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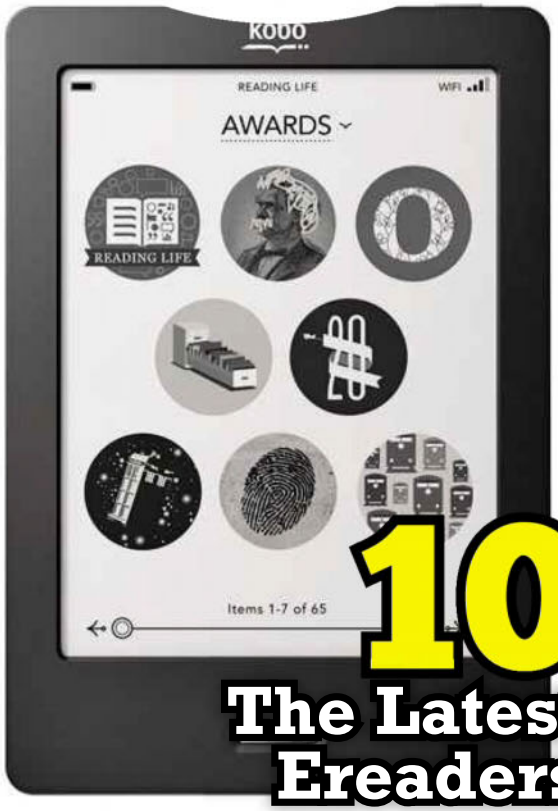

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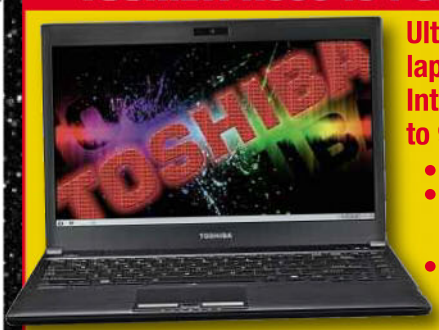

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FINDING THE BEST BARGAINS

How to get the best prices online

Searching for bargains online is never a simple task. There are hundreds of sites to look at, all of which might be hiding their best prices in a different way. To help you root out the best bargains and lowest prices for your planned expenditures, we've put together this selection of tips and tricks that will help you find the cheapest prices for hardware anywhere online. Whether you do it before Christmas, after Christmas or later in the year when your wallet's had time to recover, the tips below will make sure you get the most your money can buy.

1 Consider Buying Internationally

If you're not in a rush to get your hands on the thing you're buying, the so-called grey market can be a great way to pick up some unexpected deals. Entertainment products like games and movies tend to be region-locked, and things like mobile phones might not be compatible on this side of the Atlantic, but PC hardware has no such problems with restricted use, and that leaves your options wide open.

Consider, for instance, the Asus Nvidia GeForce GTX 760. It's a fairly high-end graphics card, which costs £159.99 if you buy if new off Amazon. Look across the pond, however, and you can easily find it on sale for just $209, which is a mere £133 once you convert it into local currency.

Obviously, it's not as simple a proposition as that. Between postage costs and customs fees, you could easily actually end up paying more for the hardware you want than if you'd bought it over here, and the long delivery time is both inconvenient and gives your package more time to get damaged en route. If the thing you're buying requires mains power, you might discover that it doesn't have the right adaptors once it arrives, and there's also the moral question of whether it's a good idea to support retailers abroad instead of ones at home.

Still, if you don't mind a gamble, can figure out a solution to any power woes and aren't worried about the health of local businesses, it can pay dividends – especially at the time of year when retailers abroad are running their own sales.

2 Buy Open-Box Items

Closer to home, few things guarantee massive savings like the phrase 'ex-display' does. We understand that part of the thrill of buying new hardware is getting your hands on factory-fresh components, but if you've ever bought a car and had someone remind you that the moment you roll it out of the dealer forecourt it starts to lose value, you'll remember that 'nearly new' is, in many ways, as good as new.

Of course, just because an item is ex-display or open-box, that doesn't mean it's actually been used. Sometimes a box might be opened just so an in-store customer can see the contents. They might have been returned unused by a customer who realised they bought the wrong thing or that their purchase was incompatible with their system. Ex-display could mean it's been running a communal system daily for years or it might mean a week of sitting in a glass cabinet beneath a 'this week's deal' sign. You just don't know.

Whatever the reality is, don't let it worry you. Most retailers sell open-box goods under the same terms as anything they sell new. If it doesn't work, you can still return it.

3 Visit The Outlet Stores

Although they don't sell individual pieces of hardware, big-name system manufacturers are just as keen to make money on goods that have been opened or returned. Indeed, the nature of their business means they're even more likely to have those items in stock.

Rather than sell such items alongside their other goods, big brand system-builders often run their

own 'outlet' site, which hoovers up all returned and refurbished systems. Dell sells refurbished and end-of-line laptops at a discount on its outlet store (**www.dell.co.uk/outlet**), while Apple sells open-box and refurbished goods in its own 'clearance' section at **store.apple.com/uk/browse/home/specialdeals**.

From most companies, you'll get a standard warranty and be afforded the same support and delivery as if you bought a system as new – the only real difference is that the price is slightly lower. In many cases, the product has actually been tested more rigorously and completely than any 'new' purchase, simply because they've been returned once and therefore had to be thoroughly tested (and potentially repaired) before they could be placed on sale a second time. It's always a gamble, but especially if you're buying a laptop or tablet, there are substantial savings on offer.

4 Try Using Price Comparison Sites

The price comparison industry isn't what it once was, not least because most consumers would rather have reliable service from a familiar brand than save a few pence. But when it comes to computer hardware, the UK is blessed with a large number of reliable hardware retailers, many of whom can undercut the prices of big retailers by a substantial amount.

That being the case, you have two options: check every site manually to see who can offer you the best price, or try out a price comparison website to do it for you.

It sounds simple, but using Price Comparison sites is as much as an art as a science. It's important to spot the ones that are more concerned with funnelling traffic to their clients than giving you the best deal, and you also have to be able to filter out the good information from the bad.

For example, we find that Google Shopping offers a comprehensive, no-nonsense approach to price comparison, but the retailers they list aren't necessarily the best quality. Many of the sites it returns results from neglect to mention that they don't include VAT in their prices (until you pay!) so sometimes they look cheaper than they are. Similarly, there's a high number of retailers who look suspicious, so if you see a name you don't recognise, research them before you spend any money!

5 Remember To Check eBay

Buying second-hand goods is a canny way to make large savings on the cost of computer hardware with reasonably little risk, but sites like Craigslist and Gumtree are much harder to gauge, meaning you're more likely to pick up a huge bargain or end up ripped off. By comparison, eBay is a virtual police state and far safer than many online stores thanks to its robust feedback and policing systems.

Hardware on eBay falls into one of two categories: new/unused and second-hand. It's up to you which you're most interested in buying.

January tends to be a good time to pick up nearly new items on eBay, because it becomes a dumping ground for unwanted gifts received at Christmas. It's also a good place to buy hard-to-find or otherwise out-of-stock goods, because it operates outside of traditional supply chains.

The downside of this is that contrary to what you might think, eBay doesn't tend to net you much of a saving. People rarely make eBay the only place they look at, so if you're bidding on something against a few other people, there's a strong chance its final value will skirt close to the retail price. Few people are likely to bid higher than they'd be able to spend elsewhere, but they will risk spending exactly as much!

Hopefully that advice will help you track down the best price for your coming purchases. Just make sure you don't get stung by extra charges when buying your hardware. If you take only one piece of advice about buying hardware in the sales from us, make sure it's this: always check the VAT and postage costs before you buy. That's how they try to get you! **mm**

The Latest Ereaders

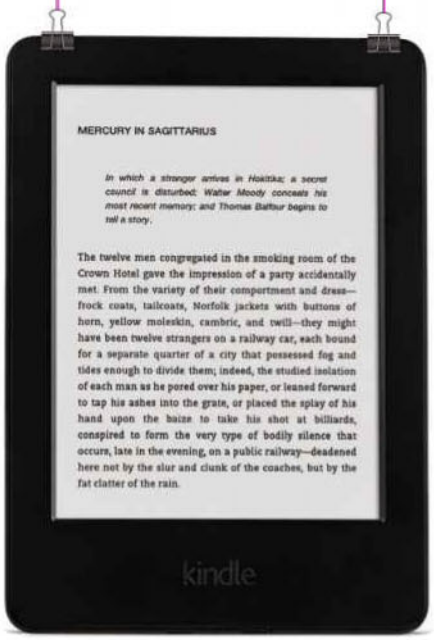
With the holidays upon us, it's a great time to get some reading done

The January sales is the perfect time to unload your Christmas money, get the most value out of any vouchers you've been gifted or even pick up a belated present for yourself if your family missed the hints you'd been dropping. It hasn't been long since ereaders first arrived, but they've already become an essential part of any reader's arsenal, and that means it's always a good time to buy your first or replace an aging one.

As usual, most ereader lines have been refreshed or updated in the run-up to Christmas, so we took a look at what's on the market to figure out which ones are worth buying and why.

Basic Ereaders

If all you want is an e-ink device for reading, you don't have to spend a lot of money at all. These models are the current basic crop, which all share the same qualities: a 6" screen, wi-fi only connectivity, a touch-screen and a low price.



Amazon Kindle (£59)

The cheapest Kindle, aka the Kindle 6, was refreshed in October 2014. The sixth-generation model replaces 2012's similarly basic Kindle 5, but with a number of new upgrades. Like the Kindle 5, it comes in black (earlier models were silver/grey), and a new 1GHz processor gives it page turns that are 20% faster than the previous model. On-board storage has been doubled from 2GB to 4GB, and perhaps most pertinently it's the first basic Kindle to use a touch-only input, effectively elevating haptic page-turn buttons into a premium feature (since they're now unavailable on cheaper Kindles). Although it's basic, the Kindle 6 has the latest software including X-Ray, Kindle FreeTime (a child-friendly mode) and more.

The basic Kindle can be coaxed into reading free ebooks with a little file conversion, but in general it's only useful if you're the sort of person who'll buy exclusively from Amazon's online store. Kindle Unlimited is a bolt-on but does give you library-style access to 650,000 commercial titles, so if you're a voracious reader, it's worth investigating. It does come with a USB charge cable, but it's worth remembering that most of its accessories (the cover, power adaptor and clip-on reading light) must be purchased separately.

Finally, we should point out that the £59 price is only for the 'special offers' version, which displays adverts on the lock screen when the device is in standby mode. If you'd rather not see anything like that, you can pay £10 extra for the same model without adverts.

Kobo Touch (£59.99)

Sold in the UK by WH Smith, the Kobo Touch is available in black or white/blue models, currently reduced from its original retail price of £89.99 – though probably because the hardware is still the same as it was in 2011. You still get the Kobo's soft, quilted back and 2GB of storage, which can be augmented by up to 32GB of micro-SD. There are no physical buttons other than a discreet power button, and the home button on the front face of the device, which gets you back to the main menu.

Although the specs aren't particularly modern, there's little that isn't up to scratch. Like most budget ereaders, it's mainly competing against the Kindle 6, and while it can't boast the same access to services and titles that Amazon's flagship ereader does, you do get an extensive library of books to download and support for DRM-free ePub files, which is lacking in Amazon's device. It even supports CBR/CBZ files if you want to use it to read comics!

Ultimately, though, the Kobo Touch is in dire need of an update. Although there's little wrong with it in itself, the fact that it's now more than three years old is easy to see when you compare it to its competitors, which pack in new features like dictionaries and note-taking that simply don't exist in the Kobo. Support for proprietary formats aside, there's nothing here that's better than the Kindle 6, and in a competitive market, that's the one thing your hardware really needs to be.

Nook Simple Touch Glowlight (£49.99)

The Nook is well-known in the US due to its association with the huge bookseller, Barnes & Noble, but in the last two years it's been possible to buy in the UK as well (not that many people noticed). The cheapest model, the Nook Simple Touch, is only available through third-party sellers like Argos rather than off the official site, since it was discontinued from manufacture in early 2014, officially replaced by the newer and more expensive Nook Glowlight. That means if you can find one, it's probably a good time to pick up a bargain, because once it sells out it won't be coming back.

The hardware itself is from 2012, and on the surface it's a basic ereader positioned against the basic Kindle of the time. Like the Kobo Touch, it has 2GB of space, a micro-SD slot and the ability to read ePub files, and the battery life is also slightly more competitive. The fact that it has both a built-in light and costs less than the Kindle 6/Kobo Touch gives it a definite edge for thriftier buyers, but it's worth noting that the screen contrast is poorer than almost any other mainstream ereader.

In a market where there are much better devices available for just a few quid more, you have to be a particular sort of money-saving buyer to opt for a device that even the manufacturers have abandoned, but there's no getting away from the fact that it's the cheapest ereader around with a light, and that makes it a genuine consideration – while it's still possible to find one, at least.

Mid-Range Ereaders

For around £20-£30 more, most ereader manufacturers offer advanced versions of their hardware, which incorporate extra features. That used to be a touch-screen, but now that even the cheapest ereader has one, it's usually a light, a higher resolution screen or better connectivity. Here are the main candidates should you want something a bit better than the basic ereader.

Kindle Paperwhite 2 *(£109)*

The original Paperwhite was released in 2012, but the current version on sale was refreshed in October 2013 and is informally known as the Paperwhite 2. A more advanced, more expensive sibling of the standard Kindle, the Kindle Paperwhite has a touch-screen, which is also a self-illuminating e-ink display so that you can read it in dark or low light without any lighting attachments.

Compared to the original 2012 Paperwhite, the Paperwhite 2 has improved lighting with more uniform screen coverage, the storage has been doubled to 4GB, and the processor is a 1GHz chip that turns pages 25% faster. Compared to the Kindle 6, it has a higher resolution screen and backlight, but it's also very slightly larger and heavier.

The only real problem is the price. You're essentially spending £50 for a light-up screen and slightly sharper text. You have to really want them to make the price seem reasonable, especially when you consider that much cheaper models incorporate those features too. There's no question that the Paperwhite was revolutionary when it came out, but these days you're paying for the Amazon name more than the features.

Kobo Aura *(£79.99)*

Released in September 2013, the Kobo Aura replaced the Kobo Glo as Kobo's equivalent of the Kindle Paperwhite. Although the Kobo Glo didn't do much to distinguish itself against Amazon's competition, the Aura is at least £30 cheaper thanks to a recent price reduction.

The perks of the Kobo platform still apply here – easier access to ePubs and access to micro-SD storage expansion – but there aren't really any extras to speak of beyond the illuminated screen. The contrast is poorer than the Paperwhite, but in the context of the device being £30 cheaper that's not particularly hard to get on with. Some users have also complained about 'pinprick' light leaks in the screen, but it's hard to say whether the problem is widespread enough to worry about.

It is, at the very least, superior to the Kobo Glo for having full-screen Paperwhite-style lighting rather than disappointingly dim sidelights, and you do get 4GB of storage compared to the 2GB the Glo offered, but all of this simply brings it in line with the current Paperwhite. The low price is definitely a boon, but Amazon's software services are arguably enough to justify the extra cost, and if you want a cheap ereader with a backlight, then the Nook Simple Touch fills that gap pretty well itself. It's not a bad device, but in the face of that competition, it does struggle to distinguish itself.

Nook GlowLight *(£89)*

Released in October 2013, the Nook GlowLight has recently seen its price drop to £89, making it slightly more expensive than the Kobo Aura but still significantly cheaper than the Kindle Paperwhite 2. It replaces the Nook Simple Touch Glowlight on the slate as Nook's cheapest (and only) in-production ereader.

To that end, it has double the storage space (4GB), a faster processor (800MHz) and a sharper screen resolution (1024 x 768 versus the Simple Touch's 800 x 600). But not every feature made it over from the earlier model. The Nook Glowlight has dropped its micro-SD slot, leaving the Kobo Aura as the only mid-range ereader with support for the format, and the hardware page-turn 'bars' present on the Simple Touch have also disappeared.

With this in mind, it struggles as an alternative to the Paperwhite, because the Kobo Aura is already filling that gap far more convincingly at a tenner less. Add to that the fact that there are problems with touch-screen lag compared to most ereaders – probably thanks to the slower processor – and it's hard to recommend. Its only real distinguishing feature is that it comes in white, and we're not sure that's really enough.

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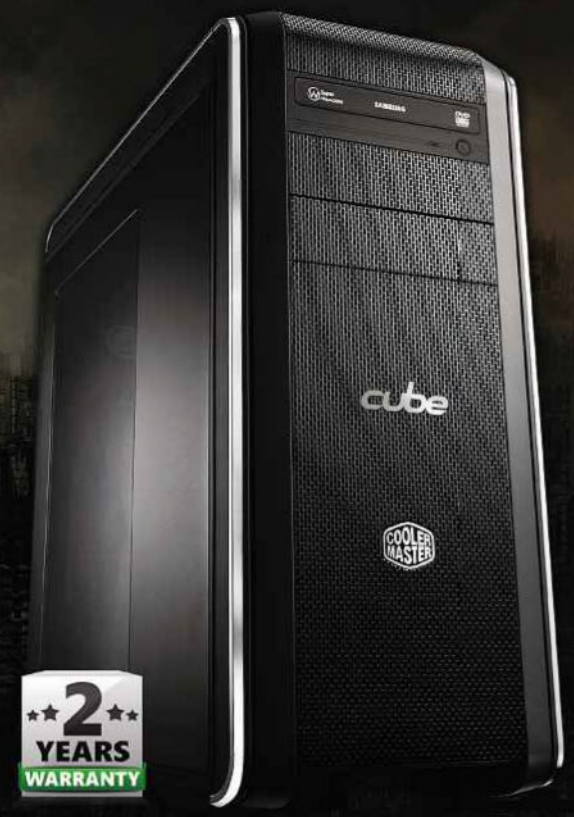

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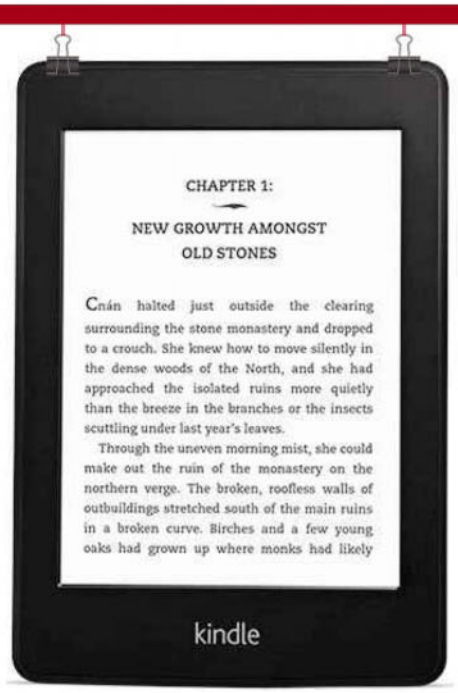
Premium ereaders

If you're willing to spend upwards of £110 on your ereader, you can get even more features and functionality – some of it slightly more experimental than others. These ereaders are as expensive as certain tablets that have a far greater range of applications, so you have to be a heavy user to justify spending this much on an E Ink display.

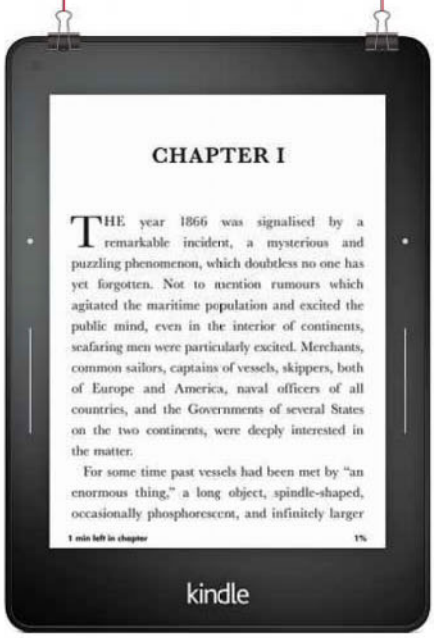


Paperwhite 2 3G (£169)

For £60 more than the basic Paperwhite 2, you can get a version with a 3G connection, giving you the ability to buy and download books as long as you're somewhere with a data connection. And, of course, you can use the Kindle's experimental browser to look at the web, but that's so imperfect an experience that it's not really worth considering.

The 3G connection is unmetered, so you don't ever have to pay for the data you use, which is made possible purely because the device is unable to shift any large amount of data. It's not like you'll be using it to watch videos and download music, after all. The £60 is essentially you pre-paying for all of the data you'll ever need.

Other than that, the hardware is identical. Using the internet connection will run the battery down faster, but it's otherwise identical to the cheaper Paperwhite. We ultimately think that makes it a little too expensive given the limited use a 3G connection will entertain.



Kindle Voyage / Voyage 3G (£169 / £229)

The latest Kindle was released in October 2014 and is already on backorder, so if you want one before Christmas, you might not be in luck. In case there's any doubt, it's the new flagship Kindle, and that means it has a raft of new features.

Foremost among these is a further improved screen, which is now the highest resolution available on any ereader to date, 1430 x 1080, which is equivalent to 300ppi and double what the Paperwhite offers. It's also the thinnest Kindle ever at 7.6mm, and the first to have an adaptive front light, which automatically adjusts the brightness depending on the ambient light (though you can still manually control it). The screen is also flush against the front of the device (i.e. there's no bezel), which makes touch input much less fiddly. Another large change is that it's the first touch-screen Kindle to incorporate the ability to make hardware page turns. You can still tap or swipe the screen, but there are now page turn buttons ('PagePress') on both the right and left – something previously only available in the original, non-touch Kindles that you can no longer buy.

Like the Paperwhite, this is also available with an unmetered 3G connection for an extra £60, although given that it's already pushing the limits of acceptable pricing in the standard version, we can't imagine that being a popular option.

Kobo Aura H2O (£139.99)

The latest and most expensive device in Kobo's line, the Kobo Aura H2O is actually based on the limited-edition Kobo Aura HD, meaning it has the largest screen of any in-production ereader. The diagonal is 6.8", compared to the 6" screen found on almost every other device, and its resolution is the same as the Kindle Voyage at 1430 x 1080 – although the larger screen means it's only 265ppi, so it's not technically as sharp.

The real selling point, though, is that the device is waterproof, hence the name. As long as the port cover is closed, it'll remain waterproof for up to 30 minutes while submerged in one meter of water, making it ideal for readers who have previously had to rely on deftly employed resealable bags to enjoy a read in the bath.

Other than that, it's the same as the standard Kobo Aura: 4GB of storage, a micro-SD slot and built-in ComfortLight. Given that it's £30 cheaper than the Kindle Voyage and waterproof, we'd say Kobo has a winner on its hands with this one. **mm**

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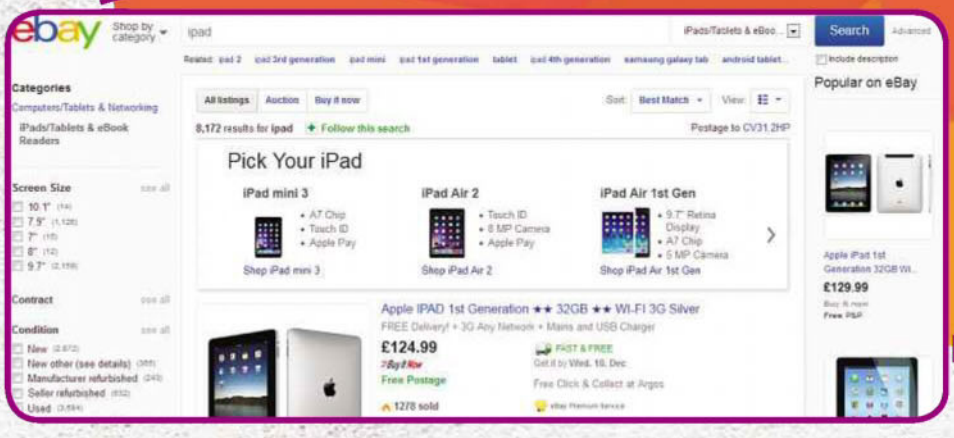
WHERE TO SELL UNWANTED GIFTS

Turn those festive disappointments into hard cash, says James Hunt



The frenzy of consumerism that begins in early December always extends into January, as the seasonal sales are used as an excuse to prevent a downturn in buyer behaviour and unload unsold stock. This is bad news if you're susceptible to a bargain, but if you've suddenly found yourself with unwanted gifts, hardware you no longer need or intended presents that you didn't find a recipient for, now's the time to sell. It'll be another 11 months until people are this free with their money again.

There are plenty of ways to find a home for your unwanted goods, whatever condition they're in. Obviously, the internet is a great way to do that. But where do you start? We have some suggestions right here.

eBay

eBay is, without a doubt, one of the best places to sell your second-hand goods online. There's a lot of talk about how eBay is a buyer's market, but that's not really the case. eBay is actually a seller's market. It's where all the customers go looking for second-hand and cut-price deals, and that means you can guarantee that you'll get the market rate for your items, whether there's one person interested or a hundred.

The good things about eBay are numerous. Close integration with PayPal means it's easy to get paid, and there are feedback systems in place for both buyers and sellers, which ensures a good quality of user – and at the very least, you get a warning about the risky ones. Listing stuff is easy, because the site makes it as simple as possible, even to the point of integrating its mobile and web-based processes. You can add photos from your phone without hitting so much as refresh on your PC.

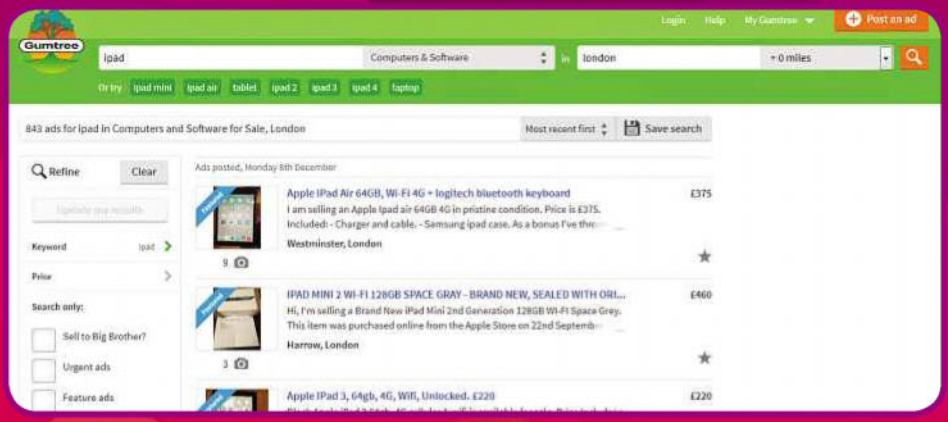
But it's not all good news. The bad thing about eBay is that there's a lot of competition, which means your item might not sell at all, and you have to put a lot of work into creating and managing your listings to ensure you're top of the heap. And then there are the fees. You'll end up paying as much as 10% of the final sale price to eBay as fees, and it costs money for extras to your auction (though pictures are free these days).

If you're selling something for the first time, your lack of any feedback profile could also be a problem – people aren't as likely to buy from someone without a proven history, and no feedback is almost as bad as negative feedback. You might attract a few bidders who are hoping for a bargain, but with a zero or otherwise low feedback score, you might end up selling your item well below the market rate.

Still, if you have an eBay account and any level of profile already established on the site, it's by far the best place to begin. There's nothing else online quite like it.

Amazon Marketplace

Well, we say that there's 'nothing' like eBay, but Amazon Marketplace is somewhere that gives it a fairly good run for its money. A lot of things about Amazon Marketplace are similar to eBay: you pay fees to sell (but not when you list), and you earn feedback from your buyers depending on how well you've served them. Like eBay, competition between sellers is high, and like eBay there are loads of buyers available to you – if you've ever seen



a 'prices from…' link on an Amazon product page, that's because there are marketplace sellers selling it.

The main difference between eBay and Amazon Marketplace is that the latter used fixed-price sales of unlimited duration, rather than an auction or time-limited model. Listing your items for sale is free and easy to do, because there's no need to write a description yourself. You simply find the product you're selling in Amazon's existing product database, add a brief note about the item's condition and then set your price.

Because listings are free to add and essentially never end, there's a lot of competition over pricing. If you list something alongside several other sellers, the lowest price is very likely to sell before the others (regardless of feedback), which means if you undercut the existing sellers by a small amount, they'll return the favour. There are even scripts that can do this automatically for some sellers, which can create a back-and-forth that pushes prices ever downwards. Not good for sellers.

The practical outcome of this is that common items like books and DVDs will probably sell for pennies. But then, they probably wouldn't have sold on eBay at all. The good news is that Amazon calculates and takes postage for you, so you shouldn't lose money on anything you sell – but watch out. Some things will sell better on Amazon than eBay, and sometimes it's the other way around.

Classified Sites

Historically, classified ads have been a great way to sell anything you don't want second hand – although in the era of eBay and Amazon Marketplace, they've become a lot riskier. Sites like Craigslist and Gumtree are basically unmoderated, meaning that it's hard to gauge whether someone's worth dealing with. The lack of any feedback or robust protection systems means they're hives of people who can't use the more corporate arm of the second-hand market.

That said, not everyone using those sites is a crook; it's just that there's almost no way to tell the good from the bad until you're actively engaging with the process. To keep yourself safe, make sure to follow the rules of common sense: don't accept payment by cash or bank transfer, keep copies of correspondence and make sure you post items using a registered or tracked service so you can be sure of a safe delivery.

The benefits of these sites are that you probably won't have a lot of direct competition, so it's easier to make a sale if you have something anyone wants, and you can probably get a good price by doing so – if someone's not buying off eBay or Amazon already, they probably have a good reason for not going there. It's also a good place to sell job lots and mixed bags that wouldn't make it through eBay's descriptions or fit in Amazon's catalogue. Just be careful not to take any chances!

Freecycle

Arguably the home of the best bargains of all, Freecycle (aka The Freecycle Network) is an organisation that co-ordinates groups of local people over an email list/forum, allowing them to request and offer items of any kind. It's like a classifieds website, only the listings are all entirely free.

The idea is to unite people's unwanted goods with those who actually want them, saving potential junk from a rather more useless fate in a landfill somewhere. The nature of the organisation means it's particularly good for getting rid of unwanted computer components. When old systems and peripherals are replaced, they're often listed on Freecycle as an alternative to being thrown out in case anyone wants to refurbish or strip them for parts. All you have to do is pass the goods onto the interested party. No money changes hands, and that means the potential for fraud is virtually nil.

As a seller (or rather, donor), you don't get much out of giving stuff away on Freecycle, though you do remove the hassle of finding a home for stuff that isn't ready to be thrown away but isn't necessarily ready to sell either. Everything from empty CD cases to broken monitors to unused laptops will be snapped up on Freecycle. At least you don't lose the time and money it'd take to drop your unwanted hardware off at the dump. **mm**

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Whether you have an HTPC you're planning to upgrade or simply plan to buy one, knowing what you can get for your money is a good way to keep your expectations realistic and help you stay on the lookout for potential bargains. To help you navigate the unfamiliar waters of the HTPC market, we've put together this guide to the best HTPC accessories you can buy no matter how much you want to spend. You don't need them to run an HTPC, but your HTPC won't be complete until you've bought them!

TV Tuners & Video Capture Cards

The advent of IPTV services and the necessity of external set-top boxes means that TV tuners aren't found in every HTPC, but they undoubtedly enhance any existing one. The problem is that TV tuner cards can only receive free-to-air DVB broadcasts, which isn't much good for anyone who has, for example, an encrypted Virgin Media or Sky TV package. If you want to watch high-definition or subscription-television, you'll instead need to use a video capture card to pass the signal through from the set-top box to your computer.

Still, if you prefer your free-to-air streams to be high-def and can't get your broadband to handle the strain, a TV card can get a much better signal to display on your HTPC, and that certainly makes them worth considering.

Budget TV Card: Hauppauge WinTV Nova-T 500 (£61)

The WinTV Nova-T 500 is one of the cheapest internal TV cards Hauppauge makes, and it distinguishes itself from other budget TV cards by packing in not one but two fully digital receivers. Many cards still feature one analogue tuner (now useless in the UK) and one digital, but the WinTV Nova-T 500 doesn't cut corners.

That at least gives it an advantage over freeview TVs and set-top boxes, because you can use this card to watch two channels at once or watch one while recording another – a

feature common on multi-tuner pay TV set-top boxes, but still not available in low-end digital hardware.

This card also offers the unusual ability to combine the signal from both of its tuners, so if you're getting a poor reception you can plug two aerials into the back and turn two weak signals into one strong one. It's useful for those forced to use indoor aerials or if you have a poor signal because you live in the shadow of a hill or in remote rural areas. Crucially for this piece of hardware, it's a capability found almost nowhere else in the consumer market, and that makes it stand out.

Mid-Price TV Card: Hauppauge WinTV NOVA-HD-S2 (£90)

The cheapest satellite-enabled TV card around, the WinTV Nova-HD-S2 has a DVB-S/DVB-S2 tuner in it, which means you can use a digital dish – any kind – to receive free HD television from across Europe. You can't use it to watch Sky TV even if you have a subscription, but it will give you access to freeview channels with a better picture than an aerial alone, as well as free foreign TV stations and any free HD channels found on Freesat.

The card itself has an F-connector input for the dish and space for a 2.5mm remote jack, with the necessary sensor and remote control provided as part of the retail package. It's also compatible with third-party digital TV applications thanks to BDA-compliant drivers, so if you want to use software other than that which it's bundled with, you can do just that. Features in the default application include time-shifting and PVR recording, as well as a seven-day EPG, subtitles, video capture and conversion and a variety of other advanced controls. If you want to get free HD satellite channels into your HTPC system, this is a great way to do so.

High-end TV Card: Hauppauge Colossus (£125)

But what about those of us who *do* want to watch subscription TV on their HTPCs? What you need is a video capture card with an HDMI input, and that's exactly what the Hauppauge Colossus is. Install it in your system, plug your Sky/Virgin box into the back, and you'll be able to watch subscription TV through your HTPC as normal. It even comes with an 'IR Blaster', an infra-red relay that can pass on remote control signals, allowing you to use a PC remote control to operate your Sky/Virgin box.

As capture cards go, it's a strong example by any standards. There are loads of inputs, so you can use the card to capture from multiple video sources (HDMI, component, analogue and even Toshiba's TOSLINK), while the bundled software can act as a PVR to record high-definition TV directly to your hard drive. You can even configure it to work with the likes of Windows Media Center or XBMC, and it captures full 5.1 surround sound – something that cheaper devices are unable to do.

One thing it doesn't do is receive TV signals itself. On this occasion, you definitely do need a set-top box to see anything, not just an aerial. But we imagine anyone serious enough about their entertainment to build an HTPC is going to have subscription TV anyway, and if that's the case, this is the card you need. Without it, your HTPC is only half as entertaining.

5.1 Speaker Systems

It's important to pay attention to the way HTPCs sound as much as how they look, so if you're trying to accessorise your home theatre system, a good set of 5.1 speakers is invaluable. Most motherboards support 5.1 surround to a reasonable standard, but do check first – if you've bought a shrunken motherboard to fit in a smaller HTPC case, some genius might have shuffled those capabilities off in the name of space-saving!

Budget 5.1 Speakers: Creative A550 (£55.99)

The Creative A550 uses the same subwoofer and satellite speakers as the stereo Creative A250, only in a 5.1 configuration (five satellites, one subwoofer). Although the A250 is quite expensive for its price range, the A550 is definitely the opposite: it's probably the cheapest 5.1 system you can buy at retail.

As a 5.1 system, it has some things wrong with it – not least the shortness of the bundled satellite cables, which greatly restrict the positioning. It doesn't help that three of the cables you need to run it are hard-wired into the unit either, which makes trying to move it a cavalcade of untangling. The output is also quite low, at 37 watts total – five per satellite and a 12W subwoofer.

Still, it can't be bettered on price, and 5.1 sound doesn't normally come this cheap. We'd recommend it for gamers who want a big experience on a small budget, rather than those seeking high-fidelity sound for their home cinema system – but at this price, you're unlikely to find too much fault with it.

Mid-Price 5.1 Speakers: Logitech Z506 (£95)

This offering from Logitech has at least one thing going for it that most 5.1 speaker systems at this price don't, and that's a dedicated centre speaker. That alone gives it an air of seriousness that other cheap 5.1 units often fail to match. The total output is 75 watt, so clearly it's aimed at providing some room-filling, wall-shaking, neighbour-enraging sound, and that's crucial if you're trying to build a serious HTPC even if you don't have a lot of cash to spend.

Each speaker contains two drivers – a woofer and a tweeter – apart from the centre speaker, which contains two equally sized woofers. A dedicated bass controller on the subwoofer allows you to tweak the balance of low-frequency noise, and there are dual 3.5mm inputs for stereo use, three for 5.1 use and even a headphone socket on one of the speakers, meaning there's room to expand and modify the setup.

The only thing that lets this system down is something that afflicts most systems at this sort of price: the cables are too short to be truly convenient. Aside from that, we have no complaints. You're never going to get crystal-clear audio out of a sub-£100 speaker system, and there's very little middle ground, but the Logitech Z506 can at least guarantee a high volume and dedicated surround sound.

High-end 5.1 Speakers: Logitech Z906 (£300)

Positioned as a successor to the critically acclaimed Z-5500, the Z906 system is a 5.1 setup with THX certification consisting of a subwoofer, decoder and five satellite speakers. And in case you hadn't noticed, it's quite expensive.

Still, for what you pay, the hardware is sturdy and well designed. A remote control means you don't have to move much more than a finger to tweak the sound's volume or mix. The cables for each speaker are more than long enough for any room, with 4.6m for the front speakers and 7.6m for the rear ones. All input and output ports are all located on the subwoofer, although unusually there's no support for HDMI, which could lead to problems if you wanted to use a separate Blu-ray player instead of an internal one in your HTPC.

As with most high-end speaker sets, you might need a dedicated sound card to get the most out of it. There's the option to use 3.5mm jacks, but digital inputs are required for the best experience. Of course, the output is clean, crisp and loud, and it's important to make the most of that. The lack of HDMI support does raise an eyebrow, but that does mean, when the time comes, there's a good chance it'll go on sale.

Media Remotes

The hardest thing about setting up an HTPC is that traditional PCs don't marry well with remote control. In lieu of sitting with a wireless keyboard and mouse balanced precariously on your lap, a media remote can give you the ability to access your HTPC's essential functions right from the palm of your hand. And that's just for starters. By the time you've spent a little time treating your HTPC like you would any other television system, you'll wonder quite how you ever lived without it.

Budget Media Remote: Rii i25 (£24.95)

The Rii i25 is an XBMC and MCE compatible remote control with a built-in qwerty keypad, air mouse and IR-learning function, giving you everything you need to assert general control of your media PC. It's not exactly elegant or compact, but for £25 it has all the functions you'll ever need, and that's a huge part of its appeal.

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One disappointing limitation is that despite the IR-learning function giving it a universal quality, it can only be paired with one device at a time. If you're just looking to control a single system (say, your PC or games consoles rather than an entire stack of set top-boxes), then that's great, but it wouldn't have taken much more hardware to turn it into a seriously powerful remote control, instead of a decent basic one.

Still, the advantage of a remote like this is that you can use it for emails and web browsing as well as controlling movies and entertainment. Its RF connectivity means you can connect it to any USB-powered PC, and it's also compatible with PlayStation consoles and Android devices too. It might not be pretty, and there are cheaper remotes out there, but it'll get the job done.

Mid-Price Media Remote:

Xsight Plus (£49.99)

Unlike cheaper models, the Xsight Plus incorporates universal functionality, meaning that it can be configured to communicate with any one of 12 separate devices at the touch of a button, including PCs. It even incorporates an LCD screen to help you configure the controller's behaviour, which is far more useful than 12 device-selection buttons would be. The on-screen menu navigation also makes it easy to map new functions and macros to the configurable buttons on the top half of the controller, giving you tight control over what your remote does and how it does it.

Although you can set it up in stand-alone mode, it's quicker to use the bundled PC app. It supports a huge number of devices out of the box, but don't worry if you can't find the one you want: there's a learning function too, which allows you to copy controls from existing remotes. The only catch is the weight: four AAA batteries and a rubberised back mean it's a reasonably heavy piece of hardware. Admittedly it's also not the simplest remote to set up, but exercise a little persistence through the more confusing bits and you'll have a truly powerful remote control on your hands.

High-end Media Remote:
Logitech Harmony Ultimate (£149.99)

The Rolls Royce of its field, the Logitech Harmony Ultimate is essentially the last word in what you can do with a remote control. It can be paired with any IR-capable or Bluetooth-capable device, from TVs to HTPCs to games consoles and even the Philips Hue remote-controlled lightbulbs. It has the ability to recognise both short and long keypresses, essentially doubling the number of buttons you can access, and that's in addition to built-in tilt sensors, a vibration engine and a touch-screen, all of which give you multiple ways to input information and accept feedback. The buttons are backlit, and there's even a charging station included in the box.

Perhaps best of all, it comes with a companion app, which allows other people in your household to access its features remotely using their smartphones and tablets. This means that you can essentially get multiple handsets for one price. With support for up to 15 simultaneous devices, after you've bought this piece of prime gadgetry you may never need a new remote control again. **mm**

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High-End Screens Guide

They get better and better, while costing less than you may imagine

It seems like computer screens are getting better all the time. It's a safe bet that if you've bought a tablet, laptop or smartphone in the last year it's packing a screen that's brighter than the sun with visuals sharper than Oscar Wilde. Meanwhile, your standard desktop system is allowed to languish with a screen that – at best – manages a full HD resolution despite having four times the visible real estate of your tablet.

Treating yourself to a high-end screen can transform the experience of using your desktop system, because you'll literally be seeing things in a whole new light. Desktops have a lot more power than other devices, at that means they can handle technologies that might require more processing capabilities or a more readily available power than portable hardware can contend with. Technologies like 3D and 4K.

To show you what's on offer, we've collected together some of the best high-end screens for your perusal. With the sales on their way, there's no better time to think about buying one than now. Once you've chosen a model to look for, you'll be ready to strike when the prices start to drop!

3D Monitors

A 3D monitor is surely the ultimate in desktop status symbols. Nothing says 'here's something your tablet can't do' like a device designed exclusively for high-definition movies and high-end gaming. Of course, flashy visuals aren't all that 3D monitors have going for them. They also have super-high refresh rates that give a smooth appearance to everything they display, and they tend to be decent HD monitors underneath too. Whatever you think of the technology itself, it's clear that there's a certain futuristic spectacle involved. You'll probably need a 3D Vision Kit and compatible graphics hardware, but if you've got those, 3D visuals are just the right screen away from being a reality.

Asus VG248QE (£245)

At £245, the Asus VG248QE is everything you need from a desktop monitor. It has a 24" widescreen display with a native resolution of 1920 x 1080, a refresh rate of 144Hz

and a grey-to-grey response time of 1ms. Whether you're after fully 3D gaming or you want to enjoy movie blockbusters in 3D from a Blu-ray disc, you'll be glad to hear that it's compatible with Nvidia's 3D Vision Kit.

Crucially, though, it's not just a good 3D monitor, it's also a good monitor in its own right, with a low-latency display and a selection of 'Splendid Video' presets to enhance colour, brightness, contrast and sharpness for any given situation it may come across. Meanwhile, its GamePlus mode allows you to add a crosshair and in-screen timer to any image, regardless of software support for such features.

Even the stand is good, with full height, tile and swivel adjustments that cheaper monitors try and get away with omitting, as well as plenty of connectivity on the base – DisplayPort, Dual-Link DVI-D and HDMI. Asus' hardware has enjoyed a great reputation lately, and when their monitors are this good it's not hard to see why.

“A high-end screen can transform the experience of using your desktop system”

BenQ XL2411Z (£233)

All of BenQ's 3D gaming monitors are good, but for the best balance of price and performance it has to be the XL2411Z, which has built-in Motion Blur Reduction technology and a Low Blue Light to prevent eye strain, save energy and reduce sleep-cycle disruption. Its 3D-capabilities allow it to run in 100Hz, 120Hz or 144Hz mode so that you can choose the optimal refresh for your purposes, and the Display Pilot software allows you to quickly set and save viewing profiles depending on your preferences.

Specs-wise it's a competitive screen too – its 24" diagonal width, 1920 x 1080 resolution and 1ms grey-to-grey response time put it at the top of its class, while VGA/DVI-DL/HDMI inputs mean you'll have no difficulty connecting it to your preferred source. There's a headphone socket at the side, but the screen is kept relatively slimline with no DisplayPort, no USB hub and no speakers, which is great if you want to minimise clutter and weight.

Although undeniably a little less impressive than its more expensive line mate, the XL2420Z, the XL2411Z is still good enough to justify its price, and at £50 less than the high-end model it's far better value. Unless you need a USB hub or demand the OSD remote control that the more expensive monitor comes with, the XL2411Z is by far your best choice when it comes to BenQ's monitors.

AOC D2769VH (£190)

If you want to save money, it's worth going for a passive 3D model instead of an active shutter one. Sure, the 3D resolution might not be as good and the bleed-through between left and right eyes is a far more pronounced, but you can't argue with the price. Indeed, where the other 3D screens we've featured are both 24", for £50 less than they cost you can net yourself a full 27" screen, with speakers.

Aside from being passive 3D, it's worth remembering that a larger screen doesn't necessarily mean better. It's still a fairly standard 1920 x 1080 resolution, so you don't see any more than on the other models, and what you do see will be less sharp for being larger. Then again, if you want to use it as a 3D TV or gaming screen, it helps to have that extra size so that you can sit a little further back from it.

It's not actually a bad monitor, either. The IPS screen gives it stunningly vivid and accurate colour reproduction and superb viewing angles. Passive 3D means the glasses are cheap, so you can easily pick up multiple pairs, and you still get dual HDMI connectors, so you can even plug in two different sources – say, your PC and games console. For all these reasons and many more, if you're looking for a low-priced or larger-than-average 3D monitor, this is the one to go for.

4K Monitors

Few would deny that home 3D hasn't really taken off outside the gaming and movie enthusiast audience, but there's no getting away from the inevitable rise of 4K resolutions, which are already supported by the latest entertainment hardware and graphics cards. Even YouTube already allows you to select 4K video where available.

In case you're unfamiliar, 4K resolutions are over twice as wide and twice as tall as standard HD monitors. Full HD usually means 1920 x 1080, which is (retroactively) a 1K display. A 4K screen has a native resolution of 4096 x 2160, which gives it four times as many pixels as Full HD video.

Although 4K monitors are currently quite expensive, prices have already dropped significantly since their mainstream introduction earlier a year ago. This holiday season will be the first where 4K monitors are truly part of the market, so if you're looking to buy one it's probably your first chance to get one in a sale!

Samsung U28D590 (£425)

The 28" Samsung U28D590 is one of the cheapest native 4K monitors you can buy, but that doesn't mean it's a slouch. A 1ms response time and dual HDMI input with DisplayPort make it more than adequate for games and movies, and there's even a special 'Game Mode' that optimises colour, brightness and contrast for gaming at the touch of a button. Combine that with Samsung's 'MagicAngle' viewing-angle enhancements, and you've got a monitor worth paying for at any price.

Even at this comparatively low price, there are loads of extra features, like PIP 2.0 and PBP, which allow you to show multiple inputs simultaneously while retaining the source resolution. Ultra HD upscaling allows you to enjoy smooth-looking content even when using low-resolution sources. As well as dual-HDMI inputs, there's a headphone jack and DisplayPort input.

“4K screens are expected to be the norm within three years, so it's only a matter of time”

It's fair to say Samsung's reputation for high-quality hardware isn't at all sullied by the U28D590, and its low price certainly helps make it a contender as an entry-level 4K screen. The fact that it's the best part of a year old also means that it's a prime candidate for upcoming price reductions. Keep an extra eye out for this one in the sales.

4K & 3D Together?

If you're wondering whether there are monitors out there that can support both 3D AND 4K visuals, the answer to that question is a disappointingly vague 'sort of'.

That's because, as part of Computex 2014 in June of this year, Asus did showcase a proof-of-concept 28" monitor that could show 3D images and support 4K resolution. It was actually a glasses-free screen, using the same technology as the Nintendo 3DS to deliver slightly different images to each eye when you look at it. Reports from those who experienced it first hand were good, and Asus confirmed that you could view the 3D from 28 different angles, meaning that it even had potential to work as a communal screen.

The kicker is that, despite having a 4K resolution, you can't view 3D visuals in 4K. It's strictly one or the other – and if you opt to use the screen in 3D mode, the resolution of the display will drop back to standard HD at 1080p. Partly that's due to the availability of the 3D sources, but it's also because of how it works: like all 3D technologies, you have to sacrifice either framerate or resolution to get both left and right images displayed.

Although Asus has no plans to release this particular screen commercially, we wouldn't be surprised to see something a couple of iterations advanced from this concept within 2015, even if it is unfeasibly expensive. 4K screens are expected to be the norm within three years, so it's only a matter of time before 3D muscles into that territory as well.

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Asus PB287Q (£449)
It's not much more expensive than the Samsung U28D590, but the Asus name means it's every bit as reliably high-quality as the Samsung monitor, and probably better value for money too. Its flicker-free backlight and strong anti-ghosting technology keeps images sharp and well-defined, making it ideal for gamers – especially since it also has Asus GamePlus hotkey that moves it straight into gaming mode.

Combine that with built-in 3-watt speakers and HDMI, DVI, DisplayPort and VGA sockets, and this monitor definitely gives you everything you need to get a 4K system up and running without the need to buy extra accessories. A fully configurable base allows you to create the ideal viewing angle by adjusting the tilt, swivel and pivot as well as the height.

Few manufacturers can exemplify the drop in 4K pricing since the technology was first released better than Asus. In October 2013 its first 4K screen (the PQ312QE) cost a massive £3000. At release in June this year, the PB287Q cost £600. It's now just shy of £450 and still going down. That rapid descent does mean it's unlikely you'll be able to find this screen at any significant markdown price, but at the same time, you're getting £150 off retail to start with, and that's already a stunningly good deal, so maybe it's not such a bad thing. It's incredibly affordable and an ideal entry-level 4K monitor for the slightly more demanding buyer.

Dell UP2414Q (£505)
Another 4K monitor that's shown a surprisingly huge price drop, the Dell UP2414Q originally sold at a wallet-vaporising £1,287. There's a good reason that it's lost so much value: it's hitting its one-year anniversary even as you read this, so it's likely up for a refresh any day now. The good thing about that is that if you can find one, it's going to be dirt cheap. We've seen them at £505 already and there's a good chance you can undercut even that. If you spot one, don't dither – it won't be around for long.

Enough about pricing, though, what about the hardware itself? UltraSharp monitors are renowned for their superior performance, and while it's an expensive piece of hardware you definitely get your money's worth – you'd have to, when you consider that at 24", this is far smaller than most 4K monitors!

“4K screens are expected to be the norm within three years, so it's only a matter of time”

It's definitely a case of quality over quantity, though. Where sub-£500 28" screens are exclusively built on older TN panels, the Dell UP2414Q uses an IPS panel with PremierColor technology, delivering vivid, true-to-life images with 100% sRGB coverage and ultrawide viewing angles. If that's not enough for you, the connectivity is also great: HDMI, Mini DisplayPort, DisplayPort, five usable USB 3.0 ports in addition to the USB upstream port, and a built-in card reader. This is fantastic value hardware, despite – or maybe even because of – its age. Its small screen width means it probably won't function well as a TV or console screen in a bedroom or living room, but if you're only using it at your desk it's got everything else you'd want **mm**

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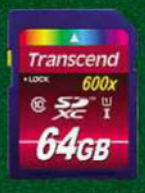

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Which Laptop Is Right For You?

We help you find a portable PC that will suit your requirements and your budget

With so many laptops on the market, it can be tough to narrow down the whole field to the one that's right for you. After all, every user is different. Some people want an expensive, powerful laptop that will do everything they ever need, and other people just want something that will allow them to check their email and run excel once a month. Some people are gamers, some aren't. One of the great things about the laptop choices on offer is that everyone can find what they want. The bad thing is that you have to actually sort through the chaff to find it.

That's why we've done the hard work for you. As long as you know what type of user you are, we've come up with this list of laptop recommendations that will guide you instantly towards the best choice.

The Ultra-Thrifty Buyer: Lenovo B50-30 (£199.98)

Spending less than £200 on a laptop is risky territory, and in most cases it would make more sense to buy a tablet or netbook for the same amount. But there are things cheap laptops can do that those devices can't, like run Windows software or give you a full-size keyboard to use, and that means there's still a market for the cheapest of the cheap laptops.

Whatever your reasoning, you won't find anything new that costs less than the Lenovo B50, which is currently available to buy from multiple outlets for just £199.98. Better still, if you take advantage of an eBuyer cashback offer currently available on the hardware (until December 31st!) it can be picked up for the grand total of £169.98.

Despite the price, the hardware is actually quite serviceable. It's not going to work as a gaming laptop, but only an incurable optimist would think otherwise. We won't pretend it isn't a little slow, but once it's booted up and you're actually working on it, you'll barely notice. It's fine for doing some light office-type work on, and if you want to use it to watch BBC iPlayer, it isn't going to baulk at the idea. Don't expect multitasking miracles, but it is at least capable.

“One of the great things about the laptop choices on offer is that everyone can find what they want”

Specs-wise, the CPU, an Intel Celeron N2840, is the least convincing part of the package, but it could be much worse. It's a dual-core chip clocked at 2.16GHz, but it was released this year, meaning it's about as up to date as low-end chips get. 4GB RAM is an adequate if unimpressive amount (if we were going to upgrade anything, we'd add another 4GB), and a 500GB hard drive is more than enough for comfortable use and, we should point out, vastly more than a netbook or tablet would offer you.

Beyond that, it's fairly standard. The 15.6" display is a good size, and the 1366 x 768 display, while not full HD, is sharp, large and vibrant enough that you probably won't notice that you're getting a slightly lower resolution. Integrated into the top of the screen you'll find a 720p webcam for video chat, and the laptop has Bluetooth capabilities so you can attach extra peripherals wirelessly. There's an HDMI-out port, a 4-in-1 card reader, and three USB ports in total: one USB 3.0 and two USB 2.0, so it's compatible with all the latest hardware despite its price. As well as an Ethernet port it also has wireless N built-in, so there's no need to buy any extra hardware. Essentially it has everything a modern laptop needs; it just saves on price by having less of it.

The Budget Buyer: HP Pavilion 15-N278SA (£299+)

The problem with buying the cheapest laptop you can find is that before long, you're going to end up with hardware that needs replacing. It's a false economy, in that you'll eventually spend more on laptops than if you'd bought a decent one up front. Still in the low-price bracket but far more capable as a system, the HP Pavilion 15-N278SA can be found for less than £300 (At Morgan Computers, for instance).

Powerful enough for any type of casual use, the system has a quad-core AMD A8-4555M clocked at 1.6GHz. Like all AMD chips it has powerful on-board graphics, which in this case come in the shape of a Radeon HD 7600G GPU. At this price level, AMD's on-board graphics are far more powerful than an Intel chip can offer, and that's visible in every aspect of use, whether you're browsing the web or trying to watch HD video.

The really good thing is that it also has 8GB of RAM, which is unusual for systems this low priced. RAM is an area where manufacturers often cut corners, even though it's one of the cheapest ways to raise a system's performance, so it helps to have a full

8GB in here – especially when it's running Windows 8, which baulks at smaller amounts.

The screen is a fairly standard one – 15.6" with a 1366 x 768 resolution – and the 1TB hard drive is again good for the price, being another area where a few quid can be dropped despite the low price of the hardware itself. Other extras include three USB 3.0 ports, an HDMI port, a DVD-RW drive and SD reader. Wireless N connectivity is built in as well.

With so much in here, you might be wondering where corners have been cut, and the answer, really, is nowhere. It does lack Bluetooth support, but that's a very minor concern. The real reason it's so cheap is because it's running an AMD processor, and while AMD's performance at the high end of the market doesn't often match Intel's, its budget chips manage to be both cheaper and better value. That's how you can get so much stuff at such a low price without feeling the effects and why we think it's an ideal system for anyone who wants to maximise the performance they get for their money.

The All-Round User: Asus X550CC-XO016H (£499+)

If you want a laptop that will allow you to do everything you want *and* play games, you'll have to start spending serious money. The cheapest reasonable example we've found is the Asus X550CC-XO016H, and that costs £499 on a good day because it's now well over a year old.

This does mean that once again, you get an Ivy Bridge Core i5-3337U clocked at 1.8GHz, as opposed to a Haswell chip, but Haswell chips are only about 10% faster than Ivy Bridge ones, so it's not like there's a huge gap in performance, only price. What makes this better for users with broader interests isn't the CPU anyway, but the fact that it has a separate GPU.

Inside, you'll find an Nvidia GT720M graphics processor, which lifts much of the graphical burden off the CPU. As a result, the speed of graphics-intensive tasks is greatly improved. A standard laptop becomes one that can handle gaming to a reasonable degree. High-definition video becomes a cinch to play. Even the operating system's UI is improved, and no matter how many visual effects you turn on, the system will remain smooth and responsive.

This laptop is also the first we've looked at that provides a full complement of RAM. Eight gigabytes is enough to meet virtually any consumer need right now, especially if you're running the RAM-hungry Windows 8 (which this laptop is). As well as gaming, you can do visual design work or multimedia editing, something cheaper systems with less RAM might not take to.

While the interior is convincingly high-end, on the outside things are a little less embellished. This is a laptop that puts the focus on the inside rather than the outside, so you get fairly basic features: a standard 15.6" screen at 1366 x 768 resolution, a 720p webcam, smart touchpad, standard optical drive, Asus' SonicMaster speakers and WebStorage features. Wireless N is paired with gigabit Ethernet, and you still only get one USB 3.0 port.

But the superior performance of the laptop more than makes up for its uninspired exterior. It's clearly aimed at users who want a bargain, and while there are things we'd change about the outside – extra USB ports would be particularly welcome – we can't think of anything wrong with the components inside it. That's a pretty good vote of confidence.

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The Fence-Sitter: Lenovo Yoga 2 (£599+)

If you're the sort of person who doesn't know whether they want a tablet or a laptop, then the best thing you can do to avoid making the choice is to buy a convertible laptop. Depending on their form, they either split apart or fold back into a tablet-style device, which gives you the portability and simplicity of a tablet while retaining access to the better features of a laptop.

Of the convertible laptops available, the 13" Lenovo Yoga 2 is probably the one to go for. It's expensive enough that you get a decently powered laptop for your money, but it's also cheap enough that it's still just about competing with tablets on price. If you want to go further in either direction, it also comes in an 11" model (£399+) or a 13.3" Pro model (£1,199+), but we've stuck with the middle iteration, because it gives the best balance of price and performance.

Where some convertible laptops struggle to deliver a full HD screen, the Yoga 2 has a full HD 1920 x 1080 IPS touch-screen. The CPU in the current basic model is a Haswell Core i3-4010, which is considerably faster than any tablet in the same price range. Other features include 4GB of RAM, a 500GB hard drive, a backlit keyboard, 720p webcam, micro-HDMI port, Bluetooth and built-in wireless N. There's also an SD reader and a USB 3.0 port. If you want, you can upgrade it with a better CPU, better storage or more RAM. You also get Windows 8.1 and a huge selection of pre-installed software (though that may not be a good thing in everyone's eyes).

Despite its fairly good specs, the Yoga 2's real selling point is its trademark foldable screen with 360-degree positioning that allows you to fold it back on itself in several different ways, including into a flat tablet mode. The downside is that it's still quite heavy like this (at 1.66kg it's more than three times as heavy as an iPad Air), but when it's in laptop mode that won't matter so much. The only major problem is the five-hour battery life, but this is something you'll face with any modern laptop.

In almost every way that matters, the Lenovo Yoga 2 is the best convertible laptop around. Not everyone will appreciate it, but if you want the power of a laptop with the versatility of tablet, this is the best way to get that without spending double the amount on a Microsoft Surface Pro 3.

The Casual Gamer: Gigabyte P15F V2-CF1 (£789.99)

Buying a laptop that makes a convincing games machine normally requires you to spend double or even triple the amount you'd spend on a basic all-rounder, but the speed benefits can be seen in every way that you might use it, whether you're using it for work, play, entertainment or research.

At just shy of £800, the Gigabyte P15F V2-CF1 gives you excellent value for money, but it also has a relatively powerful interior and, most importantly, the outside to match. It's not an Ultrabook (you'd have to

“Buying a laptop that makes a convincing games machine normally requires you to spend double or even triple the amount you'd spend on a basic all-rounder”

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spend a couple of hundred more for that), but it does match the performance of a desktop in many ways.

That's because it's running an Intel Core i7-4710MQ – a Haswell mobile chip clocked at 2.5GHz. It also has 8GB of RAM and a 1TB hard drive, meaning there's basically as much power in this system as in the average desktop. Gamers will take note of its Nvidia GTX 850M, which takes the burden off the CPU and allows for high-resolution, high-framerate gaming.

Of course, that wouldn't be much good if there wasn't a display to match, and luckily there is: a 15.6" full HD 1920 x 1080 anti-glare screen. Large enough and sharp enough for gaming, but compact enough to keep the laptop convincingly portable. As systems go, it would also be good for watching high-definition movies. Even the sound is better than most normal laptops, with Creative's Sound Blaster cinema optimisation technology included on the on-board audio.

It's worth noting that you do get a DVD-RW drive as well – something Ultrabooks lack. A Blu-□□y drive would have been a welcome addition, but for some reason no laptop manufacturer seems keen on adding them. At least you can watch DVDs, and an external Blu-ray drive would turn this gaming-focused system into a fairly competent entertainment all-rounder.

The rest of the extras are fairly standard for the price: gigabit Ethernet, wireless N networking, Bluetooth 4.0 and two USB 3.0 ports. The weight is at the high end of acceptable at 2.5kg, but as soon as you're playing games, you'll want a mains connection anyway, so portability isn't at the top of this system's requirements. It's not a particularly flashy laptop in any way, but the specs make it a workhorse, and once you're playing games, you won't care about anything else.

The Premium Worker: Fujitsu Lifebook U574 (£1,058)

If you're someone who genuinely needs a high-end laptop for work and, perhaps most crucially, you're likely to travel with it a lot, then what you need is an Ultrabook. Lightweight, stripped down and yet incredibly powerful, Ultrabooks are aimed at people who can't afford to waste time, no matter how much it might cost them.

Fujitsu's Lifebook range has always housed some great high-end laptops, and the U574 Ultrabook is a good example of just how strong they can get. The screen is a 13.3" touch-enabled IPS display with HD resolution. The CPU is a Haswell Intel Core i7-4500U clocked at 1.8GHz, there's 8GB of 1600MHz RAM and a 256GB SSD drive that will allow your system to operate at super-fast speeds without space becoming an issue.

Although it costs more than gaming laptops, there's no internal graphics card. Instead, you get Intel's HD graphics 4400 GPU, which is one of the best it makes. The system packs in a huge variety of connectivity including Bluetooth 4.0, dual-band wireless N and even 3G mobile internet so that you're never without the opportunity to make a data connection. There's a webcam built in, and some of the USB ports can be used to charge devices even when the system itself is switched off.

Windows 7 fans will also be intrigued to hear that there's a trend among more expensive devices such as

Laptop Or Tablet?

Deciding whether to buy a laptop or tablet is largely a matter of knowing what you want to do with a system once you own it.

If you're a light user who does little more than read Facebook, check your email and maybe do a bit of shopping online, a tablet is going to save you money. If you want a device to watch TV and movies on, then a tablet will save you money as long as you don't mind a smaller screen. If you want a device you can actually sit down and write on for any length of time, then a tablet (with a Bluetooth keyboard) will save you money but at the expense of your convenience. It's very hard to work on a tablet even if you have the hardware to do so.

Where laptops come into their own is in their familiarity. The fact that they run Windows software might make them desirable for people who don't want to learn a whole new system, and their hardware keyboards are especially good if you have difficulty with fine motor controls or other accessibility issues. Gamers simply can't replace their laptop with a tablet, because the majority of gaming titles are completely unavailable for mobile devices.

One of the problems with trying to decide whether you buy a tablet or a laptop is that other than at the very low end, the two devices do completely different things. They might cost similar amounts, but that's all. Ultimately, a tablet is a casual-use system only, while a laptop is more versatile. There's no reason you can't have both!

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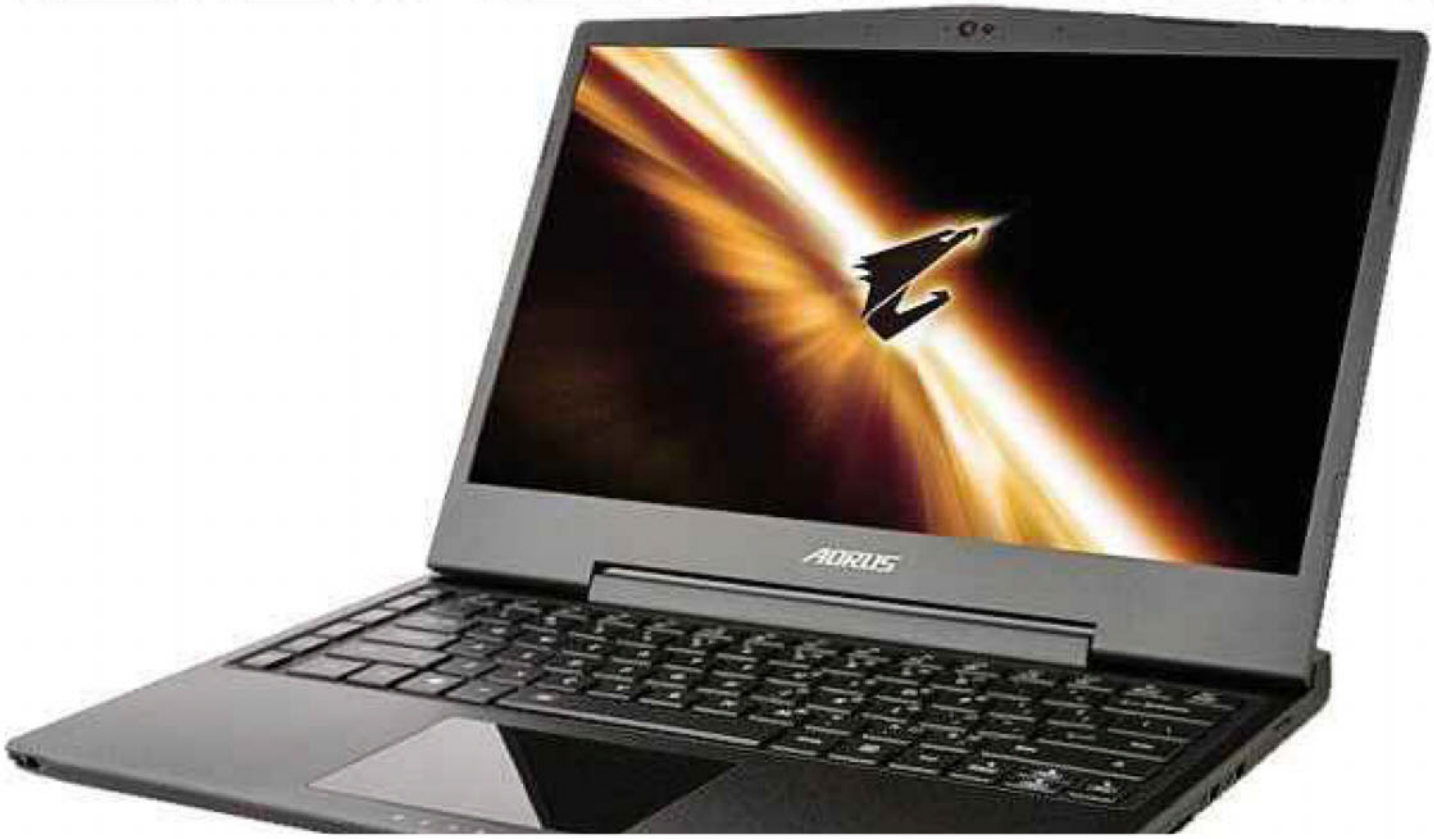

this to offer customers a free 'downgrade' to Windows 7 – something we suspect will curry much favour with those who don't like being forced onto Windows 8. It's not necessarily a feature that's worth paying extra for, but if you're spending a grand on computer hardware anyway, it's nice to have the option.

As laptops go, it's standard of any Ultrabook for being both lightweight and thin. At its widest point it's only 19mm, and it weighs just 1.5kg – lighter than any other system we've looked at in this piece. This emphasises the portability that's at the heart of the Ultrabook class of devices, while the large SSD makes it clear that processing speed is also a huge concern.

Despite its power, it's not much good for gaming due to the lack of a discrete graphics card, and it's not much good for viewing movies, because there's no optical drive. Of course, that's not what Ultrabooks are for. This is a system designed for serious use, and if that means it doesn't look like much fun, then fine; it's not supposed to. It is, quite literally, all business.

The High-End Gamer: Overclockers Aorus X7 v2-CF2 (£1,499)

Some people will tell you that as good as gaming laptops get, they'll never compete with a full-size gaming desktop. The Aorus X7 v2-CF2 is proof, if any were needed, that those people are wrong.

It is, unashamedly, a gaming laptop, which contains some of the most up-to-date and powerful hardware you can buy in a laptop or otherwise. The CPU is a 2.4GHz Intel Core i7-4860HQ Haswell chip. Graphics are handled by dual NVidia GeForce GTX 860M chips in SLI, each with 4GB of DDR5 memory, meaning games look absolutely state-of-the-art – the performance is equivalent to a GTX 880. 16GB of RAM is, quite frankly, more than any system will need for years to come, and the 17.3" full HD screen allows for seriously high-quality visuals.

Storage-wise, you could scarcely ask for more, with not one but two 128GB SSDs in RAID 0 (striped) configuration, and a 1TB HDD giving you both the speed of an SSD and the capacity of a mechanical hard drive. It is, quite simply, the best of both worlds. You'll have the space to install loads of games and store HD video, and the SSDs will ensure that frame-rates don't drop and boot times are short and sweet.

Even the smaller details have been well-constructed. The keyboard is fully backlit, there are three USB 3.0 ports, a surround-sound port and separate jacks for external microphones and earphones. The Ethernet LAN is a gaming-optimised 'Killer NIC', which has its own processor to minimise drain on the main CPU, and the wireless board supports the latest 802.11ac standard as well as Bluetooth V4.0. The chassis is thin, lightweight and looks as fierce as the system handles. It is, quite simply, everything you could want in a laptop and more.

Not that you'd expect any less for the best part of two grand, but one thing is certain: if you're prepared to spend the money, you won't find any aspect of the system letting you down. And this isn't even the best gaming laptop on offer, just one that's a good balance of price and high-end performance. Admittedly not everyone needs a system like this, but with this level of quality on display, we've yet to meet a person who'd say they didn't want it.

The only bad points? With all this hardware inside, it's quite heavy (almost 3kg) and, as you might expect, the battery life isn't very long once you fire up your favourite 3D title. Keep a plug socket nearby at all times! Ah well, can't win 'em all. **mm**

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AMAZON FIRE HD6

The Budget Buyer: Amazon Fire HD6 • £79+

The 2014 refresh of the Kindle Fire line has dropped the 'Kindle' part of the name and split it into three different models: the cheap HD 6, the mid-range HD 7 and the high-end HD 8.9. We'll return to the others later, but if you want a tablet for as little money as possible,

then the Fire HD 6 gives every other sub-£100 tablet a reason to worry.

The cheapest configuration – 8GB of storage with 'special offers' (adverts) on the lock screen – is available for just £79. You can remove ads for an extra tenner and double the storage for £20, but thrifty buyers need do neither of these things. 8GB storage is fine for low-use owners, and the adverts aren't intrusive enough to worry about removing.

Although the price might cause you to worry about its capabilities, the reason the price is so low is because of the screen size. Underneath, the HD 6 and HD 7 are identical, but the former's 6" screen means it's basically scraping phablet territory. It's not like it even performs particularly better for having a smaller screen, because it's still got the same 1280 x 800 resolution. That does mean it looks a little sharper, though!

The tablet runs Fire OS 4, which is an offshoot of Android (KitKat) and comes with unlimited cloud storage for your Amazon media purchases and photos taken on your Amazon devices. Its CPU is a 1.5GHz quad-core with 1GB of RAM. The front camera is a rather weak 0.3 megapixel affair, and while it has finally got a rear camera, at two megapixels you have to wonder why Amazon bothered. It is, at least, lighter than older Kindle Fire HDs at just 290g. Connectivity includes a micro-USB port, HDMI, Bluetooth 3.0 and wi-fi.

Although the performance does lag slightly on occasion, the Fire HD 6 is comprehensively better than its competition when it comes to things like screen quality, battery life and built-in services. You don't get Amazon's MayDay live help function, but if you're an Amazon Prime member, you do get Instant Video access, which adds a huge amount of value.

Ultimately, though, any of its failings are mitigated by the price. It's cheaper and more powerful than its direct competition, and it comes with the added benefit of Amazon's backing. Unless the smaller screen is a serious problem for you, the 6" version is the stand-out model in its field, and the one to beat for any buyer who wants a tablet but doesn't want to spend too much money.

TESCO HUDL 2

The Household User: Tesco Hudl 2 • £129

The original Hudl was a surprise hit for Tesco, which found itself with what was by some distance the best low-end tablet on the market. The original Hudl came out in September 2013 and sold 500,000 units in six months, making a follow-up a virtual certainty. In October, the follow-up arrived, named – surprising no one – the Hudl 2.

Although the idea of a Tesco tablet might not appeal in theory, the reality is that the hardware is bought in and therefore quite good. While, at time of writing, speculation surrounds Tesco's ownership of the streaming media service Blinkbox, the built-in Tesco software suite is undoubtedly appealing to those who do their shopping and banking with the company too. It does run on Android (Kit-Kat), however, so you get a huge number of applications to install as well.

While some tablet refreshes simply upgrade the internals, the Hudl has had a near-complete makeover. It's now available in eight colours instead of four, and it's longer and heavier than the original Hudl, with a larger screen. It now has an 8.3" 1920 × 1200 screen, compared to the 7" 1440 x 900 of the original. In addition, the RAM has doubled to 2GB, and the processor is now a more powerful Intel Atom Z3735D. The cameras have changed too: the rear camera is a 5MP 1080p video camera (up from 3MP 720p), and the front is a 1.2MP conferencing camera (oddly, down from a 2MP one).

Some things remain the same, though: there's 16GB of internal storage, micro-USB and micro-HDMI ports, Bluetooth 4.0 and wireless N. The only other thing that's changed is the price: it's now £129 as opposed to the £119 the Hudl opened at, but it's worth remembering that the Hudl dropped £20 quite soon after its launch.

As before, it's not much for gaming or working on, but if you're playing music, watching a movie, reading Facebook or doing some online shopping, it has all the capabilities of a larger, more expensive tablet without the inflated price. There's also a very well-developed kid-friendly mode, which makes it ideal for families. Enthusiasts and committed tablet-users will doubtlessly want more out of their hardware, but if you're after a device that can give you portable entertainment and browsing at a low cost, it's ideal. The only thing that doesn't hold up to scrutiny is the weight: at 410g it's almost as heavy as the considerably larger iPad Air 2!

The Android Fan: Google Nexus 9 • £319+

Replacing (sort of) the much-beloved and mysteriously departed Nexus 7, Google's new Nexus 9 tablet was released just weeks ago. In case you haven't heard, it's basically an Android fan's dream tablet.

For a start, it runs the latest version of the OS, an unmodified version of Android 5.0 (Lollipop). There are no OEM additions, no custom front-end, and full access to the operating system's features. It's also guaranteed to receive updates for two years, meaning that even when the next version of Android hits, your tablet will still look like new.

The hardware is similarly impressive. It's got a 64-bit Tegra K1 processor and its 8.9" screen has an iPad Air-baiting resolution of 2048 x 1536. There are stereo front speakers integrated behind the screen. It has 2GB of RAM and comes in both 16GB and 32GB varieties, with or without 3G. The cameras are 8MP at the rear and 1.6MP at the front. The only bad thing about it is that there's no high-capacity option, nor even a micro-SD slot, so if you're the sort of person who wants 64GB storage (or more) then this isn't the tablet for you.

Like its spiritual ancestor, the Nexus 9 is the best response the current Android market can come up with in the face of the devastating combo of the iPad Air and iPad Mini 3. That's demonstrated no more obviously than in the new foldable cover, which seems explicitly designed to take on the iPad's Smart Cover.

It's true that the Nexus 9 doesn't have the excitement surrounding it that the Nexus 7 had, but when mini (and indeed, midi) tablets are so common, it's unlikely that will happen again with any device. There's definitely nothing in the hardware that comes close to grabbing user attention (the software's doing all the work here), but if you're after an Android tablet that shows off the best the OS has to offer, this has the hardware you need to do just that. The fact that it has nothing more shouldn't count against it.

GOOGLE NEXUS 9

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The Movie Viewer: Amazon Fire HDX 8.9 • £329+

Although it's mostly known for being a mini-tablet, the latest version of the Amazon Fire tablet (released in October 2014) is also available as an 8.9" device called the HDX. Far from being small, this tablet has dimensions somewhere between an iPad Mini and iPad Air, putting it at the high end of home-use tablets.

The key difference between the HDX and its HD 6 / HD 7 line-mates is, of course, the screen. It's 8.9" in size, with a resolution of 2560 x 1600, meaning there far more space to play with. Like the other 2014 Fire tablets, it runs the latest version of Fire OS (Sangria), and it improves on its predecessor by adding wireless AC connectivity. There's also an 8MP rear camera, and a 1.2MP front-facing camera, both of which are far better than the HD 6 and HD 7 cameras. To compensate for the increased power draw of a larger screen (and take advantage of the extra internal space available), the Kindle Fire HDX 8.9 also has a larger battery, which gives it about an hour's extra use over the 7" version.

Of course, with these extras come some slight disadvantages. The Kindle Fire HDX 8.9 is heavier than its more compact siblings, though not as much as you might think. The difference is a surprisingly conservative 70 grams, pegging it at 375 grams total. That's lighter than an iPad Air, at least.

The best improvements come under the hood, though. The 2013 iteration of the Fire HDX used the same processor as the 7" Fire HD, so it actually performed a little worse. Now it uses a 2.5GHz CPU instead of the 1.5GHz one found in the HD 6 and HD 7, so it's definitively faster. But it's also proportionally more expensive, because the cheapest incarnation (16GB, with lock screen ads and wi-fi only) is £329. It used to be a mini-tablet with a large screen. Now it's competing with other genuine full-size tablets. As proof, you only need to look at the price of the best model: 64GB, no adverts, with Wi-fi and 4G costs £489. Smack in the middle of iPad Air 2 territory.

“ The iPad Air has something no other tablet ever will: it's genuinely cool ”

In some ways, though, this refocusing works in its favour. It used to be hard to place, because it was the expensive tablet for people who wanted a cheap tablet. Now, it's upgraded internals mean it's not a mini-tablet playing dress-up; it's one of the cheapest big-screen devices around. Pair it up with Amazon's entertainment library and the media-friendly FireOS, and it's clearly an ideal way for entertainment fans to get their fix on a large, sharp, bright screen without spending too much money.

The Trendy User: iPad Air 2 • £399+

It doesn't matter what the competition does; the iPad Air has something no other tablet ever will: it's genuinely cool. Nothing Samsung, Microsoft or Google do will change the fact that they're seen as tech companies. Apple sells a lifestyle. It certainly helps that the iPad was the first tablet to really take off and therefore is the archetypal ideal of one.

The benefit of caring more about image than capabilities is that it frees you from the arguments about the iPad's worst qualities as well – specifically, its walled-garden approach to software, which demands that you buy only approved programs from a single source and won't help you if you try to get your software onto it in any other way.

Specs-wise, it's certainly a very good tablet, and although it's slightly less powerful than its peers on paper, it's worth remembering that the hardware and software are built explicitly for one another, which means that performance is comparable with much better systems. The iPad Air 2 is both thinner and faster than its predecessor, and incorporates a TouchID fingerprint sensor, which sounds gimmicky until you actually use it.

Inside it uses a 64-bit Apple A8X chip (1.5GHz) with 2GB of RAM, a 9.7" 2048 x 1539 screen and two

iPAD AIR 2

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cameras: a 1.2MP front camera and an 8.0MP rear camera. The wi-fi supports wireless AC, and it even comes in 3G variants, though that automatically adds £100 to the price, which makes it an even less attractive prospect. It also weighs just 437 grams, hence the 'air' moniker – it really is light enough to use one-handed.

The only real problem is the price. There's no getting away from the fact that it's incredibly expensive. The most basic model, the 16GB one, starts at £399. The only tablets that cost more are productivity devices aimed at professionals.

But if you're the sort of person who buys Apple's hardware already and is used to swallowing the high prices in exchange for the cachet you get, the iPad is nothing short of a must-have accessory. It's not unreasonable to call the iPad Air a contender for the best full-size tablet on the market, and it really comes into its own if you already have an iPhone or existing iPad that you can synchronise content with. It's expensive, but you're paying for quality as much as the name. The truth is that no full-size Android tablet can convincingly beat it, and there's a certain premium quality to the iPad that you just can't get with any other device.

The Budget Business User: Lenovo Thinkpad 10 • £439+

One of the problems with tablets is that the vast majority run on Android or iOS. If you're someone who wants to use your tablet for work – and, crucially, don't have an unlimited budget to spend – then your choice of Windows tablets is limited. The Surface Pro might be powerful and capable, but good value is not a quality it strives for.

The Lenovo Thinkpad is a bit better in that regard. As a productivity device, it's larger than most tablets, with a 10.1" screen. It also contains a less powerful version of the Intel Atom CPU found in high-end tablets, and that slight downgrade allows it to be offered at a substantially cheaper price than others in its class: models start at £439.99.

The price is certainly one of its good points, but it's not the only

LENOVO THINKPAD 10

“Although the idea of a Tesco tablet might not appeal in theory, the reality is that the hardware is bought in and therefore quite good”

one. The screen is a pleasingly sharp 1920 x 1200, and the device is even thinner than the Surface Pro 3 at 8.9mm versus Microsoft's 9.1mm, making it one of the thinnest tablets available. Like the Surface Pro 3, there's an official keyboard add-on, which turns it into something more like a laptop, although it doesn't really prop the screen up high enough for you to actually use it comfortably. But again, it costs £100, so actually buying it would mean the price advantage evaporates in one fell swoop. The same goes for the (keyboardless) docking station, which adds a full-sized HDMI port, two USB 3.0 ports and an Ethernet port.

The tablet's integrated ports are hidden behind various covers, which make it look nice but isn't exactly convenient when you want to use them. There's a micro-USB port, a micro-SD slot, space for a SIM card and a full-size USB 2.0 port. It also has its own proprietary power adaptor, which sounds like a nice idea but isn't really that much help when you get to work and don't have the charger handy.

The basic model is about on a par with the devices of its price range, with 2GB of RAM and 64GB of SSD storage, both of which can be doubled for more money. If you're looking for a budget Windows tablet that you can actually work on, we recommend you buy this with a cheap Bluetooth keyboard rather than the official one. It's not perfect as a stand-alone device, but it performs well for the amount it costs – and when you're on a budget, that's what matters most.

The Corporate User: Microsoft Surface Pro 3 • £639+

If your company is buying your tablet for you, there's no reason to settle for anything other than the most capable, most powerful productivity tablet out there, and frankly this is the one to beat. The latest (and

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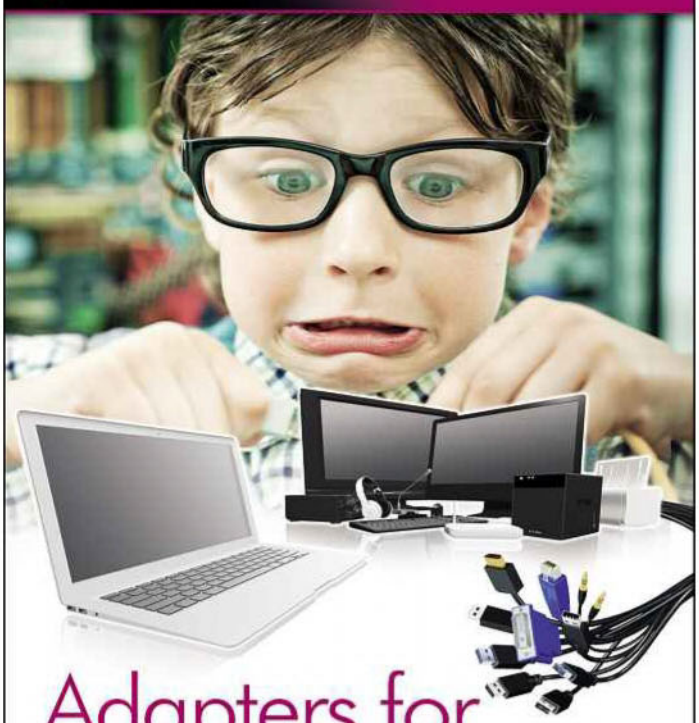

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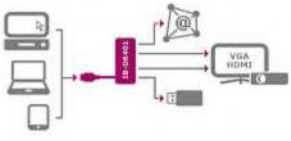

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indeed, most successful) iteration of the Surface Pro, Microsoft's Surface Pro 3 has been available for a few months and was literally given the strapline "the tablet that can replace your laptop", which is a bold claim. But is it an accurate one?

The Surface Pro 3 is clearly priced at that sort of level, starting at £639 for the most basic model. For that money you get a 12" higher-than-HD display, a Core i3 Haswell CPU (upgradable to Core i7), between 64GB and 512GB of SSD storage and between 4-8GB of RAM. You also get wireless AC, a full-size USB 3.0 port, a mini-DisplayPort socket and a micro-SD card reader. Clearly, in hardware terms, it's undeniably competing with a laptop, and the fact that it runs the full Windows 8, rather than the reduced version found on some versions of the Surface, means it's consciously competing on that level too.

> **Microsoft was slow to get into the tablet game**

The problem with Microsoft's logic is that you do need to buy the snap-on keyboard cover (or at least a Bluetooth keyboard) to make it properly productive. If you go the official route, that means shelling out another hundred quid. The tablet itself has a kickstand on the rear so you can prop it up, laptop-style, and the aforementioned cover incorporates an ultra-thin keyboard and trackpad, so you can actually use your tablet like a laptop if you prefer. There's also the 'Surface Pen' stylus included for free.

Of course, while the cheapest Surface Pro 3 is acceptably cheap in laptop terms, the more expensive versions seem less and less so. The 128GB version with a Core i5 and 4GB RAM is £849. The 256GB version with a Core i5 and 8GB RAM is £1,109, the 256GB version with a Core i7 and 8GB RAM is £1,339, and the best model – the 512GB, Core i7, 8GB RAM version – is a whopping £1,649. Given that there's no other change in the hardware and that 64GB of SSD with 4GB of RAM is already well above the market average, it seems ludicrous to even consider anything other than the most basic model.

But if you have the money (or rather your employer does), then the hardware won't disappoint. We're not sure it's going to replace everyone's laptops, but if you do need a productivity tablet, then it's probably the best out there. Microsoft was slow to get into the tablet game, but the Surface Pro 3 is performing as well in shops as it looks like it should on paper. If you want to work on a tablet, it's by far your best option. **mm**

Whatever Happened To The Nexus 7?

When Google launched the Nexus 7 in June 2012, it was a game-changer for the tablet market. Until then it had been overwhelmingly dominated by Apple and its expensive high-end devices. After the Nexus 7, Android tablets – and specifically cheaper, smaller ones – became just as desirable. It's no coincidence that Apple launched the first iPad Mini just weeks afterwards.

After the original took the industry by storm, a refreshed Nexus 7 arrived in July 2013 with improved specs and newer software, and performed just as well. In 2014, everyone waited to see what the refreshed version of the Nexus 7 would look like... and then nothing happened. It didn't come out. The 2013 Nexus 7 is now unavailable from Google, having sold out, and it doesn't appear that any new version is coming at all. So what happened?

Some people have suggested that the Nexus 6 (a large-screen smartphone/phablet) is its replacement, but we're sceptical. The Nexus 6 is a high-end phone, whereas the Nexus 7 was a budget tablet. Aside from a similar screen size, the two devices aren't remotely alike.

It's possible that Google and Asus stopped wanting the same thing. Both versions of the Nexus 7 were developed in collaboration with Asus, while Google's larger tablet, the Nexus 10, was handled by Samsung. Maybe Asus felt it could translate the praise for its tablet into a device that didn't share the profits with Google. Or maybe Google wanted to find a better deal. It has, after all, just released the 8.9" Nexus 9, which was made by HTC.

It's clear that the Nexus 7 hasn't been abandoned completely. Google just released an update to Android 5 (Lollipop), making it one of the first tablets to receive the latest version of the operating system. But software updates can only go so far before the device can't handle them. Until and unless a hardware refresh gets announced, it looks like the Nexus 7 is genuinely gone for good.

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2014 Releases You Might Have Missed

James Hunt looks at what this year's hardware had to offer

The constant churn of hardware releases means that there can sometimes be a lack of reflection in the computer industry. Looking ahead to the next piece of kit schedules to arrive on shelves means you can accidentally end up ignoring what's already there. Similarly, if you're content with the hardware you have, maybe you don't realise there are better alternatives now available.

To give you a chance to look back at the products you might have missed, we've taken a look at some of 2014's best releases so that you can keep them in mind when sales season rolls around. Whether you want them full price, discounted, new or second hand, these are the 2014 hardware releases you have to keep your eyes peeled for.

1. Intel Core i3-4160 (£85)

Intel's Haswell CPUs are great for gaming, but chips in the core line are expensive, and it's often tough to tell whether you're getting a good balance of price and performance. That's not the case with the i3-4160, which hit shelves in July 2014 and quickly proved itself to be a well-refined competitor to other Core i3 and Core i5 chips, standing out instantly thanks to its solid performance and low price. Anyone trying to build a gaming system on a budget would do well to consider it, especially if you're wedded to the idea of buying Intel rather than AMD.

This dual-core chip has a 3.6GHz clock speed, two hardware cores, on-board Intel HD Graphics 4400 and a pleasingly low TDP of just 54 watts. Although it can't be overclocked thanks to locked multipliers, benchmarks show that its Hyper-Threading capabilities give it gaming prowess beyond the suggestion of its model number and price. If you're looking for an entry-level gaming chip, the i3-4160 is a late contender for the best value Core i3 that Intel can offer. While you'll need to pair it with a separate graphics card for the best results, it's a perfect low-cost springboard to a better system.

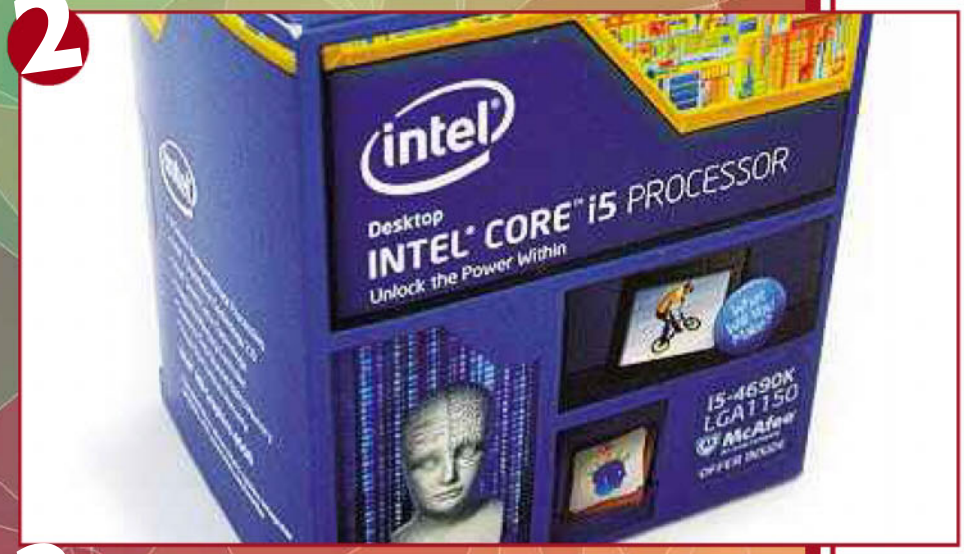
2. Intel Core i5-4690K (£185)

If you're after a more powerful CPU, then don't worry: Intel has also released something for the more hardcore gamers among us. First on shelves in June 2014, the Core i5-4690K has a base rate that's 100MHz faster than the previous best, the Core i5-4670K from June 2013, but that translates to better single-core performance and slightly better value than the older chip. This one has a TDP of just 88 watts and on-board Intel HD Graphics 4600, though it's even more important to have a separate graphics card if you're buying this CPU for a gaming system.

Of course, the main advantage with the K-series chips is their overclocking capabilities, and if that's what you're looking for, then it's a good idea to go for the latest, fastest chip in the Core i5 line – the newer materials will stand up to that little bit more stress. Obviously, if you want a faster Haswell chip you could look at the Core i7 series, but for single-threaded tasks like gaming there's very little advantage to be had by paying extra, and in any case, once you start buying in that price bracket, the performance you get per pound starts to drop significantly. The Core i5-4690K is, by far, the gaming chip with the best speeds for the best price, so if that's what you're looking for, this is the chip to get.

3. EVGA Nvidia GT 730 (£59.99)

Another summer release, the GeForce GT 730 cards were released in June this year and are the new standard for entry-level graphics cards – as long as you make sure you buy the right one. For some reason, Nvidia specced multiple different cards under this name despite massively differing hardware. There's a stripped-back,



underclocked 128-bit version with 1GB of DDR3 RAM, a faster 64-bit version with 2GB of DDR3, and a 1GB GDDR5 version of the 64-bit card.

EVGA's best version of the GT 730 (and therefore the one you want to seek out) is the full-speed 64-bit version with 2GB of RAM, which is slightly better than – or at least as good as – the similarly priced AMD R7 240. It runs on a GK208 chip previously found in GT 640 GeForce cards, though it has more memory bandwidth, making it about as fast as a GeForce GT 650 in benchmarks, and it's therefore a great deal for gamers with a budget to service. Don't worry that it's only 64-bit; the 128-bit version of the card is actually slower than the 64-bit ones, because it contains a GF108 chip originally found in the 400-series GeForce cards.

4. Asus Radeon R9 270X DirectCU II (£190)

If you want a much faster enthusiast-level card that won't break the bank (though it could dent it a little), then one of the best candidates was actually released in March 2014. Replacing the HD 7870 on Radeon's slate, the R9 270X has a faster clock speed and improved memory subsystems, and although the vanilla versions came out in October 2013, the early part of this year saw a new crop of improved models aimed at high-end gaming.

Of the available models, we're fond of the Asus Radeon R9 270X DirectCU II, which has 4GB of RAM and a GPU that's factory-overclocked to 1120MHz, ensuring high-end gaming performance. This is made possible by Asus's high-end cooler, which combines two fans with precision-shaped SSU heatpipes. You'll need a powerful system to run it – not least because the TDP is a massive 225 watts – but if you're looking for a card that'll handle the latest games and run for a good few years yet, this is one of the better choices. The fact that it's both quite expensive and the best part of a year old means there's a strong possibility that it'll come up in the sales too, so definitely keep your eyes peeled for it.

5. TP-Link Archer C20i (£33.50)

A fairly recent release (it only came out in September), the TP-Link Archer C20i is the latest in the company's range of low-priced network accessories. Why is this one interesting? Well, it's not just TP-Link's first sub-£40 AC750 router – it's pretty much the first one ever. High-speed wireless AC networking is now quite definitively within everybody's reach.

As well as supporting dual-band 802.11AC at speeds up to 750Mbps, the router also supports 802.11n devices, so it's compatible with existing network hardware. The new standard gives it a longer range than older routers, and while you don't get some of the high-end features seen in the older, twice-as-expensive Archer C7, you do get a USB port, which allows you to share storage and printers over the network through built-in software. It's incredibly

useful and a genuine rarity on entry-level wireless routers.

Although TP-Link doesn't have the best reputation for quality, it's hard to deny that the Archer C20i runs counter to expectations in that area. The upright form factor hides three internal antennas for stable, omnidirectional connectivity, and the software is made to meet modern needs – a guest network allows you to easily share your connection with visitors, while built-in parental controls allow you to restrict access and bandwidth by IP. If you're ready to upgrade your router, this 2014 release is undeniably worth considering.

6. TP Link Archer T2UH Wireless Adaptor (£35)

On similar lines, the TP-Link Archer T2UH is a USB-powered wireless adaptor, which can add 802.11AC functionality to your laptop or desktop system for a reasonable price. Released in October 2014, it has a good combination of speed, range and power for the money you spend on it, and it makes the perfect complement to the Archer C20i router.

Crucially, it's better than many wireless AC adaptors, because it has a high-gain external antenna, which allows for high-speed, long-range connections of up to 600Mbps – several times that of the average wireless N adaptor. Selectable dual-band connections allow you to find the best connection for high-speed video and gaming, and WPS compatibility allows for one-touch setup.

In addition, you also get a one metre USB extension cable packed into the box, so if you want to orient the dongle for the best connection, there's virtually nothing stopping you. It's compact, lightweight, stable and generally everything you could want out of a USB wireless adaptor. Again, TP-Link's reputation may not be the best, but products like this are proving that they can be low-cost and high-quality. If its 2014 releases are anything to go by, the company has definitely turned a corner.

7. Samsung 4TB D3 Station (£104)

The 1TB Samsung M3 has long been one of the most successful low-priced external hard drives around, and this year it brought the technology to even greater storage form factors with the refresh release of the 4TB D3 Station in January. Although 5TB and 6TB versions are due for release soon (if they're not out by the time you read this) it's hard to beat the price of the 4TB model, which is on sale for little more than double the price of the 1TB version despite having four times as much storage.

Admittedly, like the M3, the D3 station is very much a no-frills approach to external storage. You won't find fancy management and cloud storage software here – just a few small security apps and electronic documentation. That doesn't detract from its purpose as a simple, portable, universally compatible drive; in fact, it adds to it. There's no reason a D3 station wouldn't work with any system you have that can

accept USB storage (although it does come formatted for NTFS, so you may have to change the file system).

With USB 3.0 transfer speeds, a three-year warranty and low-power functionality, the refreshed D3 station is definitely one of 2014's must-buy products if you're after some low-price, high-capacity storage.

8. Crucial M550 1TB SSD (£331)

Released in March, the Crucial M550 1TB SSD did two things well. First, it put 1TB SSD drives into consumer hands for something approaching a reasonable price, and secondly it improved on Crucial's already-strong M500 performance to create, in the M550, one of the best SSDs on the market.

Although it's only a minor upgrade, the M550 features a new controller and slightly more space. It achieves this by dropping the amount of NAND flash kept in reserve, meaning that drive health is theoretically going to be worse in the long-term. But at the same time, estimates show that the M500 was overly conservative about how much of its flash memory might fail, so the M550 gives us access to an extra 40GB that was previously held back in case of failure.

Price wise, it's literally half as expensive as some of its Intel counterparts, which makes it ideal for home use (primarily because you can actually afford to buy it). Read and write speeds are comfortably above 500MB/s for large files, at least equal to the M500, and read/write speeds were vastly improved for small file sizes too. If you don't already have an SSD in your system it's well past time to think about getting one, and this combination of price, capacity and speed suggests that it's the one to get – especially if it turns up in any new year sales.

9. Silverstone Strider Essential Gold 600W (£65)

PSUs are rarely the most inspiring component to upgrade in a system, but if you're overdue a replacement or an upgrade, then maybe one of 2014's best releases will give you the motivation to shell out your hard-earned cash.

First put on sale in February, the Silverstone Strider Essential Gold is a 600W PSU that's powerful enough for any single-GPU systems, and potentially some low-end multi-card systems too. Its 80 Plus Gold certification keeps its efficiency high, meaning it's nice and cool and doesn't waste your money pumping out heat instead of power. The Strider Essential line isn't modular, which might put off the most hardcore gamers, but a comparatively low price compensates for any irritation that may cause.

Although the wattage and price might be mid-range, the hardware itself is comfortably high-end. There's a 120mm fan which has a hybrid ceramic bearing to reduce noise, and as well as four 6/8pin PCI-E connectors, you get one 24-pin, one ATC 12V 4/8-pin, nine SATA connectors of varying sizes, three Molex and one Floppy. We wouldn't suggest gamers spend any less than £65 on a PSU, but whether you're a casual user who wants an efficient system or a gamer looking for a good deal, this is a well-rounded PSU with all the features you'll need. **mm**

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Your Letters

Online Shopping

I live in Spain but frequently buy goods from Amazon UK, because they have a wider choice than their Spanish website. Amazon UK have always charged me at the Spanish rate of VAT (21%). However, they will not sell ebooks or Kindle ereaders to non-UK residents - in fact, until about a year ago you had to buy from Amazon USA; now Amazon Spain has a Kindle department.

The reluctance of many UK-based online sellers to deal with offshore residents is probably associated with these crazy tax rules - when you consider that there are more than five million Brits living abroad, that's a lot of business being turned away. The whole situation makes a mockery of the so-called 'common market'.

Colin Hughes

Black Mark

The avarice that fuels Black Friday must surely make it one of America's more questionable exports - and this week that's really saying something. However, what really amazes me is that people are apparently willing to buy anything that has a discount big enough. To hear someone on Radio 4 comment that they didn't know whether they needed the Dyson vacuum they'd just bought, but they got it 'because it was cheap' was enough to make you want to be sick, frankly.

I like to think that my purchases are thought out, researched and tailored to suit me - if I'm going to part with multiple hundreds of pounds, I want to feel assured that what I am getting is right for me and do what I want. I certainly wouldn't want to risk making a hasty decision to purchase something like a laptop in a 'flash sale' on Amazon/PC World/John Lewis, only to find it was unsuitable later. I don't know, maybe I'm picky or more demanding than some people.

All Black Friday did for me was highlight that there can be a big difference between paying less and getting value for money. I'll take the latter, thanks, and I think some other people should too.

Martin Prince

Silliness Filter

Apparently, Facebook is planning to produce technology that will prevent people posting photos they might regret later. Wow! Just wow. I really can't believe that people have got to the point where their stupidity is being openly encouraged.

Shouldn't we perhaps be encouraging people to show a bit responsibility for their own behaviour, rather than just telling them there's a 'get out jail free card' for their recklessness? Surely learning from your mistakes is an important part of growing up. And once you've been hauled in front of your boss for posting a drunken photo of yourself in a bar when you said you were ill, you probably won't do that again for a while (the skiving off work, not the Facebook posting). Instead, we're telling people that it's okay to behave badly, because technology will cover up for your mistakes later.

I don't blame Facebook for this, though. It they hadn't done it, someone else would have and, admittedly, I have to say the technology itself is clever, but where does it all end? Will we have social networks deciding our every thought for us? Arguably, though, we're already there.

Andy Berg

Christmas Amnesia

It seems that your office has started celebrations early this year judging by the fact that the latest issue of MicroMart is labelled issue 1341 and dated 11-18 NOV 2014.

Wishing you and your staff a happy Christmas,

David Mitchell

Apologies to everyone for this silly human error. Maybe it's time for the robots to take over?

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Looking for a last-minute gift or just fancy treating yourself? We got you covered!

If you're reading this issue in the week of release, then you've only got a couple of days left to get your Christmas presents sorted, and that means buying online is going to be a huge gamble. Then again, maybe you can just buy the presents now and then blame it on bad postal service – It's plausible, at least. Whatever your plans, you'd better make sure you're spending a lot of money to make up for potential lateness, so here's a selection of expensive last-minute gifts worth checking out.

Deal 1: Speedo Aquabeat 2
RRP: £100 / Deal Price: £50

Whether you're a dedicated swimmer who looks jealously at runners working out to their favourite tunes or just someone who thinks they've seen every MP3 player variation out there, then this one's for you: a 4GB MP3 player which you can use underwater. With 25 hours of playtime and special ear-sealing headphones, this is one MP3 player that'll make swimming even more fun. It's waterproof at depths of up to three metres, and now available at 50% off from the manufacturers only!
Where to get it: Speedo (**bit.ly/1qq0b85**)

Deal 2: Logitech K810 Illuminated Keyboard
RRP: £90 / Deal Price: £70

If you want a serious, all-business Bluetooth keyboard that's really going to help you get some work done, Logitech can cater for your desires in that regard. Indeed, the Logitech K810 has multi-device capabilities, that will allow you to control multiple systems from a single keyboard. It also has a pleasingly robust brushed-aluminium finish case, and even a backlight to help you find the right keys in low light. It's pretty expensive, but hopefully this deal – that knocks just less than a quarter off – takes the sting away just enough to make it worth considering.
Where to get it: Maplin (**bit.ly/1wckW6H**)

Deal 3: Intel Core i3-4330
RRP: £116 / Deal Price: £87

Recently reduced to its best-ever price, this Haswell CPU is a dual-core Intel Core i3 clocked at 3.5GHz – perfect for light-to-medium use, whether in the household or in the office. It's not the fastest Haswell chip around, but it is one of the fastest you can get without shelling out for a Core i5 chip. A great upgrade for Sandy/Ivy Bridge systems, and certainly a bargain worth taking advantage of.
Where to get it: CCL Online (**bit.ly/1yMd2TQ**)

Deal 4: BenQ GL2450
RRP: £145 / Deal Price: £112

Most low-price monitors aren't worth the money they cost, but the BenQ GL2450 allows you to experience full HD visuals, with a 250cd/m2 brightness rating, a 12000000:1 contrast rating and 5ms response time. It's also VGA/DVI only, so it's mainly aimed at older systems and people who want a secondary screen for their laptop, but it's a great monitor in its own right, and at little more than £100, it's still a total bargain.
Where to get it: Dabs (**bit.ly/1wcmeia**)

Deal 5: Asus R9 290 4GB
RRP: £360 / Deal Price: £240

The Asus R9 290 is one of the most powerful graphics cards on the market. 4GB of DDR5 memory makes it a perfect choice for 4K-level gaming, and there are plenty of other high-end features – like support for DirectX 11.2, automatic overclocking, support for up to six simultaneous displays (through AMD Eyefinity) and online streaming capabilities built into its software. An amazing card at any price, but this one can't currently be bettered.
Where to get it: Overclockers (**bit.ly/1wX6wtV**)

Google Working On Browsers For Children

Microsoft Celebrates Giving Tuesday In UK

Hot on the heels of Black Friday and Cyber Monday

As we're a charitable lot here at *Micro Mart*, we wanted to bring a new initiative to your attention that may have otherwise passed you by. You've heard of Black Friday, of course, and probably Cyber Monday for that matter. You may have even taken advantage of the many and varied deals on offer on both of those days. Quite probably you were just as shocked as we were to see the footage of shoppers fighting over a television.

Anyway, Microsoft has launched its own #GivingTuesday activity in the UK following a successful launch previously in the States. #GivingTuesday is all about encouraging people to donate to charities on the Tuesday following Thanksgiving, pointing out the fact that if people are so happy to spend, spend, spend, then they might as well spend for a worthy cause, right? Brought to these mighty shores by the Charities Aid Foundation and with the support of Microsoft partnered with UK Youth, we should applaud the efforts to bring this initiative over to this side of the Atlantic.

> They might as well spend for a worthy cause

Clearly, #GivingTuesday has now been and gone for this year, but we wanted to mention it here as it seems only right at this festive time to point out the more charitable side of the technology industry. It does exist, you know.

Targeted content for under-13s

In America, USA Today has reported that Google is working on versions of its products targeted at children under 13-years-old. A VP of engineering at the company is reported by the newspaper as stating that products such as Chrome and YouTube will be due out next year and that they will help children "be more than just consumers of tech, but creators, too."

From a parents' perspective, the idea of separate products specifically targeted at children is no doubt a welcome one, particularly when it comes to search engines. Let's see how this story develops.

Gangnam Style Breaks The Internet

Well, not quite... but YouTube was worried for a bit...

Before continuing with this story, can we presume from the outset that you've either directly heard, or at least heard about, the little ditty *Gangnam Style* by South Korean entertainer Psy. If you haven't, then don't worry too much as you're not really missing out on any great creative breakthrough – though it does make us wonder exactly what you've been up to for the last couple of years.

The song had been obscenely popular for that time, thanks chiefly to its associated video, which became quite the hit on a little video sharing website called YouTube. So much of a hit, in fact, that it threatened to break the site's view counter, forcing the service to upgrade it in anticipation.

The video is the site's most-watched, amassing over 2,147,483,647 views, which was the limit for views (due to the use of a 32-bit integer, apparently). In surpassing that figure, YouTube has been forced to change the max view limit to over a 64-bit integer and a new maximum of over nine quintillion (9,223,372,036,854,775,808 to be exact). Shame that the honour didn't go to a more worthy video, but that's just the way of things.

With Christmas and the new year just around the corner, we've reached the last issue of *Micro Mart* for 2014. As usual for this time of year, this issue will run for two weeks, so you'll see us next in January.

Hopefully, with the advice in this week's special, you'll be able to pick up a deal in the upcoming sales.

Of course, many of us will have spent so much money on Christmas presents and food that there's nothing left for the January sales. Well, if that's the case, you can always get onto eBay or something and sell your unwanted gifts. Then you can put the proceeds towards something you actually do want.

Is that truly in the Christmas spirit? Possibly not, but if it means you end up with a new motherboard instead of a Katie Price novel and yet more socks, then we think Santa Claus would probably understand.

Happy holidays,

Anthony

Editor

Meanwhile... On The Internet...

In the words of TorrentFreak, it was "deja vu all over again" as the Pirate Bay's servers were once again raided by Swedish Police and the site bought down (**tinyurl.com/MotI1342a**). Apparently, a raid on a data centre in Nacka, a town just to the east of Stockholm, owned by Portlane (**www.portlane.com**) resulted in the site being brought down on 10th December. At the time of writing, it's still unavailable, though a number of mirrors quickly appeared, leading some to believe the site's rhetoric about being impossible to bring down was true (**tinyurl.com/MotI1342j**). Apparently not (**tinyurl.com/MotI1342k**).

It would seem that while The Pirate Bay is proxied and mirrored in multiple locations (look: **tinyurl.com/MotI1342c**), these rely on the content of the original site in order to operate – and no servers means no new content. The most widely reported of the alleged resurrections in wake of the raid was **ThePirateBay.cr**. Though this did eventually appear to have new content on it, a Reddit discussion on the site (**tinyurl.com/MotI1342d**) concludes that the content is in fact mirroring from another site, **kickass.so**. However, as TorrentFreak points out, there's currently no evidence that the **Piratebay.se** domain has actually been seized by police, and believes that the site could be resurrected, provided the will to do so remains (**tinyurl.com/MotI1342e**).

That 'will' may not be a given, however (**tinyurl.com/MotI1342f**), as it's obvious that the authorities are intent on making an example of this most famous incarnation of online piracy, though it's only one of many such sites. Yet if Pirate Bay co-founder Peter Sunde (aka Brokep) is to be believed, the ideology behind the site has changed radically since the last raid, and the spirit that kept it going in 2006 may no longer exist (**tinyurl.com/MotI1342g**). As he opines in a blog post (**tinyurl.com/MotI1342h**), "TPB has become an institution that people just expected to be there. No one willing to take the technology further. The site was ugly, full of bugs, old code and old design. It never changed except for one thing – the ads"

Members of Team Meanwhile who have interviewed Sunde in the past certainly attest to the strong political ideology, twinned with a streak of anarchy, which appeared to underpin the nascent Pirate Bay (akin, though not interchangeable with Rick Falkvinge's Pirate Party). It's certainly unlikely that the individuals behind the site now will be as open as their predecessors **(tinyurl.com/MotI1342i)**, which is a shame.

While commenting on the activities of the CIA and its use of 'Enhanced Interrogation Techniques' (Torture, to you and I) and rendition during the so-called 'War On Terror' are beyond the remit of this column (and we couldn't really do it better than Jon Stewart, anyway: **tinyurl.com/MotI1342l**), we found some of the online aftermath nothing short of fascinating **(tinyurl.com/MotI1342m)**. Major props, though, go to the woman behind the report itself, US Senator Dianne Feinstein, who took to Twitter to live-tweet her rebuttal to CIA director John Brennan's statement on the matter (**tinyurl.com/MotI1342n**). Masterful.

It would seem that the success of YouTube phenom Zoe Sugg's first novel, the aptly titled *Girl Online* (on which we reported last week), is not all it seems to be (**tinyurl.com/MotI1342o**). Or at least, it's not what some people expected it to be.

Frankly we're surprised that anyone was surprised by the rumours and innuendo concerning just how much of the book had been written by Sugg herself (**tinyurl.com/MotI1342p**), especially as her publishers had been quite up-front about the fact that she had been writing alongside an 'editorial' team, and the fact that ghostwriting is not exactly a new idea in celebrity publishing – although, admittedly, it's something more commonly reserved for autobiographies (having said that, Katie Price has been at it in the world of fiction for years: **tinyurl.com/MotI1342r**). However, the inference that the book was probably largely written by author Siobhan Curham (and in less than six weeks) has certainly knocked the shine off this apparent crossover success story a little, and caused Zoella (Sugg's online identity) to take a break from social media for a while (**tinyurl.com/MotI1342q**). Being compared to the 'Artist' Formerly Known As Jordan is not a good look, apparently.

Dear Santa, we would sincerely like to thank you for the wonderful early Christmas present you bought us – and every tech/entertainment writer the world over. Really, nothing could have filled our collective column inches quite as wonderfully as the #GoP Sony Hack, it truly is gift that keeps giving. WE LOVE YOU SANTA... Okay, okay... yes, that note is in bad taste (this is, let us not forget, a crime), but the way that the press is poring over the salacious details of emails sent between staff at the company, you suspect that Christmas has come early. Most interesting to us is what appears to be a general consensus that while, say, the salacious contents of the Celebgate phone hack were quickly labelled verboten by the mainstream press, the same press has declared open season on this stolen information. Indeed, some have used it as an excuse to decry the perceived culture at the studio. Interesting.

Also fascinating is Sony's pro-active response to leaking of its movies and its apparent 'Bad Seed' tactics to stop torrents (**tinyurl.com/MotI1342s**). Nick Cave has yet to comment.

.AVWhy? Videos For Your Eyes... Not Necessarily For Your Brain

It's that time of year when everyone starts rounding up lists of what was best in the previous 12 months – as if we don't live in an ever-churning, always recycling and forever mixing splurge of media or something. That means YouTube's annual chance to remind you that you spend way too much time gawping at one device or another **(tinyurl.com/MotI1342u)** – although none of those guys, no matter how hip they may be, can walk on water: **tinyurl.com/MotI1342v**

Aaaaaaaand Finally...

Merry Christmas y'all. Here's a festive Spotify playlist that's been rocking the Meanwhile office this week: **tinyurl.com/MotI1342t**. Have a good one!

QUICK BITS... Apple offered coding workshops as part of the Hour of Code project that ran between 8th and 14th December

Caption Competition

This chilly chap was our caption competition star in issue 1340... And here are your best offerings. Yo ho ho...

- **wyliecoyoteuk:** "Hello helpdesk? My computer's frozen!"
- **Thomas Turnbull:** "Damn the screen's frozen again."
- **wyliecoyoteuk:** "Richard soon regretted clicking the 'freeze frame' button.
- **Blacklion1725:** "Unfortunately the next ice age had arrived before the Micro Mart forum finished loading."
- **wyliecoyoteuk:** "The new cooler in Tony's laptop worked better than he expected."
- **Ondrive:** "Computer controlled freezers proved popular, freezer/laptop hybrids? Not so much."
- **HunterTony:** "Presenting the new Apple iCool."
- **Thomas Turnbull:** "He was so engrossed in his game he hadn't noticed his central heating had failed."
- **wyliecoyoteuk:** "Apparently, the 'Any' key can only be seen at temperatures well below zero."
- **wyliecoyoteuk:** "Scrooge's fourth ghost, the Ghost of Christmas Login."
- **doctoryorkie:** "The only person in a suit to be cool."

Thanks, all, and congratulations to our winner, Thomas Turnbull with "Wow, the copy protection on the *Frozen* Blu-ray is a bit over the top". To enter this week, head to the 'Other Stuff' section of our forum (**forum.micromart.co.uk**) and say something funny (but not too rude) about the picture below or email us via **caption@micromart.co.uk**.

Sony Gives Users Early Christmas Present

No, we don't mean Sly Stallone's bank details

Sony's PlayStation Experience expo came and went earlier this month and during the event, Sony took advantage of its 20th anniversary to give owners of a PlayStation 3, PS4, and PlayStation Vita a free game for each of the platforms.

Gamers could log on to the PlayStation Store over the weekend of 6/7th of December and download the likes of *Need for Speed: Most Wanted* or *Mirror's Edge*. Quite a nice offer, although hardly outstanding titles. Also, nowhere near a good enough deal to stop the current bad headlines against the company, which has once again suffered a hack attack, this time via a group called The Lizard Squad bringing about an outage on the PlayStation Store.

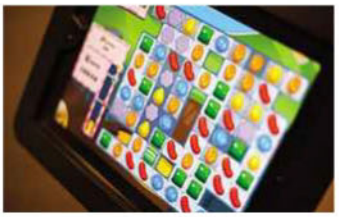
In other Sony anniversary news: one of the limited-edition grey PS4 consoles that were on offer for quick buyers, equally quickly re-sold on eBay for over $20,000. Eek.

MP Plays Candy Crush During Commons Hearing

Shocking?

This may or may not surprise you, depending on your scepticism about UK politics, but a Conservative MP named Nigel Mills has been caught playing *Candy Crush Saga* on his mobile during a Commons committee hearing.

The Sun published some photos of the incident and the MP was reported to have played on the game, presumably because he was a little bored. He was quoted as saying that "he probably had a game or two", but that he was "fully engaged".



Snippets!

Lost Without The Web?

A study of 2,000 smartphone users from the developers of free sat nav app Scout, has revealed that younger users struggle most without a web connection, with half of 18-24 year-olds admitting that they would feel "completely lost" if they can't get on the web while on the move. nIt seems that losing their ability to use social media messaging such as WhatsApp and Twitter is what makes people so angry and a third of 18-24-year-olds also said that they would barely use a smartphone were it not for a web connection.

Driverless Cars Hit UK

Bristol, Greenwich, Coventry and Milton Keynes have been chosen as locations for testing driverless cars in Britain. Announced following the Autumn Statement, an additional £9m in funding has been added to the £10m already allocated, and Bristol will play host to the Venturer consortium, aiming to look at whether or not driverless cars can help to alleviate congestion problems. Greenwich will run the Gateway scheme, carrying out tests on automated passenger vehicles and autonomous valet parking, while Coventry and Milton Keynes will joint host the UK Autodrive programme.

Console King Dies

Sad news: the "father of videogames", Ralph Baer, has passed away, aged 92. A German engineer and inventor, Baer helped in the creation of the Magnavox Odyssey, which went on sale in the 70s and was important in inspiring the revolution that followed and established the concept of a box-shaped device connected to televisions with the games on cartridges controlled via handheld controllers. Baer was also responsible for another game you might be familiar with: Simon. Yes, the electronic memory game that's still being sold today was his idea too... What a guy. RIP.

Raspberry Pi Competitor Unveiled

British brains behind the rival computer

The über-popular Raspberry Pi barebones PC now has a rival in the shape of the Creator CI20. Pleasingly, this competitor also comes from a British stable, the chip designer Imagination, and it boasts a more powerful 1.2 GHz MIPS32-based, dual-core processor, 4GB Flash memory, and more storage. The PowerVR SGX540 graphics chip on board is a version of that on the iPad and all of this extra goodness comes at the higher price of £50. Pre-installed with Debian 7, other Linux distributions including Gentoo and Yocto will be available and Android 4.4 can be installed if desired, while the built-in wi-fi and Bluetooth tick the connectivity boxes.

So, what we have here is a more "high-performance" board for users' development projects, according to Imagination. Whether consumers will be prepared to fork out the extra cash compared to the £20-ish price of the well-established Raspberry Pi remains to be seen.

Anyway, if you would like to order one, you should type **www.imgtec.com** into your browser and take a closer look. Units will be distributed at the end of January.

FUZEliers Support Young Coders At TNMOC

Young coders, we salute you

We brought you news on the launch of the FUZE Legacy edition last week, and now more FUZE news, courtesy of our friends over at The National Museum of Computing at Bletchley Park.

A gleeful team of FUZEliers, sponsored by FUZE Technologies, is going to be present every weekend to show keen young coders how it's done on the FUZE platform. Obviously, this is something that we're keen to point our readers to as nobody wants coding to become a lost art. Encouraging our youngsters to take up the challenge is all good with us and the aforementioned FUZEliers will be showing them how to program robots and other devices linked to FUZE. The best thing about this is that anyone can drop in, no experience needed, and by the end of a short session, they'll have written their first real programs, learned some key commands and, possibly, controlled a robot arm. Heck, move aside kids. We want a go.

Well done to both parties for putting this scheme together.

QUICK BITS... **Ofcom has stated – surprise, surprise – that the UK's broadband coverage remains patchy.**

Assassin's Creed To Come To London

Leaks suggest Victorian era setting

The next release in the *Assassin's Creed* series will be released next year, and it's going to be set in London according to leaks surrounding the game. It's going to be set in the Victorian era and called *Victory* and Ubisoft is quite naturally upset over the fact that a leak of assets has come out at all. In its official response, it stated: "It is always unfortunate when internal assets, not intended for public consumption, are leaked. And, while we certainly welcome anticipation for all of our upcoming titles, we're disappointed for our fans, and our development team, that this conceptual asset is now public."

So yet more bad news for the game developer, which has already suffered greatly over the many, many bugs on the *Unity* title. It's offered up a free expansion pack to try to make up for those errors.

Laptop Batteries Could Power Slums

Discarded batteries still hold power

An IBM study could have possibly found a way to power homes in slums. The study analysed a sample of discarded laptop batteries, finding that 70% of discarded batteries still held enough power to run an LED light for over four hours a day for a whole year. The concept behind this finding was trialled in Bangalore with adapted power packs making use of the old batteries, and they could prove popular with poorer families living in slums.

The UrJar prototype devices use lithium-ion cells from old batteries to power low-energy devices (like lights), with the idea behind it being to help the approximately 400 million people in India who are off the power grid.

Of course, another major benefit of this is a reduction in the vast amount of e-waste that is generated every year. Seems a no-brainer to us and we wish IBM well with its efforts on this one.

GTA Sales Ban Down Under

Retail chains take issue with violence

A couple of Australian retail chains have taken *Grand Theft Auto V* down from sale in their stores after complaints were made over violence towards women in the game. A petition to ask the Target and Kmart stores to stop selling the title amassed over 40,000 signatures, so the chains quite naturally felt compelled to act accordingly.

The petition on change.org, put forward by a group of three women, declaimed the title as "a game that encourages players to murder women for entertainment." It then went on to say that "The incentive is to commit sexual violence against women, then abuse or kill them to proceed or get 'health' points."

It's worth noting that a rival petition asked the stores to carry on as they were, arguing that grown adults could decide on whether or not they should buy the game rather than be forced against doing so by the outlets themselves.

Whatever your thoughts are on this issue, it's clear that this is a significant movement railing against the graphic depiction of violence in games. To see the stores acting in this way demonstrates that they too are all too aware of that.

Keir Thomas pushes his Chromebook to the limit to explore what can be done with these cheap little laptops

Chromebooks are the inexpensive laptops designed by Google and sold by a variety of manufacturers. They do one thing and they do it well: they get you online for web browsing and web apps. For many this is all they need, but Chromebooks have a surprisingly amount of latitude that lets you squeeze out even more functionality. We've gathered ten ideas here.

1 Install Linux

Chrome OS is at the heart of each and every Chromebook and already runs on top of Linux, but you can install Ubuntu, Debian or the security-focused Kali (**www.kali.org**) alongside it using Crouton (**goo.gl/mTKXMq**). This is achieved via a chroot environment that uses the same underneath bits as Chrome OS (kernel, hardware drivers, etc.) but installs a separate desktop environment on top in its own private file system. Because the same kernel is used, if you're online in Chrome OS, then you'll be online in the Linux installed by Crouton, and the trackpad will also work just fine.

Performance is good and even better than Chrome OS, in our opinion.

You'll need to activate Developer Mode to use Crouton (see boxout), and then download it from **goo.gl/mTKXMq**. Installing Ubuntu is subsequently as simple as opening the crosh command line by tapping Ctrl+Alt+T, typing 'shell' to switch to a full command line and entering the following, which will install Ubuntu 14.04 with the standard Unity desktop:

```
sudo sh ~/Downloads/crouton – t unity – f trusty – e
```

10 Surprising Things You Can Do on a Chromebook

Things will be encrypted for added security, and you'll need to create an encryption password/passphrase when prompted, in addition to creating a user account and password for the new installation.

Running Ubuntu each time is then a matter of again opening a crosh shell, typing 'shell' to switch to a full command line, and typing 'sudo startunity – b'. You'll be prompted to enter the login password for the new installation as well as the encryption password/passphrase. Once Linux is up and running, you can switch between it and Chrome OS by tapping Shift+Ctrl+Alt+← (page back) and Shift+Ctrl+Alt+→ (page forward), and can close the crosh browser tab. To quit the Linux session, just log out of its desktop but don't choose to shut down or reboot, because this will shut down or reboot the Chromebook!

The Chrome OS keyboard hotkeys won't work – Linux will see then as function keys – but the brightness command issued at the Linux prompt lets you increase/decrease the screen brightness (e.g. brightness up, brightness down or brightness 70 to set a brightness of 70%). This command can be bound to keystrokes on most versions of Linux.

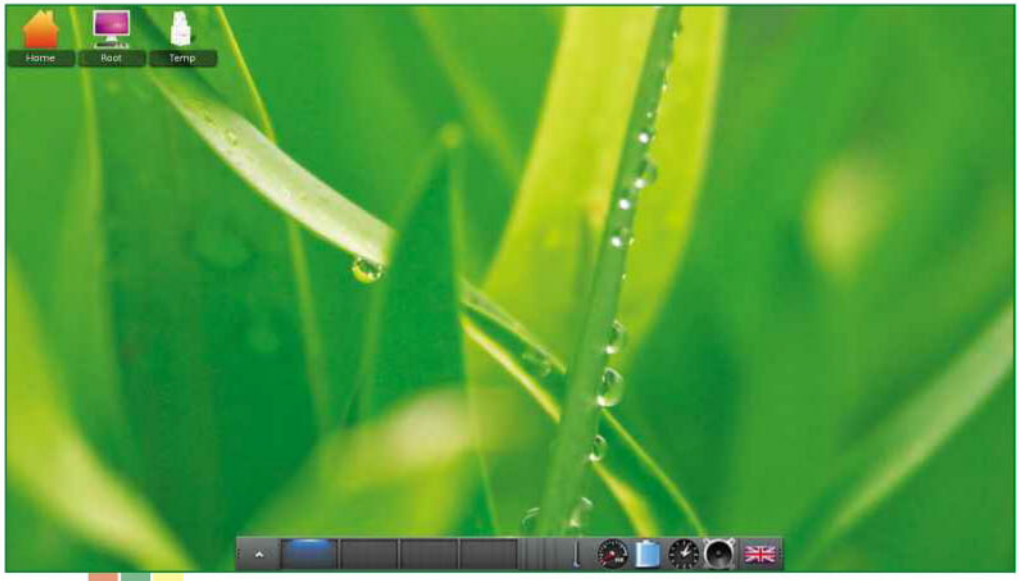
Crouton doesn't create a traditional Linux installation. For example, run levels are still controlled by Chrome OS, so starting services on boot within the new Linux becomes a matter of adding the daemon to the bottom of /etc/rc.local. Installing software can be done at the command line via apt-get, or you can install Synaptic using the following command typed at the command line of the new Linux (NOT in Chrome OS!):

sudo apt-get install synaptic

Once installed, the program will be found in the usual application menu of the new Linux.

If your Chromebook uses an ARM processor, then software built specifically for x86/x64 processors won't be available. Examples include Wine or VirtualBox. However, other software like LibreOffice, the Chromium/Firefox browsers or VLC media player will work just fine. There's no 3D acceleration for ARM-based Chromebooks (desktop environments run fine in 2D mode), although 3D should work fine on Intel-based Chromebooks.

A variety of Linux desktops can be installed, such as E17 seen here, and they run alongside Chrome OS in a chroot environment



2 Install Windows (Easily)

If you have an Intel Chromebook, then you can install Windows – in a virtual way. The first step is to install Crouton, as mentioned above. Switch to a prompt in your new Linux installation and install VirtualBox (sudo apt-get install virtualbox). You'll then need to switch to a PC to create a bootable USB memory stick containing the Windows installer. If you have a Windows CD/DVD, then this can be done using Rufus (**rufus.akeo.ie**). Windows 7 and XP will work, but XP will run much better and consume less disk space. All you then need do is start VirtualBox in your new Linux installation, create a new Windows virtual machine, and point it towards the installer on your USB memory stick.

Be warned that a Windows 7 installation might struggle to fit in the small confines of a typical Chromebook's hard disk, and as with all virtualisation regardless of operating system, a computer with 4GB of RAM will cope better than one with 2GB.

3 Install Windows (Hardcore)

If you have an Intel Chromebook, then you could try installing Windows directly onto the Chromebook hard disk, replacing Chrome OS (dual boot isn't

possible). This will let it run natively, but there are so many caveats that frankly only the foolish or brave would actually go ahead with it. For starters, you'll need to replace the existing Chromebook BIOS with Coreboot (**www.coreboot.org/Chromebooks**), a project to create an open-source BIOS. Needless to say, flashing the BIOS with third-party software is a very risky thing to do, although most instruction guides explain how to create a backup of the existing BIOS. Before doing that, you'll need to open up the Chromebook to access the motherboard and attach a jumper to make the BIOS writable.

Getting the sweaty palms, yet?

Subsequently, you can boot from the same USB memory stick mentioned above at boot time to install Windows, and installation should proceed fine, but when you boot into your new installation, you'll find that very nearly every driver isn't installed – and this will probably include drivers for the Chromebook's keyboard and trackpad, so you'll need to plug in an external mouse and keyboard. Depending on the Chromebook model, you might be able to track down the drivers via a little Googling but, after reading several guides online, we didn't find one person who managed to get everything working. It seems that Coreboot doesn't implement ACPI fully, which perhaps doesn't help, but this also means that useful laptop features such as hibernation and suspend don't work either. You'll need to shut down manually each time before closing the lid.

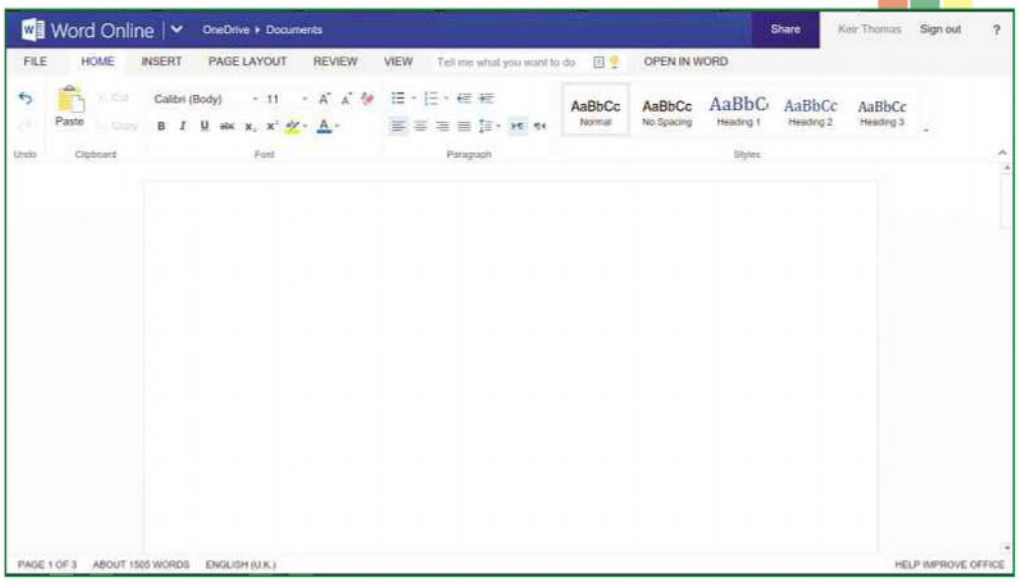
If you have an old Intel Chromebook that you're prepared to risk writing off, then installing Windows in this way might be worth a try, especially if you want to leave it running 24 hours a day, but remember that the meagre storage on a typical Chromebook means that it will never be a satisfactory experience.

4 Use A Different Office Suite

Because Google is behind the Chromebook project, it would very much like you to use Google Docs/Drive for your word processing, spreadsheet and presentation needs. However, it's not the only online office suite in town, and very strong competition is provided by Microsoft Office Online (**onedrive.live.com**), which is part of its OneDrive system and free to anybody who has a Microsoft account or is prepared to sign up for one (**signup.live.com**). You get Word, Excel, PowerPoint and OneNote. Okay, so generally speaking you get even fewer features with Office Online than you do with Google Docs, which is already pretty basic, but the core tools are there, including the ability to add and respond to comments. Couple your use of Office Online to a Hotmail/Live.com/Outlook.com email address, and you can overcome the annoying hurdles of working with others on Office documents via a Chromebook. Hotmail/Live.com/Outlook.com will offer to let you open attachments you receive directly in the online versions of its Office suite, where you can edit them and keep them in native Office file formats while doing so. Sending the edited versions to somebody else is still a matter of downloading them to your Chromebook's storage and reattaching them to an email, but this isn't too much of a hurdle, and it also creates a local backup of the file.

Alternatively, if you have an Apple ID, then you might be able to use the online versions of Pages, Numbers and Keynote – Apple's own suite of office apps. These are great for more complicated page layout jobs. Just visit icloud.com and log in. You'll see a warning about incompatibilities, but it all seemed to work fine in our tests. Files are saved to Apple's own iCloud online storage, which you'll also need to enable on one of your iOS devices if you haven't already (see **www.apple.com/uk/support/icloud/icloud-drive**). Additionally, files you create are saved in iWork formats that those without a Mac or iOS device will be unable to open. Luckily, there's a simple way around this: click the spanner icon when editing the file in question, then click either 'Download a Copy' or 'Send a Copy'. This will offer the chance to convert the file to Microsoft Office or PDF formats. Bear in mind that conversion may mess up any intricate formatting within the document.

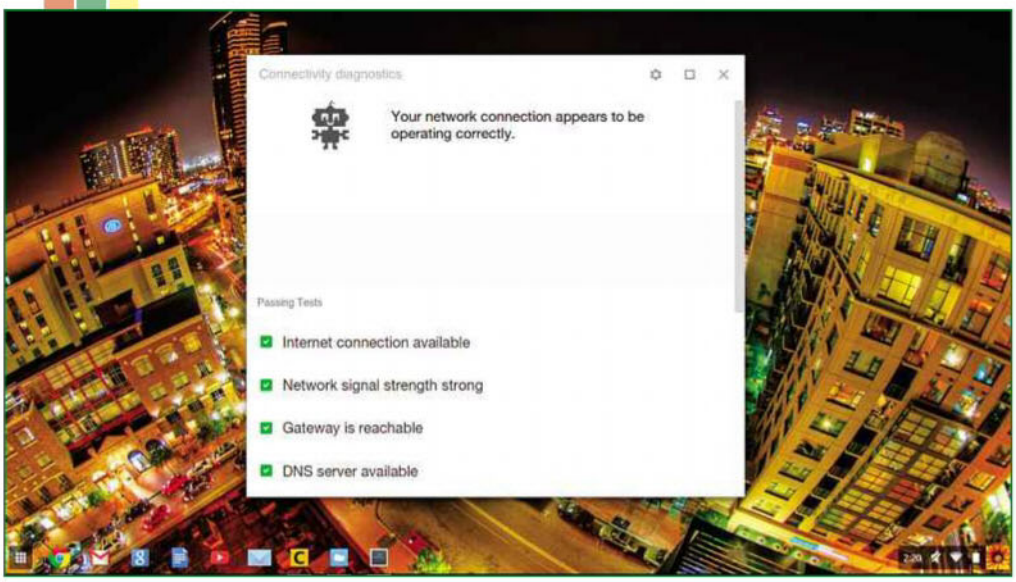
Bringing up a competent rear guard action is Zoho Office (docs.zoho.com), which is arguably the most feature packed of the online office suites, and it offers the ability to download what you create via the File > Export As menu option, as well as to save in it Zoho's cloud space, although Zoho perhaps doesn't look as pretty as the others.



The free online version of Word looks remarkably similar to the real thing and offers all the functionality most of us need

5 Check Your Connection

There are all kinds of Chrome extensions that should really be built into the OS, and one of the most useful is the official Connectivity Diagnostics app (**goo.gl/OuNqQK**). This thoroughly probes and tests your connection in an attempt to discover issues. If you've ever been connected to an



The Connectivity Diagnostics app should really be built into Chrome OS, because it can tell you why your internet connection isn't working

> **If you have an Intel Chromebook, then you can install Windows**

unreliable public wi-fi service, then it's vital, because it can also find out if you're being blocked by a captive portal service.

6 Go Offline

Chromebooks only let you do stuff if you have an internet connection, right? Not quite. There are a whole range of applications that work offline, and you'll find them listed at **goo.gl/Uj73Zq**. Most exist in their own program windows outside of the browser, just like traditional apps. Of particular interest for those who miss the days of Windows Notepad is Caret, a basic text editor that's perfect for quickly scribbling notes or even working on HTML files. Also worth singling out for attention are VNC Viewer (lets you tune into the desktop of other computers on the network), Solitaire (the card game beloved by bored office workers the world over) and Any.do (to-do list manager). There are even some popular games, such as *Cut The Rope* and *2048*. Train journeys in internet dead zones need never be dull again!

Most of Google's services also have offline modes, although for reasons best known to the search giant, offline isn't enabled by default. In Gmail, click the cog icon at the top right, then Settings, then the Offline heading. Click 'Install Gmail offline'. Follow the instructions to install the extension, then click to launch it (or click its entry on the apps menu), and follow the instructions on screen. Clicking the cog icon when the extension appears allows you to extend the amount of mail stored offline to a fortnight or month. You'll be able to use the extension to not only read mail while offline but compose it too. However, ensure the extension is running when you go back online. In fact, using the extension to access your Gmail all the time whether online or not is a good way of working, and it looks a lot like the Android Gmail app so isn't hard to use.

Taking Google Docs offline is done in a similar way: visit drive.google.com, then click the cog icon at the top right, and put a tick in the box that reads 'Sync your work to this computer so that you can edit offline'. Once enabled, you can use the standard Chrome file browser to open files in your Drive when offline. This doesn't sync all your Drive contents, however – just the Google Docs word processor, spreadsheet and presentations. You do get to edit them fully, but to ensure correct and speedy resyncing, ensure the document is open when you reconnect to the internet.

7 Share Your Chromebook With Others

Unlike a tablet or phone, a Chromebook isn't designed to be used by just one person. In fact, Chrome OS makes sharing a device easy, and there are two ways of doing so. The simplest is to log out and let another person log in from the start-up screen. They just need to click the 'Add User' button, and then provide their Google account details. If this option is greyed out, you might need to access the settings panel (click the clock, then click Settings), click 'Manage other users', and remove the tick alongside 'Restrict sign-in to the following users'.

The great thing about this approach is that, if the other user already has a Chromebook or uses the Chrome browser, their settings and extensions will sync automatically. It really will be like they're sitting in front of their own computer (although if they've encrypted their sync settings, they'll need to type the password in the settings; a notification should appear prompting them to do so).

The other way of sharing a Chromebook is to create a Supervised User, which is ideal for younger users, because it limits what they can do, and you can also monitor sites they access. To create a supervised user, again ensure you're not restricting sign-in, and log out of your account. Click to add a new user at the login screen, but this time select 'Create a supervised user'. Follow the prompts. Crucially, a supervised user isn't a 'full' Google user, and their settings won't sync online. Once the account is created, you should head over to **www.google.com/settings/chrome/manage** to configure settings. The default is a permissive policy that allows the user to access any websites. Notably, the user can't install any extensions or applications, regardless of permissions you set, although this may change in the future because the Supervised User system is still in beta testing.

8 Print From Your Chromebook

Infamously, Chromebooks don't let you plug in a printer and print.

Instead, they force you to use Google CloudPrint, by which you output to a printer attached to another computer that's running Google Chrome – terrific if you want to print to an inkjet at home when in a coffee shop but a bit of a fuss all other times.

There is a way to print to a USB printer attached to a Chromebook. There's an involved setup routine, but it works reliably afterwards.

Start by following the steps above to install Linux via Crouton. Then open a terminal window within Crouton and type the following commands, waiting for each to complete each time. Replace USERNAME with your own Linux username:

sudo apt-get install cups nano chromium-browser
sudo /usr/sbin/cupsd
sudo adduser USERNAME lpadmin
sudo nano /etc/rc.local

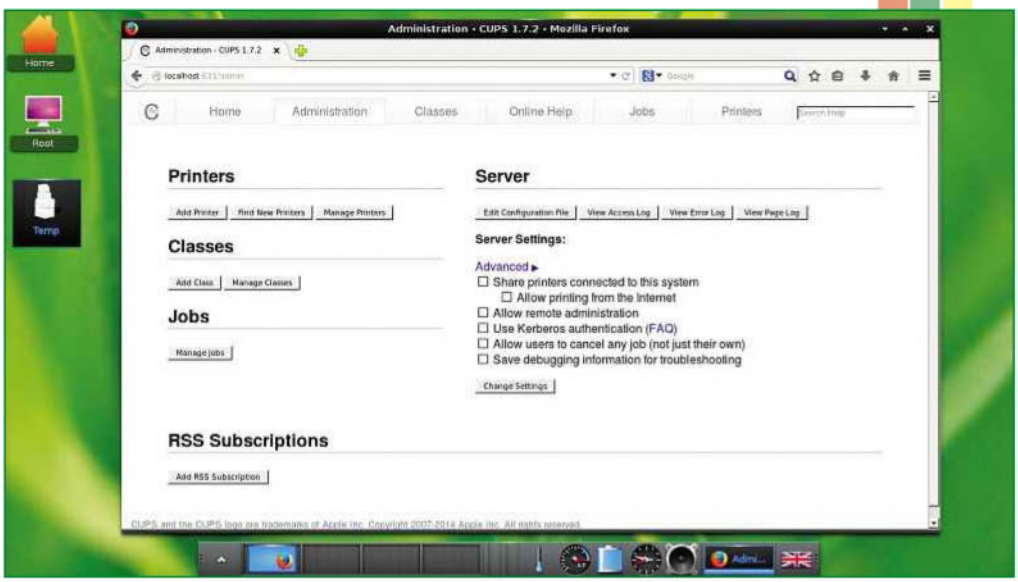
The last command will open a configuration file for editing. Above the line that reads exit 0, add the following:

/usr/sbin/cupsd

No tap Ctrl+O to save the file and Ctrl+X to quit the text editor. Still within your new Linux installation, open a browser window, and in the URL field type localhost:631. This will open the CUPS configuration screen. Click the Administration tab, and then click Add Printer. Follow the steps to add your printer, plus its drivers (be aware that it's not possible to make every printer work on an ARM Chromebook, because some use non-open source binary code).

Chromium was installed as part of the commands earlier, so open it and click the menu button at the top right, and then log in with your Google account. Then click the Settings option. Click 'Show advanced settings' at the bottom, then click the Manage button beneath Google Cloud Print. Add your new printer to CloudPrint by following the instructions.

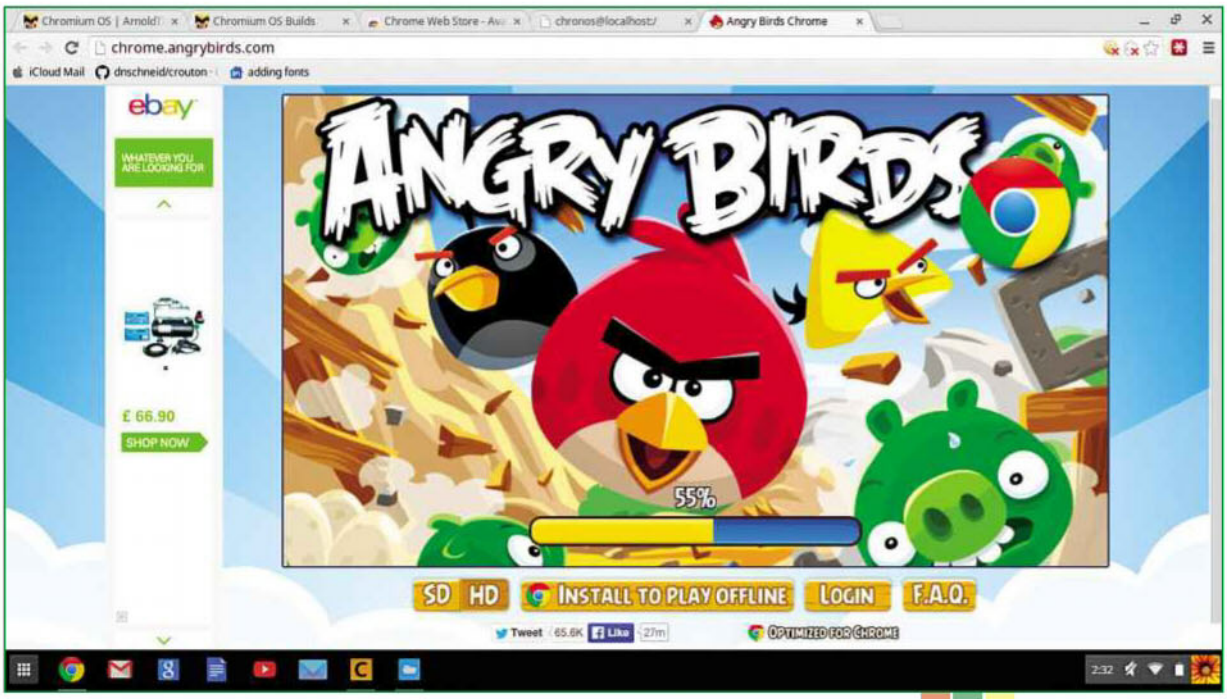
Setup is now complete. Whenever you want to print from Chrome OS, ensure your Linux installation is running in the background, plug in the printer if it isn't already attached, and then click the Print option within the web app. Select your printer from the list or click Change if it isn't listed, and then select it. Once you click the Print button, switch immediately to your Linux installation and then wait for the output to appear.



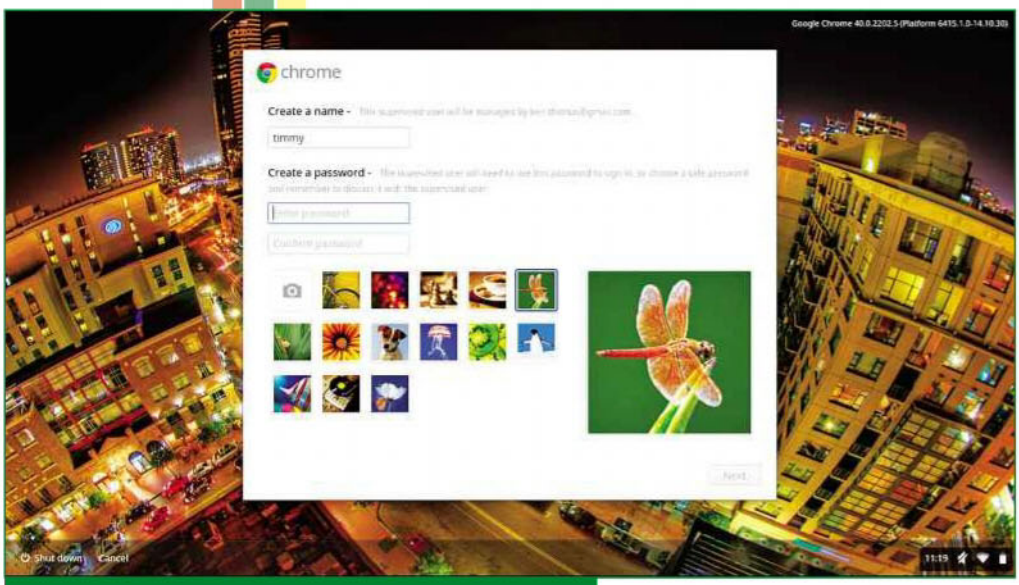
Using Crouton you can install a printer directly on your Chromebook, thereby avoiding Google's ridiculous CloudPrint system

9 Run Android Apps On Your Chromebook

One of the most obvious ideas in the world is for Google to make Chrome OS compatible with Android, and that's what it started doing this summer. Several Android apps have



Angry Birds is one of a handful of Android apps that you can now run on Chromebooks, and converting others is easy



More than one person can use a Chromebook, and you can also create supervised accounts, which are ideal for younger children

Developer Mode

From day one, Google has allowed the intrepid to 'root' their devices to gain more control over them. Officially, this is referred to as enabling Developer Mode and may be necessary because of every Chromebook's powerful security features that lock down the operating system so it can't be modified. For example, switching to Developer Mode turns off Verified Boot, which checks the integrity of the file system each boot but leaves in place some of the other protections, such as the read-only root file system. Whatever the case, switching to Developer Mode can easily be reversed in future.

How Developer Mode is activated varies from machine to machine, and instructions can be found at **goo.gl/aj9lqJ**. The system will be wiped, which is obviously not a problem with a cloud-based OS, although be sure to shift any downloaded files you want to keep into Google Drive (don't forget to allow a few minutes for syncing to complete!).

Once Developer Mode is enabled, you'll see a scary message each time you boot, and the system will pause for 30 seconds or until you tap Ctrl+D to confirm you want to proceed. However, once Chrome OS has booted, you won't notice any difference, although the Chrome Shell that appears when you tap Ctrl+Alt+T will gain the ability to run a full bash shell with read-only access to the entire file system – just type 'shell' once the crosh prompt appears. You'll also see a virtual terminal just like on real Linux by tapping Ctrl+Alt+-> (i.e. the forward key at the top left of the keyboard, where F2 normally lives).

By default, Chrome OS does not password protect any accounts, and using either the virtual terminal or bash shell, you should add a password to the default chronos account as soon as possible via the following command: chromeos-setdevpasswd. This will block anybody using sudo to gain root powers, although bear in mind that you won't be prompted for the password when opening the crosh shell.

To disable Developer Mode, simply follow the instructions that appear during booting. Again, this will wipe the system, so again be sure to transfer local files to Google Drive. Note that files generated if you use Crouton (see main feature) are NOT synced to the cloud, and nor is the Crouton installation itself.

been adapted for Chrome OS, and you'll find them at **goo.gl/I0ZZps**. If your favourite app is missing, you can even ask Google to port it for you: **goo.gl/2MoVtY**.

Converting an app so it's fully functional takes knowledge of Android and Chrome OS's inner workings, but despite this, a basic DIY approach is possible. Bear in mind results will vary! You'll need access to a computer running Ubuntu to convert the app, although you can follow the steps above to install Ubuntu via Crouton.

On the Linux computer, open a terminal window and type the following commands, which install the necessary software to repackage the apps:

```
sudo apt-get install nodejs npm
sudo ln – s /usr/bin/nodejs /usr/bin/node
sudo npm install chromeos-apk –g
```

Following this, you'll need to get hold of the Android app's APK package file. Sadly, Google doesn't let you download these directly. If your Android device is rooted, you may be able to extract the files from /data/app or use a website like downloader-apk.com to grab the file (note: we can't vouch for the security of such sites).

Download the APK file to the Linux computer, then type 'chromeos-apk', and drag and drop the APK file onto the terminal window. If you want to make the converted app run in tablet mode, add –tablet to the end (that's two dashes, not one). The default is to run in smartphone mode.

You'll end up with a folder that you should transfer to the Chrome OS machine. If using Crouton, you can simply place this in the Downloads folder, because this is shared between the two operating systems.

Finally, switch back to Chrome OS, and click the settings icon within a browser window. Click Tools > Extensions (or possibly More Tools > Extensions). Put a tick in the box at the top that reads Developer Mode. Click the Load Unpacked Extension button and select the folder you created from the APK earlier. If the Android app is compatible, installation should be instant, and the app will appear in the list whenever you open a new tab. Another way to run Android apps is via the ARChon Custom Runtime (**goo.gl/t0Ep42**), an experimental plug-in for Chrome OS that will read Android APK files directly.

10 Access Your PC Or Mac Remotely

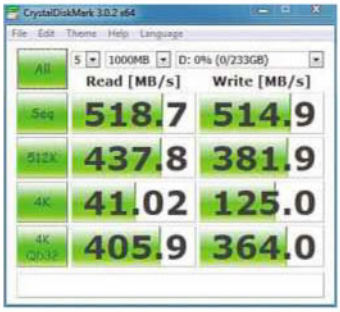
Another use for a Chromebook is to tune into your regular PC's desktop, making it a kind of remote terminal. You can do this using the VNC extension, as mentioned earlier, but a much faster way of doing so is to use Google's Chrome Remote Desktop extension (**goo.gl/P3X6Zb**). For this to work you'll need to install the extension on your Chromebook and within Google Chrome running on your PC too. You'll also need to download a separate host app on the PC, but you'll be guided through this. Both the Chromebook and Chrome on the PC will need to be logged into the same Google account.

To make it all work, open Chrome on the PC and then select the app from the launcher screen. Click to enable remote access, then when presented with a code, switch over to the Chromebook and start the extension there. Click to access a remote computer and type the code when prompted. As always, remember that the browsers on both computers must be logged into the same Google account. **mm**

Samsung 850 EVO 250GB SSD

Samsung brings 3D flash memory to its EVO series

DETAILS
- **Price: £109.99**
- **Manufacturer: Samsung**
- **Website: samsung.com/uk**
- **Required spec: SATA III port and an SSD friendly OS**



About a year ago, Samsung launched its 840 EVO SSD, and I recall being very impressed by its excellent combination of relatively low cost and high performance.

Since then, Samsung has been working hard on its 3D V NAND flash technology that first appeared in its 850 Pro series devices.

According to those behind it, the advantages of this tech were better speed, greater memory densities and reduced manufacturing cost.

Having proven the technology with the 850 Pro, the 850 EVO is now blessed with 3D V NAND and the MGX Controller (MEX in the 1TB model), and one of the first review samples landed on my desk this week.

I'd asked to see a 250GB model, because past experience has taught me that the entry level part is usually badly hobbled performance-wise. However, that general rule is not as applicable here, because the 120GB version can offer the same 540MB/s read and 520MB/s write speeds as its bigger brothers. The only real difference is that the smallest version has marginally fewer Random IOPS to play with, but only 3% less than the 250GB review model.

The numbers we're talking about at this capacity are 97000 IOPS, so this really is premium performance levels but without the collateral bank account damage.

Having ticked the boxes for raw speed and agility and with a price that pitches each GB of the drive at about 44p, my reaction was to hunt for the catch here.

The obvious mitigation candidate is the longevity of the drive, being that all flash has a finite lifespan of write operations.

Samsung quotes the 120GB and 250GB models at 75 TBW (total bytes written) and the 500GB and 1TB drive as double that. For comparison, Samsung's premium 850 PRO has a TBW of 150, identical to the larger 850 EVO capacities.

It can also match the vibration, temperature and shock resistance, and has the same AES 256-bit full disk encryption capability.

There are only a few significant differences; the EVO uses a tiny amount more power, with an average 3.7W versus 3.3W average on the 1TB models. And Samsung only offers you a five-year warranty on the EVO, whereas it's ten years on the 850 PRO.

There was a time when I'd argue that in that one difference the price difference is justified, but I can't see myself using the SSD same drive ten years from now.

Overall, the new 850 EVO represents great value for money and squeezes the difference between middle-order and premium products even tighter.

Unless you must have 100,000 IOPS or a ten-year warranty, then this is the drive you'll want, in whatever size you can afford.

mm Mark Pickavance

Top-end SSD performance at a reasonable price

Samsung 850 EVO Specs

Size	Part Number	Sequential		4KB Random QD32		Price
		Read	Write	Read	Write	
120GB	MZ-75E120BW/EU	540MB/s	520MB/s	94000 IOPS	88000 IOPS	£73.49
250GB	MZ-75E250BW/EU	540MB/s	520MB/s	97000 IOPS	88000 IOPS	£109.99
500GB	MZ-75E500BW/EU	540MB/s	520MB/s	98000 IOPS	90000 IOPS	£198.49
1TB	MZ-75E1T0BW/EU	540MB/s	520MB/s	98000 IOPS	90000 IOPS	£367.49

SanDisk Connect Wireless Flash Drive 32GB

Mark reviews a storage device that confronts all his expectations

DETAILS
- **Price: £39.99**
- **Manufacturer: SanDisk**
- **Website: tinyurl.com/1342rev1**
- **Required spec: iOS / Android devices. USB 2.0 on host PC. Web browser is required for other wi-fi enabled devices.**
- **Part No: SDWS2-032G**

It's not often that this gnarled reviewer finds a device that I'd almost class as magical. But the SanDisk Connect Wireless Flash Drive is almost that, and threw many of my initial expectations out of the window in short order.

Handling it for the first time it doesn't take Sherlock Holmes to deduct that this is a nicely made, slightly large by modern standards, USB flash memory device.

The review model has a 32GB capacity, but that's easily modifiable, because the Connect is actually a mobile caddy for a micro-SD card that you can easily remove and replace, should you want more space.

Inside the Connect, SanDisk used one of its micro-SD Ultra SDHC chips, which isn't the fastest storage it makes.

My testing concludes that putting a quicker one in there would have been a waste, because the Connect only uses USB 2.0, limiting the potential performance available.

Read speeds of 17.5MB/s and write performance of 8MB/s dictate that filling the Connect with files can take some time. If you're short of time, removingthe micro-SD and putting it in a USB 3.0 reader will speed up writing by about 50%.

I'm forced to conclude, that as a USB flash storage device, the Connect is a bit disappointing, but that's not the whole story.

The Raison d'être of the Connect is that it can be connected to wirelessly, using either a web interface or a SanDisk-designed iOS/ Android application.

Initially I was confused by why you would do this, because surely it would be easier to talk to the PC in which the Connect was inserted?

However, what I'd not considered was that a device as small as this could have an internal battery and use it to operate entirely independently. It does, and it even supports three wirelessly connected clients simultaneously.

After a two-hour charge, you can expect approximately four hours of use, depending on activity and client numbers. Longer would be better, and you do need a PC to charge it up again, but that you can do this at all is quite something.

While many people have larger music collections, 32GB is sufficient space to get a boatload of MP3s on the Connect or a few TV show seasons.

SanDisk offers a bigger 64GB model that costs about £79 or a smaller 16GB version that can be found for about £35. The 64GB model includes an SDXC chip with exFAT large file support.

That option hints at some very obvious improvements that SanDisk could make, not least supporting 128GB SDHX and higher performance transfers through USB 3.0. But as a first stab, the Connect has much to recommend it for.

I wish it was cheaper, but considering how much a wireless enabled external hard drive costs, it's not exorbitantly expensive.

mm Mark Pickavance

A battery-powered wi-fi sharing memory stick

Details
Form Factor: USB flash drive
Charging: USB port
Available capacities: 16 GB, 32 GB, and 64 GB
wi-fi standards: 802.11 a/b/g/n
Security: Optional wi-fi password protection
Dimensions: 76 mm x 25 mm x 12mm
Operating temperature: 0° – 45° C
Storage temperature: 20° – 70° C
Support: Two-year warranty in EMEA and APAC

Viewsonic VX2880ML

Mark discovers those customers Viewsonic's new 4K screen is going to impress

DETAILS
- **Price: £399 +VAT**
- **Manufacturer: Viewsonic**
- **Website: viewsoniceurope.com/uk**
- **Required spec: DisplayPort or HDMI output**

The number of monitor makers that includes 4K offering in their ranges is expanding rapidly, and Viewsonic has joined their ranks with the VX2880ml.

Its VX series consists of primarily consumer focused products. However, I can see this particular design being favoured by business users who want high-resolution media presentations and use CAD/CAM applications.

Visually, this is an attractive design, with a narrow bezel on all sides and a somewhat quirky two-part metal stand. Those not wanting to use that support can utilise the VESA 100 mount on the back.

You won't need an industrial support arm for this panel, because the mostly plastic construction contributes to a total weight of less than 4kg. Normally taking a screen this big up a flight of stairs would require a little planning, but I could just sling this under my arm and carry it with ease.

One caveat to this lightness was that it was achieved by using by using an external PSU rather than an integrated one. That's unusual on a 28" panel, even if it's common on smaller displays, and this reviewer doesn't care for them.

The big selling point in this design is the 3840 x 2160 Ultra HD resolution delivered using a 28" TN panel. Technologically Twisted Nematic (TN) displays provide good screen refresh rates that complement gaming and video, though they generally don't offer the viewing angles and colour range of IPS technology.

The VX2880ml panel doesn't break that mould, but its backlight is bright, the colours are cheerful, and output is generally exquisitely crisp. However, when I first unpacked the monitor I was really unhappy with the default settings. They made most movies appear to have been shot in a darkened broom cupboard when not representing scenes of bright sunlight. It took some tweaking to adjust this, though the transitions from dark grey to black are always somewhat abrupt however you configure it.

I'd mention the speakers if they were anything you'd want to listen to, but they're not. Display makers globally have decided that people use headphones or surround sound speaker rigs, it appears.

Full Specification

- **Size With Stand (W x H x D):** 659.96mm x 510.58mm x 240mm
- **Display Screen Size:** 28" (70.8cm)
- **Aspect Ratio:** 16:9
- **Panel Type:** TN
- **Brightness:** 300cd/m2
- **Contrast Ratio:** 1000:1 (Typical)
- **Dynamic Contrast Ratio:** 50M
- **Resolution:** 3840x2160 (30Hz)
- **Response Time:** 1ms (GTG)
- **Viewing Angle (H/V):** 170 ° / 160 °
- **Inputs:** 1x MHL 2.0 (HDMI) (30Hz), 1x DisplayPort (30Hz), 1x Mini-DisplayPort
- **Speakers:** 2 x 2W
- **Warranty:** Two years

Viewsonic's choice of display inputs is also rather curious, combining extensive DisplayPort options with HDMI (MHL). What monitor makers have against DVI these days, I'm unsure, but it's not included and neither is a USB hub. Conversely, the DisplayPort option is blessed with both a mini and full size input, and a DP pass-through for display chaining.

That last feature is a rather nice one if you intend to run a multi-display setup, but be warned that this product isn't featured for 4K gaming at all. When deep in the specifications, I realised that for whatever reason, Viewsonic capped the Ultra HD modes at 30Hz, undermining optimal frame rates irrespective of what video card drives them.

> **"Viewsonic capped the Ultra HD modes at 30Hz, undermining optimal frame rates"**

The compromise option is to use a lower 2560 x 1440 resolution that can do 60Hz, defeating much of the purpose of buying a 4K panel in the process.

All these points push me to the conclusion that there is a perfect owner for this product, and he/she uses AutoCAD over three screens, probably to design buildings, bridges or ships.

Further proof comes from the inclusion of ViewSonic's proprietary Flicker-Free technology, which drives the backlight with DC modulation, and a special blue light filter designed to reduce eye strain from extended viewing periods.

That makes the VX2880ML great for those who spend long days at the screen, and with a backlight life of a minimum 30,000 hours, they could see 15 years use from it.

Viewsonic's problem is that this business customer for the VX2880ml isn't a big niche, and for the majority of home users this isn't the 4K display they'll be looking for.

If it's any consolation to them, none of the 4K screens I've seen so far can be classed as general purpose use either, so the VX2880ML isn't alone.

While the gaming frame-rate is a real disappointment, the VX2880ML can make a desktop look huge, and Excel's columns and rows seem to stretch endlessly.

If you're looking for something to work on big spreadsheets, technical drawings or to desktop publish with, then it's an option that's competitively priced.

If only Viewsonic had empowered it with 4K 60MHz mode, I'd just be a lot more positive about the number of potential takers for it.

mm Mark Pickavance

A 4K display that good for CAD/CAM, but not games

Humax STA-1200BSW Soundbar

Michael has been comparing his waistline with that of a soundbar. He lost

DETAILS
- **Price: £199**
- **Manufacturer: Humax**
- **Website: humaxdirect.co.uk**
- **Required spec: n/a**

Described as the "World's Slimmest Soundbar", the STA-1200BSW has been developed by Humax, a company better known for its set-top boxes (STB). This product consists of the actual soundbar, a subwoofer, a remote control unit and various leads packaged in a box whose size might make you wonder about the slimmest claim.

Once everything is unpacked you quickly realise that the 'World's Slimmest' claim takes no account of the soundbar's width, which stretches to 1200mm. Other dimensions are a depth of 20mm and a height of 37mm. The subwoofer, by comparison, is box-shaped with dimensions of 195 x 266 x 265mm.

The soundbar can be free-standing or mounted on a wall using the supplied brackets and screws. In either case, the unit needs to be positioned within 270cm of an available power source due to the length of the two-piece power lead. All the physical connections to the soundbar are located at the rear of the device. Tucked away in a recessed compartment are connections for auxiliary and optical linking to a television or STB. There are also connections for mains power and the sub-woofer. All the necessary leads are supplied.

Along with the physical connections, it supports Bluetooth for audio output. I felt that Bluetooth pairing, using various devices, was among the quickest I have encountered.

Taking up a central position on the grilled front of this soundbar is a touch-sensitive control panel. Forming part of this control panel is an IR receiver allowing you to initiate controls using the supplied remote unit. This feature is particularly useful if you've opted for the wall-mounted option. Other features available from the control panel include a Bluetooth indicator light, power button and volume adjustment with an option to turn off the sub-woofer.

Humax has packed four speaker units into the soundbar. Arranged along the front of the soundbar, these speakers can combine to deliver 80W of output. Add in the sub-woofer and you get a further 100W of output, which should be plenty for most rooms in ordinary households.

As mentioned earlier, you can either control this soundbar from its front panel or the remote unit as you sit in your favourite armchair (my chair lets me raise the front and lower the back so that I can recline in comfort – if you're going to be a couch potato why not go the whole hog?). You can use the remote to activate a pairing process as you link a smartphone or tablet. Any volume adjustment can be carried out using the remote. You can also turn on/off the surround sound feature and the subwoofer plus mute everything.

Not unnaturally, this soundbar is at its most useful when connected to different devices for receiving content. Rather than allow the user to set the priority for connected devices, the Humax device comes with its own pre-set instructions. This soundbar will give priority to a Bluetooth stream, with an aux connection taking second place. This means the optical option is placed on the lowest rung on the ladder.

The Humax soundbar is capable of adding depth and bass to its output with an increase in the volume level. While you would not use this product in a large hall or assembly room, it's fine for use in a family room in most homes.

mm Michael Fereday

A wide expanse of reasonable sound quality

WinZip 19

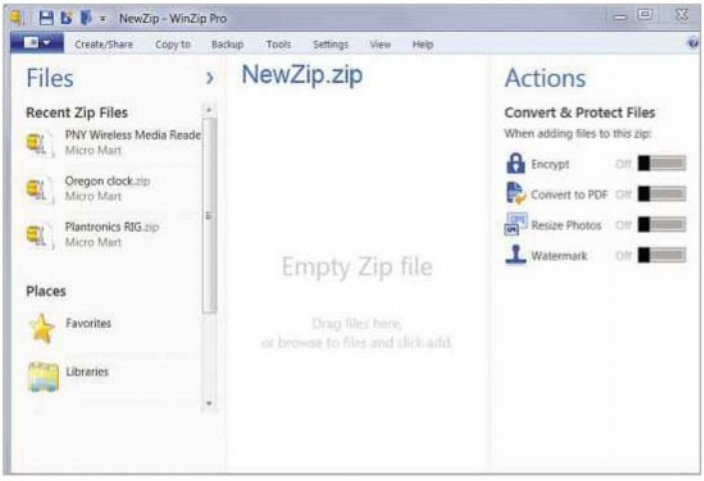
Michael checks out the latest version of WinZip

DETAILS
- **Price: £42.95**
- **Manufacturer: Corel**
- **Website: www.winzip.com**
- **Required spec: Windows XP or later, IE 8**

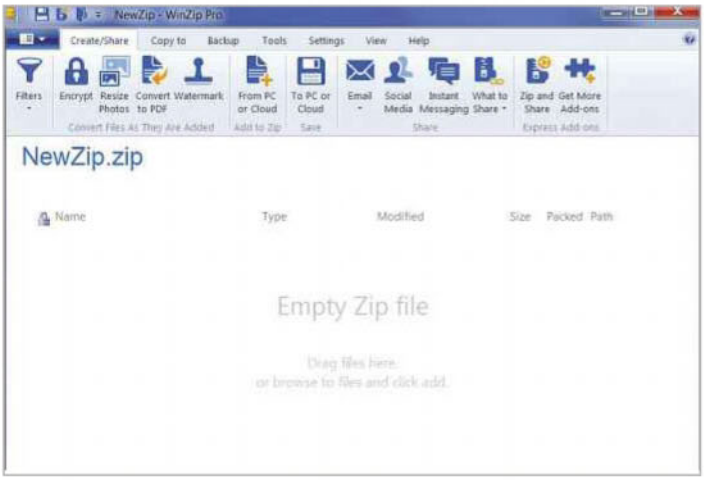
Starting life purely as a data compression utility, WinZip's developer has gradually introduced additional features. This latest version of the software, WinZip 19, offers the user file management, protection and sharing capabilities, adding to its basic compression functionality on the Windows platform. WinZip 19 comes in Standard and Pro versions, with this review being based on the latter.

Version 19 of WinZip has undergone a UI make-over. An opening welcome screen shows the new UI layout, with clearly defined icons representing the software's various features. You have the choice of using this new UI or reverting to the classic look of previous versions.

The new UI retains the ribbon bar from earlier versions of the software. This ribbon bar offers the user options to create / share, open to and backup, plus access to various tools. Positioned beneath the ribbon bar, on the left of the screen, is the File pane allowing you to drill down through a hierarchical listing of content in order to view and select items from different locations. On the right of the screen is the Action pane. Here you will find the means to convert, protect and share items. The tools available will change accordingly to the current task. Taking up a central position is the Zip pane into which you can drag and drop documents, images and the like for creating compressed zip files.



The new UI



The classic look

While on the subject of compression, this is one area that remains the same as that available with the previous version of the software. I selected three groups of documents I have compressed using the previous version of WinZip. These groups consisted on text documents and screen grabs. When zipped using WinZip 19, the compressed file size was exactly the same as that achieved with WinZip 18. Has, I wonder, WinZip run into a brick wall with regard to file compression?

Built into this latest version of WinZip is centralised file management features, which can handle content stored in a variety of locations. Whether stored locally, on a network drive or in the cloud, WinZip can handle it. This software is capable of working with and integrating directly with accounts set up with Dropbox, Google Drive, OneDrive, SugarSync and Cloud Me. Files can be renamed, deleted and moved between locations. There's also direct support for social media platforms such as Twitter, Facebook, Google+ Hangouts and Yahoo! Messaging when sharing content.

WinZip has the capability to act as a backup tool. Options are available to target documents, libraries, email messages and common folders plus images that might be stored on a camera roll. You can create specific jobs for one-off running or tied to a schedule. While lacking some of the functionality of a dedicated backup product, WinZip can perform adequately in this area.

You can use WinZip to encrypt documents, plus convert them to PDF format, with options that include the removal of comments and mark-ups, while making the document read only. Documents can be imprinted with a watermark that has user-defined settings relating to position, direction, transparency and a date or time stamp.

When working with images, there's an option to scale the image to sizes ranging from 640 x 480 to 1920 x 1080 to reduce file size. For those instances when zipped files are too large for sending by email, WinZip 19 offers ZipShares integration, which allows for files up to 2GB to be sent, with a notification indicating their arrival.

mm Michael Fereday

With its new look, WinZip 19 offers a range of features

Comodo Internet Security Pro 8

Improved protection against the wicked web

DETAILS

- **Price: £30 per year for 3 PCs**
- **Manufacturer: Comodo Group**
- **Website: goo.gl/MEl0Q5**
- **Required spec: Windows XP or later, 256MB RAM, 400MB disk space, internet connection**

▲ The UI is quicker and better designed. The tools behind it, though, are what makes this an excellent security product

➤ Comodo Internet Security 8 Pro is worth every penny

It only seems like yesterday we reviewed Comodo Internet Security 7, but now the company has released an updated version with plenty of improvements and some excellent new features.

Comodo Internet Security Pro 7 was a superb package, featuring some of the most impressive anti-virus scanning techniques combined with an all-out defensive network for your home computer. Comodo Internet Security 8 goes one better and introduces a far more intelligent system to monitor your system.

Viruscope is part of this. It closely monitors the activities of all the processes on your PC and alerts you to any suspicious activity. It's a natural evolution of the previous Behaviour Blocker technology, and aside from forming layers of anti-malware and virus detection, it can actually reverse the actions of harmful software without the need to remove the offending item altogether.

This is really quite a clever leap forward. Where most AV and security products in the past have detected a potential threat and followed up by quarantining the executable, Comodo ISP 8 will leave the program in a harmless state and instead focus on the impact it made. By doing so, any legitimate program that may produce threat-like behaviour is left alone and can run correctly.

It offers a lot more control over the detection process, and through a growing list of 'recognisers', Viruscope can determine the good from the bad.

There's also a new Website Filtering feature that will allow the user to block or allow certain sites and to customise a set of rules for other users of the computer that Comodo ISP 8 is installed on. Included with this is the ability to log any attempt to access the rule-created blocked sites. That way you can monitor who and when is trying to visit a site.

The user interface has also seen a slight redesign, which makes it easier to access the relevant features and inform the user of any potential problems it encounters. The desktop widget is a lot clearer and shows any alert,s together with an audio prompt. There's even an option prompt to 'call a live expert' should Comodo come across an At Risk status on the machine it's installed on.

Aside from the new features, Comodo ISP 8 includes a number of enhancements in the form of a drastically improved sandbox mode (which is listed as being 700% faster), quicker scanning, better visual prompts, the ability to record security and configuration events to the Windows Event logs, and improved policies for control over the software. The UI too is certainly a lot smoother and snappier than the previous version, and just the normal tasks switching through the options and features is far quicker.

On top of all this is the strong anti-virus engine and comprehensive firewall, which make Comodo a product worth its weight in gold. It's even extended its Virus-Free guarantee, whereby Comodo will pay £300 worth of repairs should your PC become infected while on its watch. Hopefully, you'll never have to use it, but the sentiment is there at least.

All in all, an excellent security product and one that's reasonably priced at just £30 for three machines for a year. If its all-out protection from everything the internet can come up with that you're after, then Comodo Internet Security Pro 8 is the one for you.

mm David Hayward

Quick, easy to use and low on resources

Oregon Scientific Prysma R

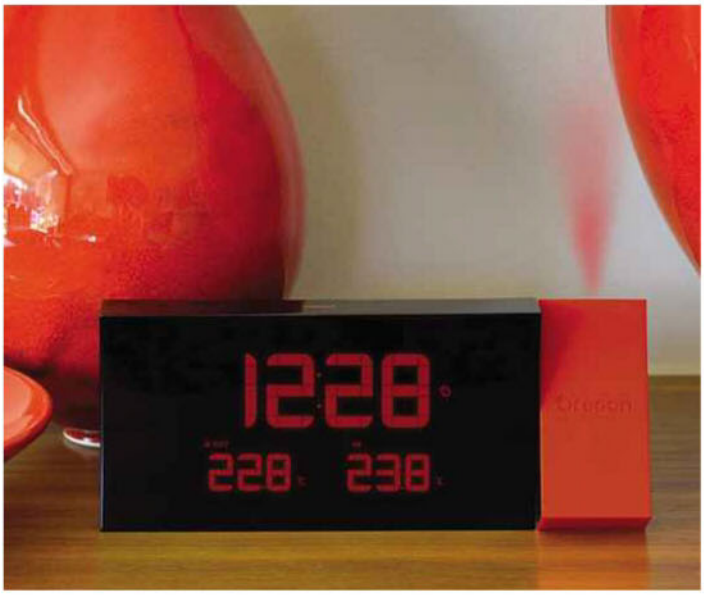
Michael checks out a clock and temperature reader

DETAILS
- Price: £49.99
- Manufacturer: Oregon Scientific
- Website: www.oregonscientific.com
- Required spec: n.a.

The Prysma R Projection Clock is one of those devices that offer to provide a range of features. As the title of this Oregon Scientific product indicates, this device offers both time and projection features. The product also acts as a basic indoor and outdoor temperature reader.

In order to provide its functionality, the Prysma R kit consists of the main unit and a separate temperature sensor. Both elements require their own power source. In the case of the main unit, this connects to a power source using the supplied lead, which links to the Prysma R unit via its micro-USB port rather than the more standard power socket method. A pair of AAA batteries is provided for powering the temperature sensor unit.

In order to receive the transmitted outside temperature data, the sensor needs to be positioned on an outside wall. To ensure the data is successfully transmitted, the sensor should be placed within 98 feet of the main unit. As mentioned, the sensor is powered by two AAA batteries, which slot into a compartment that also contains mini switches for selecting an appropriate channel to avoid any disruption caused by other devices in the vicinity. There are also other options that include selecting the region, RCC signal and a reset.



The main Prysma R unit, featuring a display that can show the current time and indoor/outdoor temperature readings, has a rubberised coating, and it can be rotated in 90-degree increments. It's this side panel that gives the unit its projection feature. The current time will be beamed in the appropriate direction, although in the case of the forward direction, you'll need to implement a Flip setting, otherwise the time will be displayed backwards.

Located on the rear of the main unit are controls designated for temperature, clock and alarm features. You can set up two alarms, adjust the time display and switch between the available channels to receive the outside temperature data delivered in a choice of C or F measurements. You can also opt to have a High or Lo backlight intensity.

Running across the top of the Prysma R unit is a snooze bar. As its title indicates, this feature will give you up to another three sessions of eight minutes' sleep following an early-morning wake-up call. Left to its own devices, the alarm turns itself off after two minutes. The snooze bar can also be used for a five second blast of high-intensity backlight when projecting the time onto a wall or ceiling. Rather surprisingly, the backlight does not automatically adjust itself to compensate for variable lighting conditions.

I found that setting up the Prysma R required a degree of experimentation in order to create a link between the main unit and outside temperature sensor. I needed to adopt a manual approach by trying the different channels to establish a link, as the proscribed automatic method failed to achieve the task.

Once a link was achieved, the appropriate time, automatically adjusted by a wireless signal, and temperature data were clearly displayed. As for the projection time beam feature, I feel this aspect of the product is little more than a gimmick and will not be put to too much use.

mm **Michael Fereday**

Does its job of providing time and temperature data

GROUP TEST

Motherboards Under £35

Not everyone can or wants to pay out over a hundred pounds for the latest motherboard and if you have several machines to upgrade, you're going to have to be a little more frugal.

Budget motherboards don't often get the credit they deserve, so David Hayward is having a look at six under £35 to see which are best for your pocket and your system.

BioStar H61MLV3 Ver. 7

DETAILS
- **Price: £26.24**
- **Manufacturer: BioStar**
- **Website: goo.gl/azqTn5**
- **Required spec: LGA 1155 CPU, PSU, RAM, case etc**

Although BioStar may not have quite the illustrious coverage that the likes of MSI, Asus or Gigabyte enjoy, its motherboards do come well and truly within the budget category. It doesn't mean they are terrible or next to useless, it's just that they tend to lack some of the more desired features.

This micro-ATX board comes with an Intel H61 chipset and support for Intel LGA 1155 third-generation CPUs. That means Core i3, i5 and i7s can be fitted up to the 3.4GHz variety.

For the £26 price, you get a couple of DDR3 DIMM memory slots supporting dual-channel RAM up to 1600MHZ and 16GB, a single PCIe x16 3.0 slot and a single PCIe x1 2.0 slot. Also, there are four SATA-2 connectors, four USB 2.0 ports, a 10/100 Ethernet port, PS/2 mouse and keyboard, a VGA port and three-port audio 3.5mm out.

It's obvious from the outset that this isn't a gaming or performance motherboard. There's little scope for expansion and, in truth, it doesn't exactly get the interest levels of the enthusiast racing. However, it's a good enough motherboard for most other basic computing duties.

If you're after a board for simple browsing, office programs and maybe even some media centre use, then the H61MLV3 will certainly fit the bill and do it without breaking the bank.

There are some quite surprising elements to this board, though. There's a six-channel HS audio codec built into the board, a moisture proof PCB using a new glass fabric design, and it's protected, or at least the components are, against electrostatic discharge. There's also overcharge and over-current protection, plus a heat limiter, and the BioStar UEFI BIOS is actually pretty good and makes installing non-Microsoft operating systems a little easier than its more expensive cousins.

You could argue that these features are nothing new and hardly make this board stand out from the crowd, and you'd be right, of course. But then you're not paying upwards of a £100 for this motherboard; in fact, for just over £100 and you can have four of these and the beginnings of a cheap cluster.

Naturally, you're missing out on HDMI, DVI and more expansion potential, but if you already have a situation where a cheap motherboard will ideally fit, then it's certainly worth considering the BioStar H61MLV3.

On the other hand, it is lacking. And for all the 'but it's only £26' comments we can muster, it still boils down to the fact that this is very cheap motherboard and we're not exactly sure just how long it would last under everyday operations. We think, though, that for simpler tasks it will suffice, but if you're considering placing a cheap board in an environment where there's anything above and beyond everyday tasks to be carried, then we would really recommend you go for one of the other examples in this group.

It's small and pretty cheap, but it works, and if there's a need it can fill it for a reasonable price

MSI H61M-P20 (G3)

DETAILS
- Price: £31.16
- Manufacturer: MSI
- Website: goo.gl/B31eTS
- Required spec: LGA 1155 CPU, PSU, RAM, case etc

This is a good quality motherboard for less than £35

It's small and neat, but does lack in some areas

We were quite surprised to see an MSI board in the sub-£35 range, as we thought MSI had stopped producing cheaper boards and now favoured the slightly more expensive and awesomely featured, flashy numbers we've recently had on our test bench. Naturally, we were quite wrong, and glad of it too, because we may have missed an exceptional deal.

The MSI H61M-P20 (G3) is a micro-ATX board with the Intel H61 (B3) chipset supporting third-generation LGA 1155 Celeron, Core i3, i5 and i7 Intel CPUs up to the Sandy Bridge i7-2700K 3.5GHz.

There are a pair of dual channel DDR3 DIMM slots, capable of taking up to 1333MHz 16GB of RAM, a single PCIe x16 3.0 slot, a single PCIe 2.0 x1 slot, four SATA-3 connections, six USB 2.0 ports, 10/100 Ethernet and PS/2 keyboard and mouse ports. There are also VGA and DVI connectors along the rear IO, which greatly improves the initial and out-of-the-box uses for this board.

Since this is an MSI board, you can expect the same level of quality components that you would see in its top-of-the-range selections. For example, the OC Genie II button is included, as is the Winki 3 Linux OS, to boot within seconds to and bypass the installed operating system. You'll also get the MSI Live Update software and the Click BIOS UEFI technology. And the same kind of MSI hard-wearing solid capacitors are present to greatly improve the reliability and lifespan of the board.

Through the improved component hardware, the MSI H61M-P20 offers better performance than most other sub-£35 motherboards. This means you could easily use this board in a variety of setups, whereas the former BioStar example wouldn't normally have a chance. The H61M-P20 makes for a far better mini media centre, for example, or specialised machine than the previously reviewed board. You could probably even get away with a spot of gaming, provided you don't expect too much from it.

> **"It offers great performance for the cost, and it will cater for most users' computing needs"**

Like the previous board there's limited expansion available, and the lack of PCI may turn a few users away. On the other hand, the DVI port makes a world of difference, especially for the out-of-the-box experience, and there's the obvious added bonus of not having to spend extra on a graphics card for DVI output. It's also worth noting that the overclocking aspect of this board is made significantly easier through the OC Genie, and the UEFI is designed to make the process of stepping up the MHz less of a gamble than previously.

The MSI H61M-P20 (G3) is a rock solid motherboard. It's only priced at around £31, it offers great performance for the cost, and it will cater for most users' computing needs. Naturally, if you need something a bit more powerful, then you'll aim higher, but for less than £35, this is one of the better budget motherboards we've tested.

Gigabyte GA-H81M-H

DETAILS
- Price: £34.28
- Manufacturer: Gigabyte
- Website: goo.gl/HHu5bi
- Required spec: LGA 1150 CPU, PSU, RAM, case etc

▲ *The Gigabyte H81M-H has some great features*

▲ *We've never liked the clunky UEFI BIOS, though*

"For around £34, you can have a fully functioning and excellent performing media centre"

Gigabyte tends to endow its cheaper range of motherboards with many of the more desirable components from its more expensive kit. It's an interesting marketing strategy and one that means the consumer gets a far better deal than with most other manufactures. But you have to wonder, how much does Gigabyte actually make from the sale of these well-equipped cheap boards?

This is micro-ATX board, as before, has support for Intel Celeron, Core i3, i5 and i7 CPUs up to the i7-4790K, 4GHz Haswell Refresh.

There are a pair of DDR3 DIMM sockets, for 1600/1333MHz RAM up to a maximum of 16GB, a single PCIe x16 slot and a pair of PCIe x1 slots. This is where things begin to get a little more interesting now, especially since this is a sub-£35 board. You see, the GA-H81M-H has a pair of SATA 6Gbps connectors, as well as two SATA-2, two USB 3.0 ports along with two USB 2.0, a gigabit Ethernet port and an HDMI port.

There's also PS/2 keyboard and mouse support, as well as VGA and a number of other similar elements to the previous boards. Gigabyte has also included this board's components in its Gigabyte Ultra Durable range, which includes solid capacitors, better temperature control, humidity protection and surge protection, along with ESD (Electrostatic Discharge) protection – through the USB and LAN ports as well.

The one fuse per USB port on the USB 3.0 ports means that should one of them go pop, the other isn't affected and can still be operational. And to top off the list of tantalising features, there's also support for Ultra High Definition 4K graphics – provided, of course, that you have a decent Intel CPU in place with better than average Intel HD graphics on board.

This means, of course, that the Gigabyte GA-H81M-H has far more potential uses than the previous boards – even more than the MSI budget board we liked. For around £34, you can have a fully functioning and excellent performing media centre, office or home PC and even one that could handle some lightweight gaming.

Needless to say, though, we'd like to have seen more physical USB ports along the rear IO, and we're pretty sure Gigabyte could have squeezed in a DVI port for good measure. Although these are only slight complaints, the bugbear we did have (and this we have with all Gigabyte boards) is the rather clumsy and poor UEFI BIOS.

We always find the BIOS on Gigabyte boards slow to respond, difficult to navigate through and not too informative when it comes to tweaking the hardware. If we could take the MSI UEFI BIOS and put it on the Gigabyte board, then we'd have a motherboard to be reckoned with. The @BIOS software does help a little, but again that's something we've never really gelled with.

On the whole, the Gigabyte GA-H81M-H is the best of the boards we've tested so far. There's more potential for various setups, and it's an excellent performer all round. Overall, a fantastic deal if we've ever seen one.

Asus AM1M-A

DETAILS
- Price: £22.92
- Manufacturer: Asus
- Website: goo.gl/w6VQAK
- Required spec: Socket AM1 CPU, PSU, RAM, case etc

micro mart
7 Quality
9 Value
7 Overall

The Asus AM1M-A is a good motherboard, but we're not convinced enough by the AM1 CPU to call it great

It does have a lot going for it, and it's the cheapest board on test

We were fairly sure we had reached the pinnacle of budget motherboard evolution with the previous Gigabyte example. After all, what else could possibly be included without the board breaking the £35 limit we'd set.

The Asus AM1M-A is a surprising motherboard for a number of reasons. The first is that it only costs around £23, which is shockingly cheap. The second is that this AMD 'Kabini' Sempron and Athlon chipset on a CPU board can support the AM1 platform SoC (System on a Chip) processors up to quad-core, with Radeon HD graphics. This new CPU houses the processer, GPU and chipset on a single, low-power chip that's roughly the equivalent of the Celeron range.

The surprises don't stop there, though. The AM1M-A has a pair of DDR3 DIMM slots for up to 1600MHz RAM to a maximum of 32GB. There's a single PCIe 2.0 x16 expansion slot and a further two PCIe 2.0 x1 slots. Two SATA 6Gbps connectors allow for more advanced SSDs to be hooked up, and there are also gigabit Ethernet, two USB 3.0 ports and four USB 2.0 ports.

Finally, the rear IO panel offers one last shock to the system. Alongside the USB ports you'll find VGA, HDMI and DVI, as well as PS/2 keyboard and mouse and the three audio jacks. Needless to say, there's a lot going on here, and the added video output ports give this board a distinct advantage over the others on test, especially considering the price.

> **"The flaw in this board is in the form of the relatively young AM1 Kabini CPUs"**

The Asus 5X protection guard offers high-quality solid capacitors, ESD protection, surge guards and so on. The newly designed UEFI BIOS is one of the best we've ever seen and offers an EZ mode, with a simpler interface and an Advanced mode for more specific tweaking. There's even 4K and multi-monitor support if you're interested in that kind of technology.

Of course, the flaw in this motherboard is in the form of the relatively young AM1 Kabini processors. The most powerful AM1 processor at the moment, as far as we know, is the Athlon 5350. With four cores, 128 GPU cores and running at 2.05GHz, it isn't not a bad desktop CPU. But at the same time it's not really all that powerful, at least when you compare it to a mid-range Core i5, which the other boards are capable of handling.

The trick here is to target the Asus AM1M-A to the user's needs. If it's just normal desktop, web browsing and word processing duties, then this board will be an excellent choice, and it offers a cost effective solution with support for decent monitors and graphics. If, on the other hand, the idea is to use this CPU for a media centre or lightweight gaming, then you'll probably find it struggling under the weight of HD content and high intensity graphics.

Overall, though, if you don't need the processing power, then this is a good value board. There are some great features here, but there's a question mark over the use of the AM1 and how good a CPU it actually is.

ASRock FM2A58M-HD+

DETAILS
- Price: £35.46
- Manufacturer: ASRock
- Website: goo.gl/xMM7b9
- Required spec: Socket FM2+ CPU, PSU, RAM, case etc

ASrock's cheaper motherboards don't often stray below the £35 mark; the older models do, but the more recent ones are still around £40 or more. However, we managed to find one that just tips the scales at 46 pence over £35, so we thought we'd see what it could bring to the group.

It's a micro-ATX board based on the AMD A58 chipset, and it supports socket FM2+, which goes all the way up to the A10 4.1GHz processor. There are a pair of dual-channel DDR3 DIMM slots for up to 1866MHz, 32GB system memory and three PCI expansion slots of PCIe 3.0 x16, PCIe 2.0 x1 and standard PCI.

The board also features six SATA-2 3Gbps connectors, gigabit Ethernet, six USB 2.0 ports and a welcomed VGA, DVI and HDMI port. As with most boards these days, the more expensive range's features have trickled down to the lower end of the budget scale. This of course means that we can now enjoy a more stable platform with advanced surge protection, lightning protection (not by holding it over your head in the middle of a storm), ESD guards for the LAN and USB ports and moisture protection through the new glass fabric design.

There's also an all solid capacitor design, support of 2K and 4K resolutions – provided you're using an AMD FM2+ APU – and triple monitor support from the rear IO ports without the need to install an additional graphics card. We even liked the UEFI BIOS.

Although this is a more expensive motherboard than the previous Asus AMD offering, it's far more useful across a range of desktop scenarios than the AM1 platform. Granted, the FM2 family of CPUs are more power hungry than their younger brethren, but they do give you a lot more performance that can be used for every aspect of PC use.

For a media centre PC, this board will shine, as it would for normal desktop duties. Even without an external graphics solution, the GPU on the likes of the A10-7850K Pro (Radeon R7) is capable of handling all but the most demanding of games.

We'll even stretch our necks out as far as saying in this case you're probably better off investing in this board than the equivalent Intel selection or AMD's more recent socket releases. Pound for pound, you'll end up with a far more useful system for considerably less, and there's better scope for expansion and improvement.

A nice touch on this board is the inclusion of the standard PCI slot, which is something that has been missing from the other boards we've so far tested. This will certainly make legacy expansion card users happier and give them a much needed performance boost and upgrade for relatively very little.

Overall, we were quite pleased with the ASRock FM2A58M-HD+. It has everything you could ask for from a budget motherboard, and the added extras improve its uses even further.

▲ *The ASRock FM2A58M is a very capable motherboard*

▲ *It's slightly over budget but is worth the extra few pence*

> **"You'll end up with a far more useful system for considerably less"**

Gigabyte GA-F2A55M-HD2

DETAILS
- **Price: £31.80**
- **Manufacturer: Gigabyte**
- **Website: goo.gl/txatna**
- **Required spec: Socket FM2 CPU, PSU, RAM, case etc**

It's a cheap board with some good features

We still don't like the Gigabyte UEFI BIOS, though

This is the second Gigabyte motherboard on test, but rather than picking another Intel platform, we thought we'd see what the budget AMD offering from Gigabyte was like.

The Gigabyte GA-F2A55M-HD2 is a micro-ATX board, based on the AMD A55 chipset, with support for the AMD A and Athlon series of processors – up to the Richland A10-6800K at 4.1GHz CPU, no less. There are two dual-channel DDR3 DIMM sockets for RAM up to 2400MHz and a maximum of 64GB (although two 32GB DIMMs would cost you about a £1,000) and three expansion slots: a PCIe x16 slot, a PCIe x1 and a standard PCI. There are also four SATA-2 3Gbps connectors with multiple RAID support. Plenty of storage available at least.

On the rear IO port we have a PS/2 mouse and keyboard combo port, DVI, HDMI, VGA, four USB 2.0 and gigabit Ethernet, along with the usual three port audio jacks. The benefit of all three video output options is great, but one or two USB 3.0 ports would have a nice addition and would probably have made the board a little more alluring to a wider range of users.

Obviously this is a budget board – you can tell just from the look of it. Mind you, for around £31, you do get some decent features.

> **"A reasonably good performance board and one that's certainly stable enough for most users"**

The previously mentioned Gigabyte Ultra Durable 4 with humidity protection, short circuit protection, ESD guards and temperature limiters are available, as well as the Gigabyte UEFI DualBIOS technology. There's support for triple monitors, Eyefinity, Dual-Link DVI and some clever software that will interact with the BIOS to produce a 3D image of the board from where you can tweak it without ever having to access the horrible Gigabyte setup.

You are, however, losing out on a few extras that would add considerable value in terms of the technology and feature set. The lack of SATA-3 connections, for example, means you won't be able to run an SSD at full pelt, and any overclocking will involve ultimately going through the Gigabyte UEFI BIOS. Plus the lack of USB 3.0, as we've already mentioned, is a limiting factor. When combined, they sound terrible, but when in practice and used as standard desktop, you'll hardly notice the difference.

Despite those negatives, the Gigabyte GA-F2A55M-HD2 is a reasonably good performance board and one that's certainly stable enough for most users. The additional PCI slot will, as with the ASRock board, make the legacy expansion card users happy, and there's about as much scope for upgrading and expanding as there is with the other boards on test.

For £31, this isn't too bad a motherboard, depending on the use you're planning to set it to. There are slightly better ones available (the ASRock entry is a good example), but it all boils down to whether you prefer AMD over Intel or whether you prefer Gigabyte boards over the other makes on offer. All in all, though, reasonably good but lacking in some technology that would have made it top notch.

EDITOR'S CHOICE micro mart

ASRock FM2A58M-HD+

It might be slightly over the budget, but the ASRock FM2A58M-HD+ was probably the best board of the bunch. But to be fair, it was a pretty tight run to first place.

HIGHLY COMMENDED micro mart

Gigabyte GA-F2A55M-HD2

Despite our moaning at how cheap it looked and the fact that we didn't like the Gigabyte UEFI BIOS, the GA-F2A55M-HD2 contained a lot of the core technology you'd need to get a decent working desktop.

As with the ASRock board, though, the competition was tight, so it's worth checking out the other boards too.

How We Tested

Each motherboard was tested with a Core i3 and AMD A10 CPU, 550W PSU and unbranded DDR3 RAM. We didn't install each in a case, as they were all micro-ATX and roughly the same size with equal screw holes.

	BioStar H61MLV3 Ver 7	MSI H61M-P20 G3	Gigabyte GA-H81M-H	Asus AM1M-A	ASRock FM2A58M-HD+	Gigabyte GA-F2A55M-HD2
Price	£26.24	£31.16	£34.28	£22.92	£35.46	£31.80
Platform	Intel	Intel	Intel	AMD	AMD	AMD
Socket	LGA 1155	LGA 1155	LGA 1150	AM1	Socket FM2+	Socket FM2
No Of PCIe x16 Slots	1	1	1	1	1	1
No Of PCIe x1 Slots	1	1	2	2	1	1
No Of PCI Slots	0	0	0	0	1	1
No Of USB 3.0 Ports	0	0	2	2	0	0
No Of USB 2.0 Ports	4	6	2	4	6	4
VGA	Yes	Yes	Yes	Yes	Yes	Yes
DVI	No	Yes	No	Yes	Yes	Yes
HDMI	No	No	Yes	Yes	Yes	Yes

Tech Origins
Digital GIS

David Briddock treks from maps to graphical information systems

A marriage between cartography and computers appeared quite logical, yet it was a journey that took decades to complete.

Pioneers

Back in the 1950s, the well-known geographer and analyst William Garrison was already considering how computers could perform statistical analysis on geospatial problems. And by 1959, researcher Waldo Tobler demonstrated his Map In – Map Out (MIMO) model for computerised cartography, which outlined many features found in modern GIS software.

A few years later, Howard Fisher started the Harvard Lab of Computer Graphics. It was here that GIS pioneers develop software solutions for handling geospatial data. Their efforts resulted in a number of important GIS applications such as Synagraphic mapping, George Farnsworth's Dual Independent Map Encoding (adopted by the US Bureau of Census) and the CIA's Auto Mapping system.

Things gathered pace in 1969 when GIS went commercial. Jack Dangermond created the Environmental Systems Research Institute (ESRI), Jim Medlock established the Integraph Corporation, and three academics from the UK's Cambridge Cavendish labs founded Laser-Scan.

Canada

The worlds first operational computerised GIS system appeared in Canada. It came about as part of a government drive to analyse Canada's national inventory.

Founded by Roger Tomlinson, a native of Cambridge in the UK, the Canada Geographic information system (CGIS) used maps and aerial photographs to capture the agriculture, forestry, wildlife and recreational areas across each Canadian province.

Tomlinson later became chairman of the Graphical Union GIS Commission and president of the Canadian Association for Geographers, while also running his own consulting company Tomlinson Associates Limited.

Satellites

Aerial photography, while fine for small areas, was much too slow and expensive when it came to wide area coverage. Unfortunately, weather satellites weren't able to obtain the type of data required for GIS analysis.

But as space technology advanced more specialised satellites came to the rescue. In 1972, Nasa launched Landsat 1 an Earth Resources Technology Satellite (ERTS) specifically designed to capture to terrain data in the red, green and infrared bands.

The Landsat program involved around 300 analysts and international scientists. In the ERTS Survey document 'A Window on Our Planet' it stated, "The ERTS spacecraft represents the first step in merging space and remote-sensing technologies into a system for inventorying and managing Earth's resources."

The latest Landsat 8 spacecraft, complete with an advanced set of instrumentation, is managed by the US geological survey (USGS) from the Earth Resources Observation and Science (EROS) Centre.

Free And Open

Up until the turn of the century, GIS software was typically expensive, complex and restricted in geographic coverage. Yet within a few short years, this picture would radically change.

In 2004, Google acquired Keyhole Incorporated. Previously funded by the CIA, Keyhole had an application called Earth Viewer 3D. Just a year later Google Earth appeared as a free download for anyone with a PC and internet connection.

Contained within a Keyhole Markup Language (KML) file, the 3D data comes from the Nasa's Shuttle Radar Topography Mission (SRTM) and includes terrain elevation, buildings and other man-made structures.

More recently, Google Earth has been enhanced with billions of photos to create Street View, and Google has used Nasa's astronomical data to create Google Sky, Google Mars and Google Moon.

Roger Tomlinson

Landsat 8 spacecraft

The Download Directory

James Hunt scours the internet for the best freeware, shareware and paid-for application releases

Welcome again to the latest instalment of The Download Directory. This month's applications include: the latest version of Photoshop alternative, Paint.NET; RA Tool, a USB disk-security application than protects your files from snoopers; Mobogenie, an Android phone manager with content packs for download; and yWriter, a novel-planning and writing program that you can use for free.

As well as all that, we've also got the usual look at the latest beta versions to be released in the last month to help you keep track of the new releases which are coming your way soon, and the latest instalment of our regular look back on previous Download Directory entries where we see what happened to the programs of the past and how they've improved – or not.

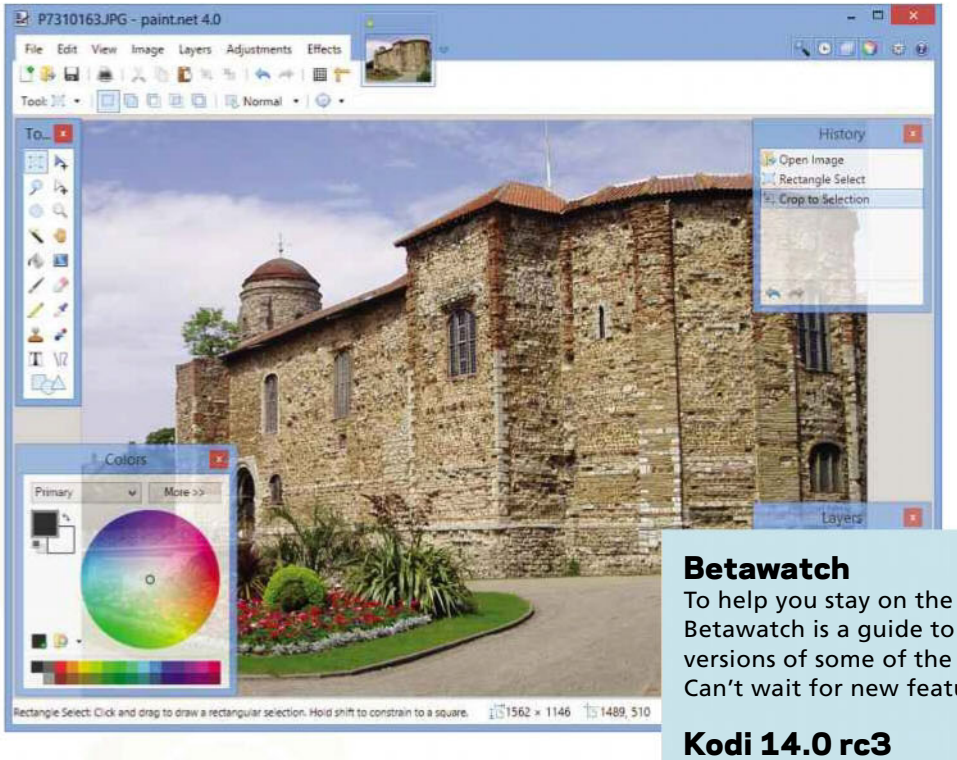
Paint.NET 4.0.5

Release Type: Freeware
Official Site: www.getpaint.net

It's been a long time coming, but the latest version of Paint.NET – version 4.0 – has finally clawed its way out of beta and into a full release. For a long time, the software has been the number one free alternative to the increasingly expensive Photoshop, but the wait for the new update to be ready has been a long one. The last update came out over a year ago, the last major revision, version 3.5, was released in November 2009, and version 3.0 came out way, way, way back in January 2007, when dinosaurs still roamed the Earth.

Still, Version 4.0 is proving worth the wait. The interface is simple, yet filled with quick access to powerful tools; its new thumbnailed image previews make working with multiple images as simple as you could wish, and its floating interface elements are gently transparent so that you can work without losing sight of the thing you're working out. Unlike its major commercial competitors, it's also super-fast. There's no protracted plugin-loading sequence, and it doesn't churn your disk when you edit.

One of its new features is a completely overhauled rendering engine, which uses asynchronous multithreading so that you can edit larger images without worrying about slowdown ruining your experience. Other updates include new options for



existing tools – the selection tools now include antialiasing options, for instance – and a general rearrangement of the interface to use the space more effectively. The program can also automatically smooth your mouse input so that you can edit finer detail better.

As in earlier versions, the program contains many features you're more likely to have seen in Photoshop, from layers support, image editing plug-ins and a huge array of filters and special effects that you can model as part of your image. You also get unlimited undo levels, meaning no change or tweak will ever be one too many, and there's support for more filetypes than we even knew existed. To be getting so much functionality without any money changing hands is, quite simply, an inspiration to what software can be at its best and one of the best adverts for open source thinking there could possibly be.

> **"In case we've left you in any doubt, Paint.NET 4.0 was entirely worth the wait"**

In case we've left you in any doubt, Paint.NET 4.0 was entirely worth the wait, and we'll happily wait just as long for version 5.0 if this is the sort of quality we can expect to appear some time around 2020. The problem with PhotoShop has always been that it's just too expensive for the home user to pay for. However, now that Paint.NET has been brought up to date, that no longer needs to be a concern for anyone.

Pros: Superb tools and interface, editing now faster than ever
Cons: Nothing worth mentioning as it's free
Rating: 5/5

Betawatch

To help you stay on the bleeding edge of software releases, Betawatch is a guide to the experimental and unfinished versions of some of the most popular applications around. Can't wait for new features? Now you don't have to!

Kodi 14.0 rc3

kodi.tv

The third (and possibly final) release candidate for the media centre suite formerly known as XBMC, Kodi 14.0 rc3 introduces a huge number of changes, which bring the software into a potentially releaseable condition. In addition to the version 14.0 release being the first under the suite's new name, the release candidate stage has also introduced the new Kodi logo for the first time. That's just an interesting aesthetic and/or cosmetic change, though. There are also plenty of new features under the hood that will affect your experience, and they're the ones we care about.

These changes include, but are not limited to: FFmpeg being upgraded to version 2.4.4, improved GUI translation files for alternative languages being made available, new speed boosts for the library indexing process (particularly on iOS and Android devices), greater user control over the update process for the main software package and its add-ons, support for non-standard and non-QWERTY virtual keyboards, and general audio-visual playback improvements in Windows.

The developers have also squashed a bunch of long-standing bugs. Video sources now switch correctly, PVR performance has been overhauled, the restart option is once again compatible with Windows 8.1, incompatibilities with certain Intel chips have been repaired, and errors with cover art should now be gone for good. So, if you haven't seen these problems in your copy of the software, rest assured that you definitely shouldn't see them in the future!

It's worth pointing out that the switch in name does mean that reverting to your XBMC 13.2 library once you've imported it into Kodi is going to be virtually impossible, so if there's any chance at all that you'd want to do that it's recommended that you make a backup first. Also, on OS X, the software is unsigned so you need to run it as an administrator the first time. Make sure you know the process for running it otherwise you won't be able to access your software properly!

ReDownloaded

This month, in our regular retrospective section, we're looking back at the February 2013 instalment of Download Directory to see how the programs we reviewed have fared. Are they better? Worse? Gone completely? Here, we find out.

FreeFixer

www.freefixer.com
Reviewed Version: 1.02, Current Version: 1.12
This 'anti-malware' program wasn't up to much when we reviewed it – it can't distinguish between settings changes you've made and settings changes made by malware – and even the fact that it's been updated every couple of months since our initial review can't change the software's behaviour. It's not a useless tool, but it still isn't quite up to the standards you want of security applications. It's basically a worse version of Trend Micro's HiJack This!, and that's something no-one needs.

Plex Media Server

www.plexapp.com
Reviewed Version: 0.9.7.12, Current Version: 1.2.3.378
When we looked at Plex Media Server nigh-on two years ago, it was still a bit of a mess, and would've proven baffling for the average user to set up. These days, it's doing much better for itself. In fact, it's now one of the leaders in its field and you wouldn't want to set up an HTPC without it or something like it. This proves that even a struggling application can turn things around as long as its developers concentrate on fixing issues as much as adding new features – and makes it doubly pleasing to see the progress the team behind Plex has made.

AdwCleaner

general-changelog-team.fr/en/tools/15-adwcleaner
Reviewed Version: 2.111, Current Version: 4.105
It's not the most encouraging sign when a piece of software's documentation claims to be for a version older than the download that you've just grabbed, but this anti-malware application has, other than that, done pretty well for itself in the time since we last lookied at it. The fact that there have been plenty of updates since our original review gives us confidence that the developers know what they're doing, too. That's always nice.

XBMC / Kodi

xbmc.org
Reviewed Version: 12.0, Current Version: 14.0 rc3
Better known under its previous name, XBMC, the now-renamed Kodi is on the verge of releasing the final version of its latest update, version 14.0. An open-source media player aimed at HTPC users, it is, quite simply, the leader in its field. The move away from the XBMC name is simply an attempt to create a trademark that isn't linked to the original Xbox, and the software itself is as good as ever. Check out the Betawatch box-out for more details of its current release candidate!

Ratool 1.2

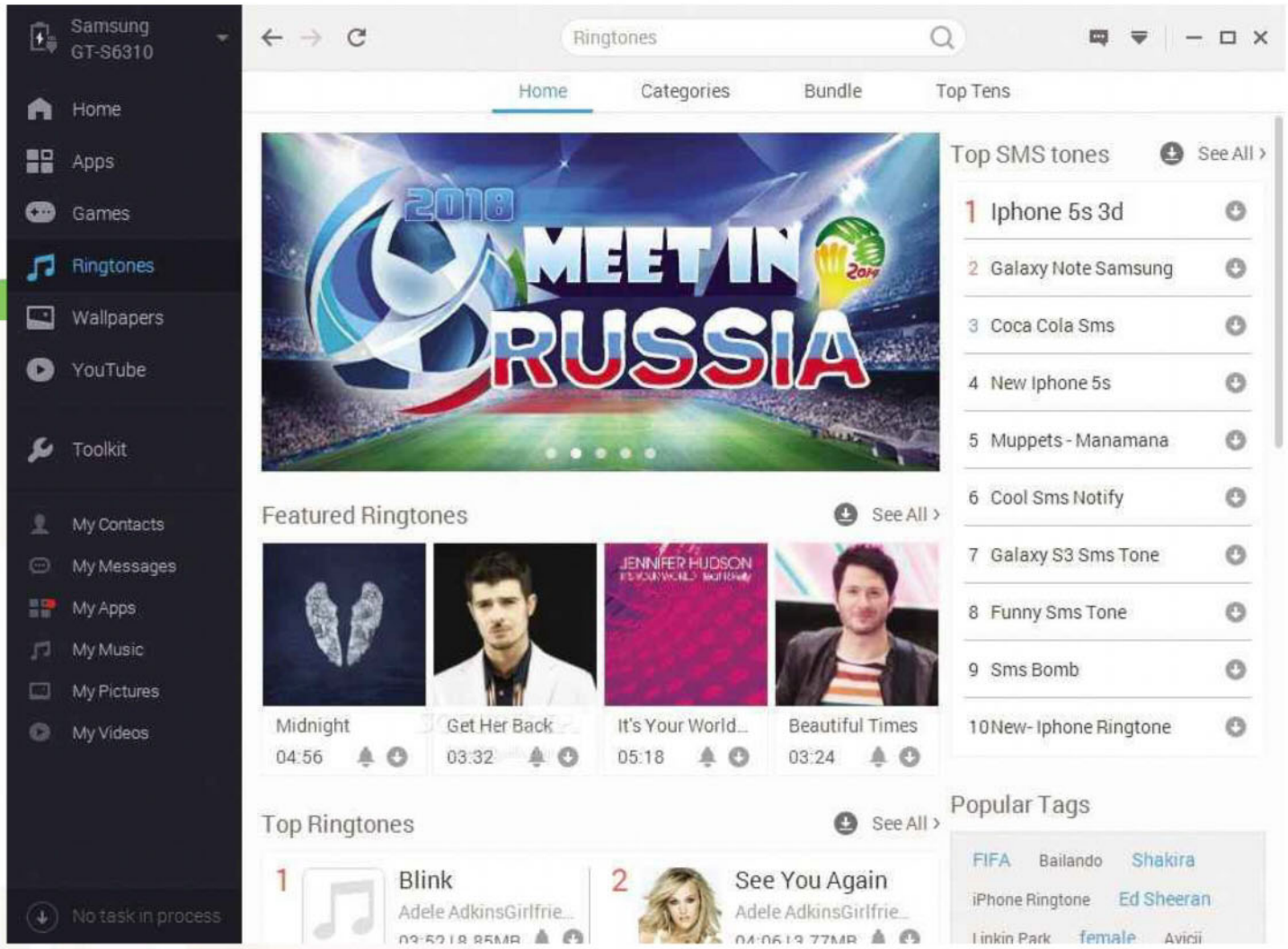
Release Type: Freeware
Official Site: www.sordum.org
While USB keys are hugely convenient and incredibly portable ways of transferring large amounts of data, one of the problems with USB storage is that it's not inherently that secure. If you want to protect your data, you have to manually encrypt it. Or, alternatively, you can use a simple application like RA Tool to do it for you.

RA Tool means 'Removable Access Tool', it's software that can limit access to any removable USB drive that you plug into your PC. There are a couple of different ways you can do this, each of which can limit the level of access anyone picking up your USB key can have, and which ensure that only you have the control over your hardware.

If, for example, you want to make sure the contents of a drive remain unchanged, you can set the USB key into a secure read-only mode. All you have to do is run the applet, select the drive and option, and hit apply. The drive in question will work normally for you whilst RA Tools is running, but if it's removed and put back into the system, then the person using it subsequently will only be able to read the contents, not add or alter any data on them. Until you unlock it, the drive will be entirely write-protected.

You can even take things a step further and disable all USB access on your machine as well. While the drives are plugged in you can access them, but once they're removed they'll cease to function. USB disk detection will be effectively disabled on your system to ensure that no-one can access your hardware without you present, or risk transferring viruses to your machine with their own USB keys.

The processes that makes RA Tools work aren't special – just small registry tweaks that can be applied by any number of tools. That does present a small problem: anyone who recognises what's going on could reverse the process with their own software (or even by manually editing the registry). In the short term, though, these one-click security features are better than the unprotected alternative.



“These one-click security features are better than the unprotected alternative”

RA Tool does try to address that by locking its changes, so some applications do struggle to change them back, and of course there's an option to password protect the software so that someone else using your computer can't simply run the program themselves. It's not exactly foolproof, but as basic security tools go, it's hard to criticise the ease with which you can deploy it.

Pros: Super-fast to use, relatively effective
Cons: Not exactly foolproof
Rating: 4/5

Mobogenie 3.3

Release Type: Freeware
Official Site: www.mobogenie.com

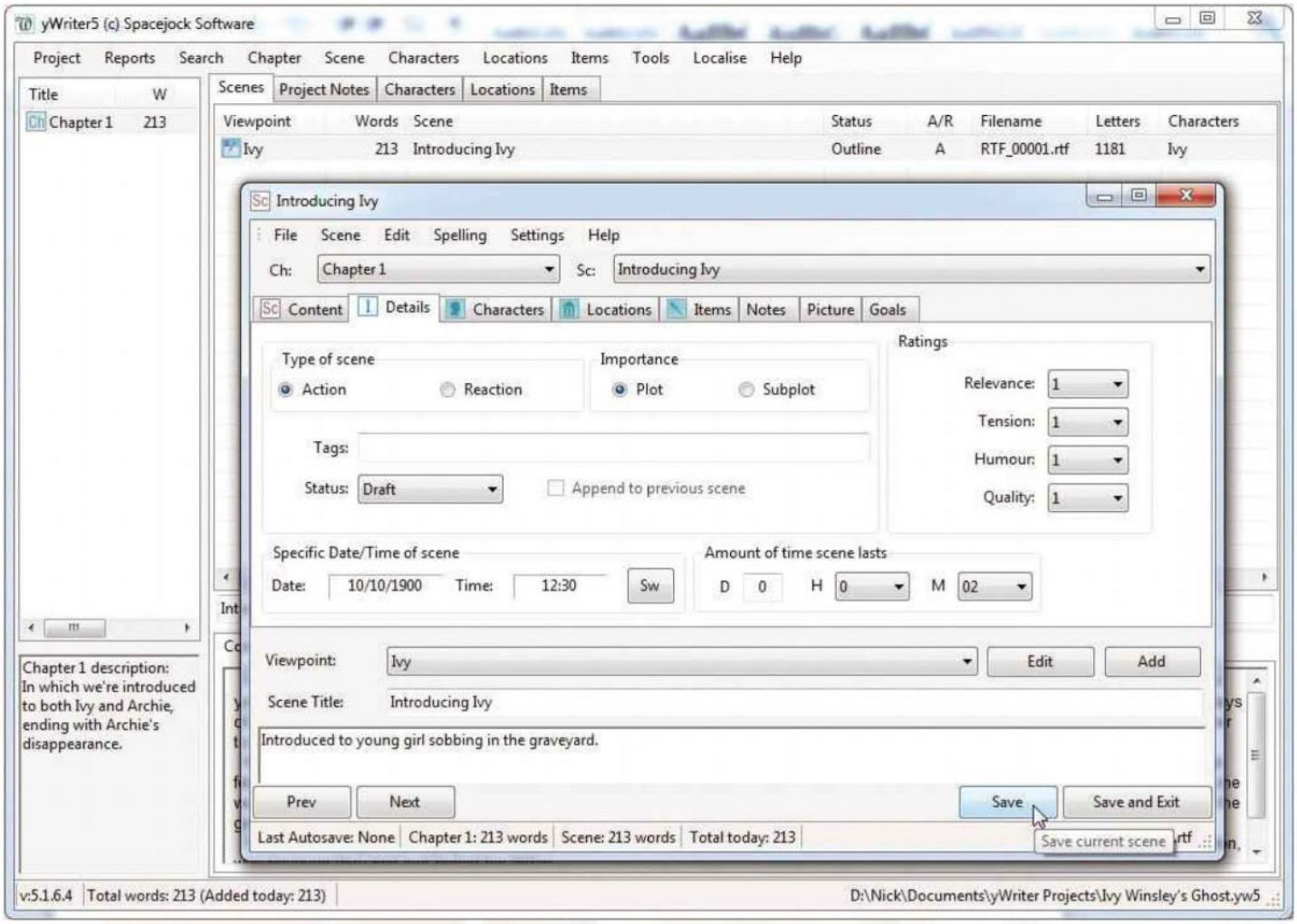
Since you can't use iTunes to manage Android phones, there's a fairly healthy market in similar third-party programs that can do the job. Mobogenie is one of those programs. If you have an Android device that you want to change the contents of quickly and easily, this might be the program for you.

Once it's installed, all you have to do is connect your phone to your PC and Mobogenie will launch then detect it. It'll display the most useful details up front – things like phone make and model, the battery's status, the amount of free storage you have and other similarly useful statistics – which gives you a good at-a-glance run-down of your phone and its current health.

A list of categories allows you to drill deeper into specific management areas – so you can edit and import/export your contacts, access your SMS archive, manage apps, music, images and videos, and more. If you want to access the phone's functions from the software, you can do that too – Mobogenie can use your phone to broadcast any text messages you write on your computer, and access the contents of an SD card plugged into your phone. You can also add and remove applications manually directly from their APK files.

Where the app falls down – or, possibly, where it provides the greatest benefit (depending on your perspective) is that large swathes of the software are devoted to providing free 'content'. This means there are portions of the suite that allow you to search for and install apps, games, ringtones, wallpaper and more. If you're trying to keep your phone neat and uncluttered, this is not the suite for you. It's essentially a phone manager with a content portal built in, and that's not going to be everyone's cup of tea.

Still, if you're the sort of person who likes having a lot of options open, this program will provide them. Getting content on your phone is a matter of clicking the download/install button



whenever you see something you like. For us, that wasn't all that often. However, if you like to keep your phone looking and feeling fresh, we can totally see how you might appreciate it.

Pros: Instant access to new content, decent management tools
Cons: If you don't want the free stuff, it's cluttered and confusing
Rating: 3/5

yWriter 5.2.1.1

Release Type: Freeware
Official Site: www.spacejock.com/yWriter5.html

Everyone knows that you can't write the perfect novel without first finding the perfect software suite with which to do it... We joke, obviously, but it doesn't exactly hurt to have a custom-made piece of software with which to organise your thoughts. After all, Microsoft Word can only be stretched so far before your document becomes a total, unnavigable mess of notes, prose and non sequiturs.

yWriter has been put together by a published author and was designed around his experiences with the process – hoping to fulfil what they saw as a need to provide the perfect novel-organising environment. Now, the problem is that what worked for one person might not work for any others, but if you feel as though you need a better workflow to help you write (or you want a process laid out for you) this sort of environment might be what you need.

Rather than being structured as pages, yWriter's text input is broken down into scenes, which are organised into chapters, which are organised into novels. This means you can quickly reorganise the contents of your writing without having to do a lot of cutting and pasting and worrying about whether you left a chunk of text behind. You can also create a skeleton of your novel using the scenes, then go back and fill them in so that you always know what to write next.

Of course, there are development tools as well as writing ones. You can make notes on the general project, or create specific details about characters, locations and items, building up a 'bible' for your story. As well as giving you somewhere to put the information you've worked up in your head, they also prompt you for things you might have missed. You'll always know what every character wants, because you have to fill in the text box that asks you.

We should state for the record that yWriter isn't a novel generator. It's not going to suggest plots or tut when you use an adverb. The idea is that it frees up your mind so that you only have to worry about the prose, not the admin surrounding it. Also, when your book is finished, it'll help you output a manuscript in a number of common formats.

Certainly, it's possible to write a book without software like yWriter, we would never suggest otherwise, but if you do need a little extra mental framework in your creative endeavours this might be the software that can give it to you.

Pros: Well-made and clearly designed
Cons: Your may work differently to the software
Rating: 4/5

Remembering... Y2K

Grab your radiation suit and head for the hills, David Hayward recalls the turn of the new century

Fifteen years ago today, panic ensued. In a matter of days, so it was claimed, planes would fall out of the sky. The financial industry would collapse, and all money and property would be null and void. There would rioting and the collapse of society as we know it. And this is our personal favourite: the nuclear weaponry of a dozen warmongering nations would suddenly become active and rocket toward their 1980s cold war targets.

Obviously, since we're sitting here on the brink on 2015, none of those doom and gloom prophesies actually happened. In fact, in the grand history of prophetic no-shows, the year 2000 bug comes joint first with the 2012 predictions.

It's a funny thing, the Y2K bug (or Millennium bug if you prefer). Now we can look back at it while suppressing a little giggle at those who bunkered down in the hills in preparation for the end of the world. But it was thought a simple date change could cause much grief. The Faulty Date Logic dictated that when the stroke of midnight occurred, every computer would revert back to 1900 or 19100 and complete failure would commence.

Its History

The core of the year 2000 bug was purely down to shortening the year, from say 1999 to 99. When 2000 would crop up, the result would be 00 and the since computers (or rather their operators) had always assumed that the prefix would be 19-something, the date would be therefore be known as 1900.

The bug itself would then interpret the date as a true fault to the system and either shut down, which isn't so good for nuclear power plants, or malfunction when a program was called on to check the date/time syntax. There was also another theory that had some computer system see the date change error as an attack, resulting in the system responding with a defensive shutdown or a retaliation.

To combat the problem, a global update and patching contract was conducted by virtually every organisation and company on the planet. The cost would eventually rise as high as £600 billion, and when the stroke of midnight hit the Eastern coast of Australia, all eyes were firmly glued to see what would happen next.

As well we know, nothing much happened at all. There were a few instances of a malfunction in timekeeping data, but the majority of the doom-mongering was left for another day.

The Good

The fact that we're all alive is pretty good. Personally, we didn't fancy much being the potential survivors of a nuclear war.

Another good point was that a lot of us in the technical arena at the time could command ludicrous hourly rates for staying in the server rooms over midnight, while everyone else partied away.

The fact that we were earning in excess of £500 per hour meant we didn't give a monkeys how drunk the outside world was, as we would soon be able to buy a new car.

The Bad

There were a few issues relating to Y2K. Some credit card transactions failed, a few people were called to court in 1900, and a nuclear power plant in Japan stopped radiation monitoring on the 00:00 batch process.

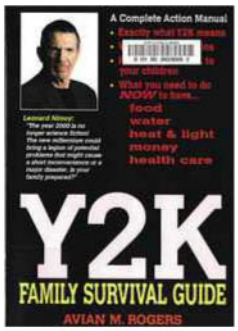
The other bad, of course, was the enormous cost of the entire affair. Which was quite a lot.

Conclusion

To sum Y2K up perfectly, Ayodele Adewale of Nigera commented, "Y2K makes no difference in Nigeria. We do not normally have light or water, so if we do now, it must be a bonus!"

Did You Know...

- The US Naval Observatory reported a date of 19100.
- Bus ticket machines failed in Australia.
- Lowestoft had a really cool firework display on the beach.
- An Italian telecoms company sent out bills dating back from 1900 to 1999.
- NORAD picked up three missile signatures launched from Russia.
- Apparently, the Commodore 64 was Y2K safe by default.

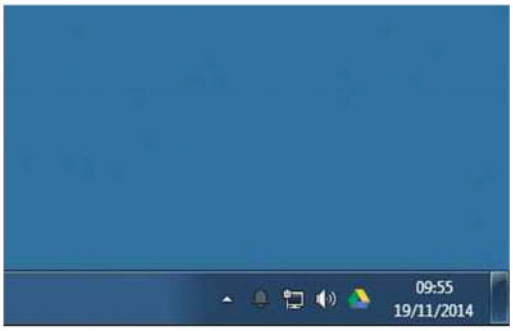


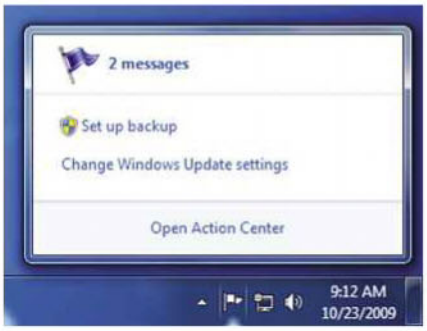
➤ *Leonard Nimoy presented and acknowledged a book and video on Y2K survival*

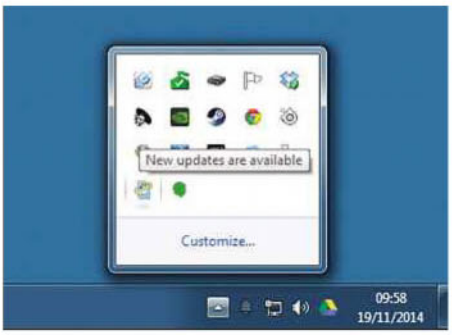
➤ *For those of you too young to remember, it really was thought to be the end of times*

Master Your Notification Centre

Mark Pickavance looks at a small part of Windows that can easily be administered







Windows, and I'm talking about most of the versions in use today, is a big and complicated tool with many subtle components. Many people choose to ignore most of it and just head to the office application or a web browser. But appreciating some other parts of it can enhance your experience and get the operating system tuned to your working practices. This article covers a specific control mechanism that's often overlooked: the notification centre.

Notification For The Nation

The notification area, as it is known these days, first appeared in Windows XP as the 'Taskbar and Start Menu Properties' but evolved through Windows Vista and then later Windows 7.

Its creation was in response to the large number of resident applications that wanted to put icons on the taskbar, entirely swamping the space available. In addition to providing an overflow for these small icons, it also allowed the management of alerts from both the system and resident applications.

> **Some notification applications are quite annoying, especially when they share with you things you just don't care about**

That was an important development, because it meant that not all applications that create a taskbar icon had to always be visible, and many can generate messages that are distracting and overly informative.

In addition to the third-party application support, the notification area also provides a predictable location for action centre messages, like those that inform you about updates or critical tasks that need performing or warnings.

Let's look at how you can manage this space to better control your PC and get the sort of notifications that you really want, rather than just everything.

Hide And Seek

When you load applications onto your system, they occasionally add things to the taskbar, and therefore by definition it's included in the notification area.

Typically, these might be small utilities that check for software updates or alert you that a friend has come online in Steam, among other things. By default they are usually added to the list of Notification Area Icons, which either makes them appear on the taskbar or in the 'overflow area', as Microsoft calls it.

The overflow section is accessed via a small upwards-pointing triangle located at the very left of the taskbar icons. Clicking on this generates a panel containing all the icons not currently installed on the taskbar, so that you may operate them.

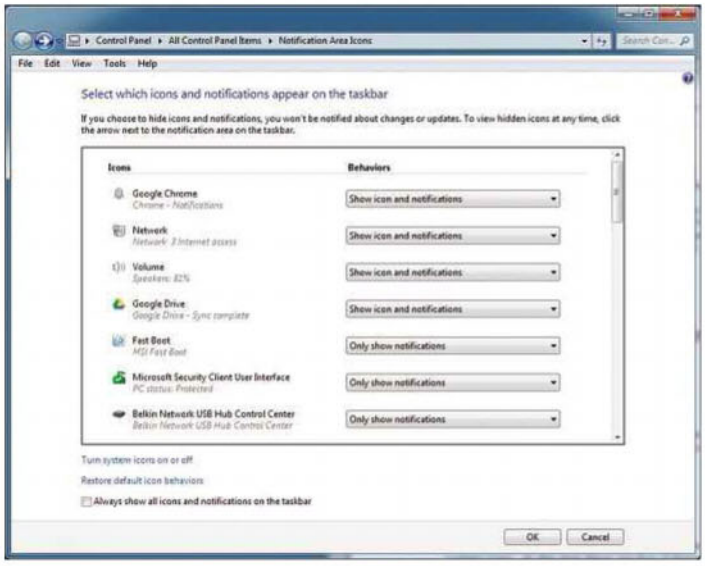
What many people don't realise is that you can also drag system taskbar icons to this panel and vice versa. This doesn't include shortcuts on the left of the taskbar, just the small icons on the right. For example, desktop PC users might not need to know they're connected to a network all the time, so they can drag that icon from the taskbar to this panel. You can also drag them around to reorder them, should you want them to prioritise them, perhaps.

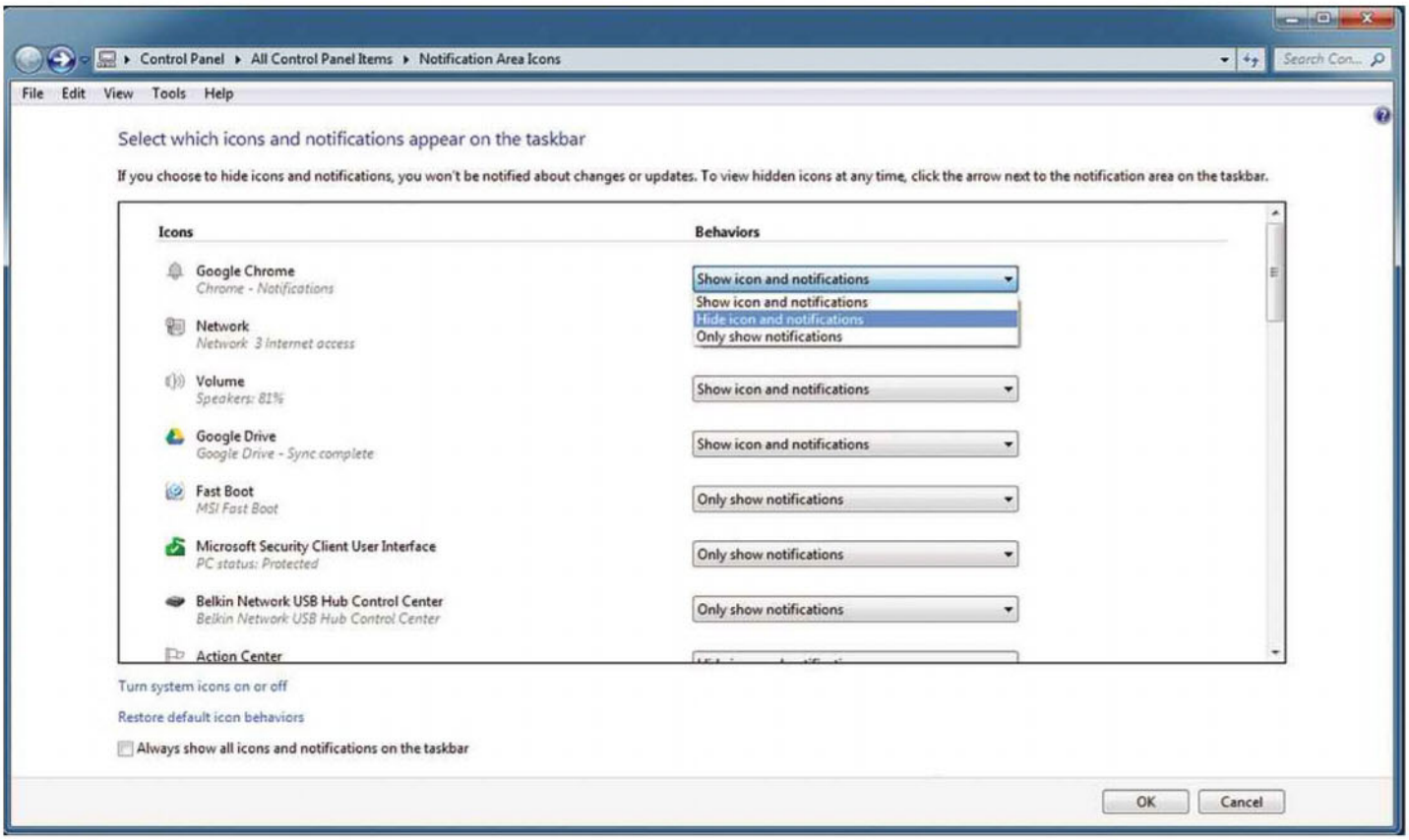
That's the first level of customisation, but there are more if you click the word 'Customize…' at the bottom of the overflow panel.

Customisation

Clicking 'Customize…' takes you to a Control Panel page entitled 'Notification Area Icons', where each control that's loaded on your system is shown, along with the last message that it sent you or its status.

Each icon has a menu in which you're offered three possible choices. These are: Show icon and notifications', 'Hide icon and notifications' and 'Show only notifications'. Logically you might wonder why they don't offer to show the icon and not the notification, but that isn't a choice you get.

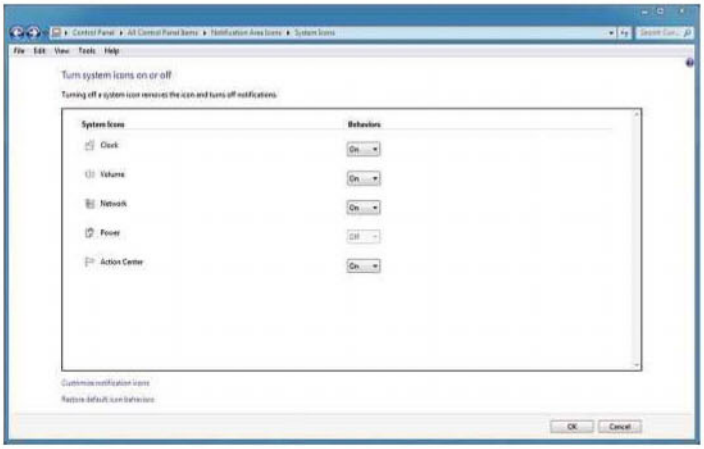




What's important to understand is that when it says 'Hide' it only means that it isn't shown directly on the taskbar; it is still available in the overflow panel. Or rather it will if it has an icon, because many tools listed in here might not have a visible icon if they're not currently in memory.

Another curiosity to this system is that even if an icon has been relegated to the overflow area, it can still appear on the taskbar under certain circumstances.

If you select Windows Update and ask it to install a downloaded patch, the icon will appear on the taskbar while the download is in progress, providing a running commentary. It will then disappear back to the overflow area once the download is completed.



The other twist to these settings is that you might select to show an icon, but it won't appear, because it's 'inactive'. Inactive icons aren't generally shown unless they have a special function, like the five that are classed as 'system icons'.

System Icons

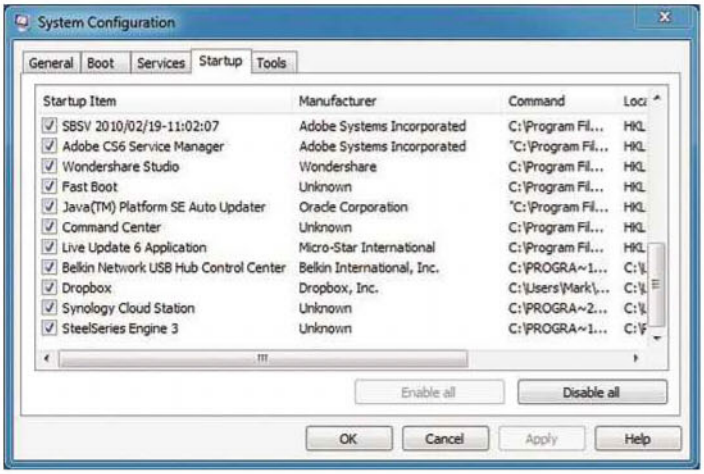
Inherent to the taskbar are those icons that all Windows computers have, termed the 'system icons'. At this time there are five of these; Clock, Volume, Network, Power and Action Center. Prior to Windows Vista, these were lumped together with the other icons that appeared on the taskbar, but they were logically split from that release onward.

All systems get Clock and Action Center, but the rest are dependent on certain features being present in the computer. If you've disabled sound, you won't get a volume control, and desktop systems generally don't have Power.

If you wish to remove any of these, the simplest way is to click on the notification area triangle and then click 'customise'. At the bottom of the Notification Area Icons panel (as available through Control Panel), is an option to 'Turn System icons on or off'. These icons don't have any more subtle options than being either on or off, at this time, but that is enough for most people.

All Icons

Having seen some people's desktops, it is apparent that they can't get enough of icons. If you're like that then you can do away entirely with the overflow area and show all the icons on the right of the taskbar.



There is a tick box at the bottom of the Notification Area Icons panel with the label

'Always show all icons and notifications on the taskbar'. This is the nuclear option, and it will soon become obvious why I can't recommend you do this on any system.

If you do, you'll notice that this feature disables the overflow area and the triangle that takes you there, and by definition access to the option to 'Customise…'

You can go to the Control Panel to get access. Alternatively, right-clicking on the taskbar and selecting properties will take you to a panel with a 'Customize…' button to click. In Windows there are usually at least two ways to do anything, and this feature has even more methods of access, this being the third.

> **Having seen some people's desktops, it is apparent that they can't get enough of icons**

Stop With The Notifications!

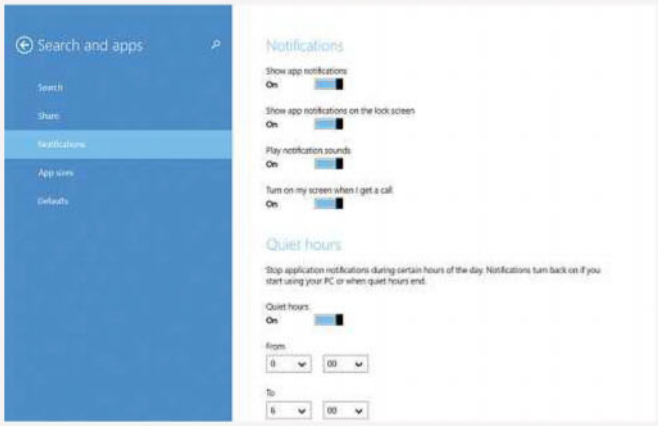
Some notification applications are quite annoying, especially when they share with you things you just don't care about. Ones I've found especially irksome are those by Apple and Adobe, which bug you to update your tools and even install things you don't want on your system.

If you've had enough of Apple Software Updates (and frankly who hasn't?), then what you need to do is stop the app loading in the first place.

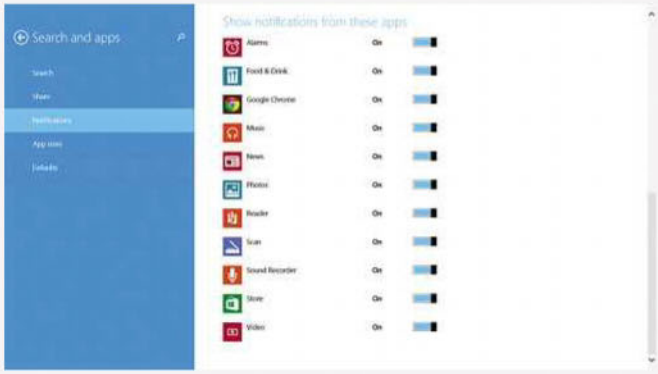
There are two ways that apps can load: firstly by their inclusion in the 'Startup' folder of the Start Menu, and secondly through their adding to the registry by the software installation. Some items get both treatments.

To remove an item from the Startup folder, simply drag it elsewhere on the menu, where you can still run it if you need that functionality.

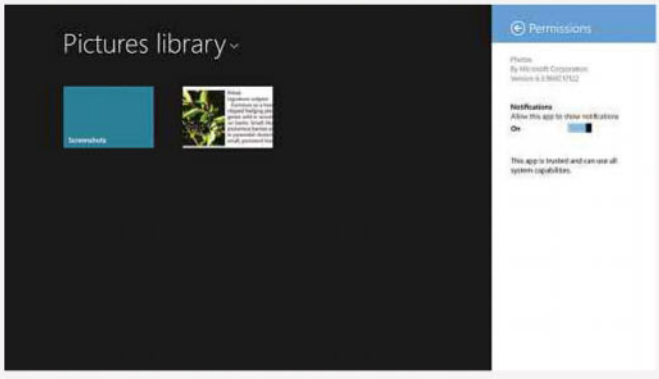
Metro Notifications



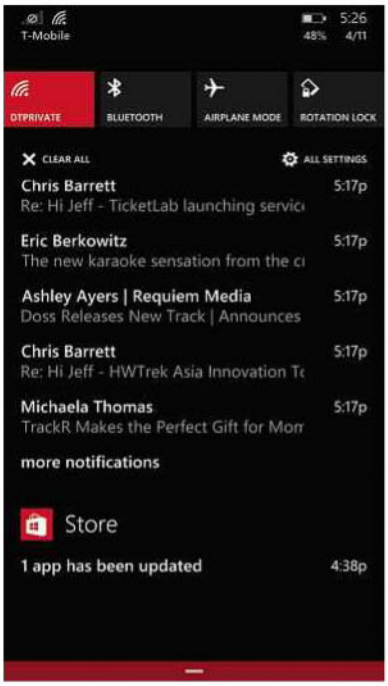
Under the Metro environment, notifications can do more than place a message on screen. They can make sounds, interact with the Lockscreen or even turn the screen on.

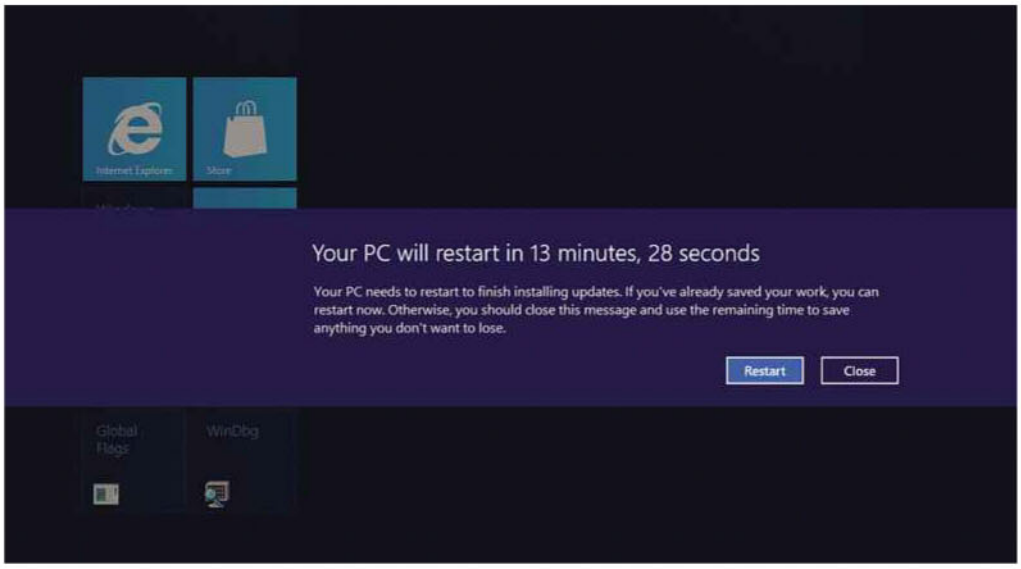


Each Metro app in Windows 8 can be enabled or disabled for alerts, allowing you to silence any that start to annoy you. However, desktop apps aren't included in this system.



In addition to the central control of Metro app alerts, most apps have a specific control on the Permissions page that can be found through the Charms bar when the focus is on that tool.





'Modal Alerts in Windows 8 can't be ignored so easily'

Microsoft's strategy for Windows future notifications seems tied to what it's done with Windows mobile 8.1, a design that borrowed heavily on what Google did with Android previously

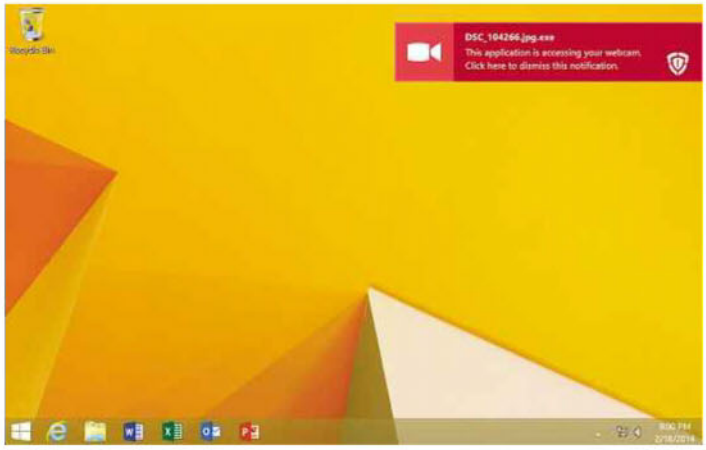
Removing registry installed apps requires you to run the System Configuration tool, which you can get by running MSCONFIG.EXE from the Start Menu command line.

This allows you to selectively disable automatically loaded code at boot time, though it won't shut down those that have already loaded until your reboot.

What you also need to consider before disabling any Taskbar application is that it might interact with other tools, and if it initiates important updates, you won't get them.

Therefore, it's probably not a good idea to disable them wholesale, and if your system doesn't operate like you're expecting, re-enabling them might be your first action.

If you can live without some, they will increase the amount of available RAM, reduce your boot times and release more CPU cycles for other tasks. So it's certainly worth being selective about what does load each time you boot.



Pop-up alerts will disappear eventually if ignored

All Change For Windows 8

What I've talked about so far relates perfectly to Windows 7, but what if you're brave enough to use Windows 8.X instead?

As anyone who has this OS knows, it has a split personality disorder, where it plays good-cop-bad-cop in respect of the Metro interface and the more familiar desktop environment.

If you're on a desktop, all the features I've previously mentioned in respect of Windows 7 are practically identical. The overflow panel works in the same way, and you can access the notification customisation with the same methods as previously described.

But, as you're probably aware, the taskbar isn't available in the Metro (or 'Modern' if you prefer) side of Windows 8. In this environment it works in a totally different way, and because of that, notification settings are also handled differently.

The alerts themselves will appear over the top of what you're doing, but there aren't any icons that signal something that you should need to look at.

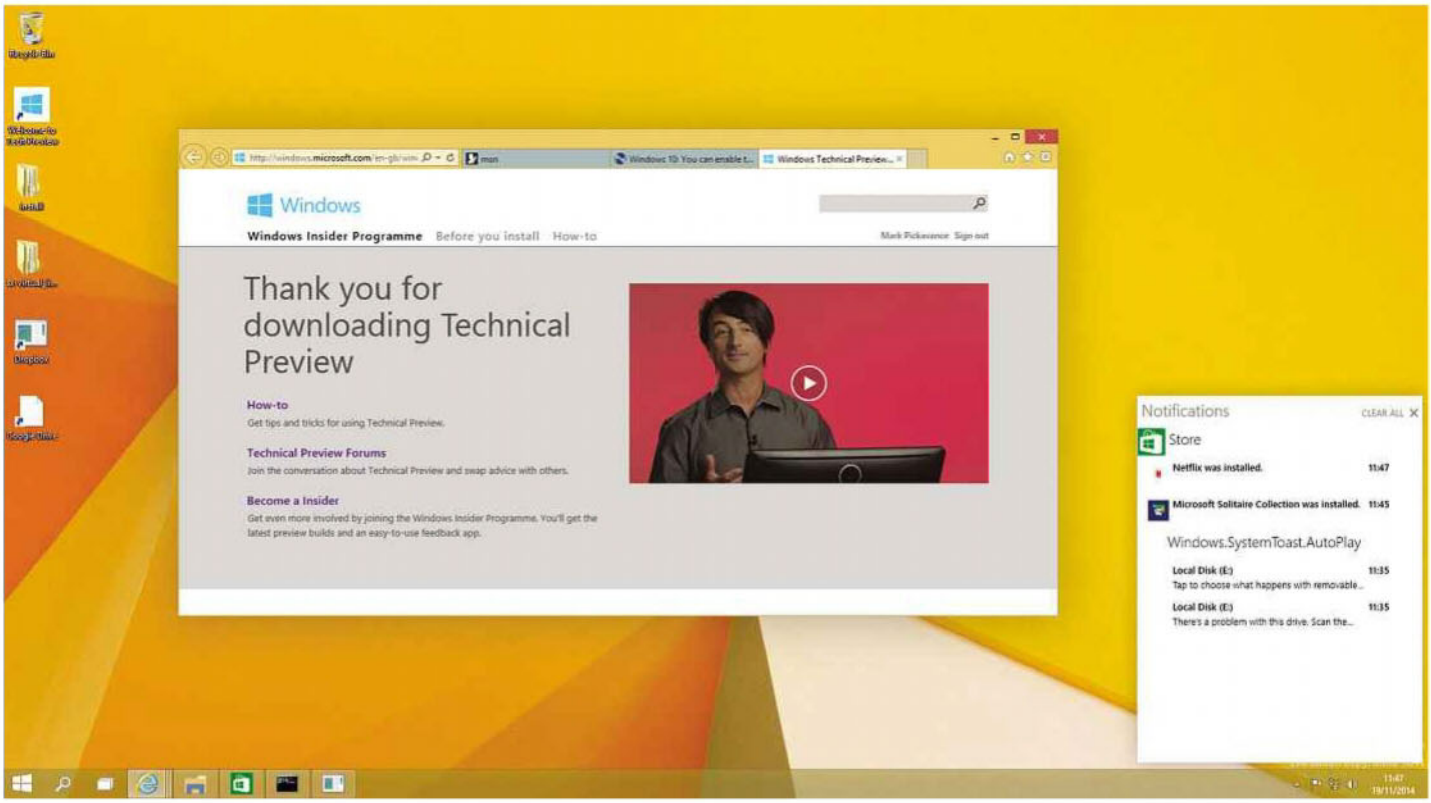
The equivalent on the Notification Area Icons panel can be found by using the Charms menu and selecting 'PC Settings'. Under Windows 8 it was the third menu item 'Notifications', but since the 8.1 upgrade, it has moved inside the 'Search and apps' submenu.

It's a more extensive control mechanism than the desktop one, allowing you to not only say when in the day you're willing to accept alerts, but also if they will cause the screen to light up or even make a noise.

If you leave your system powered all the time, you can even select to have alerts appear on the lock screen, showing you if you have incoming emails or what the weather is likely to be today. That's great, except it only applies to Metro apps exclusively and not all of them.

On the notification screen you can scroll down and see the apps it applies to, and simply select with a toggle if the notifications for that specific tool is ON or OFF. There are no system notification options per se in Metro, as they're handled by a different mechanism. In general, Windows 8 takes the view that users don't need to know about many of the background update tasks, so it doesn't bother the user with the majority of those events.

In terms of the Windows 8 alert architecture, system notifications are divided into two types, depending on how



“If you leave your system powered all the time, you can even select to have alerts appear on the lock screen, showing you if you have incoming emails or what the weather is likely to be”

important the information is considered. The critical ones are modal alerts, like those that insist you decide something immediately, which are full screen and can't be ignored. Less critical messages appear on floating Pop-ups, and will disappear if ignored for long enough. The second variety won't stop you interacting with the interface, though you can select the pop-up to take you to the email that's just arrived, for example. These pop-ups are referred to as 'toast' by Microsoft, for some inexplicable reason.

You can control how they appear on a per app basis, to a certain extent. By accessing the Charms bar in many Metro apps you can control the specific alert personality through the 'Permission' options. Not all apps have this capability, as it is dependent on what they do as to what features they get.

The only other quirk with Windows 8 is that you can delay notifications globally from the Charms bar. The Notifications icon brings up a small menu that allows you to defer alerts for one, three or eight hours.

As with much of Windows 8, there seems little uniformity in any of the way this is handled, and the early releases of Windows 10 strongly hint that notifications will see a massive overhaul in the next Windows release.

Windows 10

What's critical to understand about Windows 10 is that at this time it is a work in progress, so there isn't a guarantee that what features exist in the preview build will still remain for the retail release.

So far in the preview, notifications have been hidden and disabled at various points, so clearly they're an area in which Microsoft still has much work to complete before it is ready for the majority of users.

However, from what we have seen, the approach taken so far seems to strongly mimic that provided with the mobile version of Windows 8 used in the Nokia (now Microsoft) Lumia phones. That was patently borrowed from Android and has since been copied by both Microsoft and Apple in their latest OS upgrades.

The Windows 10 Preview implementation makes notifications part of the 'Action Center' and places the notifications on a panel that's tied to a taskbar icon, very much like the old Windows 7 way of doing things. Where it differs is that it not only provides system alerts but also application information. And it also allows you to look back at older alerts, in case you missed an important event previously. That's a major reversal of the Windows 8 policy and one that will put PC owners on a parallel with the majority of phone and tablet users.

It's interesting, considering how long ago alerts and notifications appeared in Windows, how Microsoft is still not sure how best to manage them. However, the changes that the Windows 10 preview hints at do seem to be progress of sorts towards a more uniform approach across all its platforms. **mm**

Micro Mart App Awards 2014

Join Keir Thomas as he runs through some of this year's very best apps available for iOS and Android devices

It's been another stunning year in the world of mobile apps and, as 2014 raises one last glass and 2015 crawls groggily out of bed, we're pleased to present the inaugural Micro Mart App Awards. Across this issue and the next, we pick 16 of the best apps that demonstrate how things should be done. If your phone or tablet doesn't feature these apps, then it's quite simply lacking. As usual, all the apps discussed below can be found in the Apple App Store or Google Play – or both.

Office Suite: Microsoft Office

It's rare for the troubled Microsoft to win adulation nowadays and, up until a few months ago, Microsoft Office for iPad had little chance of finding itself on these pages. Released to the public in March, apparently ahead of its scheduled launch date, the move smashed apart the Windows+Office horse and carriage and stamped new Microsoft boss Satya Nadella's identity on the company. There was only one problem: you needed an Office 365 subscription to use the apps, which were an otherwise free download in the App Store. Without an Office 365 subscription, the apps opened documents in read-only mode. Costing as little as £60 per year for the use of Office on one iPad and one PC, it's churlish to argue about Office 365's value for money, especially considering it chucks in 1TB of cloud storage too. However, what catapulted Office for iPad into our list was the announcement in November that basic

▲ *Office for iPad and iPhone brings document editing to the iOS masses and requires little more than a basic Microsoft account*

editing of documents was now free of charge – and 'basic' editing is 90% of what most of us do. On the very same day as this announcement, Microsoft released Office for iPhone, which came with the same rather lovely 'limitation'.

So what do you get for nothing? Few would argue with the fact the three office apps – Word, Excel and PowerPoint – look beautiful and make perfect use of a touch interface. The same layout engine is used as with the desktop products, so document compatibility is guaranteed, and Microsoft even ensures the same fonts are available.

It would have been so easy for Microsoft to try to force users into thinking like desktop users, but instead it applied creativity to make touch-based working seamless and second nature. Microsoft's OneDrive cloud storage is used to get documents on and off your iPad or iPhone, but Microsoft again caused jaws to drop later in November when it added support for Dropbox. The ghost of Steve Ballmer is spinning so fast that he could power Microsoft's HQ.

Office workers are going to miss some of the higher functions found in Office on the desktop, but they probably already have Office 365 subscriptions in some capacity. In short, everybody's a winner with Office for iOS.

Office for Android is on its way, and beta previews look just as good as the iOS version. Cynics might take a moment to let that information sink in: Microsoft is releasing Office for Linux. I'd be driving a Bentley if I had a pound for every time somebody said that would never happen.

Game: Monument Valley

Few games leave you with a feeling of loss when you complete them, but *Monument Valley* is one. Few games bring something genuinely new to their genres, but again *Monument Valley* is one of them.

In crude terms, *Monument Valley* is a platform game. However, it borrows heavily from the drawings of MC Escher, the artist who created impossible geometry such as waterfalls that flow back into themselves via a series of mind-bending conduits. Thus, *Monument Valley*'s heroine, Ira, is able to cut across from one platform to another where it overlaps from our 2D perspective, even though in a genuinely 3D world that would be impossible.

The story concerns the aforementioned Ira, a princess with a peaked white cap, who's exploring the eponymous valley, built by man long ago but now occupied by troublesome crow people. With occasional help from Totem – an endearing series of blocks with a single, curious eye – Ira must work through ten immersive levels in order to… Well, we won't spoil it for you, because this is one game where story matters.

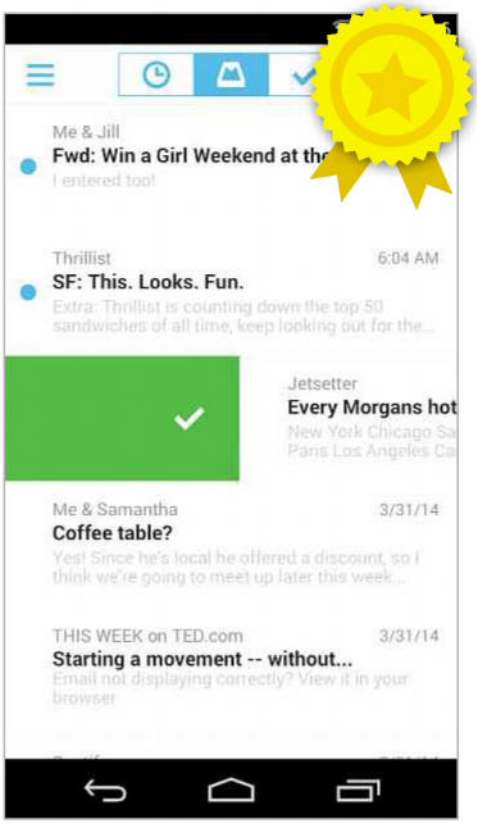
Gloriously well-designed and fun to play, Monument Valley pushes the platform genre in an all new mind-bending direction

It's not hard to criticise *Monument Valley*. Even though its puzzles might make you giggle with delight, they're pretty easy to solve. The entire game can be completed in hours. There's little replay value in each level either – no hidden features that you make a note to return to, as are usually found in platformers. Additionally, fans were irked when promised further levels appeared as a £1.49 in-app purchase.

But none of this matters, because *Monument Valley* is simply a sight to behold. It's also one of the few popular games this year to avoid increasingly aggressive freemium tactics. The fun flying game Retry might have been listed here had it not used every nasty trick in the book. You just pay £2.49 up-front for *Monument Valley* (less than a pint of beer), and you can then settle down in front of the fire for some good old-fashioned gaming fun.

Mail client: Mailbox

Popularising the 'zero inbox' approach, Mailbox has been described as an email management app. You still get the usual mail client functions – the ability to create emails and add signatures, etc. – but otherwise things are kept very simple. There's no way to create mail rules, for example.



Mailbox is better described as an email management app, and it addresses the modern problem of too much incoming mail

This is for a good reason. You don't need such features. As mentioned, the goal of Mailbox is to let you keep your inbox empty, and it lets you do this in one of three ways. The first is simply to archive incoming emails, which is done by swiping right on them until a green tick appears. This sends them to a separate archive mailbox, the contents of which are included in any searches you do.

The second way of dealing with mail is to send it into the future so that it reappears in your inbox in three hours' time, tomorrow, or even at the weekend. This is terrific for dealing with emails that you simply can't address there and then. You might be too busy to deal with an email from a colleague asking for your timesheet, but know you'll be able to do so tomorrow, so you can simply swipe left and then select tomorrow from the list. The message then disappears for now but tomorrow morning will top your inbox.

The third way of dealing with mail is to add it to a list, which you can create easily. You might create a list for interesting newsletters, for example, that you can collect in one place for reading later. Swiping left with a longer stroke will let you do so.

Of course, you can also simply delete the mail, which is done by making a longer right-hand swipe.

On their own, these features are useful but perhaps don't make for an award-winning app, and the current limitation of only working with Gmail and iCloud mail services will be a deal-breaker for many. However, what swings it for Mailbox in our eyes is the fact it's been bought by Dropbox, which allows you to sync your Mailbox settings and status across any number of iOS and Android devices. This makes a truly unified email management solution – and every part of the chain is free of charge. A beta of Mailbox for Mac has already been released, and we'd bet our bottom dollar that Mailbox for Windows will appear soon.

Put simply, Mailbox reimagines how we should manage our email. It's simple but devastatingly effective.

System app: AnyFont

The locked-down nature of both Android and iOS has put barriers in the way of those who like to take a more hands-on approach with their devices. However, at least the option of rooting is easily available to Android users. iOS users must jailbreak, if that's even possible.

So installing fonts for things like document compatibility is usually impossible. Non-rooted Android users can explore GO Launcher EX, but iOS users were thrown an unexpected lifeline this year in the form of Any Font. This makes use of the Profiles feature within iOS, which is designed to allow administrators to control and embellish devices with their own software. The power for administrators (although not regular users) to install new fonts was added with iOS7, and Any Font simply subverts the system by generating and installing custom profiles based on the fonts you provide via a USB/wi-fi connection and iTunes.

When AnyFont first appeared, users eagerly and rapidly handed over the £1.49 price, assuming that Apple would pull the app once it realised its true nature. Amazingly, that didn't happen. That's particularly interesting considering copying a font from your Windows fonts folder is essentially software piracy. To use AnyFont legally, you should be buying licences for each font you install on iOS. Whatever the case, Apple may well be revising the whole Profiles feature in light of the recent outbreak of the WireLurker malware that exploited it, so once again AnyFont's future is in question.

However, as a way of getting the new and vital Microsoft 'C' fonts onto your device (Calibri, Candara, etc.) so that you can accurately view most modern office documents, AnyFont is quite simply an essential tool.

Note Taking: OneNote

Another win for Microsoft? Clearly the post-Ballmer valley is fertile. OneNote is Microsoft's structured note-taking app that's technically part of its Office 365 offering but which became free of charge earlier this year.

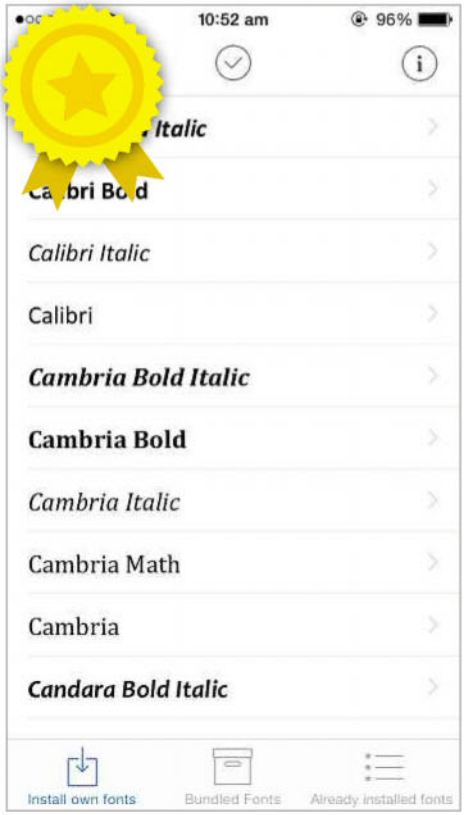
What gives OneNote the necessary punt into our awards list is twofold. First, there's its spooky second sense for working out the nature of notes you're trying to make. Type a heading, and then hit tab, and OneNote will realise you're trying to create a table. Type an asterisk, followed by a short sentence, and OneNote will realise you're trying to create a bulleted list. All of a sudden, the kind of document automation that can prove infuriating in products like Microsoft Word makes complete sense in OneNote. A huge array of formatting tools is also available if you decide to take a more DIY approach.

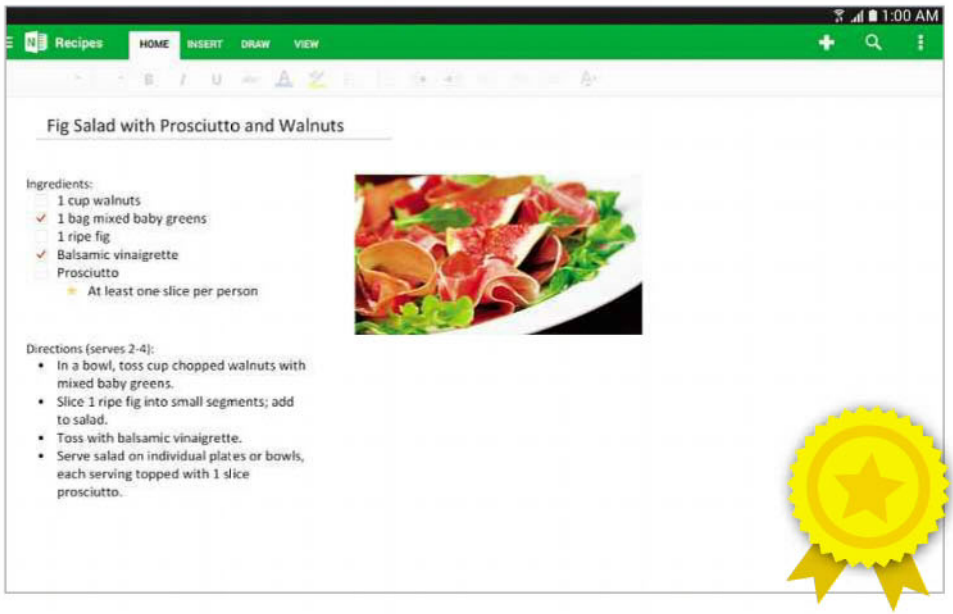
But it isn't just OneNote's features that make us happy. In addition to being available and free of charge on both iOS and Android, you can get OneNote free for Windows, Mac and Windows tablets, and Windows Phone. There's even a browser-based version. OneNote plugs into Microsoft's OneDrive cloud storage service to automatically save its data (and that's also free of charge), making OneNote a truly useful cross-platform note-taking service. Make a shopping list on your desktop PC, and it'll be there waiting for you on your phone when you get to the supermarket.

Evernote provides stiff competition and arguably more expansive features, but there's also a yearly subscription to get the whole caboodle. OneNote provides everything for zero cost and looks superb too. You just can't argue with that.

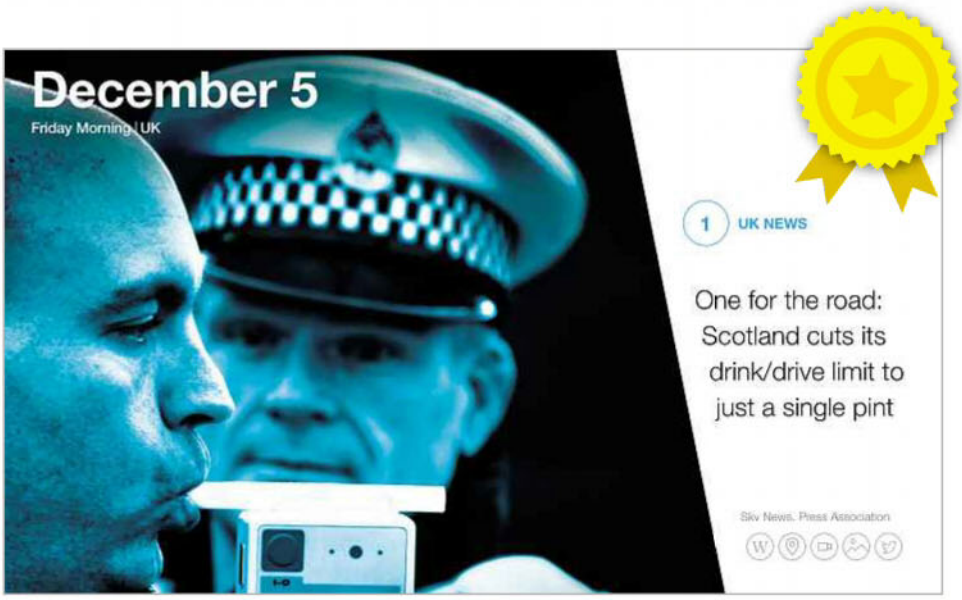
News: Yahoo News Digest

It's been a resurgent year for the ailing Yahoo too. Its News Digest app is typical of the investment it's making in innovative apps, and in another of our app group tests this year we also praised the genuinely useful Yahoo Weather.

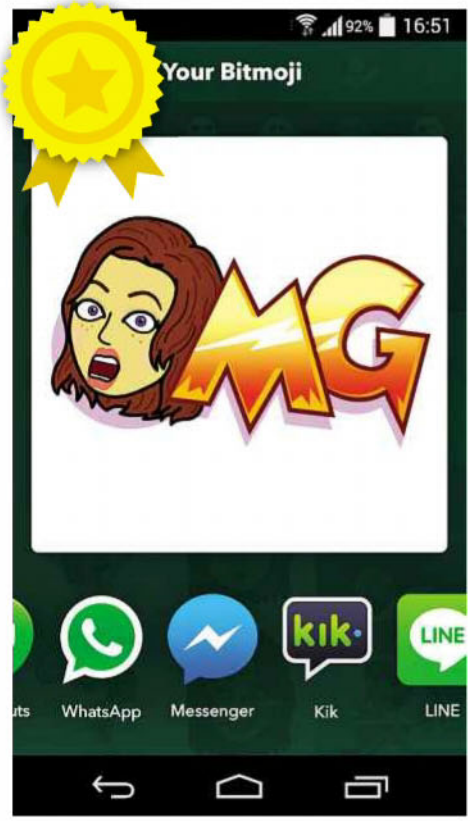




AnyFont bypasses the locked down nature of iOS and lets you install your own selection of fonts
Microsoft OneNote is a truly cross-platform note-taking service that saves data to the cloud and is entirely free of charge



Yahoo News Digest shows how seriously the search giant is taking mobile apps and is a pleasure to use on a daily basis



Bitmoji lets you send personalised avatar-based emoji to your friends via messaging and email – loads of fun!

Mirroring a traditional print newspaper approach, News Digest is updated twice a day with a morning (8am) and evening edition (5pm). This is perfect for reading on the way to and from work, and once the update has happened, you can read the stories without an internet connection. The stories are automatically created from various sources such as Sky News and the Press Association courtesy of the clever Summly summarising technology originally created by British teen prodigy Nick D'Aloisio. Underneath each story, News Digest presents additional facts and information, such as maps of the area discussed in the story, Wikipedia articles or graphs showing relevant data. The result is that readers can grab as much information as they want or need.

When we originally reviewed News Digest in Micro Mart, it was only available on iPhone/Android phones, but a recent update has brought it to the iPad too. This was the icing on the award-winning cake (although on Android it remains phone only at the moment).

It isn't just about functionality, however. News Digest also looks superb on both iOS and Android, with a large headline image heading the news list and further headlines listed underneath (or at the right on an iPad). Stories have pull quotes within them, just like a newspaper, and also cite reference links. The app records how many stories you've read, and by dragging up, you can access a whole raft of 'Extra News', which tends to be headlines that perhaps aren't as juicy but are worth reading nonetheless.

If all our award winners here have one thing in common it's that they make excellent use of touch interfaces and the often limited screen sizes of portable devices. News Digest is no different.

Messaging: Bitmoji

Popping up in the unlikely place of our iOS replacement keyboard group test a few weeks ago, Bitmoji is arguably better described as a messaging app. It ties into the popular Bitstrips personalised cartoon service and makes use of the avatar you create there.

Put simply, Bitmoji lets you use your Bitmoji avatar in messages or emails you send using any app. Usually the avatar is contorted into Emoji-like poses, or is accompanied by bombastic text captions ('ROFL', 'Hang in there!', 'Bite Me', etc.). It sounds silly, and it is, but it's also a whole lot of fun. It's possible to have entire meaningful conversations without actually typing any text.

As mentioned, on the iPhone and iPad Bitmoji takes the form of a replacement keyboard, and you must copy and paste images it generates, while on Android devices it takes the form of a floating head that appears whenever you start a messaging or email app. Tapping the head shows a pop-out menu, and you can tap to simply insert any images.

Like Bitstrips, Bitmoji is most effective when you spend time perfecting your avatar (and are realistic too – you might idealise yourself as waif-like, but a slightly more stocky body type might be more recognisable!). Get your avatar spot on, however, and there's laughter all around.

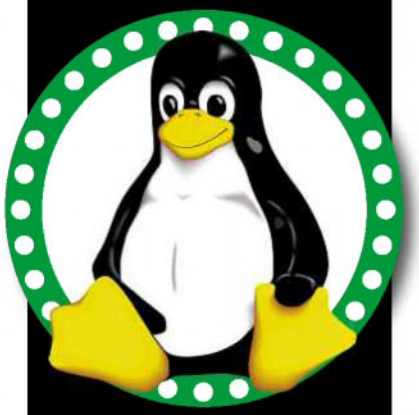
Security: Authy

Following a series of high-profile hack attacks, such as the celebrity iCloud picture theft, this has perhaps been the year two-factor authentication – wherein you type a passcode generated by a device, along with your password when logging in. It's becoming increasingly clear that the system of basic passwords that's served computing for the last 40 years is reaching the end of its useful life.

The most popular system of two-factor authentication for websites is Google's Authenticator system, and Google was kind enough to make this an open standard so that other app developers – like Authy – can implement it too. However, Authy is unique because it's able to securely back up your tokens so that you can restore them in the event that a device is lost or stolen, and also access them across a range of devices. Authy is available for iOS, Android and even BlackBerry. Additionally it comes in the form of a Chrome browser plug-in, allowing for pretty much cross-platform desktop support.

None of this would matter if Authy was difficult to use, but it makes creating and generating your authentication passcodes a breeze. It looks lovely to boot. It automatically adds the correct icons for new services you add, and a simple tap of a button is enough to copy the auth code to the clipboard for pasting into web browsers and the like. The app can also be protected with its own four-digit pin to stop unauthorised use, such as when somebody borrows your phone.

All in all, there's a lot to like, and it's all entirely free of charge. **mm**



A Call For Help

Anyone fancy offering some advice?

David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

I received a letter the other day from Tron Fisher, asking for help regarding a puzzling issue with space available in the /boot partition. He asks:

"When we install say, Ubuntu 10.04 LTS 64bit, most including me, would use the default partition for /boot. Over a period, especially if updating from previous versions, the /boot becomes full, and trying to update further produces the warning, 'Not enough free disk space.'

"I used Synaptic to view all the previous kernels, but was still apprehensive which to remove. Trawling the internet, I found the following kernel purge command which worked a treat.

```
dpkg -l 'linux-*' | sed
'/^ii/!d;/"$(uname -r | sed "s\
(.*\)-\([^0-9]\+\)\1/")"'/d;s/^[^ ]*
[^ ]* \([^ ]*\).*\1/;/[0-9]/!d' |
xargs sudo apt-get -y purge
```

I then did a "uname -r" command, and it told me I was using the latest kernel, '3.13.0-40-generic' which runs perfectly. I then did another "synaptic" searching for '3.13' and it threw up the attached screen shot. All well and good, but it still shows masses of files. Are all these required to run Ubuntu 10.04 LTS? How much partition (/boot) are they taking up?"

To be honest, Tron, I'm not entirely sure. Obviously I've Googled the issue and there seems to be much confusion as to what can and can't or rather shouldn't, be removed from a current Ubuntu install. Where people have stated they removed loads of files they never really specify exactly what files they did remove in the end, and the general consensus seems to be along the lines of 'back up your data and do a fresh install'. Which isn't a lot of help.

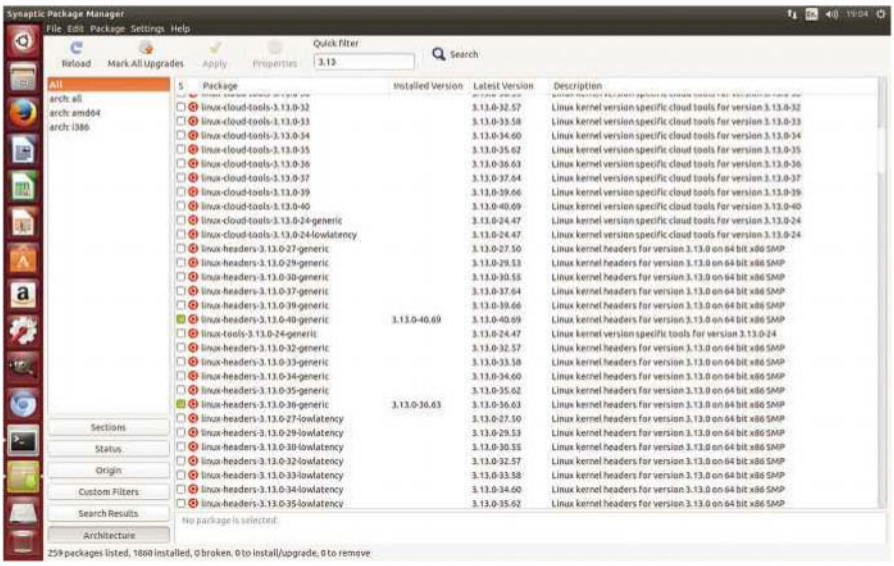
So What To Do?

Tron finishes his letter with: *"To avoid this issue, I assume that there are two other possibilities; When doing a clean install, increase the size of /boot etc in the first place or if having upgraded, again increase /boot etc. Unfortunately I'm probably not alone in not knowing how to do either."*

I think I did read once about using Gparted to increase space on an active partition, without deleting the data currently within it. I don't seem to be able to locate that information anymore, though. Furthermore, I never really liked using Gparted anyway, there was always something about it that seemed a little unstable and confusing.

What made me think in relation to Tron's letter, though, was that I've never really bothered to 'upgrade' a Linux operating system. It made me wonder what exactly is the right process for doing such a thing. I usually just wipe everything because, as I work from a central server my data is safe – and install the new OS version and point it back to the server again. It doesn't take long, and it's a routine I've gotten used to over time. It may sound clunky, but it suits my needs.

Anyway, back to Tron's problem. Do any of you out there have any suggestions for Tron to try out? How many of you upgrade rather than completely re-install? It'll be interesting to find out. Hopefully, we can have an answer for Tron in the next few issues. So please let us know.



The Synaptic search as done by Tron Fisher

Dumb Interfaces

Artificial intelligence remains some way off, and that annoys Craig Grannell, even if it might spell doom for the human race

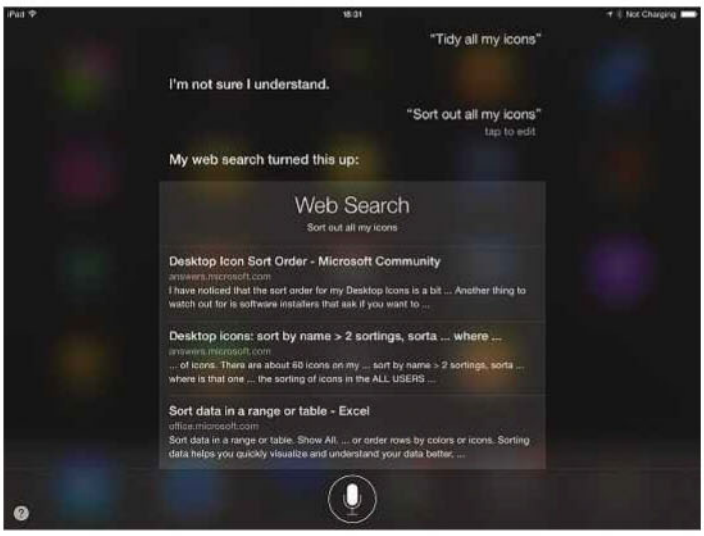
I remember once working in a company's marketing department, where I designed websites on a Mac. My developer cohort, armed with a ludicrously expensive PC, appeared especially chuffed one morning, and I asked why. He said: "Watch this!" After a little tinkering, his PC rasped something vaguely audible, and he declared: "I bet your fancy Mac can't do that!" (he had, at the time, decided that Macs were evil incarnate, a position he'd subtly shift on later in life when buying pretty much anything with an Apple logo on it). I fired up the basic built-in Mac OS text editor, SimpleText, typed 'I sure can', selected the menu command to make the Mac clearly speak the document, and watched my colleague's wide-eyed astonishment.

For a second, the Mac seemed like an intelligent machine – a glimpse into the future – next to its comparatively dumb PC cousin. Macs had of course been able to talk for years, it was something they just did. They were Star Trek technology, albeit in a universe where it was perfectly acceptable for the warp drive and deflector shields to be taken down when someone had the audacity to launch Internet Explorer without warning anyone ("The bomb symbol again? Argh! Klingons!" "Sorry, captain!" THE END).

The thing is, all these years later, and the promise of a truly intelligent machine has never arrived. OS X has several layers of security that attempt to stop a user doing something stupid, such as trashing extremely important system files, but any maverick with an admin password can breeze through them all. Elsewhere, OS X might have a new look and some handy new features, but it's certainly no more intelligent than it ever was. I can't nonchalantly tell it: "Tidy up all that stuff in my downloads folder and desktop, would you? You know where everything should go." Even with powerful software, this kind of thing is only barely possible should you spend quite a few hours writing rules yourself first.

On mobile, things aren't really any better. Siri's dumb as a post, and appears to have trouble understanding anyone who doesn't live within a square mile of Apple's Cupertino HQ. Google Now is barely any better, only offering the appearance of intelligence by scooping up every single piece of data it can about you, shoving it through complex algorithms and then presenting you with information that might be useful. You still can't tell it to sort all your Android device icons out, or have it set fire to all of the rubbish emails and only keep the good ones – at least not with any degree of accuracy that would stop you from being fired or ostracised, depending on whose emails ended up in flames.

Recently, physicist Stephen Hawking has reiterated that this is all just as well. He argues that the last thing we want is full artificial intelligence, because it would look about itself, see a bunch of meatbags telling machines what to do, and then get all smashy. Given that Google already owns a robotics company, this wouldn't necessarily end well. Apple, you can be sure, would eventually follow suit, and claim it invented death-dealing robots (with a beautiful glass and aluminium case). As the human race entered its final days, people would argue online whether Google or Apple had the best hardware for eradicating everyone on Earth. Still, while it probably won't be their first priority as they're obliterating Sweden or finding people attempting to hide in the Australian outback, it strikes me these machines would at least be able to tidy up your desktop when asked nicely, shortly before setting fire to your skull.



Siri is not exactly the computer AI we'd dreamed of years ago

Craig Grannell is a writer, designer, occasional musician and permanent loudmouth. He's owned Macs since 1996, when Apple was facing certain doom, and is therefore pleasantly surprised by its current success. Find **Craig** on Twitter at **@craiggrannell**

Bored? Games!

Ian McGurren looks at a surprising way to lighten up those board games at Christmas

Ian is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Mobile

The presents are all open, the dinner has been demolished, the sherry is looking suspiciously empty and Her Majesty has shown all these vloggers how one does it. For those left conscious, it reaches that lull in the day where something strange happens that British families avoid the rest of the year – they play games; more often than not, board games. It's a tradition that goes back as far as most of us can remember, and has barely ever changed.

This year, however, there's a new way to play and all you need is a smartphone, a TV and Google's cleverstick, the Chromecast. Yes, big screen gaming is possible now with the increasingly cheap Chromecast, an Android and iOS device and a few apps. Let's take a look at some of the most fun.

One company that's surprisingly grabbed hold of the Chromecast baton and ran with it is perennial board game makers Hasbro. It's actually quite surprising to realise the amount of intellectual properties it can call on – like a roll-call of youth of the 1970s and 80s.

Monopoly Dash

First of its offerings uses the Monopoly licence – note the word 'uses' there as, while the game is named and styled in the vein of the classic property trading game, the actual Monopoly Dash gameplay is far closer to a card game, with shades of Poker (there's no betting here though). The idea remains the same – get all the properties – but here it's done by requesting cards from other players. Guess right, they hand it over, guess wrong and the turn moves on. When you complete a suit of properties, they disappear and the competition narrows. It's clever and simple once you understand it, but can be confusing a first.

> **“All you need is a smartphone, a TV and Google's cleverstick, the Chromecast”**

Connect Four Quads

Keeping the idea of changing the gameplay, Connect 4 Quads takes the basic four-in-a-row basis of the classic Connect 4 and merges it in with a healthy dose of *Bejewelled* (match three) gameplay that'll also appeal to *Candy Crush*ers. You get a 2x2 set of discs of varying amounts of red and yellow and you take turns in placing them to make four or more in a row. Like *Bejewelled*, they will drop down if landing on split height discs, creating further combinations. Players are colour agnostic, it's points that count and whoever makes the most in 180 seconds, wins.

Simon Swipe

Last of the Hasbro bunch is a modern version of many a kid's first electronic toy: Simon. Possibly the closest to the original, *Simon Swipe* adds a twist – or swipe – to the follow-the-sequence idea. This time, as well at pressing the button, you are also asked to swipe it too, in different directions. On top of this, all players do so at the same time on their own device, with any mistakes instantly eliminating you from that round. It's tough after some Christmas cheer, but the simplicity of the game does make it a good one to pick up and play.

Big Web Quiz

Finally, we come to the Big Web Quiz. Chances are that if you're into this, you'll have some idea what it involves – though here, answering questions quicker that the others nets you more points. It's not just the normal questions that make the Big Web Quiz fun, or even its unique vibrant design, it's the slightly stranger questions that require you to purely guess that stand out. For example: “How many Adeles (yes, the singer) high is the Sears Tower?”. It's definitely a hoot.

So there you go, four ways to mobile up your Christmas and keep the family happy at the same time. Next time I'll be looking at 2014's ups and downs and accessories to adorn your Christmas presents. In the mean time, have a very techy Christmas and a well-specced new year!

Tanked Up

Shaun's been trying his hand as a tank operator this week, as well as taking care of the skies above Rome

Tank Battalion is an early 1980s arcade game released by Namco in either 1980 (according to Wikipedia) or 1981 (according to **GamesFAQs.com**), which has recently been converted to the expanded Commodore VIC-20, requiring an extra 16K of RAM or more. The game is a static screen top-down 2D affair, with this new version containing all 22 levels of the arcade original spread over eight maze types.

You have been tasked with defending your base, shown as an eagle, against invading tanks which will appear randomly within each level, also attacking in seemingly random patterns as well, at least to begin with. All tanks (including your own) have the same level of fire power, so should your artillery projectile collide with one that has been shot from an invading armoured vehicle then the two explosives will cancel each other out.

The walls within the play area may be destroyed to create new paths, and you are provided with three replacement tanks from the start, with an extra awarded for each 20,000 points you manage to amass. But if your base is infiltrated by enemy, fire then it's game over regardless of how many tanks you have remaining.

It's a fairly simple and fun game which has nice chunky graphics similar to the original, though the screen area is smaller and chunkier due to limitations posed by the VIC-20 graphics chip. There is no music, but there are some basic sound effects that accompany play.

Tank Battalion for the VIC is only the second version released for a home computer, the other being for the MSX back in 1984. Like many of you, I hadn't heard of *Tank Battalion* until this version (called *Tank Battalion 2014*) was released by the VIC-20 developer Beamrider (or Adrian Fox, as he is otherwise known). It's a whole lot of fun as well. It has been developed in the C programming language, and has been released into the public domain as a 'prg' file through the Sleeping Elephant 'Denial' forums. See **tinyurl.com/tank-battalion-2014** for more.

Tank Battalion for the expanded Commodore VIC-20

Multi Carts

The RGCD annual 16KB Games Development competition, in which Commodore 64 software developers are asked to create a game that will work within the limits of the C64's 16K cartridge schema, has concluded with 17 entries (and therefore as many new games released).

The clear favourite to win this year is *p0snake*, developed by Antonio Savona, though there is a heady mix of game genres represented within the entrants. Although many entries have been released into the public domain for use with emulators and such like, RGCD usually makes hardware versions that will plug straight into your C64 or 128 (or C64GS where there is support) for you to play on the real machine, so that's something to save your pocket money for.

To see the entries released into the public domain, head over to the Commodore Scene Database at **csdb.dk/event/?id=2230**, and to find out more about this and previous competitions, see **rgcd.co.uk**.

Air Traffic Management

Luca Bordoni has managed to recover a game that he wrote for the Sinclair ZX Spectrum way back in 1987. With help from Jarrod Bentley and Einar Saukas, he has given it a bit of reworking for release today – and it now works on 16K Speccys as well.

Air Traffic Control Rome isn't your typical release, but it attempts to simulate exactly what you'd expect. You take on the role of an air traffic control operative for the Lazio region in Italy, which has two main airports.

The task is to place and safely land up to eight flights, landing at one of the two airports in the game, with the Fiumicino airport being the easiest to land at, providing that you haven't caused any congestion that is. To find out more, head over to the World of Spectrum forums at **tinyurl.com/air-traffic-control-rome** or see **funspot.it** and navigate to the Sinclair ZX Spectrum area.

Shaun has a passionate interest in 8-bit computing and gaming and has been finding novel ways to use retro technology since 1994

Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

V for Victory

Leaked sooner than Ubisoft would have liked, the first details of Assassin's Creed: Victory reveal a Victorian London setting, and a new grappling gun weapon

This week, Ryan checks out the first leaked details from next year's Assassin's Creed game, and looks at the progress of Deus Ex Universe...

Plug & Play

Skinless face, no eyes, and teeth fixed in a rictus grin. As images of botched game launches go, it was easily the most powerful of 2015. Within a day or so of *Assassin's Creed: Unity*'s release in November, these were the pictures circulating on social media – instances where facial textures had failed to load, resulting in non-player characters that looked like something out of a horror movie.

As Ubisoft were still reeling from all that, along came a fairly major intelligence leak. According to information acquired by Kotaku, the next *Assassin's Creed* game, currently called *Victory*, will be set among the smog-filled streets of Victorian London. Due for release next year, *Victory* will feature all the elements we'd expect from an *Assassin's Creed* game – the athletic rooftop jaunts, the stealthy kills – but it will also, we're told, introduce some new set-pieces and mechanics, including multiplayer fights on the roofs of moving horse-drawn carriages and a grappling hook weapon, which can be used to haul yourself up the side of buildings *Bionic Commando* style.

Ubisoft, meanwhile, is still trying to repair customer confidence after the understandably tepid reception to *Unity*. As patches have been applied to fix the game's technical issues, Ubisoft is providing free copies of the forthcoming *Dead Kings* expansion as an olive branch. However, with the company in damage limitation mode, an early leak of its next major title is far from ideal.

"It is always unfortunate when internal assets, not intended for public consumption, are leaked," Ubisoft wrote in a statement to *PC Gamer*. "And, while we certainly welcome anticipation for all of our upcoming titles, we're disappointed for our fans, and our development team, that this conceptual asset is now public."

The statement also (inadvertently, perhaps) confirmed that *Victory* is being developed by Ubisoft Quebec – a studio which previously only dealt with downloadable content in the past, while Ubisoft Montreal concentrated on the meatier aspects of the *Assassin's Creed* series. The Quebec studio has, Ubisoft reveals, been working on *Victory* "for several years", so it's probably inevitable that a leak would occur sooner or later.

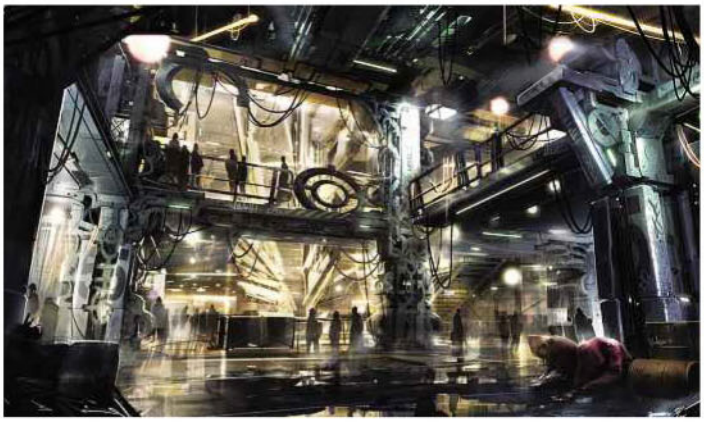
For many fans of the series, Victorian London is exactly the kind of setting they've been waiting for; in fact, we seem to recall that Ubisoft nixed the idea of a British, 19th century *Assassin's Creed* a few years ago. It now seems likely that it's been quietly been on the agenda for quite some time. Let's just hope *Victory* has a smoother release than this year's decidedly bumpy French revolution.

Online

It's now more than three years since the release of D*eus Ex: Human Revolution*, the acclaimed action RPG that blended a detailed open world with an

Famous Five

Assassin's Creed: Victory wasn't the only piece of game news to leak in recent days. On the 5th December,a trailer briefly appeared on YouTube, which confirmed the existence of *Street Fighter V*, the latest instalment in Capcom's enormously popular one-on-one brawler series. At the time of writing, we don't know too much more, other than it's a PlayStation 4 and PC exclusive, but given that it's already six years since the release of *Street Fighter IV*, it's certainly exciting news.



Its title might suggest an MMO, but the forthcoming Deus Ex Universe will instead be a series of interlocking core games. Will one of them be a multiplayer shooter?

engrossing hard science fcition story. More-or-less since then, Eidos Montreal has been quietly working away on a project called *Deus Ex Universe*, which was first officially announced last October but has remainedfirmly under wraps since.

Given the scale implied by its title, there's been some online theories that *Universe* might imply some form of MMO – a logical progression, perhaps, given the ambitious nature of the previous game. But in a recent blog post, Eidos Montreal's community manager Sacha Ramtohul made it clear that *Deus Ex Universe* isn't an MMO after all. "Some of you have had concerns that 'Universe' meant 'MMO'," Ramtohul wrote. "Rest assured, it does not."

Instead, *Universe* is "the name we are giving to the fictional world and the rich lore we are creating". In other words, we can probably expect a range of interlocking games on mobile as well as PC and current-gen consoles, with a single overarching story and possibly also an online hub akin to Blizzard's Battle.Net or Codemasters' RaceNet.

We also know that *Deus Ex Universe* will be powered by the Dawn Engine, which Eidos describes as a "heavily modified" version of Glacier 2, the proprietary piece of software created by *Hitman: Absolution* developer IO Interactive. To prove just how much power the Dawn Engine has whirring away under its bonnet, Eidos Montreal released a screenshot of what looks like a gigantic steel mill lit up by fluorescent tubing. Eidos haven't come out and said that it's supposed to be a shot from *Deus Ex Universe*, but the distinctive amber hue of the previous game provides an immediate psychological connection.

Ramtohul says that *Universe* will bring together "core games" and "any other projects" that might arise from it – though what those might be is a closely-guarded secret. Could one of those core games be a multiplayer shooter? It certainly seems likely, for two reasons. First, there's the popularity of the various fan-made multiplayer mods made for *Revolution*. Second, there's the small matter of a job advert that appeared back in April this year. It asked for an "Online Programmer" with experience in creating "multiplayer games". Their duties would also include "implementing online game features and building a suite of tools for running a live game."

It's all speculation, of course, but given Eidos Montreal's clear plans to create more than one game under the *Universe* banner, it makes sense. With *Deus Ex Universe*'s release still far off in the murky future, we'll just have to wait and see.

Incoming

Last year, *Saints Row IV* fired off another salvo of sandbox anarchy courtesy of its super powers, Dubstep Guns and oblique use of pop music – we still have fond memories of a *Star Wars*-style flight through a space ship cut to *What Is Love* by Haddaway. January sees the release of *Gat Out Of Hell*, a stand-alone expansion that provides an infernal twist: Johnny Gat must journey to hell and rescue the leader of the Saints gang from Satan himself. *Saints Row* never did take itself too seriously, and the trend continues here, as its winged protagonist fights demons with twin machine guns.

Saints Row IV: Gat Out Of Hell is out on the 23rd January.

The stand-alone expansion Gat Out Of Hell promises to add a devilish streak to Saints Row IV on the 23rd January

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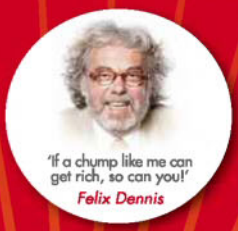

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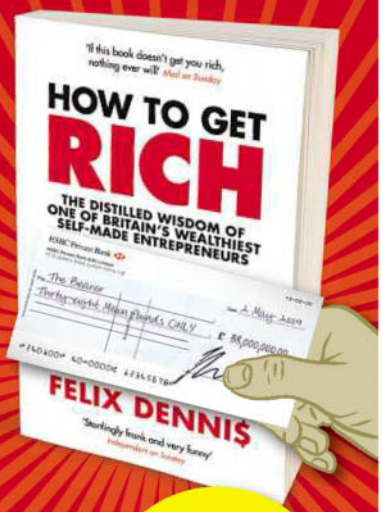

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Toshiba Satellite SA60 laptop. Model PSA60E-092058EN.Windows XP Home Edition with Certificate of Authenticity. For spares or repair - broken power connector on mobo. No power cord. Otherwise very good condition.
£40.00 + p&p
Tel: Peter Scarth (01452) 372350 Email: pscarth@blueyonder.co.uk

SoundBlaster Audigy SE 7.1 soundcard for sale. Perfect working order. Selling due to not being needed any more. Just £12 plus postage.
Tel: Ian (01132) 629028 Email: ianmatthewuk@yahoo.co.uk

Toshiba C500D-B-11 laptop. Virtually new cost £279 will accept £150 O.N.O.
Tel: (01217) 535324

Apple Touch 32 GB iPod. Virtually new cost £199 will accept £100 O.N.O
Tel: (01217) 535324

HP 4Gb memory Microserver with two hard disc drives. £110. One with Linux MINT. Other with Linux FreeNAS. This will also run Windows 7 and Windows Server or Home Server. (Win 8 I've not tried it) Two spare HD slots with appropriate caddies. Slot for your SATA DVD drive also, (or use external usb or DVD drive if needed. 4 usb sockets on front, 2 on rear. VGA, network, power sockets on rear. Supplied in original HP box with CD and leaflets etc. Collect from Harrogate, North Yorks, or posted via Hermes for £12 (or less if I can do it). Cash on inspection and collection. (Highlands and Islands might obviously cost more on delivery)
Tel: (01423) 872045 Email: it_central@ntlworld.com

400GB IDE drive 3.5 inch formatted ready for use. Only £20 plus £3 for p&p. I can load genuine XP Professional from Microsoft with genuine certificate of authenticity for an extra £10. Refurbished.
Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

Amstrad PcW 9256 in good working condition with software. Offers.
Tel: John Adams (02088) 641202 Email: meeching@uwclub.net

CRUCIAL 8GB (4x2). PC3-10600 unbuff. CT25664-BA1339A. (4X2) = £48.00. (2X2) = £25.00. Boxed kit of CORSAIR Vengeance 4GB (2X2) = £35.00. Prices include P&P.
Tel: Bob Williams (01507) 602914 Email: flipinek@hotmail.co.uk

EPSON PRINTERS T715 12 multipack F.O.C. to good home, just pay postage £2.50. (Tesco equivalent original cartridges £120 current special offer!) Perfect crisp printing etc.
Tel: Pete Dew: (07526) 988594

EPSON PRINTERS T481-T486 6 multipack F.O.C. to good home, just pay postage £2. Perfect crisp printing etc.
Tel: Pete Dew (07526) 988594

EPSON PRINTERS T711 6 multipack F.O.C., just pay postage £2. Perfect crisp printing etc. May have others F.O.C. if model older than 12 months.
Tel: Pete Dew (07526) 988594

Intel 3930K processor. Used, but not overclocked. No box or fan. £220 ono. Will ship to UK address.
Tel: Tim (01623) 624509 Email tim.stirland@btinternet.com.

Apple Mac G4 Tower. 400MHZ cpu, 640MB Ram, 2xHardDrive 40GB,20GB. DVD & ZIP Drive. OS X v10.3 Panther+OS9. NO KEYBOARD OR MOUSE. £25 ono Buyer collects
Tel: (07941) 254296 Email: jasonnd@hotmail.com

Wireless Motorised IP Surveillance Camera. White In Colour - Control from your mobile phone / tablet / pc when out of the home - ideal for home security , baby monitoring, has sound and remote recording etc Brand new in Box - £25 Price includes post and packing.
Email:omendata@gmail.com

Blueberry I-MAC. Good condition, all in working order, £55.
Tel: (01386) 832758

Lexmark Printer Z601, still working and in good condition, £25.
Tel: (01386) 832758

Dell Inspiron 660 Intel i5 QUAD CORE with ACER 23 Inch LED monitor. AS NEW. Operating System: Windows 8.1. MPN:620MT. Memory (RAM): 4 GB. Hard Drive: 1 TB. Processor Type: Intel Core i5. Primary Drive: Optical DVD+/-RW, Processor Speed: 3.0 GHz, Features: Graphics Card GT620 1GB. Acer LED monitor 23" HD. £520
Tel: Hitesh Rao (01163) 198895

PRINTER CARTRIDGES. Suitable for Epson printers range T711 - T714. Work perfectly. 50 pence each, plus postage (brand new unused sealed). Over a dozen available.
Tel: (07541) 222678 Email:petedew@gmx.co.uk

Panasonic KX-P7105 mono laser duplex printer. Some toner left. Up to Windows XP only - hence £25. Buyer collects from N2, East Finchley
Tel: (02083) 431527 Email: pnnikiel@gmail.com

INKJET CARTRIDGES suitable for Epson Printers T711 - T714 range, and T481 - T486 range. 79 pence each, plus postage. Work perfectly, good crisp printing quality.
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50 copies of Micro Mart magazine. Mainly 2013 through 2014. Pick up as heavy. Devon. Price £20,
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Powered PCI Express x1 To x16 Riser Card Extension via USB 3.0 + Power Cable Adaptor. Allows you to add an extra Pci-ExpressX16 slot to your Pc converting an existing x1 slot to x16. Useful for adding an
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Laptop Removeable drive tray. Allows you to add an extra hard drive to your laptop by taking out the CD/DVD DRive. This device inserts into the Cd/Dvd Empty Slot and holds 1 Hard Drive. Excellent Engineers Gadget - Great for data recovery or just beefing up your laptop. Two types available - standard Sata To Sata or Sata To Ide (Pata) Slot type. Brand New Still In Box.£20.
Email:omendata@gmail.com

Amstrad PCW 9256. In perfect working order including on-top printer with a few 3" disks. Offers.
Tel: John Adams (02088) 641202 Email: meeching@uwclub.net

2 HP Laserjet 3100 printer-fax-copier-scanners. In good working order. £25 each.
Tel: John Adams (02088) 641202 Email: meeching@uwclub.net

Mini-Tower. P4 / 3.06 , 1.5 gigs, 80 GB, DVD, Floppy, Network, Sound, USB 2 etc. XP-pro fully updated, with Office suite, Anti-Virus & all usual Utilities, COA sticker & System Image. £55 (P&P £11)
Tel: Pat (07710) 348638 Email: pat4cars@aol.com

Esprimo Mini Tower. Pentium 2.8 Dual-Core, 2.0 gigs, 250 gig, DVD-RW, Gigabit network, sound, XP-pro fully updated, with Office suite, Anti-Virus & all usual Utilities, COA sticker & System Image. £65 (P&P £11)
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HP DC5700 MiniTower. Dual-Core E2160 ,160 gig, 2.0 gigs, DVD-RW, card reader, sound, Gigabit network, XP-pro sticker, upgraded to Vista Business , activated , Word, Excel, usual utilities, Recovery Image. £65 (P&P £11)
Tel: Pat (07710) 348638 Email: pat4cars@aol.com

Dell Mini-Tower. Intel P4 / 3.00 HT, 1.5 gigs, 80 Gig, DVD-RW, Network, Sound,XP-pro fully updated, with Office suite, Anti-Virus & all usual Utilities, XP-pro COA sticker & System Image. £55 (P&P £11)
Tel: Pat (07710) 348638 Email: pat4cars@aol.com

Lian Li PC-X2000 Computer Case. Supports mATX, ATX, eATX; hot swap SATA drives, six 3.5" & two 2.5"
hot swap disc holders. Three 140mm intake plus two 80mm and one 140mm exhaust fans. £140.
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1.5tb SATA drive. Fully refurbished by government acknowledged company. All data taken off (some drives are still under Western Digital warranty) ONLY £40 including P & P
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1tb SATA drive. Fully refurbished by government acknowledged company. All data taken off (some drives are still under Western Digital warranty) ONLY £38 including P & P
Tel: Dave Thomas (01942) 706572 Email: davethomas96@aol.com

2tb Western Digital SATA drive. Model WD2002F-YPS 64mb cache, fully refurbished by government acknowledged company. All data taken off (some drives are still under Western Digital warranty) ONLY £50 including P & P
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GEFORCE 1 GBYTE 24- PCI express PC card. HDMI DVI VGA PC video card. £10 plus p&p £4.50. 2 for sale. £10 each.
Tel: (01707) 339063 Email: Email: awhishaw@aol.com

6 P314 PC bases for sale, £100. The lot all with XP must be collected.
Tel: (02380) 733312 Email: zen96403@zen.co.uk

Motherboard Bundle. 2.4Ghz AMD Athlon XP 32bit CPU 512MB Ram 5xpci 2IDE LAN sound good for gaming, office work, surfing the net, watching movies generally a good all round system spec can slightly be changed if required please email or call me for a price.
Tel: David (01616) 888119 Email pcmadnessltd@yahoo.co.uk

4 gb (2 x 2gb) of OCZ Reaper PC2 6400 ddr2 memory. Fast gaming memory, used but in excellent condition, £49.95 inc postage.
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500GB SATA drive. 3.5" formatted ready for use. Software can be installed for an extra charge. Windows 7 extra £35 includes disk and certificate of authenticity. Only £23 including P&P.
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Retro Commodore 64 with 1541 disktrive tapedeck. All in original boxes, mags. Pick up from Somerset. £75 ono.
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CISCO CONSOLE CABLES. I have a lot of Cisco console cables all new let me know how many you would like please email or call me for a price and more information.
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750GB SATA drive for sale. Perfect working order. Formatted ready to use. Only £25 plus £3 p&p. Genuine Windows XP with Certificate of Authenticity can be pre installed for an extra £10.
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Six p3/p4 PC with XP. £100 the lot. Buyer collects. Get in touch for more information.
Tel: (02380) 733312 Email: zen96403@zen.co.uk

Socket 775 System. Coolermaster Case, audio + USB. Asus P5KPL-AM EPU E6600 CPU. 250 GB Hdd. DVDRW, ATI 5450. Boxes, drivers. Samsung 19" Monitor HDMI USB. Keyboard mouse. Windows 7 Professional SP1. £100 collect from Louth, Lincolnshire.
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2 x 2GB Samsung DDR3 pc3-8500 1066 SODIMM. 204 pin as new laptop memory. £15 inc postage to inland UK.
Email: jvital@mail2web.com

HP 5101 5102 5103 Netbooks and Notebooks. Lots of parts available down to the tiniest screw. Contact with requirements.
Tel: (01892) 833413 Email: fwfkent@gmail.com

Dell OptiPlex 755 (80 GB, Intel Core 2 Duo, 2.33 GHz E6550, 1GB memory, DVD/CDRW) Ultra small form factor. Fantastic small and very fast computer. You will need to load the drivers. XP Pro or Vista Business can be loaded for an extra £10. The hard drive and memory can be upgraded for an extra cost. £70 plus £10 for delivery.
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Internal Card Reader. Compatible with most camera memory cards. Also has a USB port. Colour: black or silver. Please email or call me for a price.
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AGP, PCI and PCI-e graphics cards. Please email or call me for a price.
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Motherboard Bundle. 3Ghz AMD 64bit CPU 512MB Ram 5xpci 2xSATA 2IDE 1Gb LAN 6 channel sound firewire. Comes with driver CD and manual. Good for gaming, office work, surfing the net, watching movies, generally a good all round system. Spec can slightly be changed if required. Please email or call me for a price.
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PC gaming hardware. I have got 1 x force feedback steering wheel, 1 x force feedback joystick, 1 x normal joystick, lots of game pads. Please email or call me for a price.
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Brand new USB brackets. Add 2 extra USB2 ports to your computer at little cost. Very simple to fit cable connects onto the motherboard and uses a spare slot on the back of your computer. No drivers required. Please email or call me for a price.
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Brand new Laptop bag. Still sealed in the plastic bag and never used (it came as part of a bundle). Please email or call me for a price.
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Desktop cases. AT and ATX types and tower and flatbed form factor different sizes and colours can be posted or picked up from Manchester please email or call me with your requirements.
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Laptop RAM. 2x1GB PC3-8500 DDR3 1067MHz pulled form a working mac book pro but can be used in other laptops this is the quickest way to boost your laptop's speed. Please email or call me for a price.
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Computer Monitor. HP s2231a. 1080p, 22 inch display, 1920x1080 resolution. 60 Hz, contrast 15,000:1. Price £40 ONO
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Two Apple G4 iBook Laptops. 12" screen, 800 MGHZ CPU 640MB RAM. OSX (Tiger) 30GB HDD batteries ok M/Chargers, nice machines. £105 each or £200 for the two.
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Gaming PC HAF-X case. ASUS P6X58D-E, i7 930 4GHZ 6GB Corsair i7 mem, gigabyte gtx470, Asetek CPU LCLC 240mm radiator + watercooling. Two 12cm fans, PSU needs replacing. DVDRW, networking, original software, extra cabling. (Price: £400 ONO).
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SATA Drive Tray For Laptops. Allows you to remove your CD/DVD Optical Drive and Insert a second Hard drive.
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Midi tower PC. Windows XP, Office XP, 230GB HDD, FDD, 2x DVD drives, HP Photosmart printer & Canon scanner. All relevant discs. £50.00.
*Tel: Alan Phillips (01745) 354614. Email: alan.phillips747*talktalk.net*

Two Apple G4 iBook Laptops. 12" screen, 800 MGHZ CPU 640MB RAM. OSX (Tiger) 30GB HDD batteries ok M/Chargers, nice machines. £105 each or £200 for the two.
Email: micksharp@live.co.uk

XFX Radeon HD 6870. 1GB GDDR5. Original packaging, never overclocked..£75 plus £6.95 pp.
Tel: Simon Hardwicke (01536) 724334 Email: simon.hardwicke1@ntlworld.com

Asus Sabertooth 990FX Mobo. £100 plus £6.95pp (with Phenom II 980 add £50).
Tel: Simon Hardwicke (01536) 724334 Email: simon.hardwicke1@ntlworld.com

Lian Li PC-X2000 Computer Case. Supports mATX, ATX, eATX; hot swap SATA drive compartment. Includes
six 3.5" & two 2.5" hot swap disc holders. Three 140mm intake plus two 80mm and one 140mm exhaust fans.
Tel: Ian (01932) 856971 Email: a2345@btinternet.com

Matricom G Box Midnight MX2 Android HTPC. New boxed. £85 ono. Postage £3.
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Tel: Mick Young (02072) 321695 Email: mick.young@o2.co.uk

Cartridges for a Xerox 8500/8550 Phaser Colour Laser Printer. 6 Black, 5 Cyan, 4 Magenta, 2 Yellow solid block cartridges going very cheap! Check out cost new from Choice Stationary and make me an offer. My Xerox has given up the ghost after several years.
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Gaming PC. HAF-X case ASUS P6X58D-E, i7 930 4GHZ, 6GB Corsair i7 mem, gigabyte gtx470, Asetek CPU LCLC 240mm radiator + watercooling. two 12cm fans, PSU needs replacing. DVDRW, networking, original software, extra cabling. £390 ONO
Tel: Alex Thomas (01842)813630 Email: chackpobly12@hushmail.com

Custom PC. AMD FX-4100, 8Gb Ram, 500Gb HD, DVD Writer, AMD HD-6750 GPU, Keyboard & Mouse, 19 inch LCD Monitor, Genuine Windows 7 Pro, £250 + delivery.
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XFX HD 7950 GPU. I have 2 for sale, both have 6 months guarantee, willing to split, £180 for pair or £100 each + delivery.
Tel: Mike Whittington (07533) 270020 Email: mike.whittington@blueyonder.co.uk

Nvidia GeForce 9500GT Super+ 1GB DDR2 Video Card (Palit). Unboxed. Great Condition. Not Been Overclocked. £30 Inc P&P
Tel: Steven Saward (01354) 656578 Email: steven_saward@sky.com

16GB Corsair Vengance DDR3 RAM (2 X 8GB). £120 ONO. Brand new and unopened
Tel: Chris Paul (07827) 447779 EMail: cmpaul25@gmail.com

New Cooler Master HAF X USB 3.0 XL ATX Case. No PSU. Reason for sale it will not fit in my computer station. Buyer collect only. £80.
Email: paul_999@sky.com

Two laptop hard drives for sale. 1- HITACHI 250GB - SATA3 - 5400rpm. Sell for £25. 2- WD SCORPIO BLACK - 250GB - SATA3 - 7200rpm. Sell for £30. Paypal only please.
Tel: Wolfgang Dahm (07590) 440475

Intel Core 2 Duo T5600 Dual Core Laptop CPU. Removed from working Dell D630 Latitude laptop due to Gfx chip failure, Now no longer needed. Tested and fully working using CPU Burnin test. £15. Price includes P&P.
Tel: Carole Walker (07551) 293083 Email: omendata@gmail.com

Mini-Usb Finger Optical Laser Mouse. Attaches to your finger and has two side buttons. Great replacement for standard mouse. Ideal for disabled users or for use where a normal mouse would not work. £10 p&p included.
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2 x 1GB PC2100-648. These two matched sticks were removed from one of my redundant systems. Plus one PC2700 (DDR 333Mhz) and one 512Mb PC3200 DDR400 stick. All for £5 plus £2 P&P.
Tel: Alan (02084) 202322 Email: alan@asandco.co.uk.

Two 120GB Maxtor DiamondPlus 9 Drives plus one 80GB DiamondPlus 10. Can be supplied with two plug-in caddies. No reasonable offer refused.
Tel: Alan (02084) 202322 Email: alan@asandco.co.uk.

SANSUNG GALAXY Tab 3 for sale. 2mths old, 8gb, wifi, £80 open to offers. Willing to post at a charge.
Tel: Christine (01386) 831836

HP Elitebook 8760w i7 2820QM @ 2.2ghz 32GB RAM 750GB HDD Quadro 4000M GPU. Only 2 small marks on whole machine. Cost £3500 when new. £900 ONO
Tel: (07772) 926632 Email: stedaley19@gmail.com

WD 2TB desktop hard disk. Formatted ready for an operations system. Runs very nicely. New laptop means my desktop items must all go! £40 includes free tracked postage.
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Asus P8Z68-v LX socket 1155 motherboard. Original box 1/0 cover user guide driver disk fitted core i3 2100 CPU 3-1GHz and 8GB PC1300 memory. No fan. Working fast and fine. £125 + free postage.
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Asus p8h61-mle motherboard socket 1155. Original box 1/0 cover driver disk manual together with Celeron 91620 dual core CPU and 4 9195 pc1300 memory. Working fine. No fan. £70 + free postage.
Tel: (01619) 501218 Email: jmbest2@sky.com

Toshiba Satellite SA60 laptop. Model PSA60E-092058EN.Windows XP Home Edition with Certificate of Authenticity. For spares or repair - broken power connector on mobo. No power cord. Otherwise very good condition.
£40.00 + p&p
Tel: Peter Scarth (01452) 372350 Email: pscarth@blueyonder.co.uk

SoundBlaster Audigy SE 7.1 soundcard for sale. Perfect working order. Selling due to not being needed any more. Just £12 plus postage.
Tel: Ian (01132) 629028 Email: ianmatthewuk@yahoo.co.uk

Toshiba C500D-B-11 laptop. Virtually new cost £279 will accept £150 O.N.O.
Tel: (01217) 535324

Apple Touch 32 GB iPod. Virtually new cost £199 will accept £100 O.N.O
Tel: (01217) 535324

HP 4Gb memory Microserver with two hard disc drives. £110. One with Linux MINT. Other with Linux FreeNAS. This will also run Windows 7 and Windows Server or Home Server. (Win 8 I've not tried it) Two spare HD slots with appropriate caddies. Slot for your SATA DVD drive also, (or use external usb or DVD drive if needed. 4 usb sockets on front, 2 on rear. VGA, network, power sockets on rear. Supplied in original HP box with CD and leaflets etc. Collect from Harrogate, North Yorks, or posted via Hermes for £12 (or less if I can do it). Cash on inspection and collection. (Highlands and Islands might obviously cost more on delivery)
Tel: (01423) 872045 Email: it_central@ntlworld.com

400GB IDE drive 3.5 inch formatted ready for use. Only £20 plus £3 for p&p. I can load genuine XP Professional from Microsoft with genuine certificate of authenticity for an extra £10. Refurbished.
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Amstrad PcW 9256 in good working condition with software. Offers.
Tel: John Adams (02088) 641202 Email: meeching@uwclub.net

CRUCIAL 8GB (4x2). PC3-10600 unbuff. CT25664-BA1339A. (4X2) = £48.00. (2X2) = £25.00. Boxed kit of CORSAIR Vengeance 4GB (2X2) = £35.00. Prices include P&P.
Tel: Bob Williams (01507) 602914 Email: flipinek@hotmail.co.uk

EPSON PRINTERS T715 12 multipack F.O.C. to good home, just pay postage £2.50. (Tesco equivalent original cartridges £120 current special offer!) Perfect crisp printing etc.
Tel: Pete Dew: (07526) 988594

EPSON PRINTERS T481-T486 6 multipack F.O.C. to good home, just pay postage £2. Perfect crisp printing etc.
Tel: Pete Dew (07526) 988594

EPSON PRINTERS T711 6 multipack F.O.C., just pay postage £2. Perfect crisp printing etc. May have others F.O.C. if model older than 12 months.
Tel: Pete Dew (07526) 988594

Intel 3930K processor. Used, but not overclocked. No box or fan. £220 ono. Will ship to UK address.
Tel: Tim (01623) 624509 Email tim.stirland@btinternet.com.

Apple Mac G4 Tower. 400MHZ cpu, 640MB Ram, 2xHardDrive 40GB,20GB. DVD & ZIP Drive. OS X v10.3 Panther+OS9. NO KEYBOARD OR MOUSE. £25 ono Buyer collects
Tel: (07941) 254296 Email: jasonnd@hotmail.com

Wireless Motorised IP Surveillance Camera. White In Colour - Control from your mobile phone / tablet / pc when out of the home - ideal for home security , baby monitoring, has sound and remote recording etc Brand new in Box - £25 Price includes post and packing.
Email:omendata@gmail.com

Blueberry I-MAC. Good condition, all in working order, £55.
Tel: (01386) 832758

Lexmark Printer Z601, still working and in good condition, £25.
Tel: (01386) 832758

Dell Inspiron 660 Intel i5 QUAD CORE with ACER 23 Inch LED monitor. AS NEW. Operating System: Windows 8.1. MPN:620MT. Memory (RAM): 4 GB. Hard Drive: 1 TB. Processor Type: Intel Core i5. Primary Drive: Optical DVD+/-RW, Processor Speed: 3.0 GHz, Features: Graphics Card GT620 1GB. Acer LED monitor 23" HD. £520
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Panasonic KX-P7105 mono laser duplex printer. Some toner left. Up to Windows XP only - hence £25. Buyer collects from N2, East Finchley
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INKJET CARTRIDGES suitable for Epson Printers T711 - T714 range, and T481 - T486 range. 79 pence each, plus postage. Work perfectly, good crisp printing quality.
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Powered PCI Express x1 To x16 Riser Card Extension via USB 3.0 + Power Cable Adaptor. Allows you to add an extra Pci-ExpressX16 slot to your Pc converting an existing x1 slot to x16. Useful for adding an
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Please try to keep your queries brief and limit them to just one question per letter, simply so we can squeeze in as many as we can each week. Please include relevant technical information too.

Aaron

All In One?

I've found a new program on the Internet called Windows Repair. It claims to be an all-in-one repair tool for Windows, and one that can fix all sorts of problems automatically. As someone who's far more experienced at such things, I was hoping you could provide a recommendation. Should I use this program to fix any issues, or is it best to fix problems manually?

Richard

I think the program you're referring to is Tweaking.com's Windows Repair, which is currently version 2.10.2. This is found on various download sites, and via the developer website, ***www.tweaking.com****.*

It's billed as an all-round tool that can scan your system and fix a multitude of problems, from Registry issues and permissions, to malware infections. It even comes with Malwarebytes' scanning engine built-in.

It's certainly an interesting tool, and one that a lot of people use and appear to swear by. By all reports, it can be very useful, and a quick look around various forums and feedback threads confirms that it can work. Of course, the question you ask is whether or not I use it, and can I recommend it?

Personally, I'd usually avoid it, not because of any issues with the program per se, but simply because this program, like any app that can automatically fix issues and Registry corruption, it takes you out of the equation – and it cannot know your system, and what's important. As it's an automatic process, you'll rarely know exactly what's going on, and this worries me to some degree.

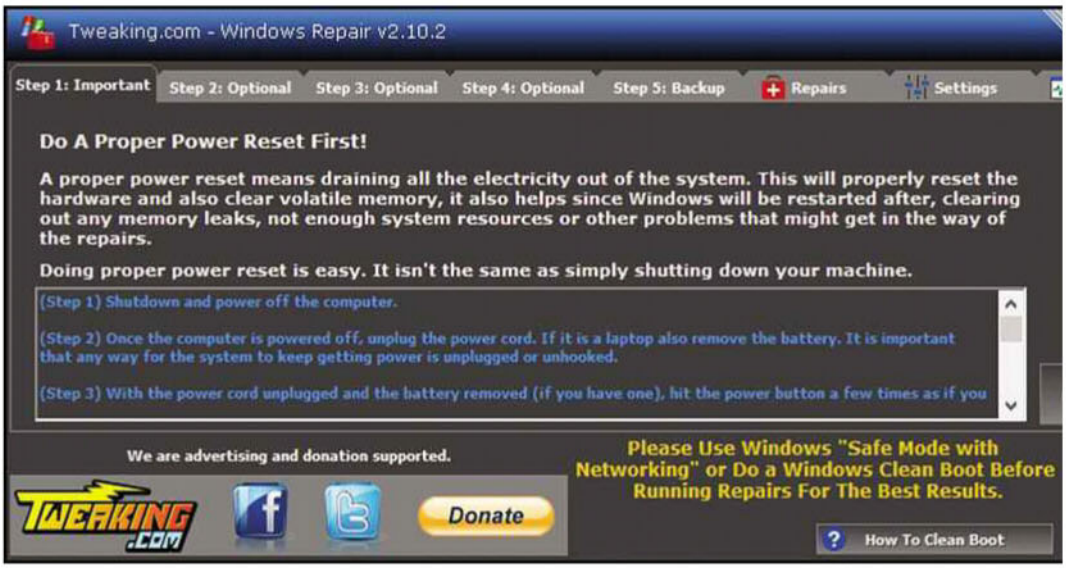
> **"As it's an automatic process, you'll rarely know exactly what's going on"**

Microsoft has fix it tools, but these are created by the OS developer, not a third party, and they often deal with a specific issue. Programs that fix a collection of problems do a myriad of things to your system in the background, and there have been numerous reports of problems arising from this approach (and I've had many letters and mails from people in the past asking how to fix issues caused by this kind of program).

The simple fact that all of these programs create system restores or backups prior to use (this program is no different) demonstrates the potential problems that can arise, and even the developers of these apps are well aware of this, often advising caution.

This is really where my answer lies. As long as you take precautions, and ensure you back up your data, create a system restore, and go into things knowing that problems could occur along the way, you may find these programs to be useful in removing some of the leg work maintaining a PC can entail. They can, indeed, fix various problems that would be difficult and long-winded to do manually, and in this regard, they're great. However, if you'd rather know exactly what's happening, or you want to learn how to fix issues, then give them a miss.

Tweaking.com's Windows Repair is a useful tool but, like all automated programs, it comes with caveats



Verification

As a long time computer user, and long time computer learner, I've picked up quite a lot of understanding over the years, and would consider myself above average. I still have a lot to learn, but can usually hold my own in most situations. I've been able to fix various problems on my own, and if I don't know what to do, I can usually find out.

In my travels I've been the victim of many driver-related errors and problems, including blue screens, and in almost all situations I've found that the solution is often hard to narrow down, even to the point of finding which driver is causing problems.

I've seen many blue screen errors, and have been unable to solve many of them, usually resorting to a reinstall in serious situations. This works, but isn't the best option, as it's both time consuming and worrying, as I'm always concerned that I forgot to back up some data.

So, I'd like to know if these are better ways to find out what drivers can cause problems, including blue screens. Surely there must be a better way than simple luck or reinstalls. I currently use Windows 8.

Lou

Drivers can, indeed, cause a lot of problems for computer users, and many BSOD errors can be traced back to troublesome driver installs. As you've discovered yourself these can be hard to nail down, and this is only made more difficult if you keep getting BSOD errors that prevent you from using the PC properly.

There are methods you can use to make things easier, though. First and foremost, always keep tabs on what drivers you're installing, and when. If it helps, keep a written record when you install new drivers, or update old ones. Then, if you have problems, you can easily narrow it down to a recent change, as this will often be the issue. By uninstalling recently changed drivers, you'll often be able to fix issues.

Another useful tool is System Restore; in some situations this can be a life-saver, as it can undo many changes that may cause problems, rolling back your PC to a more stable state. This doesn't always work, of course, but if used properly, can be a great help.

Finally, you can make use of a hidden Windows tool called Driver Verifier Manager, an application designed to help software and driver developers test out new drivers for stability. It's a stress tester that pushes drivers to their limits to see if they'll cause problems, which can also help identify problems. It is an advanced tool, though and could cause your PC to become unbootable, which can lead to additional troubleshooting. So, this is a perfect example of try at your own risk.

Before using the verifier, always create a new restore point using system restore, and back up any important data you just can't lose. This is always advisable when attempting system-level changes. It's always better to be safe than sorry, after all.

Once you're prepared, press Windows+X to bring up the mini Start Menu, and then select 'Command Prompt (Admin)'. Once at the command prompt, type 'verifier' and press Enter. The Driver Verifier Manager will open up. You'll see quite a few options, most of which are intended for advanced development use.

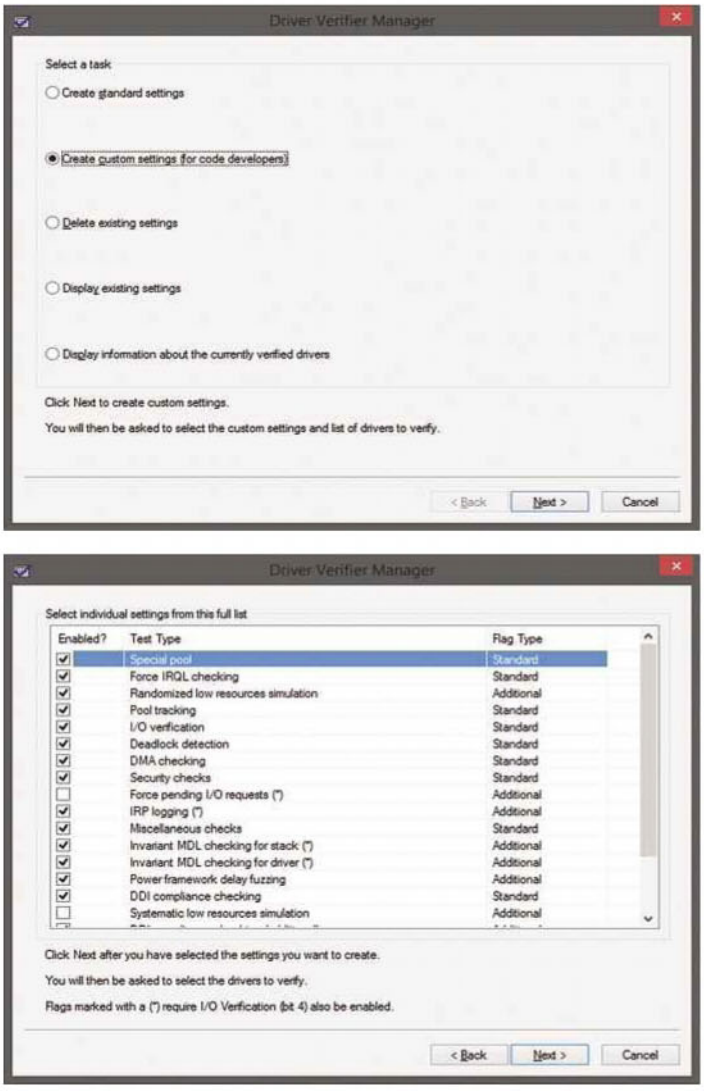
From the list, select 'Create custom settings (for code developers)' and then click Next. On the next screen, pick 'Select individual settings from a full list' and click Next. You'll now see a list of checks. You need to select all of these, but make sure you leave 'Force Pending I/O Requests', and 'Systematic Low Resource Simulation' unchecked, as these can push your system too far and are not really needed.

Click Next a couple of times and pick the option to 'Select Driver Names from a list', and click Next again. The following screen will show a list of installed drivers on your system, many of which you should recognise, along with all of the Microsoft items. If you've had errors, and you know the name of the driver file, select it here, along with any others you're not sure of if you don't know the driver name. If you're really not sure, a good tactic is to select everything, leaving Microsoft items unchecked.

When you've selected the items you want to check, click Finish and reboot the system. The Driver Verifier will now run in the background, testing drivers constantly to try and crash them. If a driver issue is found, this can produce BSOD error, so be warned. I'd advise you don't use the PC for anything important while this check is running, as you may lose data. BSOD errors you may encounter could also prevent you from booting into Windows, and you may need to use Safe Mode to recover. So be sure to have a rescue or Windows install disc ready.

If you do get an error, then reboot back to Windows and keep going, so you can try and replicate the error. This is a sure fire way to do so, and as it's used by professional driver programmers as a test, it's a perfect way to narrow down issues. Once you confirm a problem driver, you'll be able to take whatever action you need, such as removing it. You may also need to use the memory dump file the verifier creates to investigate the problem. You'll find this in C:\Windows\minidump.

Once you've finished with the verifier, be aware that it runs permanently until you disable it. To do this, open a command prompt (again, with admin rights), and type 'verifier /reset' and press Enter. This will deactivate the verifier, and your PC will return to normal.



Windows' Driver Verifier is a great tool for advanced troubleshooting, and is used by driver developers

ASK JASON

Meet Jason D'Allison, a veteran of Micro Mart's panel of experts. He's here to help with any technical questions, including anything to do with tablets or smartphones, as well as PCs

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While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

Bitter Sweet

Last week I received the update to Lollipop (Android 5.0) on my Nexus 4 phone. Since then I've had nothing but trouble. Skype no longer works – I can call but there's no ring at the other end. Every time I switch the phone off, the security tool Lookout thinks the SIM card's been removed and so takes a photo and sends me an email. And my ZDbox widgets are *so* unstable, often forcing a reboot. The list of problems goes on and on, and I'm finding more every day.

I get the feeling that Google has rushed the release of Lollipop in an attempt to keep up with Apple. Any ideas on how I can improve matters? How I wish I could go back to KitKat (Android 4.4.4)!

Francis Kinsler, Gmail

Sadly, you're not alone, Francis. Lollipop is causing headaches left, right, and centre. Nexus and Google Play devices are Google's own babies, so you'd think that they at least would be problem-free when updates are released. Not so, it seems. Mind you, they're also the first devices to receive the updates, so they're always likely to be the ones with the most teething troubles.

Lollipop introduces lots of user-interface tweaks, but the main change is under the hood. In previous versions of Android, apps are executed under the Dalvik virtual machine, but in Lollipop they're executed by the ART runtime environment (see ***bit.do/VpyE*** *and* ***bit.do/VpyJ*** *for the technical stuff). Dalvik has been a thorn in Android's side for years, often cited as the cause of general lagginess. ART should herald significant improvements.*

It's a massive change, though. The problems you're facing are less to do with Lollipop and more to do with compatibility. Many apps simply aren't taking well to the move to ART, and until those apps are updated, trouble is inevitable. I expect Google knew there'd be issues but saw no alternative but to push ahead and weather the storm. The recent update to Android 5.0.1 may have helped you some.

I don't agree that Google is attempting to 'keep up' with Apple. By most measures, it's already ahead and has been for a couple of years. The iPhone is more of a follower these days, not a leader. And then there's market share (for smartphones): ***bit.do/VpHf****. Also, iOS hasn't been without its problems. Version 8.0.1 caused so much grief for iPhone 6 and iPhone 6 Plus users that Apple had to pull it entirely, quickly rolling out version 8.0.2. Given that iOS 8.x only has to work on 15 different devices – Android Lollipop has to work on potentially thousands – that's quite alarming.*

▲ *Is Android unstoppable?*

The Big Issue

If you haven't realised yet, this is the final Micro Mart before the chunky fella in the red suit rides into town. There's now a two-week gap before the next issue. I know it'll be tough to get through that second week without your usual techy fix, but I'm sure you'll cope.

I'll sign off this issue, then, by wishing each and every one of you a very merry Christmas. The next Micro Mart arrives in 2015, so I'll also wish you all a happy New Year. Enjoy yourself, my friends. Eat, drink, argue with the in-laws, watch *The Great Escape* on the telly (it's certain to be on), and try not to break any new geeky gadgets you receive. See you next year!

Oh, one last thing. If you want to see that chunky fella in the red suit actually riding through the skies (sort of), visit **bit.do/Vrd3** and find out when and where to look for the International Space Station on Christmas Eve. Unless there's heavy cloud cover, it should be highly visible for several minutes over the UK in the early evening, beaten in brightness only by the moon. Could be quite magical if you've got young children – and even if you haven't.

Split Personality

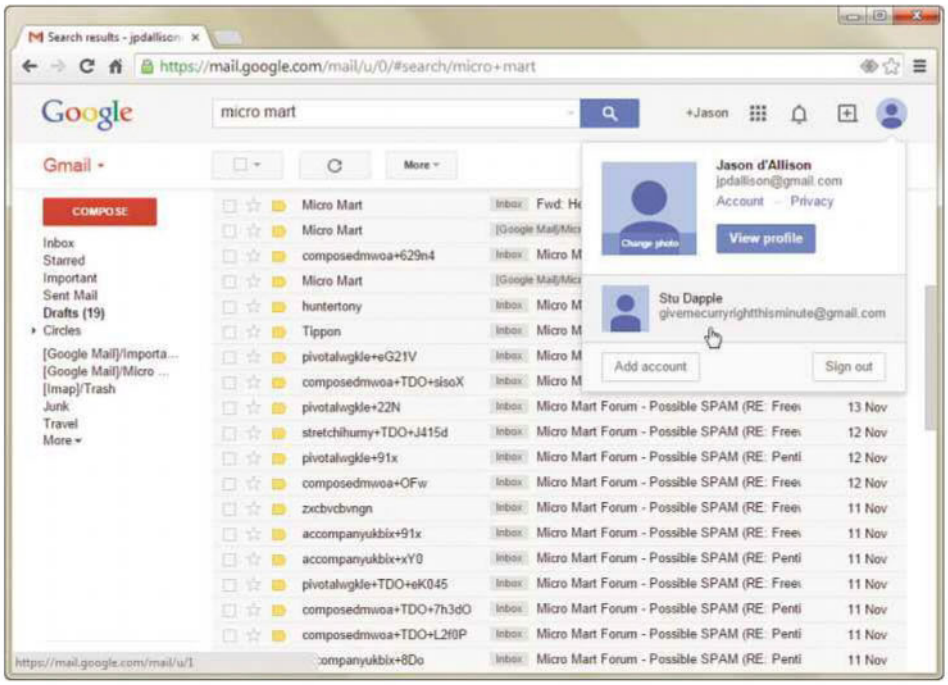
I have three Gmail accounts – one personal and two for business – and on Android on my phone or tablet I can switch freely between them. I just touch the account name at the top and pick a different account from the list. There appears to be no such feature in Gmail on the desktop, however. I have to log out of one account and log into another, which to say the least is a right old pain. Is there really no better way?

B Blower, Gmail

Good news, my friend. There is indeed a better way. In the Gmail browser tab, click the link for your account settings. This is top-right. If you subscribe to Google+, the link will be your photo or the default head-shot icon; otherwise, it'll just be your email address. In the pop-up that appears, click 'Add account'. A new browser tab will open – just sign in to one of your other accounts. Repeat for the third account.

From now on, whenever you click the settings link in any of your accounts, you'll see a list of the other accounts. Whenever you boot up and log in to Gmail, your best bet is to click the other account links straight away, giving you a tab for each one. You can then switch between tabs as and when needed, with no faffing about.

Here's how to switch between Gmail accounts quickly and easily



What's In A Name?

My laptop's given up the ghost, so I'm after a new one (15.6"). I don't need anything especially powerful – the old one used a Core Duo (not a Core 2 Duo) – and my budget is about £200. There are lots of laptops around that price or less, but I'm worried about the CPUs they use. Many seem to use the Celeron N2830, which I think is dual-core and runs at 2.16GHz. Would this be fast enough for everyday tasks? On slightly more expensive laptops, I've seen quad-core Pentiums – I didn't know they even existed. Would one of those be a lot better?

Walter, Greater Manchester

As you've found, most sub-£200 laptops use Celerons with model codes starting with N. That makes them Bay Trail-M chips – basically, Intel's new Atoms. Most are dual-core, though a few are quad-core. Again, as you've found, systems costing about £50 more sometimes use N-branded Pentiums – pretty much the same thing, but all are quad-core.

These latest 'Atoms' are remarkable compared to the older ones. They're essentially Intel's most recent attempt to make x86 competitive with ARM in phones and tablets, and in that regard they fare well. Benchmarks comparing them to 'proper' laptop and desktop Celerons and Pentiums are scarce, though.

From the figures available and from my own experience, however, it seems only the quad-core N-branded chips are a match for their Ivy Bridge and Haswell counterparts (clock-for-clock). Those counterparts are all dual-core. By that measure, the dual-core N-branded chips are 50% slower. In both the dual-core and quad-core models, the integrated HD Graphics engine gets a crippling too – just four execution units instead of ten.

Shouldn't you buy a sub-£200 laptop, then? Well, as always, Walter, it depends what you'd be using it for. For basic stuff – web, email, word-processing, Facebook, music and video – it'd be adequate (on a par with your Core Duo machine). Windows wouldn't be especially fluid, though – some applications might take a while to launch. It'd struggle with multi-tasking too. Watching a 1080p video in one window and playing Candy Crush Soda Saga in another might well induce lag.

To be safe, I recommend saving up £50 more and buying a laptop with an Ivy Bridge or Haswell chip – a Celeron or Pentium with a model code ending in M (or sometimes E, U, or Y). I wouldn't go lower than 2GHz. As you've mentioned, £250 should also put you in the realm of laptops with quad-core N-branded Pentiums, but I'd avoid those on the basis they'll have crippled graphics.

Are the CPUs in cheap laptops really up to the job?

Crowdfunding Corner

If you can imagine your ideal audio hardware, someone, somewhere is probably trying to crowdfund it... Here are just two of the latest options

i-box Slix Splashproof

One of the irritating things about Bluetooth speaker units is that the vast majority don't work in stereo. This makes it hard to position them and keeps your sound restricted to a narrow focus projected directly in front of the speaker. The i-box Slix is a speaker project that seeks to solve this problem, as well as a couple of others.

The plan was to develop versatile and durable speakers, and the results speak for themselves (no pun intended). The units are ultra-light and portable, and if you've got two units you can pair them so that they function as a left and right stereo speakers, all over a single Bluetooth connection.

In addition, the units have a splash-proof rating of IPX5, meaning that you can carry it with you and listen to your favourite music, whatever the weather. The rating literally means that it offers protection from "a 6.3mm spray of water up to 12.5 litres per minute' – which in real terms means you can take it almost anywhere without worrying about normal environmental factors that would affect your electronics. Just don't go deep sea diving with it!

The UK-based manufacturers have already completed a small trial run and are now planning to put the speakers into mass production. You can get a single unit for as little as £30 (RRP £60) with the early-bird offer, and a pair of units costs just £60 (RRP £100). Other tiers are available, and delivery of the product is estimated to happen in April 2015, as long as it hits the £20,000 target within two months. Seems doable!

URL: kck.st/12JfzkN
Funding Ends: Sunday, February 1st 2015

CHIPS

Kickstarter veterans Outdoor Tech previously delivered the Turtle Shell and Big Turtle Shell Bluetooth speakers on the back of successful campaigns. So, after conquering the world of ruggedized outdoor Bluetooth speakers, it seem logical that it's now turning its attention to headphones.

According to the project page, the design of the CHIPS universal headphones was born from "the constant frustration of trying to listen to music, make/take calls, and ask Siri those ever important questions" while outdoors. They designed their dream, all-in-one headphones, including huge 40mm drivers, over-sized buttons that allow for gloved operation, and a built-in mic so that you can take phonecalls without having to get your phone out of your pocket.

Although the headphones are designed to fit inside headgear using the internal Velcro pouch, they also come with a traditional headphones-style exo-skeleton so that you can use them like you would any other pair of headphones. They're not just a niche product!

Early backers can get a full set of headphones and accessories for $90 with shipping anywhere in the world, which is a more than reasonable price – especially when you consider that the retail price of this set will be $165. In fact, that's a huge bargain! They're already well past the $30,000 goal with almost two months to go, so back now and see where the success takes them!

URL: kck.st/1B1lm1j
Funding Ends: Saturday, January 31st 2014

Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

Super Splatform

David Hayward get some platforming on this week

Those hard working developers at P1XL have done it again: another retro-looking and thoroughly entertaining Android and iOS game that's just too addictive for its own good.

With the developer's tell-tale NES-like graphics, *Super Splatform* is a remake of the Commodore 64 title *Splatform* from 2002, which was a hidden Easter Egg in the coding of the C64DTV joystick.

Combined with the wonderful retro graphics is an equally wonderful chip tune to accompany you as you slowly go mad while trying to get to the end of the level.

Splat-tastic

If you thought *Flappy Bird* was addictive, then *Super Splatform* will probably require you to check into rehab.

The idea is to guide your bouncing ball through each level, moving from left to right and using the platforms to bounce to the next.

The platforms can lead you down the screen or up or even in a complete circle. If you finish the level without falling off a platform and into the abyss, then you hop onto the last section, and you can advance to the next level. If you do fall, then it's back to the beginning platform to start all over again.

Throughout each level, you'll come across a coin, which can be collected to unlock extra bonus levels and difficulty settings when in the infinite mode. And if you're clever enough, then you could find a shortcut through the level to limit the number of bounces you took and earn yourself a golden trophy.

Modes Of Fun

There are three different game modes to choose from: Super, Classic and Infinite.

Super is the normal game, with colour, chip tune, coins and levels, etc. Classic has you view the original C64 BASIC load followed by the original game itself. And Infinite mode has you trying to bounce as high as you can up the screen through a combination of classic C64 and Super NES style graphics.

All these modes are extraordinarily addictive and very playable indeed. It's the kind of game that makes you want to try 'just one more time', before kicking yourself for missing the platform for the umpteenth time – and then trying again.

Conclusion

Super Splatform is a great little title that's cleverly designed, well programmed and is cunningly, infuriatingly and devilishly playable.

There are hours of fun to be had here and makes you want to dust off the old C64 or NES for a spot of some old school platforming.

So for just £1.27, you can enjoy some great budget gaming and a game that will keep you amused during the commute to work or when you're supposed to be getting reviews out to the editor of a weekly IT consumer magazine who wants you to finish on time so he can secretly have a go himself. All in all, great fun.

Features At A Glance

- Three control schemes: two thumb, tilt and swipe, with adjustable sensitivity.
- Bouncy chiptune soundtrack: eight unique NES-style songs.
- Find shortcuts through the levels to reduce the number of bounces and earn a gold ranking.
- Unlock bonus levels by achieving a silver or gold ranking on all levels.
- Collect the coins on each level to unlock extra difficulty levels in Infinite mode.

Guide your bouncing 'thing' through increasingly difficult levels

Super Splatform: so addictive you'll need therapy after playing it

Now there's a screen we've not seen for a while

Logging Off

Do you ever get the feeling that you're sleepwalking into something that you'll regret later? I do. Especially when I come across another smartphone that can barely make it through a whole day without needing another recharge.

My first mobile phone was a company provided Nokia with a standby time of 650 hours, and now a single day seems something of a stretch. How did we go from changing once a week to charging once a day?

It wasn't a sudden transition. We've moved in the past 15 years from one extreme to another, mostly based on our seemingly insatiable appetite for all things colourful and twinkly. We also, if you haven't noticed, have a compelling urge to endlessly play with our phones for really no purpose whatsoever.

The best the old Nokia could do was a modest game of Snake, but a modern phone has graphics and video performance that a decade-old gaming PC would find hard to equal.

As fast as the ARM and GPU designers make power savings, we're squandering them on animated wallpaper and background tasks.

Phone makers worked out some time ago that battery technology, even using fuel cells, wasn't going to improve sufficiently to send these standby times in the opposite direction and instead worked on making charging easier.

With Qi pad charging here now and potentially contactless power solutions coming, there seems little or no interest in solving this problem at source.

Our phone expectations are that we should have the equivalent of a gaming mainframe in our pockets that we can use all day and never recharge, regardless of how unrealistic this is.

In this situation, it's easy to blame the designers of these devices, but I really think the buying public needs to take some responsibility for encouraging such silliness. If you look at tech companies, there are those who listen to everything their customers say and others that are entirely tone-deaf.

But in a significant number of instances, it could be that companies pay a little too much attention or fail to balance that with practical product testing. A good example would be Microsoft, which, swayed by the huge iPad sales that Apple achieved, decided that its next customer would pick touch over any other form of control.

Given that it was selling to an established mouse and keyboard driven market, this now seems utterly absurd, but it somehow

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convinced itself that this was the future.

Actually, looking at some of the presentations it gave, it believed that Microsoft decided the future, and customers play their part by buying it.

If it performed the same analysis now, it would note that tablet sales growth has flatlined, and the expanding market in education is the humble Chromebook. A company with less hubris might see opportunities with a Surface-G, repurposing the Surface 2 with Chrome on it. But I doubt we'll see that product officially.

For our part in this relationship, we need to stop accepting products that will be better in the next generation or that don't do what they're sold to do.

These companies don't usually meet the low standards we set them, so perhaps it's about time we started holding them and their products to even higher ones. Otherwise we're doomed to be unpaid beta-testers for the foreseeable future.

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: **7** Laminar Flow, **8** Escape, **9** Occupy, **10** Cookies, **12** Oscar, **14** Meows, **16** Checked, **19** Effort, **20** Exempt, **22** Overvaluing.
Down: **1** Plus, **2** Embark, **3** Integer, **4** Argon, **5** Clicks, **6** Two-Phase, **11** Overflow, **13** Wheedle, **15** Woofer, **17** Credit, **18** Stave, **21** Page.

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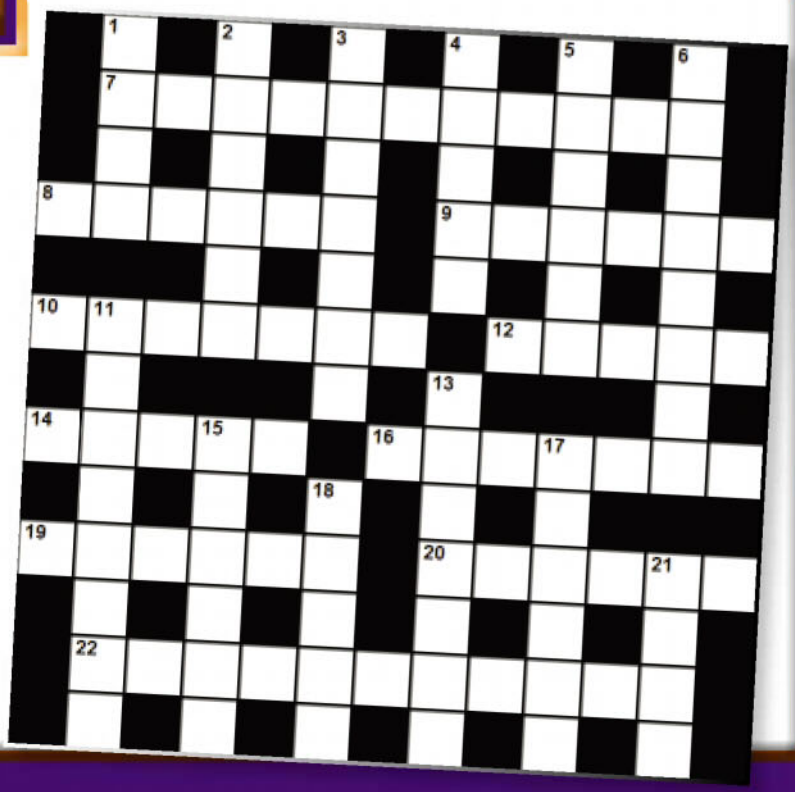
It's officially Nearly Christmas in the Micro Mart shed. Our 100% genuine imitation tree has been dragged down from its place of slumber in the attic and, as we type, is standing proudly in the corner of the room, completely unadorned. No, we haven't outstretched the wire branches, but the fact it's up at all is something worth celebrating. Indeed, as part of these celebrations, we've bought some presents for people, but not one of them is wrapped, and we have boxes of blank greetings cards waiting to be filled. Yes, the Nearly Christmas season is truly in full swing, and we're all not quite feeling the festive spirit. If you listen carefully, you can just hear the faint humming of Santa Claus is Coming to Town (in a Couple of Weeks) floating around the office, and you can perhaps smell a hint of brandy in the air (although, to be fair, that's nothing to do with Christmas; it's just what we put in our coffee on a Friday afternoon). Merry Nearly Chistmas, one and all.

THIS WEEK'S CROSSWORD

Across
7 With little or no preparation or forethought. (11)
8 .mw tld. (6)
9 Software application capable of transferring digital audio files from a CD or DVD to a hard drive. (6)
10 A track on a map connecting points with the same value for variables such as temperature or air pressure. (7)
12 State or assert that something is the case, typically without providing evidence or proof. (5)
14 A device that is controlled by another device. (5)
16 +1 (4,3)
19 An awkward task requiring extra care and skill. (6)
20 Rebounding from an impact. (6)
22 A stable situation in which forces cancel one another. (11)

Down
1 The sixth letter of the Greek alphabet. (4)
2 A Christian missionary to the Gentiles and author of several Epistles in the New Testament. (2,4)
3 An advertising technique that makes use of sites or objects other than the established media. (7)
4 Intel co-founder whose 'law' states that the number of transistors in a dense integrated circuit doubles approximately every two years. (5)
5 American international e-commerce business allowing payments and money transfers to be made through the internet. (6)
6 The Titan of light, the father of the sun, the moon and the dawn. (8)
11 Employees receiving fixed regular payments rather than wages. (8)
13 Dominant Chinese internet-based e-commerce company. (7)
15 A space entirely devoid of matter. (6)
17 A place where music, film or sound recordings are made. (6)
18 In alternating current, the change of the poles from negative to positive and back. (5)
21 A technique used mainly with personal communications devices such as mobile phones that digitises the conversation and tags it with a special frequency code. (Abbr) (4)



The Things That Frustrate Us About... Mobile Phones

We wouldn't leave the house without one, but sometimes, mobile phones are really irritating

Everything that's good about mobile phones is also what's bad about them. Our phones mean that we can be in touch with people all the time – and that means we can keep working wherever we are. Having a phone means you can tell someone if you're running late – but also tends to mean we don't worry so much about being on time. Being in constant contact means you never have to be bored, but also that it's hard to wrench yourself away sometimes. On balance, we'd probably never give up our smartphones… but they do annoy us. Here's why.

What? No Signal

It's 2014, and for about the last ten years we've been taking the mickey out of horror films using the "oh no, we've got no signal!" cliché when their characters are in peril. It seems like there shouldn't be anywhere you can't get a signal any more, but there is, and not just middle of nowhere rural retreats, either. A recent trip to visit family confirms that yes, the countryside is a prime 'no signal' location – and sometimes it's hard to get a signal in the middle of London, even. How is that possible? It's always when you most need to make a call or send an email, too. Argh!

Fix it: There's not much you can do to improve your mobile signal, but you could try finding a wi-fi hotspot in an emergency. If you're a BT customer, you can use your login to connect to BT hotspots, and they're pretty much everywhere; O2 lets even non-customers use their wi-fi for free, though hotspots are harder to find. There are apps for both BT and O2, though, to help you find your nearest connection.

Nrgh! No Battery Life

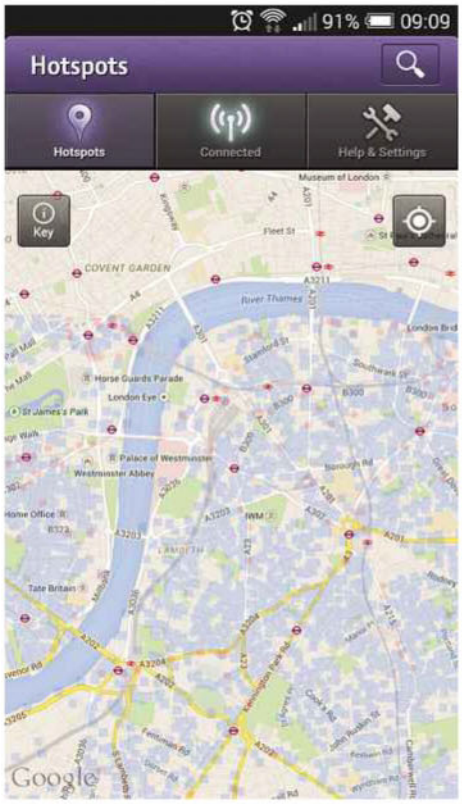
Once upon a time, when the Nokia 3210 was still the coolest phone you could possibly imagine, phone batteries would last for days – or even weeks – at a time. Then the iPhone came along and now smartphone users are lucky if they can get a full day out of their phone's life. Partly this is because we use our phones for so many more things, of course – we don't just call or text and leave it at that, we're surfing the web and checking directions and all sorts of other things – but also it's because those huge screens we seem to love so much can't help but eat a lot of battery power. It's super annoying to have to hunt for a power point when you're out and about, though.

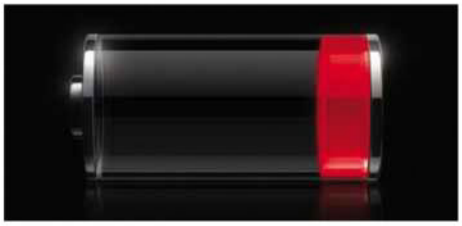
Fix it: Depending on what model of phone you've opted for, you could carry a spare charged battery. That's not possible with iPhones, of course, because their cases are sealed. If a spare isn't an option, maybe consider investing in a solar or wind-up phone charger and keeping it on hand – and change the power saving settings on your phone, too, to get a bit more juice out of it.

Argh! They're Everywhere

This is more about other people's mobile phones than our own, to be honest (isn't it always), but ever since smartphones became commonplace it's as if you can't go anywhere without seeing hundreds of lit screens! We check our phones in restaurants, waiting for our food; at bus stops, waiting for the bus; on trains, waiting to get where we're going; and if we're really obnoxious, even in cinemas, while the film's playing. Actually focusing on where we are and what we're doing is rare.

Fix it: Maybe we need to wean ourselves off our phones a bit? It's hard though. Try going to a restaurant or bar below street level if you need a break from it. No signal means no phones out.





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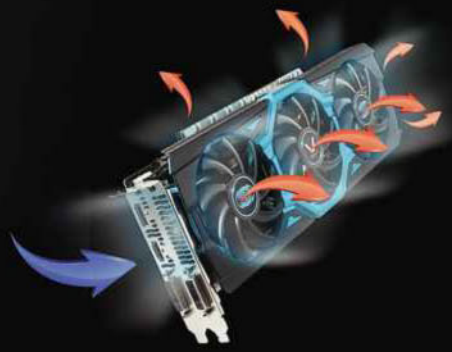

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