we recommend using the 64-bit version; just remember that you'll need a 64-bit processor to go with it.

Once you've downloaded the ISO file, you'll need to burn it to a CD, which you can do using Windows' integrated disc burner or the third-party utility of your choice. To install the operating system, you'll need to boot from the CD, so enter the server's BIOS and move

the optical drive to the top of the boot order; this is usually a case of selecting it and then pressing +. Save the changes and reboot.

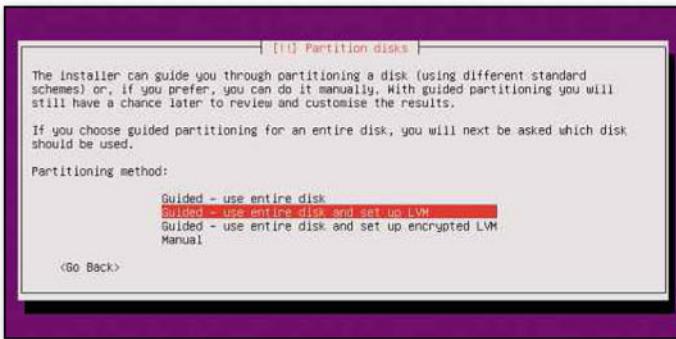
Unlike the desktop version, the Ubuntu Server disc isn't a LiveCD that boots into a working version of the OS. Instead, when you boot from it, you'll see a simple language selection screen before getting to an equally simple install menu. Most of the installation process is self-explanatory, but to get started choose Install Ubuntu Server. After a few simple questions, you'll be prompted to provide a hostname for the server. It's common to use a naming theme for servers, such as planets in the solar system or characters from *The Simpsons*, but a descriptive name such as FileServ could be more practical. Type a name then hit Enter. Continue through the next steps, providing your name, username and password, then choosing whether to encrypt your home directory – doing so will be more secure.

ACTING THE PARTITION

After you've set the time zone, you'll be prompted to partition the system's disks. You can take a few approaches here. If you want to configure a server with mirrored drives, see the box on page 156. For detailed advice, see the Partitioning for Ubuntu section of the Ubuntu Installation Guide, which you can read by clicking the link in the *Further Information* box on page 157. We'll assume your server has a single disk or a RAID array that presents

The screenshot shows the "Configure the Keyboard" step of the Ubuntu Server installation. It asks if the user wants to have their keyboard layout detected by pressing a series of keys. It also provides an option to "Detect keyboard layout". At the bottom, there are "Go Back" and "Next >" buttons.

▲ We wouldn't bother with the automatic keyboard detection; it's easy to do it manually



▲ We recommend using Guided partitioning and setting up LVM

itself as a single volume. We recommend using logical volume management (LVM). This is a way to configure a server's disk space that's abstracted from the underlying physical disk configuration, and should make it easier to add and reconfigure storage devices in future.

Choose 'Guided - use entire disk and set up LVM' and press Enter. On the next two screens, confirm the target disk and agree to write the changes to it. Opt to use the whole volume group for guided partitioning: select Continue on the next screen, hit Enter and, when prompted, write the changes to the disk. The installation will now continue. Unless you know that you use an HTTP proxy, leave the field blank when prompted and select Continue. Choose to install security updates automatically.

The next screen allows you to choose additional software packages to add functions

beyond those of a basic file server. Those you choose will depend on the role you plan for your server. Next month, we'll be configuring a DNS server and Samba file server, so select those using the cursor keys and spacebar, and tab over to select Continue. Agree to install the GRUB boot loader and wait for the installation to complete, rebooting when prompted.

COMMAND AND CONQUER

When Ubuntu Server first starts, you'll notice that it doesn't load a graphical user interface (GUI). Instead, you'll see a simple text prompt for entering commands, known in Linux as the command shell or command line. There are good reasons for the absence of a GUI; installing one adds complexity. It places greater demand on the system resources and introduces more avenues for anyone trying to hack the server.

Many authorities recommend that you don't install a GUI. However, without one, the server will be harder to configure. We'll be installing a desktop interface, but we'll show you how to 'unload' it to keep it from hogging resources.

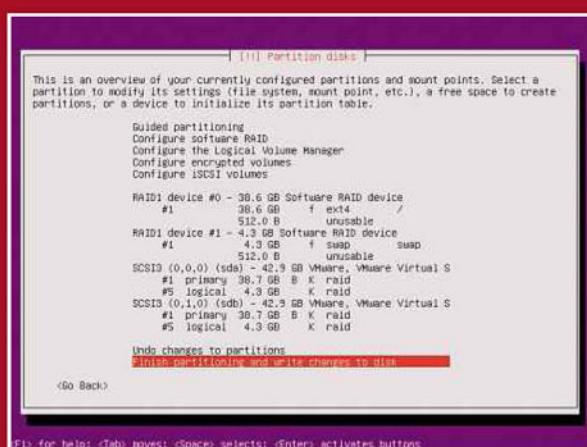
Log on to the server by entering the username created during the install, followed by the password. You should see text information summarising the system, with a summary that tells you how many packages have updates available, and how many of these are security-related. It's a good idea to update the server immediately. Type 'sudo apt-get update' (without quotes) and press Enter, and Ubuntu's command-line package manager will update its list of the latest software packages. Next, enter 'sudo apt-get dist-upgrade' and the system will intelligently apply updated software to the system.

Configuring RAID: combining disks into a volume with redundant storage

A RAID array combines two or more hard disks to create a single volume, often with redundant storage to ensure your data still exists even if one disk fails. If you're not installing Ubuntu Server on a computer with a hardware RAID controller, it may be tempting to use two disks and the motherboard's onboard RAID 1 option to create a mirrored array. However, if the motherboard fails, you might need to find an identical one to recover the array data, so we'll take you through Linux's software RAID capabilities.

Follow the installation until you're prompted to partition the disks, then choose Manual, select the first hard disk and agree to create the new partition table on it. Select 'FREE SPACE' and choose 'Automatically partition the free space'. When the installer displays the results of partitioning, select the / partition (likely to be #1) and press Enter, scroll down to Bootable flag, press Enter to switch it on, then select 'Done setting up the partition'. Select the second disk, and repeat the steps above.

Scroll up, select Configure software RAID and agree to write the changes and configure RAID. Select 'Create MD device' and choose



▲ It's a little complicated, but when you've finished setting up the RAID array, it should look similar to this

RAID 1. If you want to boot from any other type of RAID array, you'll have to install an alternative boot loader.

Next, hit Enter to confirm two active devices. Press Enter again to confirm zero spare devices, then use the space bar to select two active devices for the array. These should be /dev/sda1 and /dev/sdb1; this means the first partition on the first disk (sda1) and the first partition on the second disk (sdb1). Agree to write the changes, then repeat these steps with the remaining partitions (/dev/sda5 and /dev/sdb5) and pick Finish.

Scroll down to RAID 1 device #0 and select partition #1 underneath it. On the next screen, select 'Use as' and choose 'Ext4 journaling file system'.

Underneath, select Mount point and choose / (the root file system). Then select 'Done setting up the partition'. In the main partitioning menu, scroll down to RAID 1 device #1 and select partition #1, then on the next screen select 'Use as' and choose 'swap area'. Select 'Done setting up the partition'. Scroll down to Finish partitioning and write changes to disk, choose not to boot if the RAID becomes degraded, and write the changes to disk. Your installation should now continue.

```
Ubuntu 12.04.3 LTS ShopperFileServ tty1
ShopperFileServ login: shandby
Password:
Last login: Wed Dec 4 13:00:10 GMT 2013 on ttym1
Welcome to Ubuntu 12.04.3 LTS (GNU/Linux 3.8.0-29-generic x86_64)

 * Documentation: https://help.ubuntu.com/
System information as of Wed Dec 4 13:01:37 GMT 2013
System load: 1.54 Processes: 92
Usage of /: 0.9% of 113.81GB Users logged in: 0
Memory usage: 1% IP address for eth0: 192.168.0.12
Swap usage: 0%
Graph this data and manage this system at https://landscape.canonical.com/
77 packages can be updated.
38 updates are security updates.
shandby@ShopperFileServ:~$ sudo apt-get update...
```

▲ Before updating Ubuntu, tell it to discover the most recent software packages

'Apt-get' is the name of the tool you're using. Typing 'sudo' means you're using it as the Root SuperUser, which allows you to run commands that are usually restricted in order to help keep your system secure. For reasons of security, you have to enter your password every time you issue a sudo command.

There's usually no need to reboot the server after applying updates – in fact, you should barely ever have to – but in this case it is necessary. Once the updates have finished, type 'sudo shutdown -r 0' to force a restart, or replace 0 with a number of minutes to schedule a delay first. Shutdown is a useful command to know in Linux. Changing '-r' to '-h' will make the server halt rather than restart. Another useful command is 'exit' followed by Enter; this will log out your user account without shutting down the server. An alternative way of restarting the system is to type 'sudo reboot', which does the same thing as the 'sudo shutdown -r 0' command.

“ For a server environment, we recommend opting for stability and support over the latest features **”**

After restarting, we can install the Ubuntu desktop. Log back on and type 'sudo apt-get install ubuntu-desktop'. Linux package names are case-sensitive, and in this context Ubuntu should not be capitalised. The desktop packages amount to roughly 450MB, so they'll take a while to download, depending on the speed of

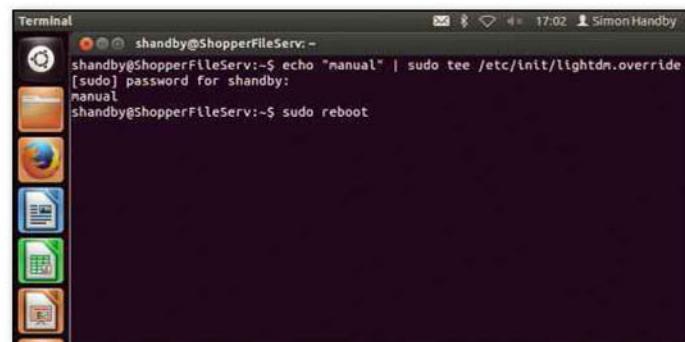
your internet connection. Once the installation is complete, restart the server using the shutdown command. You'll now boot into the same Ubuntu interface used by the desktop version. Enter your password to log on.

UNITY COMMUNITY

If you're not familiar with the Ubuntu Unity desktop, it's worth taking a minute to have a look around. The top panel contains various shortcuts, with the power icon at the right launching a menu with links to useful tools such as a software updater and the system settings menu. Move the mouse to the top left to reveal global navigation options. When an open application has the focus, this area will usually include application-specific menus.

At the left-hand side of the screen is the Launcher, which is similar to the taskbar in Windows. Clicking an icon will start that app, while you can remove an icon from the launcher by right-clicking it and selecting

Unlock from Launcher. To find any installed program, click the Dash home icon at the top and search for it by name, much as you would in the Windows 8 Start screen. Try this by clicking the icon, typing 'terminal' and either hitting Enter or clicking on the Terminal icon in the results. This should open a command



▲ Create an override file to stop the GUI loading by default

shell, providing a windowed version of the command-line environment we had before installing the GUI.

As we explained, the Ubuntu desktop makes administering the computer far easier at the cost of additional system overheads. As a compromise, we'll change the configuration so that the GUI loads only when we need it. There are a couple of ways to do this, but quickest is to create an override file. Inside the Terminal session, type 'echo "manual" | sudo tee /etc/init/lightdm.override'. The word 'manual' will be output by the terminal if all's gone well. 'Tee' is the name of the program we're using to create the file, and 'manual' is the command we're putting into it. Type 'sudo reboot' to restart the system. You can also reboot by selecting Shut Down... from the Unity GUI's power icon menu and choosing Restart.

You should find that the system reboots back into the command shell as it did when first installed. From here, you can start the desktop interface when you need it with 'startx'. Don't use sudo for this unless you want the entire desktop environment to run as root; this is not a good idea. To stop the GUI again, simply choose Log Out... from the power icon menu and click Log Out when prompted, and you should return to the command shell. You'll still be logged on to the command session; if you plan to leave the computer unattended, remember to type exit and hit Enter.

You should now have a server with the latest software updates, a GUI that you can switch on and off as needed, and knowledge of how to shut down, restart or update the server from the command shell. Next month, we'll show you how to configure it. ■



▲ Finding an application is as simple as searching for it

Further information

Ubuntu Server installation guide
<http://tinyurl.com/UbuntuInstallGuide>

Ubuntu Server guide
<http://tinyurl.com/UbuntuServerGuide>



NEXT MONTH

GET SERVING!

We explain how to configure your new server to provide essential services to other computers on the network.

Making the most of your broadband

This month, **Nigel Whitfield** delves deeper into the configuration of the Asterisk internet telephony system to help enhance your broadband use



LAST MONTH, WE showed you how the addition of an alternative firmware can turn a TP Link TL-WDR3600 router from a humble piece of network kit into a flexible Linux-powered appliance, on which you can install and configure lots of extra applications. In case you missed it, download last month's *Linux Expert* from www.shopperdownload.co.uk/313/linuxexpert312.pdf.

This month we're going to look a little more at how you can use the Asterisk internet telephony system. At its simplest, Asterisk lets you set up multiple user accounts using the SIP internet telephony protocol. This lets you use real SIP phones, PC software and smartphone clients to make calls internally, as well as with other people with a SIP telephony system. By adding a SIP service, you can also make and receive phone calls to 'real' phones, getting a proper incoming phone number. We'll even show you how you can answer this real number anywhere in the world.

While some of the instructions are specific to the version of Asterisk installed on the router, the config files will be much the same on any Linux installation, so you should be able to follow our examples quite easily even if you're running Linux on, say, a spare PC tucked away in a corner, rather than on a router. Indeed, you may want to experiment on that first anyway.

BEFORE WE GO ON

If you want to make the most of Asterisk, there are a few things to bear in mind; they're not prerequisites, but they can make life a lot simpler, especially if you're planning on using a VoIP system as your main phone.



▲ Setting up a soft phone to work with Asterisk is very simple

The screenshot shows the Sipgate website's registration process. It has tabs for 'sipgate basic residential VoIP' and 'sipgate team business VoIP'. The 'sipgate team' tab is selected. A 'Login' button is in the top right. Below it is a form with fields for 'Username' and 'Password'. Navigation links include Home, Tour, Numbers, Call Rates, sipgate1000, Downloads, Registration, and Help-Centre. The main content area is titled 'Register' and 'Step 1: Country and Language'. It asks for 'Country of residence?' with a dropdown menu showing 'United Kingdom'. It also asks for 'Areacode of residence?' with a dropdown menu showing '028 90 Belfast'. A note says: 'Important: Customers who sign up with sipgate for geographic phone numbers in the UK, must reside within the UK.' Another note says: 'Further cities and countries will follow soon ([further information](#)).'. Below these are three radio buttons for selecting a telephone number: 'United Kingdom, Belfast', 'United Kingdom, local - 0845', and 'United Kingdom, national - 0870'. A 'Continue' button is at the bottom. A blue banner at the bottom of the page says 'sipgate team Now available for businesses with up to 100 employees. [Sign up for a free 30 day trial](#)'.

▲ Like other VoIP services, with Sipgate you can choose a city in which you'd like a phone number

First, although it's not absolutely necessary, try to get a fixed IP address from your internet provider, as it may prove to be advantageous. You don't have to have one to use SIP, which is the standard Voice over IP (VoIP) protocol used by Asterisk, but if you do, it will be much easier to connect to your

system remotely when you're out and about. That means, for example, that if you can get a data connection abroad, you can make and receive calls through your home Asterisk PBX. With the data bundles available in Europe now, it can actually be cheaper to make calls that way than to pay roaming charges. If you're simply elsewhere in the UK, you can be available on your usual number, so your mobile can be just for people who really need it. If you don't have a fixed IP address you'll need to set up a dynamic DNS system, which assigns a web address to your home network. Your router then updates the web address with its current IP address. We like www.noip.com, which is supported by most routers.

You'll also need SIP phones to make and receive calls. Real ones, which look like a regular telephone but plug into your home network, cost from £35 upwards. However, you can use a software client instead. Many Android devices have SIP built in or you can use apps, like 3CXPhone for Android and iOS.

```
[peer-1939369_sipgate.co.uk]
type = friend
defaultuser = 1939369
fromuser = 1939369
secret = ****
host = sipgate.co.uk
fronthost = sipgate.co.uk
context = context-incoming-1939369_sipgate.co.uk
insecure = port,invite
quality = yes
dtmfmode = rfc2833
```

▲ Manually edit the sip_peers file if you find you can't make or receive calls successfully

CONFIGURING ASTERISK

Asterisk is configured using text files; when you enter details in the web interface on the router, you're really just updating these, and the same is true of the other front-ends that are available for it. We'll look at the text files in more detail another time (you can do some pretty clever things with them), but to start with, let's walk through the basic setup.

If you've not installed the packages on your router yet, go to the Software tab, update the list of packages, and install first asterisk18, then luci-app-pbx, which provides the OpenWRT configuration interface, which will appear on a new Services tab.

If you want to see what's being changed, connect to the router via SSH and look at the files in the /etc/asterisk directory. As we mentioned before, you'll find plenty of information to help understand these at www.asteriskdocs.org.

Start by clicking on the SIP Accounts tab in the router interface. This will let you add in a SIP provider if you want to have a real telephone number to make and receive calls on. If you don't see a blank account form, click the Add button. Fill in the username and password from your SIP provider – VoIP Talk (www.voiptalk.org) and Sipgate (www.sipgate.co.uk) are both good choices – and ensure the

Picking a SIP account

To call other people, you need a SIP service. This provides the link between your VoIP devices and the public telephone network; without it, you can only call other users on your own or a linked Asterisk system, or a direct SIP address. A provider will allocate you a number – often with a choice of city – which ordinary callers can use to reach you, and which will appear as your caller ID when you dial from your VoIP phone to an ordinary number. Check the terms, though, as some charge a monthly fee per number, while others don't. Some provide special dialling codes to call customers on other VoIP networks free, or have better rates to certain countries. It's even possible to port existing BT numbers to a SIP service, so you could ditch a second phone line, for example, and move the number to a SIP provider via Asterisk.

In our example here, we're using Sipgate (www.sipgate.co.uk), and picking a Belfast number. We've done this because friends in the Republic of Ireland can call the north cheaper than calling the rest of the UK, by swapping the 028 UK dialling code for the 048 Irish one, and avoiding making an 'international' call. When you receive your confirmation email, click on Settings to see the data you'll need to link Asterisk to your account.

options for both incoming and outgoing calls are set to 'Yes'. For some providers, you may be given additional settings, such as Realm, Proxy and perhaps a port number (the default is 5060). If you need to add any of these, click the Additional Field drop-down menu, select the right one, and click Add.

When you have filled in all the information, click the Save and Apply button. This data will

be stored in the sip_peers.conf file in the config directory. However, if you're using the standard OpenWRT installation, you may find that Asterisk is failing to register with the SIP provider correctly (see 'Solving registration problems', page 160, to find out how to fix it).

Next, you can create accounts for telephones, whether physical or smartphones, which can make and receive internet-only SIP calls, or allow you to make calls within your own home between devices. With a bit of configuration, you can also enable the accounts to make and receive real phone calls using your SIP service.

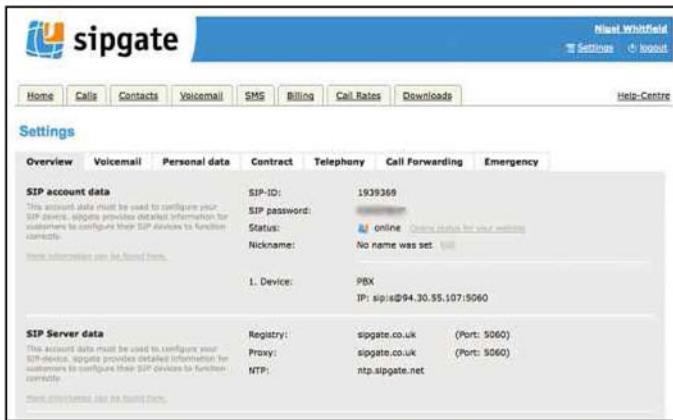
Go to the User Accounts tab in settings, and fill in the form for the first extension. The Full Name will be sent with the call and displayed on SIP phones. The username is what most people think of as the phone number, which other SIP users dial. You can use a name such as nwMobile as we have or, if you want to dial between the phones on your system, it's more sensible to give them numeric names, which can be dialled easily if you use a phone with a standard keypad. The settings here are on OpenWRT and stored in /etc/asterisk/sip_users.conf.

Pick a password, allow the phone to take incoming and make outgoing calls, letting them access your SIP service, and you're more or less ready. Find a SIP client for a phone or PC (in the example we're using Blink for OS X) and log in to an account using the details you have just created, with the server set to your internet address or dynamic DNS name.

↑ For Sipgate, you just need to enter your username, password and hostname

↑ Don't forget to make sure that the appropriate ports are opened on your firewall to allow VoIP

“ Although it's not absolutely necessary, try to get a fixed IP address from your internet provider, as it may prove to be advantageous **”**



↑ The Settings screen on Sipgate will show whether your PBX has connected correctly, as well as other essential settings

The next step is to test everything; most VoIP services have a test number that you can dial to check everything is set up. On Sipgate, it's 10000; enter that into your test client and, if all's well, you'll hear a message telling you things are working OK.

Now, try dialling the number you've been allocated from a different phone. This is where

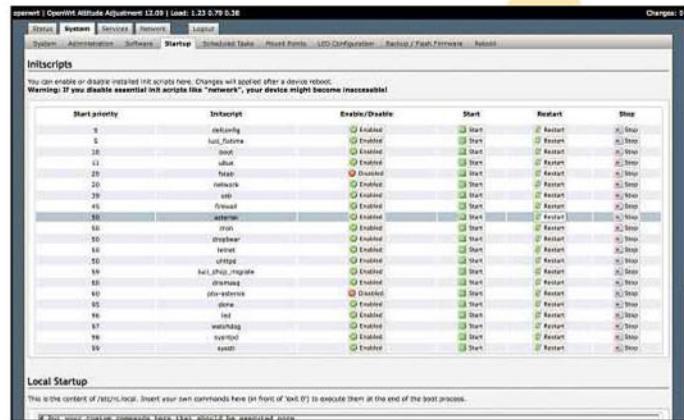
things may be a little more fiddly, as it's quite common for firewalls and NAT to play havoc with SIP (one reason why Skype became popular), so if your Asterisk router is behind another router, you will need to ensure that connections to port 5060 are passed to your SIP router, and also the UDP ports required for the actual voice calls, which by default are

19850 to 19900 in the OpenWRT package. But if all is well, you should receive incoming calls on the VoIP phone you've set up.

You can now set up more options on the Call Routing tab, such as specifying that certain numbers always go via a specific SIP provider, using patterns to match. That's particularly important if only some of your SIP providers have a 999 service, so you can ensure that whichever phone is used, a 999 call will always be routed to someone who can handle it. You can also make different extensions ring for calls on different SIP accounts, or use them for outgoing calls. Just remember that if you change settings in the web interface, you will probably need to re-edit the sip_registrations and sip_peers files, too, so it's a good idea to copy these files after changing them. ☐



↑ The PBX tab in OpenWRT will show you the current status of Asterisk



↑ You can stop and restart Asterisk from the System/Startup tab after editing the config files

Solving registration problems

A common problem you may have with Asterisk on OpenWRT is that the system won't register with your SIP provider, and you can't receive any incoming calls. That's usually due to a bug in one of the libraries in certain versions of the software, including the current release.

There's a fairly straightforward workaround for this; do it when you have added the local user accounts, to avoid the settings being overwritten by the Luci configuration tool. Edit the sip_peers.conf file with your favourite text editor. There'll be a section with a name based on your SIP account, such as:

```
[peer-1939369_sipgate_co_uk]
```

For Sipgate, change the line that says:

```
type = peer
```

to:

```
type = friend
```

Alter the 'qualify' setting to 'yes' and then add a line that says:

```
dtmfmode = rfc2833
```

Next, edit sip_registrations.conf, which is where the info needed for outgoing calls via the VoIP provider goes. The entry will look something like this:

```
register => 1939369:PASSWORD@peer-1939369_sipgate_co_uk
```

where 1939369 is your Sipgate number. You need the IP address of the SIP server; in the case of Sipgate, it's 217.10.79.23, but you can't just swap that in, as some providers won't register you if you just use the IP address. Change the line to look like this:

```
register => 1939369@sipgate.co.uk:PASSWORD@217.10.79.23
```

replacing the IP address and password with the correct ones, and your own number. But remember: do this after you've set up other options in the Luci interface.

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Zygote

Zygote is pulling his hair out over MafiaLeaks and the Swiss cloud network. Still, there is a cure for baldness on the horizon, although it does seem to require a pound of flesh

BLOW ME DOWN

Whistleblowing websites such as Wikileaks use anonymous data-sharing systems with no central server to be tracked down by the enemies of free speech. The obvious reason for this is to protect the identities of contributors. This is especially relevant at a new site dedicated to blowing the whistle on the Mafia. MafiaLeaks.org's motto is simply, 'If you know something, say something'. The site features a section optimistically labelled 'We are hiring', which invites "the heroic to join us". However, Zygote questions the wisdom in linking this anonymous website to Facebook, where anyone hitting the Like button can be instantly identified.

Zygote also notes that the MafiaLeaks.org key image shows a young brunette looking surprisingly relaxed, seeing as she is about to be shot in the head by a Mafia gangster. It's taking Facebook unfriending a bit too far.

SOUND AS A POUND

Spotify is an excellent online showcase where recording artists get paid a very small royalty every time someone clicks a button to hear one of their music tracks. The more plays they get, the higher the royalty payment. With millions of people using the Spotify service, some chart-toppers can do very well. Recently, an unknown artist by the name of John Matrix shot to virtual stardom. The new music sensation has now been revealed as Peter Fillmore, an Australian software security engineer who has never written a song, sung a note or played an instrument in his life.

Fillmore hacked into the charts with catchy little tunes such as *I've Only Known You Five Minutes And I Want You Dead*, from his fake album *Kim Jong Christmas*, and hoovered up a million hits in less than a month. He harnessed three virtual servers linked to Amazon, and

used them to simulate fans playing his rubbish songs 24 hours a day. This generated a spectacular return of 33 dollars for every dollar he invested. The fact that his music attracted a torrent of abuse and universally unfavourable reviews seems only to have helped perpetuate his ride to the top of the charts – a lesson Sir Cliff learned ages ago.

FOGGY LOGIC

The Chinese government is having a problem keeping tabs on its population because its mass surveillance cameras are playing up. The computer-controlled spy network works exactly as designed, but the cameras often can't see beyond 10 metres, and now winter is here they are sometimes down to a range of three metres. This is not very useful when trying to watch over vast areas of urban sprawl.

The reason the system is failing is down to smutty smog. Pollutant air particles are generated by the increasing levels of coal burned in Chinese power stations, factories and homes, and the pollution is so bad that airborne particles block visibility. Even infrared images are next to useless. Two teams of boffins have been given significant government funds, not to come up with a cure for the smog, but to develop software that will filter out all the gunge from the

camera images. The *South China Morning Post* reports that after recent terrorist alerts, the engineers need to "completely rewrite algorithms in mathematical models, do lots of computer simulation and extensive field tests".

Zygote reminds them that even if the cameras fail to spot terrorists intent on mischief, chances are the bad guys won't be able to see their targets, either.

WHOLE NEW BALD GAME

At last, the announcement we've all been waiting for: researchers at Durham University have found a way to cure baldness. Computer scientists, geneticists and dermatologists have proved that cells taken from a specific area of the body can be grown in a three-dimensional culture and used to create a new head of hair.

"We show that human dermal papilla cells, when grown as spheroids, are capable of inducing de novo hair follicles in human cranial skin," they say. If that's too jargon-heavy for you, allow Zygote to translate it into plain English: "We can cure baldness using cells taken from nipples and foreskins."

Zygote has always been puzzled by the offensive terms used for gentlemen with receding hairlines who resort to comb-overs, transplants and wigs, but now understands that calling

them a tit or a dickhead is merely a statement of scientific fact.

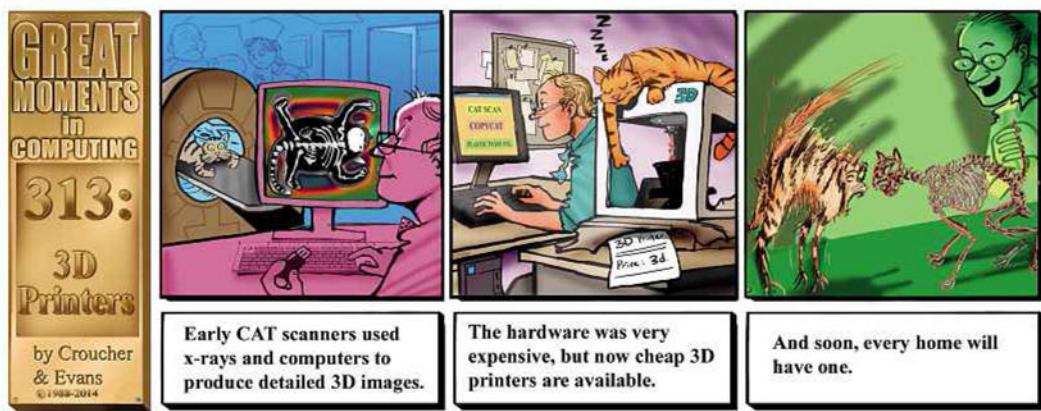
SWISS FORTRESS

Zygote is intrigued to learn that Switzerland is extending its long tradition of rigorous data protection. The government-owned telecommunications provider Swisscom announced it is setting up a national cloud-hosting system that will warehouse 250 petabytes of data and adhere to the strongest privacy laws in the world.

The Swiss cloud network will be completely independent from outside interests and act as a haven from the prying eyes of foreign secret services and other sinister forces, leaving the field clear for traditional users – such as cuckoo clock manufacturers, money launderers and the custodians of mislaid Nazi loot.

AIR APPARENT

Hot on the heels of Apple's announcement that its new datacentre will be solar-powered, Microsoft has bought the total output of a brand-new wind farm. The 55 giant turbines at the Keechi Wind Project in Texas will generate 110 megawatts, and is already plugged into the electric grid that feeds Microsoft's San Antonio mission control. This proves that while the sun shines out of Apple's assets, Microsoft continues to run on hot air. ☐





242G5



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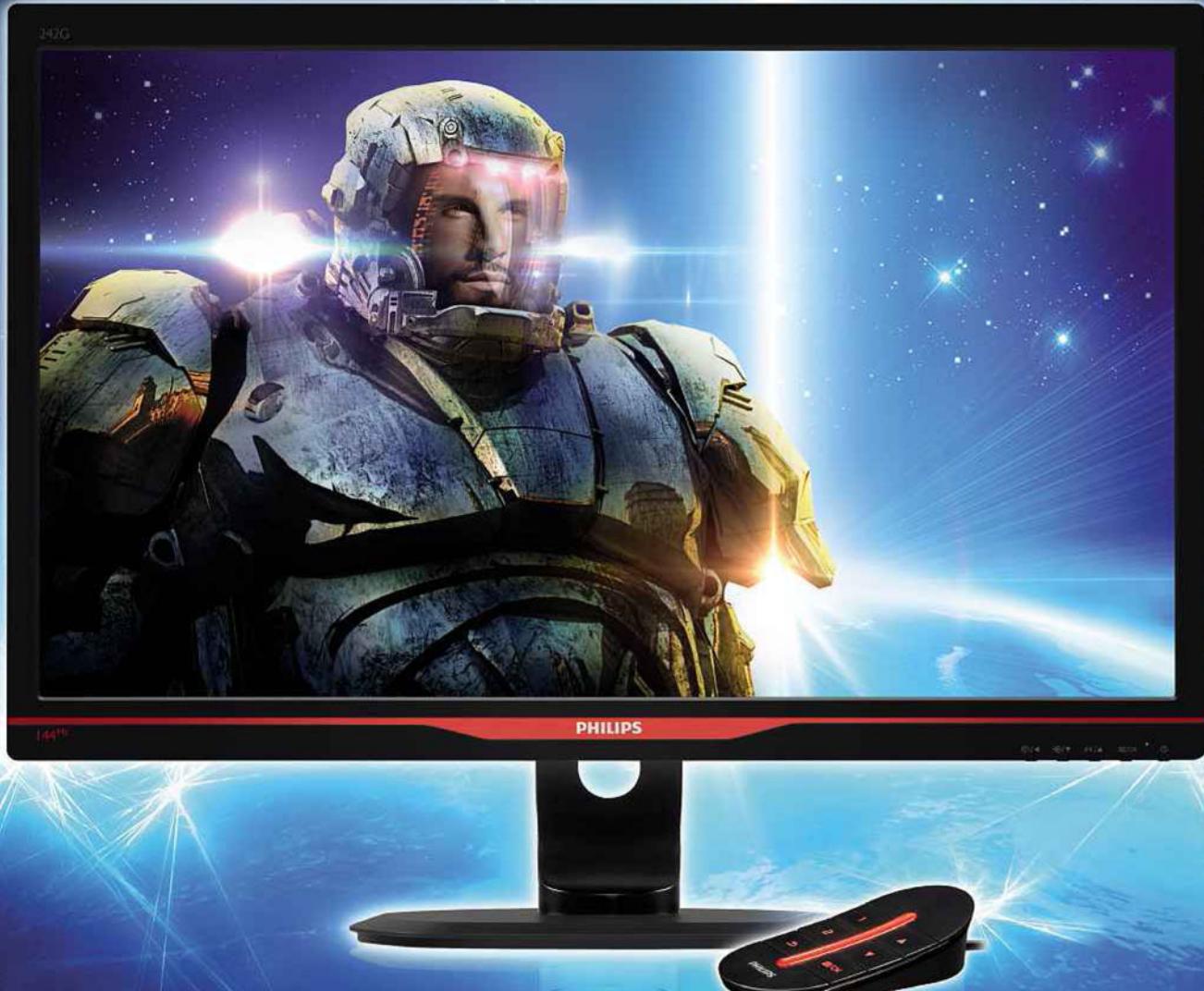
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