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06 High-end Processors

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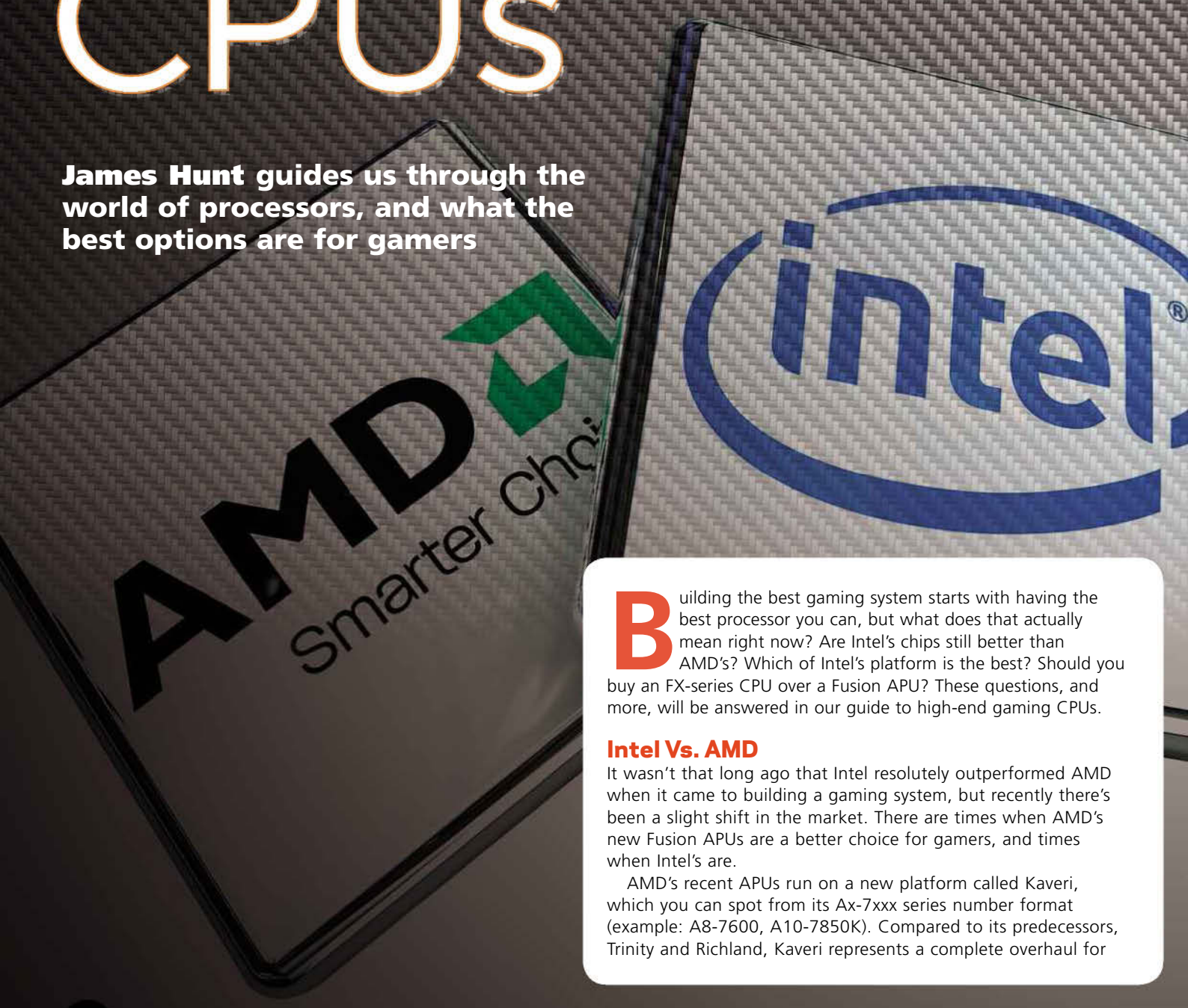
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HIGH-END GAMING CPUs

James Hunt guides us through the world of processors, and what the best options are for gamers

The background of the page features two processor boxes. On the left, an AMD box is visible with the AMD logo and the slogan "Smarter choice". On the right, an Intel box is visible with the Intel logo. The boxes are slightly out of focus, emphasizing the text in the foreground.

Building the best gaming system starts with having the best processor you can, but what does that actually mean right now? Are Intel's chips still better than AMD's? Which of Intel's platform is the best? Should you buy an FX-series CPU over a Fusion APU? These questions, and more, will be answered in our guide to high-end gaming CPUs.

Intel Vs. AMD

It wasn't that long ago that Intel resolutely outperformed AMD when it came to building a gaming system, but recently there's been a slight shift in the market. There are times when AMD's new Fusion APUs are a better choice for gamers, and times when Intel's are.

AMD's recent APUs run on a new platform called Kaveri, which you can spot from its Ax-7xxx series number format (example: A8-7600, A10-7850K). Compared to its predecessors, Trinity and Richland, Kaveri represents a complete overhaul for



VS.



AMD's Fusion processors. Most importantly for gamers, Kaveri contains a more powerful integrated GPU specifically designed to improve gaming performance. Not a bad idea, given how thoroughly Intel has trounced its kit for the last few years.

Indeed, at its price point, the A10-7700K APU is arguably better than Intel's chips if you want to save money by skipping a graphics card. The Kaveri architecture contains an integrated Radeon R7 GPU, which has better graphics capabilities than both the equivalently priced Intel chip, the Core i3-4340, which has an Intel HD 4600 GPU, and the equivalently priced AMD FX-series chip, the FX-8320, which lacks a GPU. They also officially support 2133MHz RAM clocks, which is an attractive quality for gamers.

That said, both of these CPUs are superior to the A10-7700K when paired with a graphics card. Indeed, if you have a separate graphics card, you can even look to the preceding line of Fusion APUs for a more powerful chip. The Richland-based A10-6800K is a stronger CPU, but with a weaker GPU. This means that in general, Richland chips are less attractive than Kaveri for stand-alone gaming, but more attractive if you already have a separate graphics card that's better than the Kaveri's integrated GPU.

For reference, the Radeon R7 GPU in Kaveri chips is considerably more powerful than anything Intel offers. It's capable of running most games in full HD resolutions (with some settings turned down) whereas Intel's HD graphics is strictly a low-end, non-gaming solution. All of this means that if you're after a competitive mid-range gaming system at a good price, Kaveri might actually be a good choice to make.

However, once you get to the point of actually needing a separate graphics card – and that's the kind of system we imagine most gamers reading this would be looking to create – Intel's chips are once again in the lead. The Haswell-based Core i5 chips aren't just faster than Kaveri APUs, they also have a lower TDP (Thermal design power), meaning they require less power to run. Obviously, the combination of a Core i5 and graphics card will require more power than a Kaveri alone, but combine the Kaveri with the same graphics card and it'll cost more to run, and place more stress on the PSU. That's just one extra reason, aside from raw speed, why Intel's chips are better once the GPU is discounted.

Even AMD's FX-series chips, which omit a GPU in favour of faster multi-core processing, can't compete with Intel's core chips. The AMD FX-8350 is one of AMD's Core i5 competitors, but as with other FX-series chips, it's good at multi-core tasks and has poor single-threaded performance. Most games are single-threaded and use no more than four cores, which is why Intel's chips clean up. By comparison, the eight-core FX-8350 is left twiddling its thumbs, and has a considerably higher TDP

to boot – so it's more expensive to run and heats up a system more. Neither prospect makes it attractive.

Intel's Core i5 and i7 CPUs also have the obvious benefit of being overclockable, at least if you choose a 'K' version of the chip and team it with an appropriate motherboard. Haswell CPUs aren't quite as resilient as the Sandy and Ivy Bridge models that came before them, but they can still go like the wind with extra cooling, which is something AMD CPUs can't do as convincingly.

We should note that Ivy and Sandy Bridge CPUs, while still available, aren't necessarily good choices for new systems, or system upgrades, unless you're already tied to that platform by hardware you don't want to replace, or can't afford to replace. Haswell CPUs cost the same as previous generation Intel Core chips, but they're considerably faster (8% faster than Ivy Bridge, 17% faster than Sandy Bridge) and use much less power. An idle Ivy Bridge CPU consumes an average of 11W more than an idle Haswell CPU.

“ Multiple cores aren't much use for improving gaming performance beyond a certain point ”

Best Haswell Chips

At the high-end of Haswell CPUs, you'll find the Core i7 range. These chips are expensive, but their capabilities (quad-core with Hyper-Threading) help make them some of the fastest consumer CPUs on the market. Of course, as we've established, multiple cores aren't much use for improving gaming performance beyond a certain point. Furthermore, with a high-end cooler you can overclock a Haswell Core i5 so that it runs almost as well as a Haswell Core i7, saving a bunch of money in the process.

That assumes, however, that you don't mind the risk of pushing a CPU to the limit. If you want high-end performance and aren't worried about cost, or don't want to risk burning out your CPU, then a Haswell Core i7 is the choice you want.

Again, compared to AMD's chips they're stunning. A Haswell Core i7-4771 has a TDP of just 84W. Compare that to the eight-core FX-9590 – one of AMD's fastest – and you'll see that the AMD chip has a TDP 136W higher. In fact, it needs a full 220W when under full load! That's a lot of extra power consumed and heat generated, with all the attendant problems such things



“ **There has to be a reason for Ivy Bridge E to exist alongside Haswell, so what does Ivy Bridge E offer that Haswell doesn't?** ”

cause. Most AMD motherboards struggle to supply that much power, and you'll need a lot of cooling to keep it happy. Add to that the fact that the its gaming performance will barely touch that of the Core i5, let alone the equivalently priced Core i7s, and it's easy to see why AMD struggle with gaming.

Ivy Bridge E Vs Haswell

At the high end of the processor market, Intel has both its specialist platform, Ivy Bridge E, and its Haswell Core i7 chips. If you're building a new gaming system, you might reasonably want to know which of these is the better choice. One's newer, but the other's designed to be the fastest platform around; so which do you go for?

Confusingly, Ivy Bridge E chips have the same i7-4xxxK serial numbers as Haswell CPUs, even though they run on older architecture. Ivy Bridge E chips are essentially identical to Ivy Bridge Core i7 chips, with one difference: they have two additional cores unlocked, for greater performance. Six in total, with hyper-threading. Two extra hardware cores might sound like a big deal, but it's worth noting that this only has an effect on multi-threaded applications. Most games are single-thread affairs, unable to take full advantage of multiple hardware cores even if they are available.

On the surface, either platform would seem to be an effective choice for high-end gaming. As well as improving power usage and speed over Ivy Bridge chips, Haswell CPUs have added support for new technologies and instruction sets not found in Ivy Bridge E. But those additions tend to be obscure at best. In fact, a bigger problem with Ivy Bridge E isn't that the chip is older – it's that the motherboard you're using will be older too.

Ivy Bridge E chips use X79 chipset motherboards, which are both more expensive and lacking in features compared to the average Haswell motherboard. There are fewer USB3.0 and SATA

6GB/s ports, for example, which might not affect gaming but can affect the general practicalities of a system build.

Furthermore, Ivy Bridge E uses the same socket type (LGA2011) as its predecessor, Sandy Bridge E, whereas Haswell chips use the newer LGA1150, the same as their planned successor, Broadwell. Usually, this would mean that you could put Broadwell chips in a Haswell board, meaning they have a clearer upgrade path. However, there are suggestions that this will not be possible due to an upgrade in the motherboard chipsets. Nothing will be clear until the chips come out. (You would, however, be able to upgrade your motherboard and retain the original chip should you so desire, which gives some leeway with regard to a graduated upgrade path.)

One thing that's definite, though, is that the forthcoming Haswell-E platform will use Socket LGA2011 but NOT be compatible with Ivy Bridge E motherboards. So if you're trying to decide which platform to go for, you've got the choice of a probable upgrade dead-end in Haswell, or a definite one in Ivy Bridge E. Not the most tempting offer, but it's clear which one makes the most sense.

But clearly, there has to be a reason for Ivy Bridge E to exist alongside Haswell, so what does Ivy Bridge E offer that Haswell doesn't?

Primarily, it's support for the absolute high-end of gaming technologies. Ivy Bridge E motherboards support quad-channel RAM, meaning you can use four sticks as a single unit to reduce lag and improve throughput. Haswell boards are limited to dual-channel setups. All Ivy Bridge E boards also support dual 16x PCIe lanes, meaning they're automatically set up for multi-GPU systems. They also have more Level 3 cache, but this



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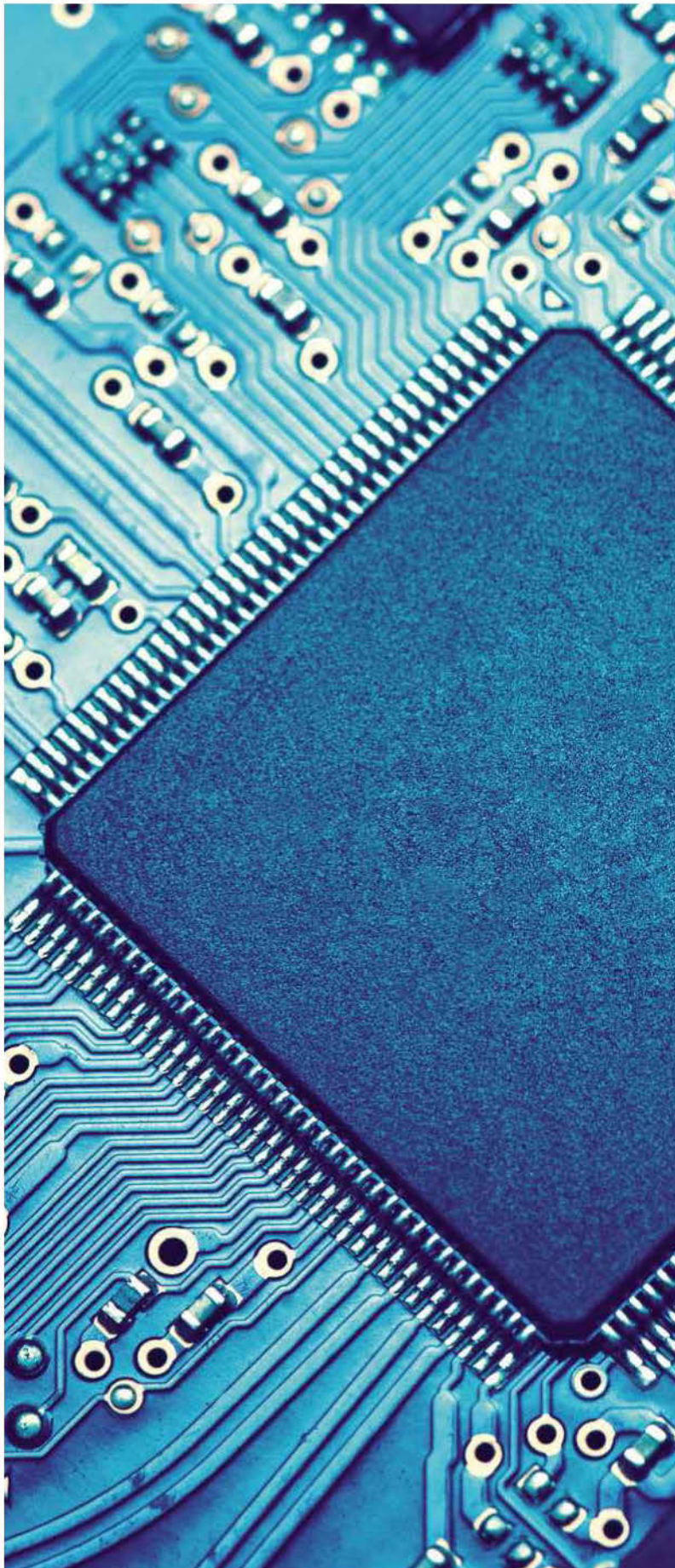
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doesn't make much of a dent in gaming performance, practically speaking.

The Ivy Bridge E chips do offer notionally faster performance out of the box – the Ivy Bridge E-based Core i7-4960X is 200MHz faster than the equivalent Haswell chip, the Core i7-4930K. But the latter can be overclocked, and you could easily get the Haswell chip running as fast as the Ivy Bridge chip using its own cooler.

So really, Ivy Bridge E is useful for creating systems with excellent multi-threaded performance using legacy hardware. When it comes to gaming, Ivy Bridge E CPUs are no quicker than Haswell chips, and the platform they run on has significant practical disadvantages that gamers are likely to rub up against. Unless you've got a specific need for good multi-threaded performance, then you should choose a Haswell system over an Ivy Bridge E system every time.

“Haswell E will be the first Intel consumer platform with an eight-core design”

What Next? Broadwell & Haswell E

If you're planning an upgrade, it's always worth asking whether the next generation is close to release, and whether it's worth waiting for. In this case, that means waiting for either Intel's Broadwell platform or Haswell E.

Broadwell isn't expected until towards the end of the year, so there's little sense in waiting for its release if Haswell currently looks like an attractive upgrade. The die-shrink to 14nm will mean power consumption drops by about 30%, but Broadwell will be a refinement of Haswell. Expect slightly lower temperatures and around a 5-10% increase in CPU speeds. Hardly worth waiting for.

But Haswell E is another matter. Due for release towards the end of this year, if not next year, Haswell E will be the first Intel consumer platform with an eight-core design and support for the latest memory technology, DDR4. This could offer significant advantages for gamers looking to improve performance in a significant leap.

It's likely that DDR4 won't come to 'mainstream' platforms until Broadwell's successor, so the fastest memory performance will only be available on Haswell E. Expect to pay through the nose in more ways than one. The chips won't be cheap, the RAM won't be cheap, and the new X99 motherboards won't be cheap – but unlike Ivy Bridge E, we expect the improvements to be significant.

Building a high-end gaming system remains the kind of gamble most people would rather not take (after all, the mid-range of the market is better priced and more stable), but hopefully we've given you a decent crash course in picking the right CPU for your high-end system. Just remember not to get too caught up in the speed hype. Stick to your budget and once you're playing games you won't care if there's a slightly faster chip around. [mm](#)



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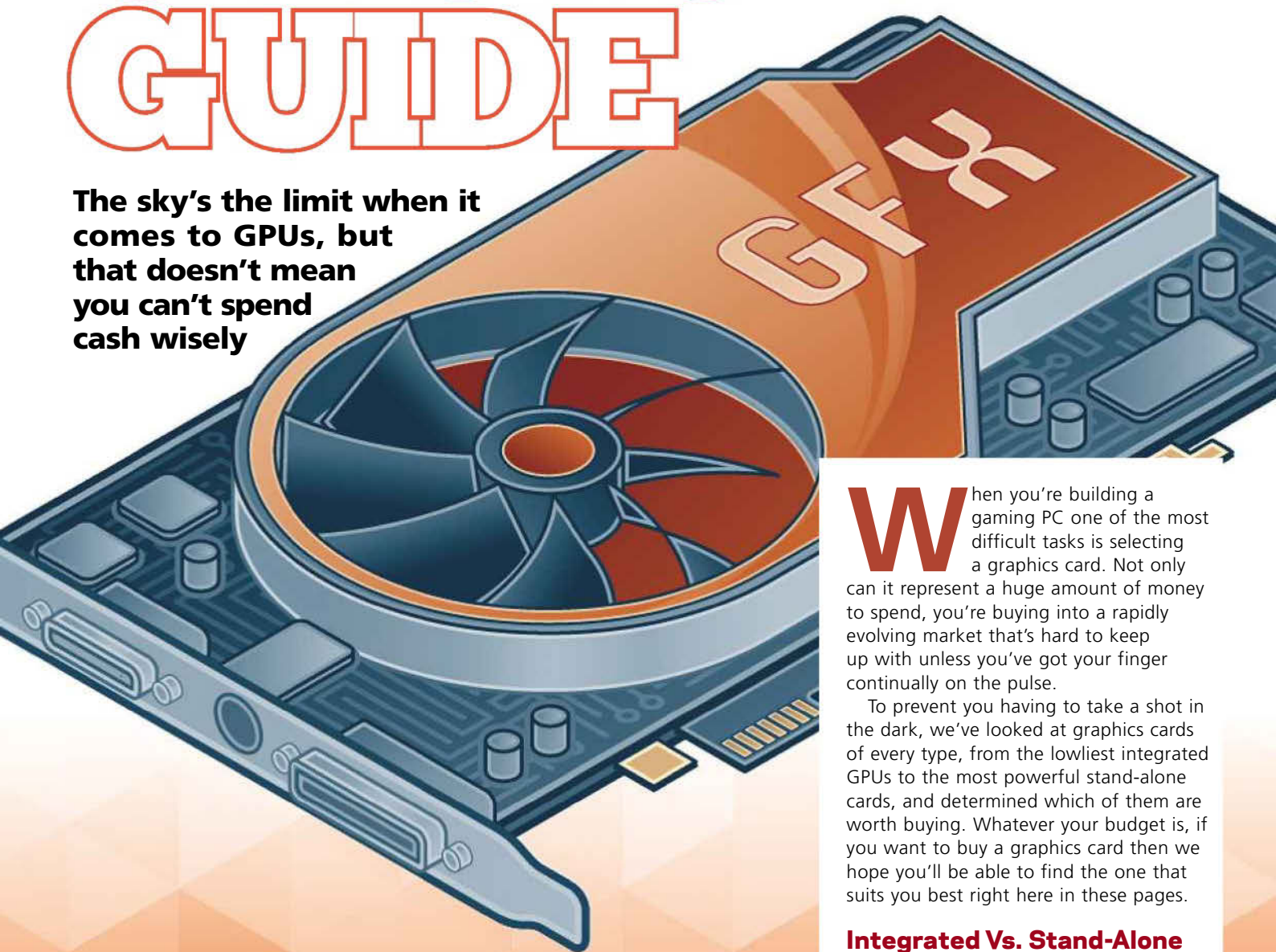
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GAMING GRAPHICS CARDS GUIDE

The sky's the limit when it comes to GPUs, but that doesn't mean you can't spend cash wisely



When you're building a gaming PC one of the most difficult tasks is selecting a graphics card. Not only can it represent a huge amount of money to spend, you're buying into a rapidly evolving market that's hard to keep up with unless you've got your finger continually on the pulse.

To prevent you having to take a shot in the dark, we've looked at graphics cards of every type, from the lowliest integrated GPUs to the most powerful stand-alone cards, and determined which of them are worth buying. Whatever your budget is, if you want to buy a graphics card then we hope you'll be able to find the one that suits you best right here in these pages.

Integrated Vs. Stand-Alone

Whether building a gaming PC or trying to upgrade an existing system to handle the latest titles, you must first determine how good the current GPU is. If you're

running an AMD Fusion chip or an Intel Core CPU then, at the very least, your system already contains a GPU. These are called 'integrated' GPUs, because the graphics chip is part of the processor. The problem with integrated chips is that they're often very slow and lack any dedicated RAM. Essentially, this is because they not really designed for gaming. Instead, they're designed to decode video, run the Windows interface – and very little else if we're honest.

Although it is possible to squeeze some visual prowess out of an integrated GPU if it's one of AMD's newer fusion chips, which are built around the Radeon R7 technology, the truth is that such integrated solutions aren't generally capable of high-end gaming. You're mostly restricted to older and low-requirements titles. At best, you might be able to play a game or two with the details and resolution cranked way, way down. It won't look great, however.

Generally speaking, if you're currently running an integrated GPU you need to install a stand-alone graphics card to give your computer the power it needs to play a game. The good news is that even the cheapest graphics cards can make a system with an integrated GPU into something that can give gaming a fair go, so you don't even have to spend a lot of money to see immediate improvements.

While Intel's integrated graphics top out fairly low, it's worth noting that AMD's go a lot higher, because its APUs contain actual Radeon GPUs. Even then, the best Radeon GPUs are only as good as cards, which cost around £50 anyway. Unless you have a Kaveri-based APU with an R7 onboard, the next best GPU (an integrated HD 7660D) is only as good as the GeForce GT630 (£48). By that point, if you want graphics that keep up with your processor, you'd have to spend much more than £50!

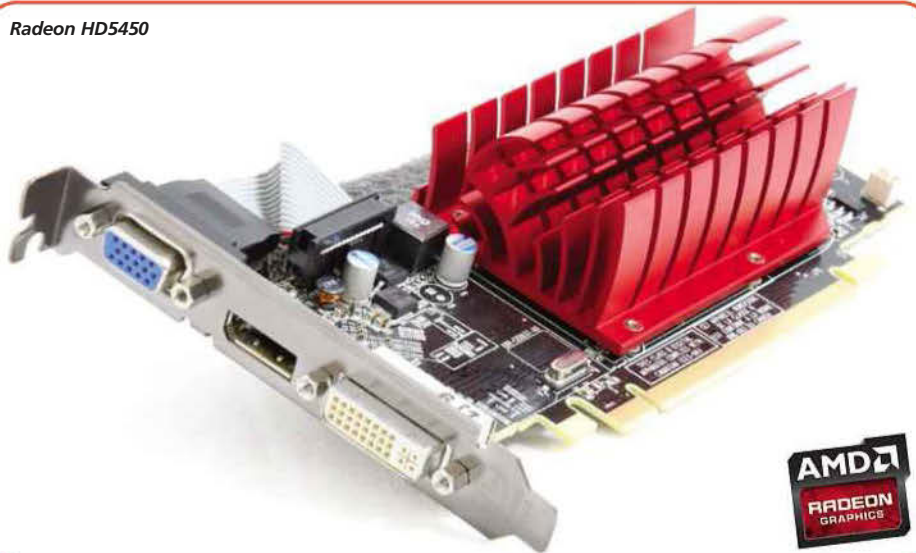
Graphics Cards Under £50

The cheapest cards on the market run to as little as £20, but don't think that because you've got an integrated GPU those cards will automatically be better than what you're using. If you want to spend as little as possible, you can buy a GeForce GT210 for about the price of a large pizza – though, all things considered, you'd probably rather have the pizza. That's because the GT210 is only about as powerful as the onboard GPU of a pre-Sandy Bridge Intel Core chip. Nowhere near good enough to run modern games!

GeForce GT 210



Radeon HD5450



As it stands, the GT210 is only much use for adding basic graphical capabilities to systems which don't have an onboard GPU, such as an FX-series AMD system. But even then, it's only cheap, not good value for money.

One of the cheapest AMDs on the market – the Radeon HD 5450 – is several generations old, and costs only a few pounds more than the GeForce GT210. It's not exactly a powerhouse, but it is significantly better than the similarly priced GeForce. With 1GB of RAM and a 650MHz GPU clock, it's roughly as powerful as an Intel HD Graphics 3000

GPU, which is the kind found on board Ivy Bridge chips. Compared to integrated Radeon GPUs, it's about as powerful as the HD6310 and HD6320.

Luckily for Nvidia, the GT210 is really only around to plug a gap in the extreme low end of the market. The next most basic card it offers is the GeForce GT610, which comes in at about double the price (£35, or so). Don't be fooled by the model number – the GT610 isn't a 600-series card, it's actually a rebadged 500-series GT520, so it's older than it looks. Even so, this isn't a complete surprise – it's common for graphics cards

“ You can buy a GeForce GT210 for about the price of a large pizza – though you'd probably rather have the pizza ”



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Asus' AMD Radeon 6670



Radeon HD 7700



manufacturers to do this to make their line numbering easy to understand (make your own jokes about this). In any case, the GT520 is roughly equivalent to the Intel HD Graphics 4000-series GPUs found on the latest Haswell chips, or to Radeon 6520D and 7480D onboard GPUs.

£50-£100

Spending money in this price bracket might seem like a fair amount to dedicate to graphics performance, but don't be fooled. These cards are mid-range at best, and towards the low end of that. You'll be able to play most games without much trouble, but you won't be getting fully effects-laden, super-high resolution gaming. At best, you'll be able to play in full HD if you turn down some settings. You can get away with this price graphics card if you're a casual or occasional gamer – not a serious one.

One of the best value budget cards on the market is the Asus HD 6670, which

costs around £60. It's getting a little long in the tooth, but it's definitely affordable and reasonably powerful. Don't bother with the 1GB model, purely because the 2GB model costs less than a fiver more in most situations. As hardware goes, it's not particularly notable – what matters is that it offers good performance for the price.

As with most cards found at this price range, it takes its power direct from the PCI bus. You don't need to connect it directly to the PSU, and that helps keep running costs, system temperature and PSU loads down.

Remember, though, it's about as cheap as such cards come; which means full HD gaming might be slightly beyond its capabilities. We'd recommend this card to casual gamers who have a monitor with a native resolution below full HD – say, 1600 x 900. Anything bigger, and you'll want a more expensive card.

An example of which is the Radeon HD 7770. A full generation older, this

can be picked up for as little as £75, although factory overclocked editions may cost more than £90, so be careful which you're going for. At this point in its lifespan, it's the slowest card on the market that still just about counts as a piece of serious gaming hardware. It'll show its age if you put it up against the latest effects-laden titles, but it'll handle any casual games and releases from the last few years that you throw at it.

If nothing else, it looks the part: not only is a double-height card, it's also one of the weakest that still requires its own 6-pin power supply. It shouldn't present much of a problem to power. Even at full load, the TDP is just 80 watts. Full HD gaming should be possible as long as you turn details down a little, which is fair enough for a sub-£100 card.

Finally, if you're interested in buying a card from the latest AMD line, look at the Radeon R7 260. It's a little bit more expensive than the HD 7770, but just as powerful, and runs on the latest architecture. In practical terms there isn't a huge difference, but if you want to go with a current generation card it's your best option under £100.

You will probably have noticed that we haven't picked a GeForce card in this price range, and the reason for that is fairly easy to explain: AMD's low-end cards are simply better-suited to gaming. Radeons are usually cheaper than their similarly powered GeForce equivalents, and any disadvantages in the Radeon hardware manifests itself more obviously at the higher-end of the market. Down here, where temperatures aren't a problem and no-one's looking to overclock very far, AMDs win out all the way.

£100-£150

This price bracket represents the mid-point of graphics card performance, though not pricing – that's because as you reach the higher end of the market, the best-performing cards start to cost a premium. If you're trying to build a system that will remain competitive for some time, rather than just to play a single game, this is the minimum price you should be looking to pay.

In recent times we'd have recommended the Radeon HD 7790 as one of the best cards in this price bracket, but it's currently being phased out and replaced with new R7-based cards. If you can find one, however, the Sapphire HD 7790 OC edition is still a great bargain at about £112 with an overclocked GPU squeezing even more performance than usual out of it.



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We're also quite fond of the XFX HD 7790 Black Edition, which is slightly more expensive than other models but worth paying slightly more for. The Black Edition is overclocked to 1075MHz which, again, offers extra performance without you having to worry about tweaking the settings yourself. You'll need at least a 550W power supply to run a card of this strength, but give it what it needs and high-definition gaming shouldn't be a problem even on the more recent titles.

It's at this point that GeForce cards start to hold their own against the Radeons. The GeForce GT 660 has repeatedly been hailed by us as being a true gamer's choice card, offering the perfect balance of power and respectable pricing. As long as your requirements are reasonable – a normal HD resolution, one screen, and most (if not all) settings turned on – then the GeForce GT 660 will handle it with little-or-no complaint.

“ The GeForce 660 has repeatedly been hailed by us as being a true gamer's choice card, offering the perfect balance of price and performance ”

That said, it's been jostling back and forth in competition with the Radeon HD 7850 for a while. When the price of the latter drops, it becomes a better value buy. At the moment, though, the HD 7850 is almost impossible to buy new because it's being phased out thanks to the R7 line. This leaves the GeForce GT 660 in the best position for the moment, not least because you shouldn't have to work that hard to find one. You can pick most models up for £130 or less, and even the most expensive, most factory-overclocked versions shouldn't go north of £150.

The good thing about cards in this price bracket is that they should remain competitive for a good year or so before you even have to think about replacing them. If you're a regular gamer who keeps up to date with new titles, this is the sort of level you should be aiming for as a minimum. By comparison, if you're a casual gamer who just wants to enjoy the game they're buying, this is probably the most you'd want to spend.

Keep in mind, too, that cards in this bracket have substantial power requirements. The GeForce GT 660 needs at least 140W under a full load, so aim to pair it a 600W+ power supply just to make sure you've got enough power to deliver a smooth supply and the overhead to power all the system's other components too.

£150-£200

Above the £150 threshold, graphics cards begin to take on a less 'casual' air. Occasional gamers will find cards require too much money and effort to make them worth buying, while hardcore gamers will come this low looking for bargains, or perhaps hoping to buy multiple cards to run in SLI/CrossfireX mode.

Whichever category you fall into, these cards shouldn't be bought on a whim. You'll need a confidently powerful PSU and a system that can do justice to their capabilities in every way. Not just a fast CPU, but a good monitor, capable motherboard and fair amounts of RAM. Otherwise you're spending money on power you can't use.

Just over the threshold of this price bracket, you'll find the Radeon R9 270X, which can be found for as little as £145, but more commonly around £165. It's one of AMD's latest cards and has all the performance that implies. We're particularly enamoured of the MSI R9 270X Hawk, which offers 2GB of RAM, a 1100MHz clock and support for resolutions up to 2560 x 1600, making it worth paying a little extra for.

In case you're wondering, the Radeon R9 270X replaced the Radeon HD 7870 on AMD's slate, but if you're thinking of dropping back a generation to get a bargain, don't bother. Not only is the R9 almost identically-priced, it's also slightly

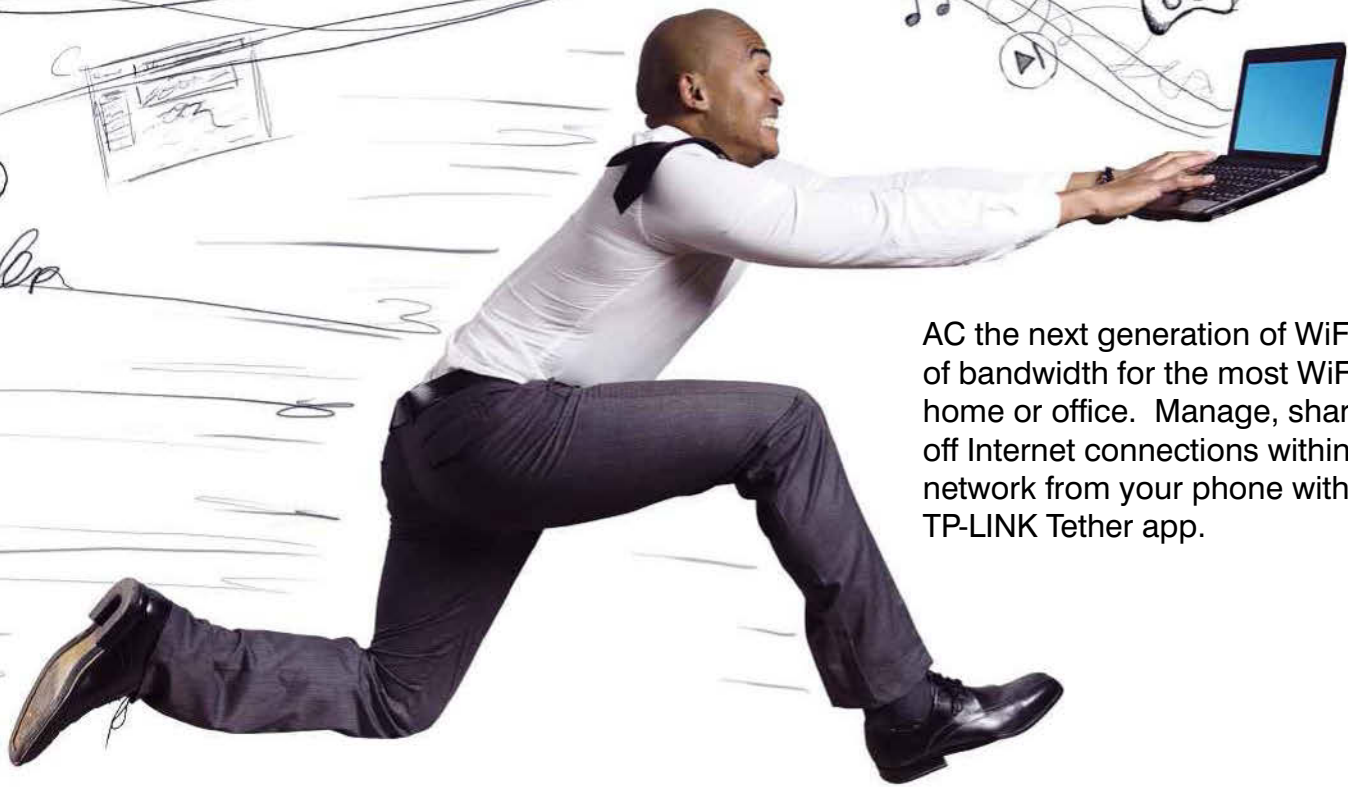
GeForce GTX 660



XFX Radeon HD 7790 1GB



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GeForce GTX 760 OC



Card Model Notes

Finding the best graphics cards is difficult enough without the weird flourishes and model number touches Nvidia and AMD place on their hardware. To help you navigate the confusing waters, here's our guide to decoding graphics card models.

For GeForce cards, GTX denotes a high-end card, while GT or GTS means an older or less powerful card.

For Radeon model numbers, HD-labelled cards are older-generation models. Current cards are either R7 or R9, with the latter being the superior line.

A 'Ti' after a GeForce model number denotes a 'Titanium Edition'. The Ti cards are considerably faster than the non-Ti versions, but there aren't any particular differences in their architecture – the GPUs are just more powerful.

Similarly, an "X" after a Radeon R7/R9 card means the same thing: a faster edition of the graphics card model, otherwise identical to the non-X version.

Radeon R9 270X



faster and slightly cooler. There's maybe £10 to be saved by choosing the older card, and we think any gamer planning to spend £150 on a graphics card should probably go the extra mile and get the latest hardware, at least in this case.

Those who have a little more cash to spend should probably take a look at the GeForce GTX 760. Now we've reached the point where price is less of a concern than a card's power and efficiency, Nvidia's models start to come into their own – and the GTX 760 is the perfect example of that, especially if you still want to keep your expenditure below £200.

Released about nine months ago, the GTX 760 has lost much of its high-end premium, which means it's not too expensive as cards of its quality go. You can pick up basic reference-type designs for around £180, while overclocked versions sell in the high £190s. If you're determined to keep your budget under £200, it's a strong choice.

It's still the second-slowest of the GeForce 700-series cards, but that does mean it's got a reasonably low TDP of just 170W, which is very reasonable considering the requirements of the previous generation's GTX 660. This

quality may interest those who already have a decent PSU and don't want to replace it entirely just to get a better graphics card.

If you're looking for a specific version of the GTX 760 to buy, we can't help returning to the Gigabyte GTX 760 OC, which is factory overclocked by around 10% to 1085MHz, and has a Windforce cooling system to compensate. With triple-stacked heatpipes and three fans, it's much better than the reference design calls for. The 2GB version costs around £190, but if you're feeling really flush, you can go for a 4GB version of the same card. It's a little bit outside the stated price range, at £225, but it's definitely not a bad card to go for if you can afford it. With that much RAM, it should last a long time, too.

£200 And Above

One of the things all of the graphics cards we've looked at until now have had one thing in common: they all represent a compromise between cost and power. Well, from now on, you can forget that. Once you get above £200, prices begin to increase rapidly as cards improve. That's because these are the premium models. The ones aimed at people who value performance above all else. If there's a

“ Now we've reached the point where price is less of a concern than a card's power and efficiency, Nvidia's models start to come into their own ”

way to get better speeds or more power by throwing money at a card, they're happy to do it.

The diplomatic term for this sort of computer user is 'enthusiast'; the sort of people retailers and manufacturers love, and most consumers envy. They never find that their computer runs games slowly, although it frequently runs games too slowly for them.

Still, if you're the sort of person who doesn't think an upgrade's worth making unless you're getting the best on offer – or if you want become that sort of person – this section's for you. £200 isn't a target, it's the minimum price of entry.

The next card up from the GeForce GTX 760 is, of course, the GeForce GTX 770. And while the idea of a "good value" enthusiast card seems contradictory, it's hard not to look at the way this card stands out in terms of its price to performance ratio. No-one said that you have to be immune to a good deal to buy

“ The diplomatic term for this sort of computer user is ‘enthusiast’; the sort of people retailers and manufacturers love, and most consumers envy ”

an enthusiast graphics card, and that's why we can't get past this one.

Think about it: for £240, you can get performance better than any games console, for less than the price of a games console. Factory overclocked versions are of course available as well, and of those, the Gigabyte GTX 770 OC is probably the best. It runs at 1137MHz, has a triple-fan design, and you can get your hands on one for just £256, which isn't much more than some considerably slower-running variants. If that's not good value, what is?

Again, there's a 4GB version of the card available, but this time it's harder to justify the price. Retail is almost £40 more than an overclocked GTX 770, and we couldn't find it for less than £299. That's £60 more than the standard edition. A lot of money for a card that's going to be out of date in a year.

Of course, while GeForce rule the top-end of the market, AMD have something they don't, and that's the newest hardware. Clocking in at around £320, the Radeon R9 290 (and its overpowered, more expensive variant, the R9 290X) are the newest, fastest cards you can spend your money on. The GTX 770 might be alright if you want to keep one eye on your bank account, but the R9 290 cards ensure you get the maximum performance possible. The most expensive R9 290X cards go up as high as £500.

We're not seriously suggesting you spend £500 on a single graphics card, of course, but only because the benefits of spending £200 more than a standard R9 290 are, in real-world terms, virtually impossible to notice. There are better cards on the market, but until Nvidia release the GeForce GTX 790 you'll struggle to find one that isn't previous generation in some way.

As usual, picking the right R9 290 is like choosing a needle from a needle-stack, but we do like the look of the PowerColor model, which is a 4GB card costing £320. As well as the better-than-average pricing, it's overclocked (just a smidge) but runs cooler and (reportedly) more quietly than the competition thanks to its single-fan design.

At this point, we must draw this guide to a close. Once you crack the £300 barrier there's little extra performance to be found, just the world of unused potential and specialist-use cards. 6GB of video RAM might look good on paper, but in a practical situation, no gamer will use that much. Those cards are aimed at professionals, developers and artists.

Still, if you've got the money and the will, feel free to go further. If you can guarantee one thing about graphics cards, it's that there's always a better one to come...[mm](#)


Gigabyte's Nvidia GTX 770 Windforce 3X OC...



... And its Radeon R9-290X variant



SILENT GAMING GUIDE



James Hunt looks at creating a gaming PC without creating a din

If you're the sort of person who gets irritated by a noisy PC, whether it's distracting you from what you're trying to do or drowning out the sounds you're trying to listen to, then building a gaming PC could prove tricky. The majority of the noise that comes out of a computer is caused by cooling fans, and if there's one thing all gaming PCs have in common, it's that they need some serious cooling.

While there are silent components available, most of them are aimed at low-end use, where active cooling isn't necessary. So is it possible to build a gaming PC that doesn't make any noise? Or should you just invest in a pair of noise-cancelling headphones? We've been looking into the matter to find out.

Graphics Cards

Most graphics cards generate at least as much noise as your system processor when idle, and when your gaming kicks

into high gear, so do your graphics card's fans. The better your card, the more fans it has (two or even three), so it's fair to say that in a gaming system, the graphics card is the component that makes the most noise.

This begs the question: is there anything that can be done to reduce that?

While it is possible to replace the cooling system on a graphics card, that's the sort of procedure that could go wrong very quickly, costing a lot of money in the process. Swapping fans for water cooling is the obvious way to make the graphics card less noisy, but it's a delicate and difficult thing to do, requiring precise knowledge of the cooling systems involved and the temperature tolerances of your hardware. If you can afford to risk a graphics card's functionality on lowering its noise, feel free to try, but it's not something we'd recommend to amateurs or anyone without a lot of cash to spare.

If you want to run a high-end card, a custom cooling system is your only choice for silent running. Luckily, if you're okay with a more conservative (but still reasonably powerful) gaming graphics card, there are silent versions available. It's possible to cool some mid-range graphics cards enough using just a heatsink, rather than a heatsink and fan.

There is a trade-off involved, of course. The cards generate no additional system noise, but the cooling is less effective. This means that the temperature is more likely to reach an unstable level if, for example, the rest of the system heats up too much. It also means there's no overhead for overclocking. The niche appeal means you even pay a premium for the hardware, and it's possibly hard to swallow that you could spend the same money on a much better card, if you would accept fan-cooled hardware.

Unfortunately, silent graphics cards aren't the most popular gaming product, largely because of their sub-optimal performance. They're fine to put into HTPCs or media-editing systems that might require slightly beefed-up graphical power, but as far as gaming goes, you'll never get better than a mid-range card. That's good enough for playing games that aren't too taxing, but well short of the graphical prowess the market is capable of providing.

Still, if you're more concerned about the noise than anything else, here's our look at silent graphics cards that you might want to look out for.

Sapphire R7 250 Ultimate - £75

Sapphire is one of the manufacturers most committed to silent graphics cards, with its consistently released 'Ultimate' variants of current-generation graphics cards. The latest addition to the line is the Sapphire R7 250 Ultimate, which came out mere weeks ago.

Like all R7 cards, the R7 250 is more or less a rebadging of the previous Radeon generation – in this case an HD 7750. While some R7s have a faster clock speed than their 7000-series equivalents, that's not the case here. Hardly surprising, given the engineering it takes to get a card cool enough for a passive heatsink anyway. Fully loaded, it draws less than 60 watts, so the requirements are reasonably low, and it gets everything it needs from the PCI bus.

It may not be particularly impressive for gaming, but the low price and reasonable capabilities make it worth buying, not to

mention the fact that it's one of the newest cards around. Indeed, if you want better performance, you might even try running multiple R7 250s in CrossFire – although we'd recommend using an exhaust fan if you did, which may defeat the point of trying it at all!

Zotac GeForce GT 640 ZONE Edition - £65

If you're after a GeForce card, then there's no chance of finding a fanless 700-series card yet, but Zotac does have the previous generation covered with its passively cooled GT640 Zone Edition. It's a little older than its Radeon equivalent, and to keep temperatures low it actually runs slower than the reference version of the GT640 – 902MHz rather than the standard 950MHz.

It does have the advantage of having 2GB of RAM, compared to the R7 250's 1GB, even if it is GDDR3 rather than GDDR5. A lack of DisplayPort isn't a problem, because it has two DVI and a mini-HDMI, so there are alternatives available. It's still not exactly a powerhouse card – high resolutions have poor performance because the RAM's slow, and it's substantially less powerful than the Ultimate R7 250, which costs virtually the same price. The only area where it has any benefits is unloaded power consumption. It draws only 9W while idling, although fully loaded it's

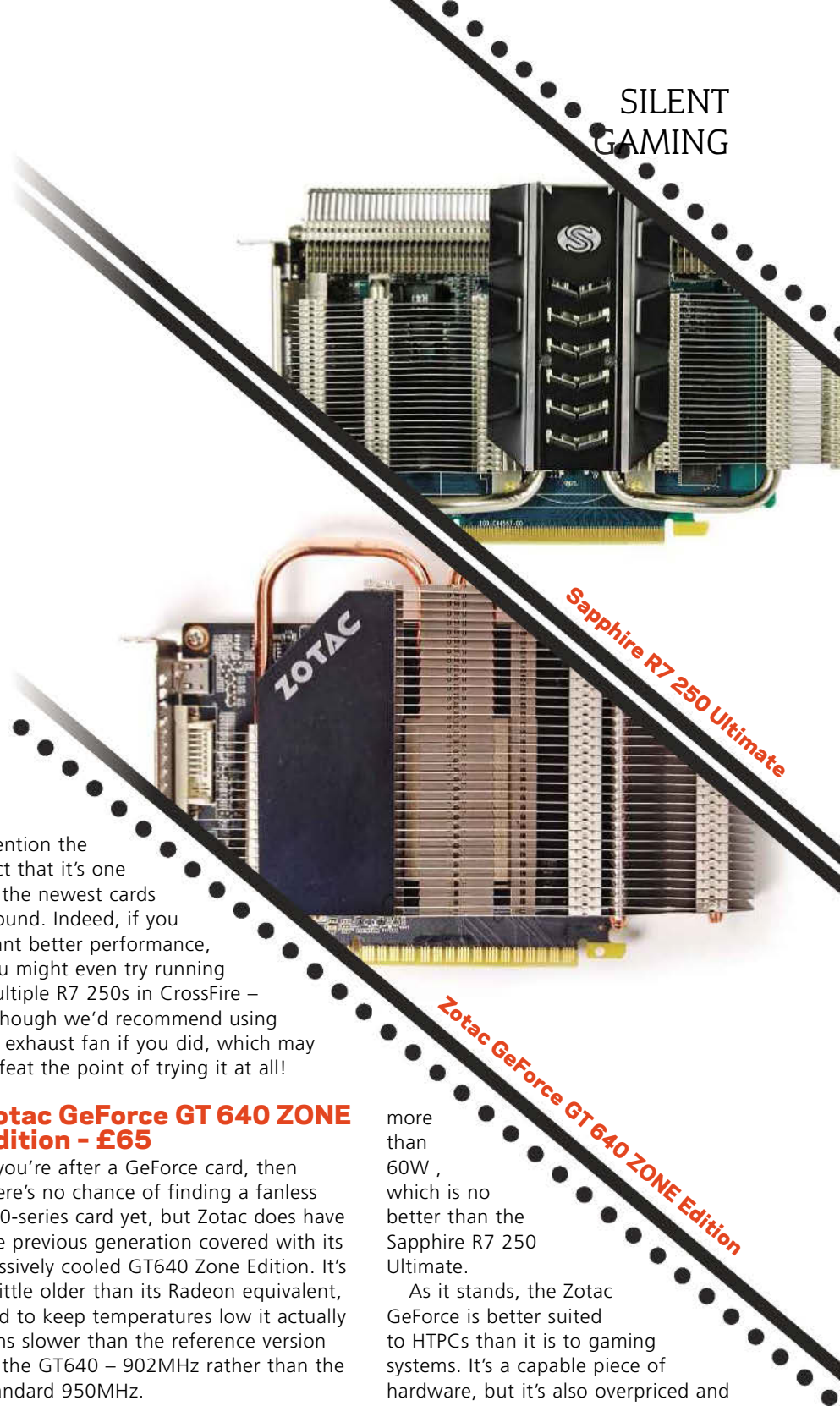
more than 60W, which is no better than the Sapphire R7 250 Ultimate.

As it stands, the Zotac GeForce is better suited to HTPCs than it is to gaming systems. It's a capable piece of hardware, but it's also overpriced and inferior to the alternatives.

Still, if system volume is more important to you than power, either card is your best bet for a competitive system, though not a guarantee of one. As you've probably guessed, we prefer the R7 250 over the GT 640, because it's faster and better value, even if it is rebadged. But ultimately, whichever card you prefer should be fine. You're not going to find much better for gaming.

Case Fans

If you want to make a real impact on the amount of noise your PC makes, the



“ Monitoring the air flow inside a system is important for keeping the interior cool ”

best place to concentrate your efforts is on the cooling systems. Most gaming systems need some form of active cooling on the CPU, simply because games run high CPU loads, but that doesn't mean there aren't alternatives to other fans. In gaming systems, a case exhaust is a simple way to keep overall system temperature down, which can in turn reduce noise. You just have to make sure that any exhaust fan is generating less noise than it prevents!

The important thing to remember when you're choosing a fan is that the bigger they are, the slower they run. Slow fans generate less noise, so always look for the biggest you can get away with. As well as being quieter overall, large fans have reduced potential for other problems. Dust clogs are less likely, and buying one fan instead of two means you've got half the chance of a misaligned bearing that might rattle or buzz while in use.

To give a practical example of how to choose a case exhaust, if you want to put an exhaust fan into your case, you should aim for a single large one instead of two small ones. It'll take up more room, but make less noise for the same amount of cooling. Standard fans are 80mm in size, but most 80mm fittings are also able to take 120mm fans as well. If you can find space for a 200mm exhaust fan, then you'll reap huge benefits!

If you want to take serious steps towards reducing fan noise, you could even go so far as to install a fan controller in your system. Fan controllers give you (or a piece of

software) the ability to directly manage the speed that fans are running at and thus determine how much noise they generate. As long as you keep proper track of your system's temperature so that the interior doesn't overheat, there's no reason your fans can't be slowed to the point where they're basically inaudible.

Monitoring the air flow inside a system is important for keeping the interior cool. If the fans in your system are sucking air in different directions or if the air flow is impeded by improperly placed components, you'll end up with pockets of hot air that keep the system temperature from coming down. If you have to use an exhaust fan to keep your system cool, try to keep air flow in mind; imagine where air is coming into the case and compare that to how the fan is extracting it. Moving the right component or cable can have a dramatic effect on the temperature of a system!

AeroCool Touch 1000 - £26

Fan controllers come in all shapes and sizes, but there's something of a *Back to the Future* charm about the 7-bar digits on this touch-screen system. Capable of managing up to four fans, this rack-mounted unit fits in any 5.25" bay and features touch-LCD technology for ease of use. You can switch between Celsius and Fahrenheit temperature displays at the touch of a button, and a lock setting ensures you don't accidentally change the fan's performance when you don't want to.

The Touch 1000 can be plugged into to any standard three-pin connector and has four heat sensors to monitor performance, drawing a maximum of 6W per fan channel. If you're trying to keep your system quiet, it'll help you maintain a low enough temperature without ever using more fan power than you need, although the overheating alarm might puncture your attempts at silence!

Aerocool Silent Master 200mm Quad Green LED Case Fan - £10

There are plenty of 200mm fans out there, but we like the look of Aerocool's Silent Master fans, which have cool LED lighting on top their ultra-slim design. Designed to be ultra-quiet, the fans spin at just 800rpm, which is almost half the speed of a standard fan, while shifting more than double the amount of air. A standard three/four-pin connector means it's compatible with just about any controller, whether stand-alone or motherboard-integrated. We admit, there are more sophisticated and more complicated case fans around, but we're impressed with the simplicity

AeroCool Touch 1000

Aerocool Silent Master

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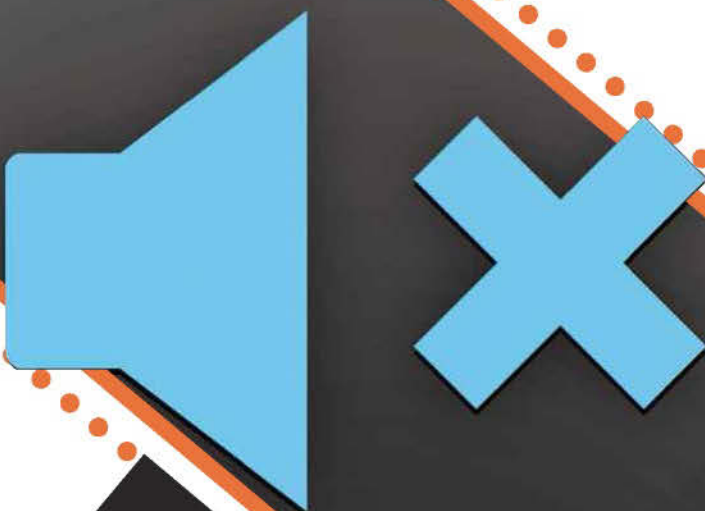
The power supply unit is one of the unholy trinity of interior cooling devices, along with the graphics card and the CPU. Between them, those three components are the bane of anyone trying to reduce noise in a system. But while you can get fanless graphics cards and use a combination of water cooling and heatsinks on CPUs, it's virtually impossible to get a completely quiet PSU. Even fanless models emit a whine due to the sheer power they have running through them. All you can do is minimise the volume of the noise they make.

“ **Silent PSUs are rarely completely silent, but they tend to compensate by being both efficient and well-built** ”

Luckily, there are a couple of ways you can do that.

As with most components, the noise comes from the fan cooling it, and the reason it needs a fan to cool it is because it gets hot. Therefore, to keep it quiet, you need to keep it as cool as possible. This might mean making sure the extractor fan has a clear space for ventilation, so that air moves freely. It might mean keeping dust out of the vents and fan mechanisms to ensure that heat extraction is efficient. Or you can buy a low-noise PSU, which is built to be inherently quiet.

Silent PSUs are rarely completely silent, but they tend to compensate by being both efficient and well-built. Inefficient PSUs convert power into heat, which means the fans have to work harder, which creates more noise. You can check the efficiency rating of a PSU by looking for '80-Plus' certification, which guarantees various levels of quality.



SSDs

It's possible you've noticed this already, but if you've only used computers with mechanical hard drives in, it can come as someone of a surprise when you realise how much noise they make.

Mechanical drives make noise when they power up and down, when they're spinning idly and when they access data. You're probably so used to it being part of the experience of using a computer that you never stopped to think that there might be a way to get rid of it completely.

Solid-state drives obviously have one major benefit when it comes to running a gaming system. They access data so quickly that it can actually improve your frame-rates. But if you're trying to build a silent system, that's not the only reason to go for one.

Chiefly, fans of low-noise systems should be interested in SSDs, because they're practically silent. There's no access noise, no spinning up or down, and there's no chance that their vibrations might rattle any other part of the case. Better still, they're so much cooler and power-efficient that they have the knock-on effect of making the rest of your system run cooler as well. If you've ever touched a hard drive soon after it was active, you'll know how much heat they can generate. SSDs make a fraction of that, and their reduced size also means they allow air to flow around a case more freely.

In almost every way, SSDs are superior to mechanical drives, and that goes double for a gaming system. We know that there are price concerns, but if you're trying to make your PC as discreet as possible, there's absolutely no alternative. It will shock you how quiet your system is once it's running off a single SSD.

The good news for buyers is that no SSD is particularly quieter than any other; they're all pretty much silent, and the temperature differences and power requirements are negligible from make to make. Just buy the best you can afford, get rid of your mechanical drive and take satisfaction in the amount of silence you just created.

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** World's fastest PC as tested by PC Pro Magazine - <http://www.pcpro.co.uk/reviews/desktops/371152/chillblast-fusion-photo-oc-iv>

You can also specifically look for low-noise PSUs, which will be marked as such, although beware that there's no technical underpinning to this claim. Nothing is stopping a PSU manufacturer claiming their hardware is silent except their reputation, so beware of companies you haven't heard of – they won't have a reputation to protect!

So that you don't have more noise than you need to, you need to find the most efficient PSU, with the lowest wattage you can reasonably get away with. If you're not sure what that is, find a system power calculator online to help you determine the base amount for your system, then get a PSU at least 30% more powerful than that. Ultimately, finding the right silent PSU depends on your specific needs, but there are a few models we can point you in the direction of.

OCZ PC Power & Cooling Silencer MK III (400W) - £60

It's not particularly high powered, but if you're building a fairly modest gaming system, then OCZ's Power & Cooling Silencer MK III should suffice. This ATX power supply is 80 Plus Bronze rated for efficiency, and built on the award-winning 'Silencer' core architecture, which is designed to keep temperatures and noise as low as possible. It succeeds brilliantly, and many reviews have called this PSU as close to silent as is physically possible.

Cooling is provided by a 140mm double ball-bearing fan, and there are two modes it can run in, normal and silent, with the latter ensuring that fans run slower and quieter. In addition to this, the PSU is modular, so you can eliminate dangling wires and the associated clutter, with the added bonus that this will improve air flow around the rest of the case. It's a high-quality piece of hardware, well-reviewed and available in variants up to 850W. A seven-year limited warranty seals the deal.

Seasonic X-Series 650W Full Modular PSU - £100

One of the most popular PSUs for silent PC builders is the Seasonic X-Series, the 650W version of which features 80 Plus Gold certification, a variable fan speed with a fanless mode and modular power cables. Every aspect of the PSU's design is intended to keep it quiet during operation, and it clearly succeeds at this. At 650W, it's perhaps a little more powerful than an HTPC might need, but it's right on the money for a gaming system. Only the most powerful

multi-GPU systems will need a PSU better than this one.

It's not just about quantity, though. Seasonic's design helps to minimise voltage drops and impedance, maximising efficiency and cooling to enhance the unit's performance and reliability. A three-phased cooling system balances the fan's performance between silent and cool modes, automatically choosing the right one for any given moment.

While either of these PSUs would fit the silent-power bill, don't assume that these are the only ones. There are plenty of other acceptable choices, with higher and lower wattages and different features. We've started you off, but now you can hopefully go and find the one that suits you best.

CPU Cooling

Keeping your CPU cool is a necessary part of a gaming system, but in terms of noise, it's always worth looking at

of doing it!

If you want to do away with fans entirely, you can try to cool your CPU using alternative systems, such as heatsinks and water pipes.

Heatsinks are used to draw heat directly away from components using conductive metals to extract heat and dissipate it into the air. Although they work best in conjunction with fans, certain types of heatsink can replace a fan altogether. Even if it doesn't do quite

“ **The power supply unit is one of the unholy trinity of interior cooling devices, along with the graphics card and the CPU** ”

your processor and seeing just what you can do with its cooling system. Most processors use a standard OEM fan or, in more sophisticated systems, a combination of fan and heatpipe. This is an effective and cheap way of cooling your processor, but those small, fast-moving fans definitely aren't a quiet way

enough to cool a processor on its own (and in a gaming system, even the best heatsink would struggle), then a good heatsink can do enough extra work that your CPU fan can work slowly, rather than ramping up to its case-rattling maximum.

Heatsink installation can be difficult, though. As well as removing the fan from





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“ Installing a water-cooling system on your CPU can be difficult, but it’s worth the effort ”

your CPU, you’ll also have to properly seat and secure the heatsink, which involves applying thermal gel and custom mountings. It’s definitely not an activity for the faint-hearted. Space can also become a problem. Heatsinks need a lot of space around them to dissipate heat, so they’re often far taller and wider than a standard CPU fan, which can become a problem if your case is small or if there’s a large component near your processor. It’s not so bad if you’re running a system inside a full tower, but when component room is limited, heatsinks might simply prove inconvenient, no matter how silent they are.

The other alternative to fans is water coolers, which work on a similar principal to heatsinks, only instead of conductive metal, they use flowing water (or rather, water-based solutions) to draw heat away from components. It’s possible to get fanless water coolers, but as with heatsinks, most work in conjunction with a fan of some sort. Luckily, these fans don’t have to speed up as much as a stand-alone fan, because the heat transfer is being done by something else (in this case, the water), and all the fan has to do is keep the air moving. They aren’t no-noise systems, but they are low-noise.

As with heatsinks, installing a water-cooling system on your CPU can be difficult, but it’s worth the effort: they’re incredibly efficient and versatile and, indeed, you can use them to cool just about any component if you know what you’re doing. Closed-loop systems are cheaper than ever, and many cases now include space for mounting water cooling pipes, making them much easier to manage as well. Admittedly, the threat of a leak might put some people off, but for the most part we think anyone seriously interested in reducing noise should give water cooling a try.

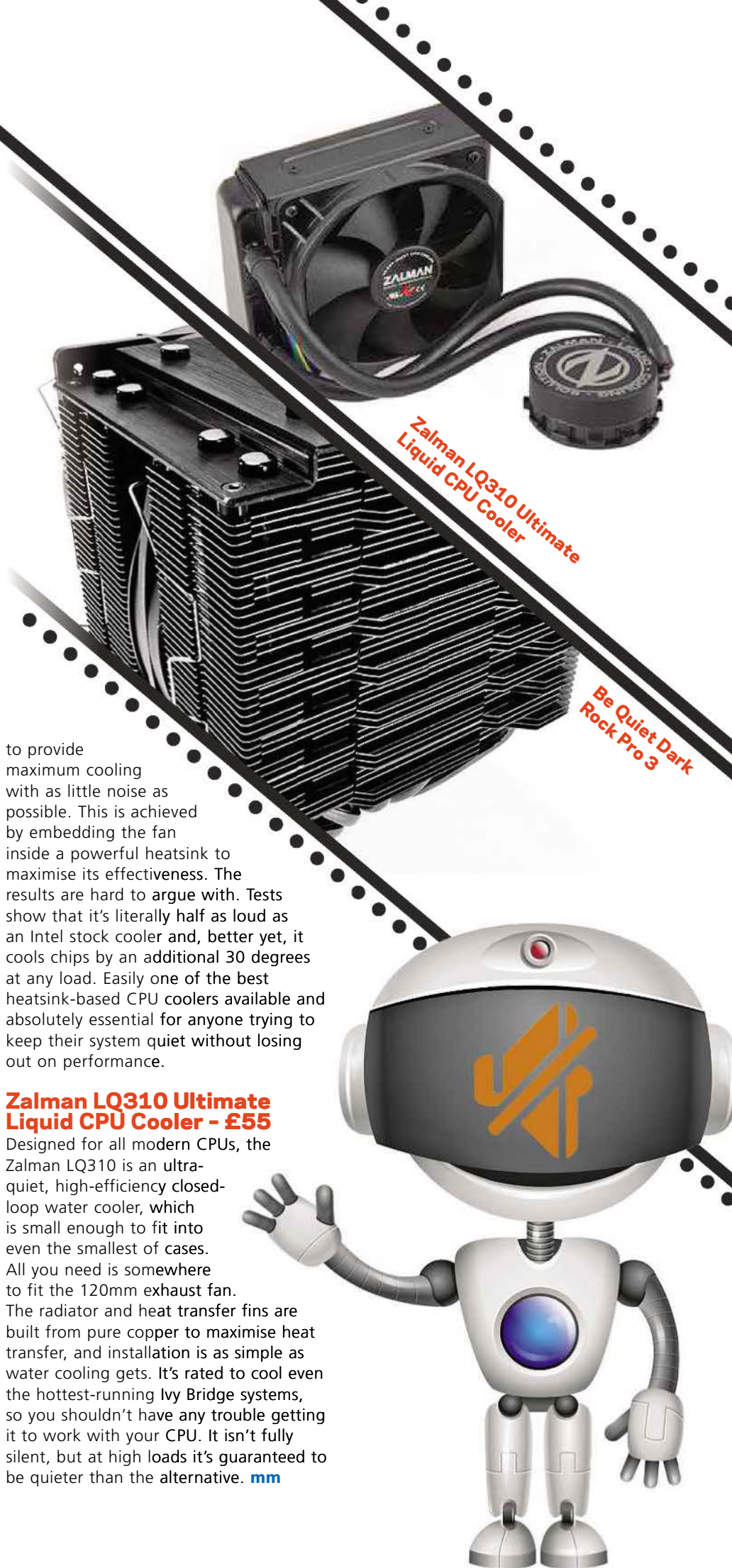
Be Quiet Dark Rock Pro 3 - £60

The Be Quiet Dark Rock Pro 3 is a combination fan/heatsink cooler designed

to provide maximum cooling with as little noise as possible. This is achieved by embedding the fan inside a powerful heatsink to maximise its effectiveness. The results are hard to argue with. Tests show that it’s literally half as loud as an Intel stock cooler and, better yet, it cools chips by an additional 30 degrees at any load. Easily one of the best heatsink-based CPU coolers available and absolutely essential for anyone trying to keep their system quiet without losing out on performance.

Zalman LQ310 Ultimate Liquid CPU Cooler - £55

Designed for all modern CPUs, the Zalman LQ310 is an ultra-quiet, high-efficiency closed-loop water cooler, which is small enough to fit into even the smallest of cases. All you need is somewhere to fit the 120mm exhaust fan. The radiator and heat transfer fins are built from pure copper to maximise heat transfer, and installation is as simple as water cooling gets. It’s rated to cool even the hottest-running Ivy Bridge systems, so you shouldn’t have any trouble getting it to work with your CPU. It isn’t fully silent, but at high loads it’s guaranteed to be quieter than the alternative. [mm](#)





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DO YOU NEED WATER COOLING?

While water cooling is still and 'enthusiast' pursuit, it's nowhere near as daunting or dear as it used to be. As James explains...

If you're the kind of system tinkerer who reads a magazine like *Micro Mart*, it's a safe bet that you're probably aware of one of the basic principles of computing: if you want your components to perform at their best, you have to keep them as cool as possible. When components get hot, they become unstable. When they're kept cold, they become more efficient and less prone to failure. That's why processors have fans, and why hot days are bad news for server rooms.

The reason heat causes problems for components is actually sort of startling: if your CPU, or graphics card, or RAM or SSD or any other component gets hot enough, the sheer force of the electricity starts to damage it on the molecular level. Transistors, tracks, pins and wires get melted or warped, and in extreme situations you're left with a pile of

scorched, melted slag where there was once an expensive piece of hardware.

In a sense, this process is happening all the time, even when your components are running at normal temperatures. It's why your processor will one day fail, it's why your RAM eventually develops errors, it's why SSDs get bad sectors. It's why the lifespan of overclocked CPUs can be dramatically reduced: they literally burn themselves out. You can't stop this from happening, only slow it down, and that's why you have fans in your system to directly cool the hottest hardware you use and to maintain its ability to operate effectively for as long as possible.

What if you want to make your cooling even more effective, though? What if you want to overclock your chip without dramatically shortening its lifespan? What if you've got a system that generates heat



as quickly as fans can blow it away? What if you are in search of an effective way to keep your system stable even on the hottest days of summer?

Well, the answer to all of these questions may well be water cooling. Formerly the preserve of only the most dedicated enthusiast, water cooling has, certainly over the last few years, become more simple and more affordable. Where once you had to spend hundreds of pounds to build a cooler from scratch that would let you run your CPU like one fifty quid more expensive, these days the economics actually fly.

Better still, the difficulty of setting up water cooling has also been dramatically reduced. True, it's not the easiest procedure in the world, but closed-loop, pre-assembled liquid coolers mean it's now almost as simple to install water-

based cooling systems as it is to install a fan and heatsink, and hardly any riskier. Undoubtedly, gamers are the people who have benefitted most from this change, and that begs the question: if you're building a gaming PC, how do you know if you need water cooling or not? Hopefully, we can answer that question (and more) by looking at how water cooling works, and why you might want to use it.

How Does It Work?

Most consumer water-coolers are the same kind of self-contained unit. They contain a pump, for shifting the fluids around the system, a cooling block which draws heat out of a component, a radiator to disperse the heat into the air, and a fan to suck/blow that air out of your case. Typically, the cooling block

attaches to the CPU, or the GPU, or whichever other component you wish to cool, and the fan attaches neatly to any standard-sized case exhaust port.

The only maintenance you have to do on most CPU coolers is on the fan, so in that sense it's no different to an air-based cooler. If you're used to keeping the dust out of fan blades, you're doing all you have to. Modern water cooling units are completely sealed, so there's no need to change or refill coolant, and there's no great danger of it leaking out over your PC internals either.

If you're wondering why we said 'coolant' just now rather than 'water', that's because watercoolers don't only use water. Rather, they contain a water-based solution of chemicals, with additives designed to improve heat conduction, and to prevent limescale build-up, corrosion



and other adverse reactions. There's nothing particularly dangerous in there, but in case anything goes it's worth remembering that it's not just water flowing through those pipes.

Like fans, if water coolers want to bring the temperature of a component down faster, they can speed up – though in their case it will be the flow of liquid, rather than the speed of the fans. Some coolers do this by increasing the system pressure; running the pump faster to shift heat more quickly. Others may speed up the radiator on the fan, maintaining as low a temperature in the coolant as possible. In both cases, you'll get a noisier but more effective cooling result, just like you would with a fan that was stepping up its speed.

Water cooling systems start at about the same price as a high-end fan-based CPU cooler, but they have numerous benefits that justify you opting for them over air cooling. They're considerably quieter than CPU fans (particularly multi-bladed high-end ones) and they're much more effective than air-based coolers as well. If you're in any doubt, performance is the best reason to pick a water cooler over a standard fan, as it's the one area where there's truly no contest.

Setting Up

Water-cooler installation used to be a complicated process, but modern coolers aren't that much more difficult to fit than

modern fans. As with any heatsink, you have to take great care to make sure it's properly conducting heat from the thing it's cooling, but other than that the hardest part is attaching the fan in such a way that the water can flow freely. As long as you avoid twists and sharp kinks in the piping, it's not much work at all.

That assumes you want it to be easy, however. If you want a more powerful, bespoke-build water cooler then there's nothing to stop you building one yourself. The components are freely available, so you can pick a radiator, reservoir, pipes and extractor fan that suits your personal needs and tastes. Just make sure you put it all together nice and tight!

Do I Need A Water Cooler?

The truth is, if you're reading this article and wondering whether you need water cooling, the answer is probably 'no, not really'. Water cooling is aimed at high-end users who are used to customising a system and will probably be acutely aware of the cooling requirements before it's even built. The only circumstance in which you might need a water cooler and not be aware is if your CPU frequently gets too hot and crashes.

However, just because you don't need one, it that doesn't mean that you can't want one. Virtually every system will benefit from water cooling in some small way. Furthermore, if you're thinking of building or improving your existing

system, you may not know that water cooling would be an appropriate inclusion in the updated PC. With that in mind, here are a few situations where we think water cooling is worth pursuing.

If you're running (or plan to run) an HTPC, then the system can hugely benefit from the reduced noise a water cooling system offers. They aren't zero-noise coolers, because you still have to run the exhaust fan, but they run at a more consistently-low volume and are less likely to speed up during an important part of the film or TV show and kill the mood.

Additionally, water coolers tend to be more compact than standard CPU fans, because the CPU heatsink and fan aren't locked together in a single giant lump. If you've got an HTPC in a mini or non-standard case, the flexibility of a water cooler might be more convenient than a standard, immobile cooler.

In the gaming world, SLI/Crossfire systems will also benefit from the use of a water cooler that can reduce the temperature of graphics cards that have been placed close together where air might be difficult to properly extract. A water cooler's ability to snake around the cards means the lack of space won't cause a problem.

Some people also cite the looks of a water cooler as being integral to their appeal. Certainly, they have a neo-industrial charm, especially the ones that come with built-in lighting or different

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coloured coolants, but this is purely a matter of taste. We wouldn't presume to tell you what looks better, (and besides which, some fans look so futuristic it's not inconceivable that they were actually nicked from somewhere within the bowels of the large hadron collider).

Perhaps the best reason to use a water cooler, however, is if you're planning to overclock your components. If you want to push your CPU or GPU further than their stated limits, you need to make sure they stay as cool as possible. OEM fans – the ones they come bundled with – are very basic and don't have much built-in tolerance for extra heat. If you're overclocking, a new cooler is a must-buy, and a water cooler could well give you more headroom than any other option.

When Are Fans Better?

Just because water cooling has a lot going for it, that doesn't mean you should use it exclusively. There are plenty of situations where a standard fan might be a better choice.

Primarily, a standard CPU fan costs a lot less money than a water cooler. If you're building a system on a budget, it can be hard to justify spending the extra money a water cooling unit demands. As well as costing less in absolute terms, they're often worse value than a fan if you look purely at the amount they cool versus their cost.

That said, they can still save you money – a water cooler and overclocked processor will cost less than the equivalent speed processor – but if you're running a budget system containing a low-end CPU, it's likely a half-decent fan cooler would be able to do just as well with the hardware.

Water coolers are also likely to be unnecessary if you're not running either a high-end gaming system. As we've noted, some HTPCs might benefit from a water cooler, and all PCs see some benefit – but if you're a casual gamer or light desktop user, there's no sense in using a water cooler. It'd be like buying a Ferrari and using it to drive to the shops and back once a week.

Fans are also better if you're just not that technically-minded. Sure, water coolers aren't all that difficult to fit, but they are quite definitively more complicated pieces of machinery than the average CPU fan. If only because there's only one thing to plug in on a CPU fan. It's not a huge concern for most people, but if you've never cracked your case



“ If you're a casual gamer or light desktop user, there's no sense in using a water cooler. It'd be like buying a Ferrari and using it to drive to the shops ”

open before, trying to install a water cooler might feel a little daunting in the way that installing a CPU fan most definitely wouldn't.

Recommended Options

It's fine to talk about water coolers on a conceptual level, but how about we give you some specifics? If you're unsure where to start in the world of water-cooling units, this last section should give you some idea.

Best Cooling: Cooler Master Nepton 280L - £100

The Cooler Master Nepton water cooler is arguably the most efficient and effective water cooler on the market right now, continuing the company's dominance in the field. Built using an exclusive Cooler Master-designed pump that can't be found in anyone else's product outside the brand, it's also got a highly effective heat block and thicker, longer tubing for

greater reliability and manoeuvrability. Dual JetFlo 140 fans and a double-size 280mm radiator also go a long way to explaining its high performance – and while it's not the quietest CPU cooler around, it's good enough that you won't care. Perfect for overclockers.

Quietest Cooling: Zalman LQ310 - £55

Built by water-cooling pioneers Asetek, Zalman's LQ310 cooler is designed for use with a single 120mm fan. It's not the most efficient cooler on the market, but it more than makes up for that by being whisper-quiet.

We don't think there's a quieter CPU cooler on the market, and in any case, its capabilities are instantly superior to any CPU fan you care to put it up against, so it's not like you're losing out in any great way. If low volume is important to you, this is definitely the model to go for. Ideal in an HTPC. [mm](#)

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Simple Gaming Upgrades

Which components will make the most difference to your PC with the least fuss?

Keeping up with gaming is a difficult task. You can buy a top-of-the-line PC, and within months it's struggling to run the latest games in the manner to which you've become accustomed. And worse still, if you buy a mid-range gaming PC, within a year you might find yourself cranking every detail as low as they can go just to keep playing at all!

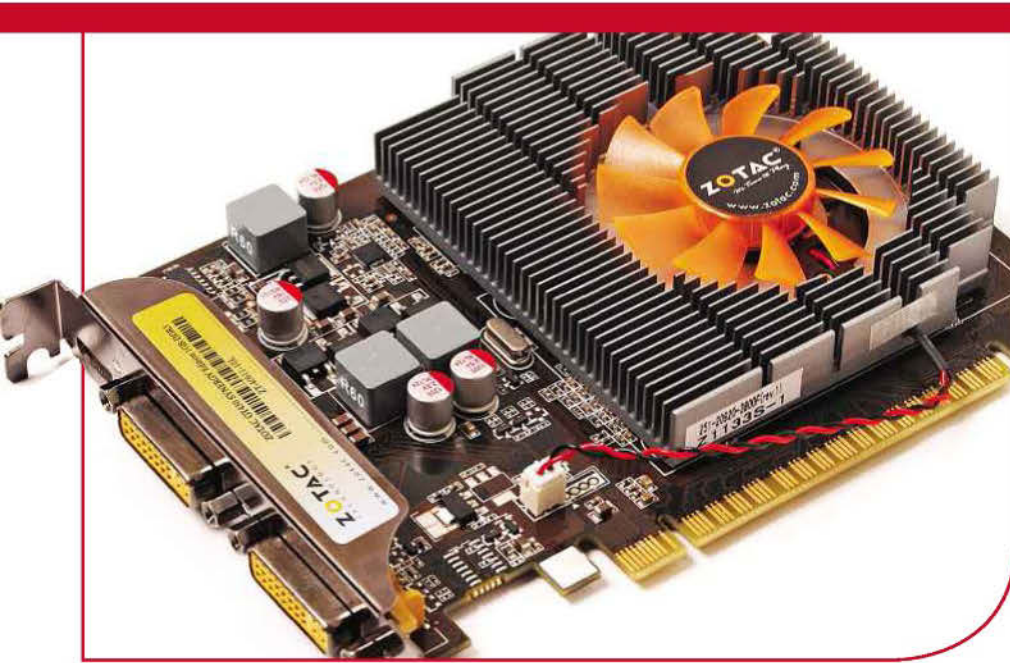
While your first instinct might be to junk your existing PC and buy a new one, we think there's a smarter way to operate. Sometimes, a single upgrade can improve a system. Maybe you don't even need to replace the hardware, but rather give it a little maintenance. Either way, in case you're hoping to squeeze some extra gaming performance out of your system, we've put together this list of tips, tricks and upgrades you can carry out to help rejuvenate an otherwise ailing PC.

Add A Graphics Card

Assuming you don't have one in your system already, the quickest way to turn any system into an instant gaming machine is to add a graphics card. On-board GPUs might be cheap, but they're not designed for gaming. A separate GPU will, in almost every case, offer a considerable performance improvement on an integrated one.

In fact, any system of reasonable power – even Core i3s and low-end AMD chips – will become an acceptable gaming machine once you put a graphics card in. In most cases, as little as £50 will buy you one better than any integrated GPU you might be using, and you don't even have to stick to a recent generation of card, so bargains can be found everywhere.

The exact level of upgrade does depend on which type of integrated GPU you're using. If you're running a Sandy Bridge or



Ivy Bridge chip, virtually anything from the last generation or two would be a vast improvement. If you're running a Haswell chip, the GPU is slightly better but still much weaker than most discrete cards. In either case, the cheapest card you can buy new is the GeForce GT 630, which costs around £50. The cheapest better Radeon is the HD 6570, which costs around £75.

Adding a graphics card isn't even a very difficult procedure at this end of the market. If you're installing a very powerful card, you'll have to think about things like system temperature, power drain and interior air flow, but the cheapest cards around will easily run off all but the most weedy PSUs. As long as you've got a free PCI slot and a power supply stronger than about 350W, you won't even need to look at the rest of your system.

Improve Your Graphics Card

Having a graphics card is one thing, but sometimes the quickest route to improving your gaming is to choose a better one.

It's often difficult to decide exactly which card to go for, not least because there are loads on the market. It doesn't help that multiple manufacturers make different implementations of the same card, nor that several generations of graphics card appear to be on sale at the same time.

To make sure you get a card that's better than your existing one, you need to know how the generations fit together. Nvidia's GeForce line is currently the simplest. The 200-series cards are the

cheapest and most basic (it's a budget line), and after that point, 600-series cards are previous generation, and 700-series cards are current generation.

With AMD's Radeon cards, it starts off similarly, but there are more around. The 5000-series cards are the oldest, while 6000-series and 7000-series cards are more recent generations still available to buy new. However, it's the Radeon R7 and R9 series that are the newest and best. The R7 240 is the most basic, and the R9 290 is the best.

As a rule, if you're upgrading, you want to make sure the model numbers are all higher than your current card. That way you know you're not buying

anything slower! RAM amounts aren't such a big deal – aim for 2GB, but don't be too upset if you have 1GB. Anything lower is too little to be effective, and anything higher means you've strayed into the premium end of the market, so make sure that's what you want before you start spending!

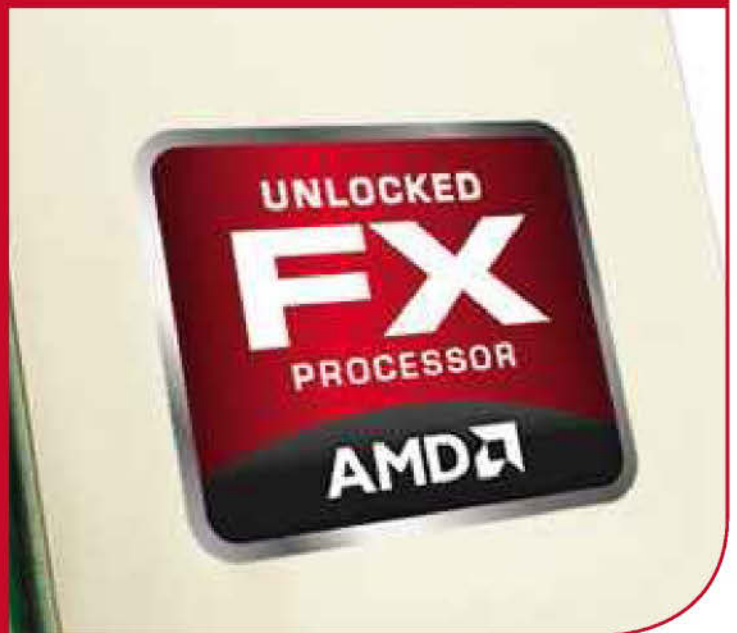
As hinted earlier, high-end cards do come with attendant concerns, the most pressing of which is the issue of power. If you have a card that needs its own internal power supply, check that your PSU can handle it before you do anything else. You can use an online calculator to figure out the specific values involved, but if you find out the TDP value of the card, make sure your PSU outputs around 2.5 times whatever that is and you should be fine. As an example, a Radeon R9 290 has a TDP of 275W, so a good-quality 700W PSU or higher should be more than enough to run it on!

Add An SSD

One of the more expensive upgrades you can do to improve gaming performance is to add an SSD to your system. A good one of reasonable capacity (128-240GB) costs between £100 and £200, but they eliminate a huge gaming bottleneck that you might not even know existed.

Specifically, their fast read and write speeds allow SSDs to shift data around your system faster than any hard drive could hope to. You may not be aware, but a lot of the frame-stutter and pop-in you experience when playing a game isn't caused by an inadequate CPU or slow graphics card; it's caused by the sheer





time it takes to fetch the data from your hard drive and load it into memory.

This is the bottleneck that SSDs fix. Even the slowest, most bog-standard SSD will be exponentially quicker than a standard mechanical hard drive, so as upgrades go, they're a guaranteed winner.

Don't rush to get one right away, though; there are practical difficulties inherent in an SSD upgrade that might put you off. For a start, to get optimum performance from one you'll need to be running Windows off it (since the windows cache also slows down games). You don't just have to install an SSD physically – you have to transfer Windows to it and make it your primary drive.

Some SSDs come with apps that help you do this but not all. If you're used to doing this, a fresh installation might appeal more anyway. But it's a step that you can't really skip, and it's not an especially simple one.

The space constraints might also put you off. If you're playing a lot of games, you might enjoy having a terabyte-level hard drive to install them on. Being bumped back down to something measured in gigabytes could be a rude awakening. To see the best effects, you need to run games off the SSD as well as your operating system, so prepare to do a little reshuffling and reorganisation!

Upgrade Your CPU (Intel)

A new CPU is always worth considering, not just because it improves in-game performance, but because it improves your system generally.

If your PC currently runs on an Intel platform, then there's a good chance you have plenty of room to upgrade it without having to replace your motherboard as well. Sandy Bridge motherboards from several years ago can take any socket LGA1155 CPU, from the lowliest Sandy Bridge Celeron up to an Ivy Bridge Core i7. Unless you started with one of the faster Ivy Bridge chips, you shouldn't have much trouble finding an upgrade that's worth making.

Unfortunately, if you're running a Haswell chip or a pre-Sandy Bridge Core CPU, it's harder to upgrade your processor without replacing the motherboard at the same time, at the absolutely minimum. You could, however, see if your chip has support for any overclocking features. If your chip's serial number has a 'K' after it (e.g. it's an Intel Core i5-2500K), then the hardware is considered unlocked and ripe for overclocking.

As long as your motherboard supports it, you can overclock K-series chips so that they run faster. There are risks associated with doing this: overclocked chips run hotter, which makes them less stable and more prone to damage, so you may need to improve your cooling system to maintain the quality of performance you're accustomed to. It's not a perfect solution, but when the alternative is essentially rebuilding your entire PC from the ground up, this might be a better approach for you.

Upgrade Your CPU (AMD)

Upgrading your AMD system is, in many ways, an easier process than upgrading

an Intel system. That's because they only have two major socket types, which are compatible with a larger number of chips.

FX-series chips fit in Socket AM3+ motherboards, so if you have an existing FX-series chip, you can upgrade as far as an FX 9590 without having to buy any new hardware. In gaming terms, that's not a bad upgrade, but it's worth pointing out that for the same price – approximately £230 – you could buy a new motherboard and an Intel chip that's as fast as the FX 9590.

The problem is that Intel's dominance over the FX series of chips is so assured that buying one at all is an inefficient way to spend your money. Even AMD recognises this, which is why there are so few AMD chips available at the moment. The selection isn't huge and won't be for some time.

Fusion APUs are slightly more fragmented than the FX series chips, with both FM2 and FM2+ chips available to buy. The A10-7850K is one of AMD's best chips, not least because of its built-in Radeon R7 GPU. If you've got a motherboard that supports FM2+ chips, it's worth upgrading to. Indeed, AMD's dual-graphics solution, CrossFire, means that if you have an R7 in your system, you can use its GPU in tandem with the stand-alone graphics card – something Intel can't compete with at all!

So while AMD upgrades appear easier when it comes to determining compatibility, it's worth remembering that the value for money isn't particularly great, and that contrary to common sense, in certain circumstances you can



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get a better performance leap for less money by buying a new motherboard and CPU, rather than just upgrading the CPU by itself.

Install Extra RAM

Additional RAM can be a simple way to upgrade any system, but be careful if you're doing it to improve gaming. There are only certain situations in which it makes a difference.

Most games, for example, don't use more than a gigabyte or two of RAM. This is because they rely more heavily on graphics memory than system memory. If you're running an integrated GPU only, this is the same thing, and therefore low system RAM can have an effect. Similarly, if you have an exceptionally small amount of RAM such that your operating system struggles to keep up, another stick or two will improve your gaming performance.

Generally speaking, if you're running a 64-bit version of Windows, you should have 4GB of RAM as the absolute minimum for a functional system. 8GB is the minimum amount you need to run your operating system and games comfortably, so if you have less than that, you probably will see a small improvement in your gaming benchmarks by adding more.

Above that point, the likelihood that more RAM will effect a visible improvement becomes smaller and smaller. 16GB is vastly more than any gaming system needs and is only likely to be of benefit to systems with heavy RAM usage – media editing systems, for instance.

We appreciate that it can be tempting. RAM upgrades are easy to install and cheap to get hold of. Just don't let the ease fool you into thinking it's definitely worth doing – spend your money wisely!

Upgrade Your Cooling

We've already mentioned how an improved CPU cooler can allow you to overclock your chip and squeeze more power out of existing hardware. The same is also true of other forms of cooling in your system.

Graphics cards, for example, can be fitted with custom coolers, which allow you to overclock them without fear of causing damage.

This might mean fitting a secondary (or tertiary!) fan, an additional heatsink or a water-cooling system. Unlike CPU fans, additional cooling of this manner can be tricky to install and should not be attempted unless you have full confidence in your abilities. Remember that most high-end graphics cards already have multiple cooling systems, so it may not be possible to add more!

Another alternative might be adding extra cooling features to your case. A lower ambient temperature in your case will let graphics cards, RAM and processors cool down quicker, allowing them to run faster whether overclocked or automatically stepped by a built-in thermometer.

The simplest thing to do is add exhaust fans, which aid the removal of warm air. You do have to contend with increased noise as a result, but it's a small price to pay for a faster system. More complicated cooling methods might involve creating air ducts by drilling strategically placed holes in your case, but that's a trick for those who like to get their hands properly dirty.

If you're of a less powertool-happy disposition, you can achieve similar cooling effects simply by rearranging your internal components to eliminate warm air pockets and cables that may impede air flow, or (even more simply) by making sure components, their heat and their fans are kept dust-free. You'd be surprised how much heat a layer of fluff can keep in! [mm](#)



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ARE MULTI-GPU SYSTEMS WORTH IT?

We see if more power is necessarily better

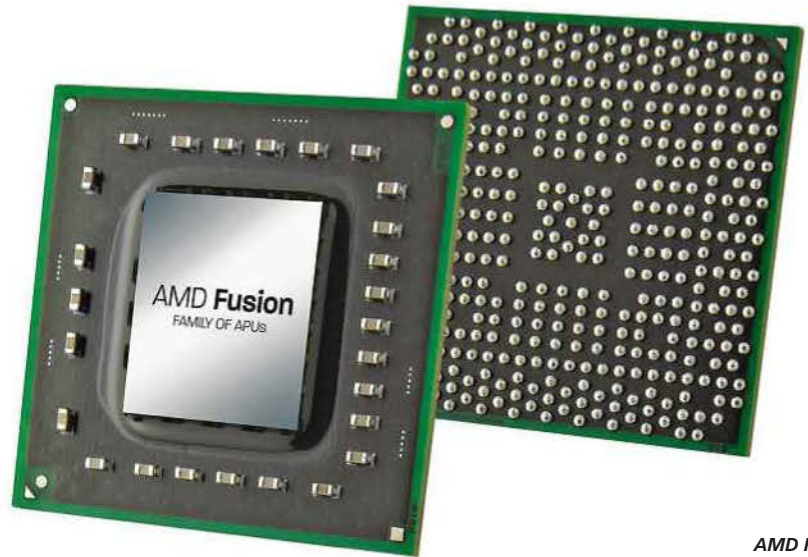
Gaming systems are notorious for their high-power approach, and no quality can be more representative of this than the fabled multi-GPU system. Like a coach with two horses, multi-GPU systems use more than one graphics processor to summon up visuals far in advance of what most single-card systems can manage.

But while they might come with bragging rights and a certain trendy appeal, it's not often made clear what they can offer that a single-card solution can't. With that in mind, we've looked into the issue of multi-GPU systems to ask the ultimate question: are they really worth your money?

Budget Multi-GPU Systems

While multi-GPU systems are often seen as the preserve of high-level enthusiasts, the reality is that most systems actually already have more than one GPU in them. If you have an Intel system that has a separate graphics card, then your PC has multiple

SLI AND CROSSFIRE



AMD Fusion

GPUs. If you're using an AMD Fusion platform with a separate graphics card, then again, you have multiple GPUs.

The difference between this and SLI/CrossFireX systems is that when you put a graphics card into a system which has an on-board GPU, the on-board GPU is bypassed completely in favour of the more powerful graphics card GPU.

Generally speaking, that's a good idea. The on-board GPU isn't very powerful, so bypassing it completely makes sense. However, there are exceptions in some AMD systems.

If you're running a Fusion-based APU, the processors contain AMD Radeon-based GPUs. As long as you have a compatible motherboard and graphics card, you can run your system in a configuration originally known as 'Hybrid CrossFireX' and since renamed 'Dual Graphics' to differentiate itself from a true dual-GPU system.

Dual Graphics was introduced with the Llana-based APUs in 2011, and persisted through the Trinity and Richland platforms. It's still available to use today, and although it originally had problems with its implementation it's now considerably more stable, if not perfect.

You can currently run Dual Graphics with a Radeon HD 6000, HD 7000, HD 8000 or R7 series graphics card, as long as your Fusion chip's on-board GPU is of a similar series. Performance is higher than either unit on its own, but there are limitations. DirectX9 graphics aren't supported, only DirectX 10 and DirectX 11, so older games won't benefit from the increased capacity.

The benefits to this approach are limited, of course. If you have an APU, you can use it to guide your choice of separate graphics card for increased performance, but we wouldn't recommend actively pursuing this direction for a gaming system, not

least because an Intel CPU and graphics card would be considerably better in performance terms, even if it wouldn't take advantage of the second GPU like a Dual Graphics system would.

Dual Graphics, then, is best considered for those who already have an APU-based system who want to get better graphical capabilities while spending as little money as possible. Buy a card in the same series as your on-board GPU and you'll get noticeably better performance for less money than a single-card solution would cost. It isn't perfect, but ultimately, it's good enough to be worth pursuing.

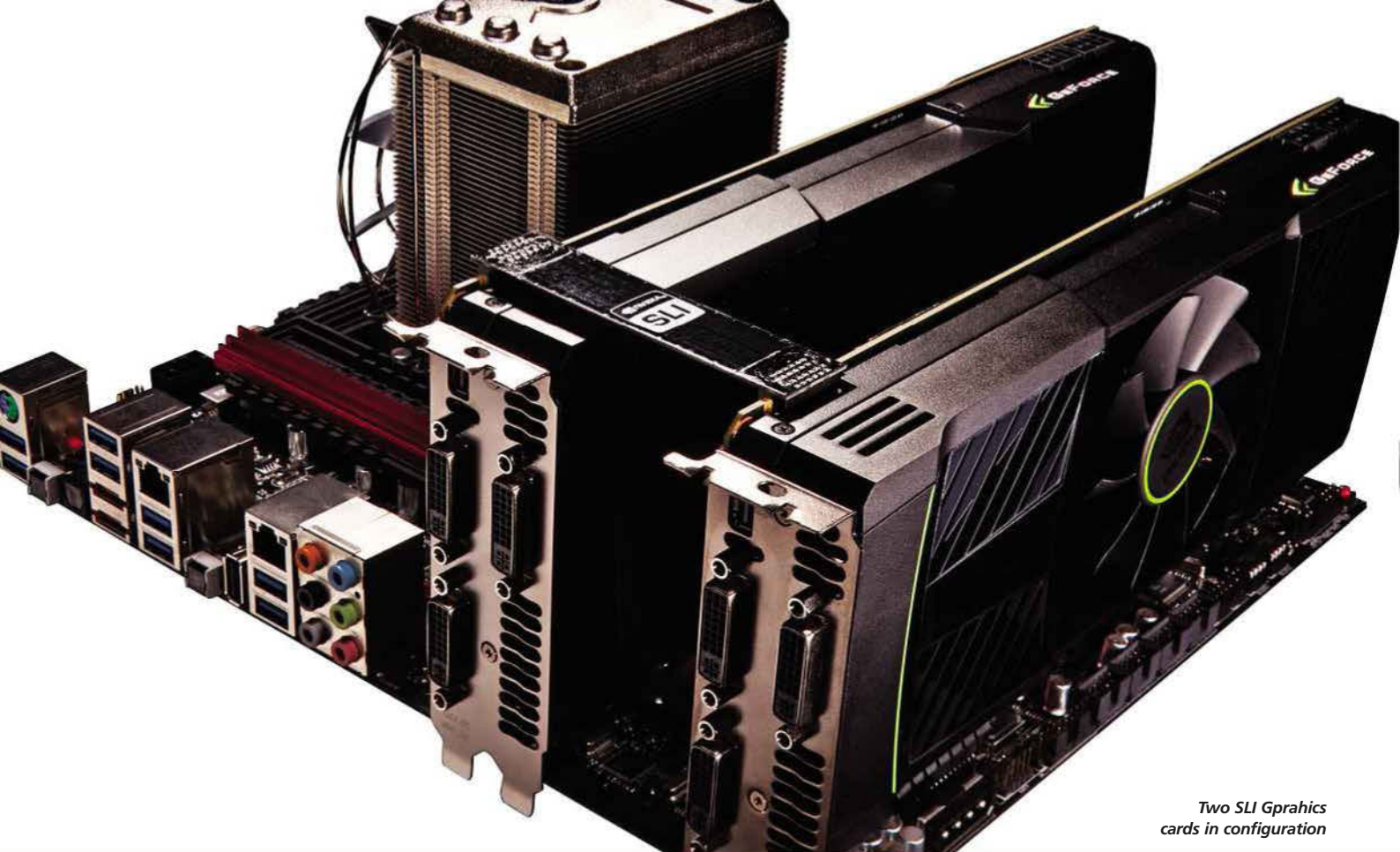
Enthusiasts

At the enthusiast end of the gaming market, there are two options for high-capability graphics systems. Either buy a single, superb graphics card, or buy multiple graphics cards and run them in configurations of two, three or even four cards together. The questions we need to answer are whether a single high-end card is better than two lesser-powered cards running in tandem and whether there's any big difference between Nvidia's SLI and AMD's CrossFireX systems.

SLI Vs CrossFireX

Although the technologies do essentially the same thing – link up two or more GPUs so that they can share the burden of graphics processing – SLI and CrossFireX have several important differences, which might influence your choice of which to go for when you're building a multi-GPU system.

Perhaps the most important thing to note is that Nvidia graphics cards must have exactly the same GPU and RAM amount to run in SLI mode. They can be from different manufacturers, but they need to be essentially the same card underneath. You



Two SLI Graphics cards in configuration

can mix and match a Sapphire GeForce GTX 660 and an MSI GeForce GTX 660, but not a Sapphire GeForce GTX 660 and an MSI GeForce GTX 670.

With AMD's Radeon cards, that's not the case. You can run any two Radeons from the same line together, regardless of RAM configuration. A Radeon HD 7770 can be run in CrossFireX mode with a Radeon HD 7750, but not a Radeon HD 8750. Manufacturer and RAM amounts have no influence on the capabilities and, of course, if you have an APU with a compatible GPU, you can link that to the other GPUs for improved performance.

CrossFireX is also slightly streamlined compared to SLI. All Nvidia cards still require a connecting bridge to connect the two cards, while newer AMD boards don't; they can run in CrossFireX configuration purely off their motherboards. It's not a huge problem, admittedly, but it is one extra link in the chain that can fail when it comes to SLI boards, and another tick in favour of AMD's technology.

CrossFireX also has the distinction of being available in more motherboards. SLI is only supported by the higher-level Intel boards, and even then, only the most expensive support more than two GPUs.

All of this tilts the favour slightly in the direction of CrossFireX over SLI, especially if you have plans to start with a single-GPU system and upgrade it later. But there are some things in Nvidia's favour that are worth nothing.

For example, at the top end of the market, Nvidia graphics cards are more

expensive in terms of the raw power they offer for their price, but they're also better-made. This means that they have greater tolerances and can be overclocked more readily. AMD cards, by comparison, are generally held to be better value, but they run hotter than an equivalent power GeForce and are thus harder to overclock.

This makes choosing a card relatively easy in retrospect. If you're a spend-happy consumer who can afford to go straight to a multi-GPU system, you should spend your money on a Nvidia-based SLI system. The hardware's better, if more expensive. If, on the other hand, you're more frugal or hoping to use a multi-GPU solution to get the best performance out of cheaper components, AMD Radeon-based CrossFireX is the system you need. You'll save the most money that way.

One GPU Vs Multiple GPUs

And so we reach the ultimate question: does it make more sense to run two graphics cards in SLI or spend the same amount of money on a single really powerful card?

Obviously, the single-card setup has some obvious benefits. They only take up one slot in your system, which leaves more room for other devices and/or better air flow for cooling. They're less likely to encounter misconfiguration and technical issues, because you don't need any extra hardware capabilities or special drivers to run a single card, compared to running SLI or CrossFireX. And they arguably retain their value better

when it comes to reselling a used card, since they take longer to fall below average.

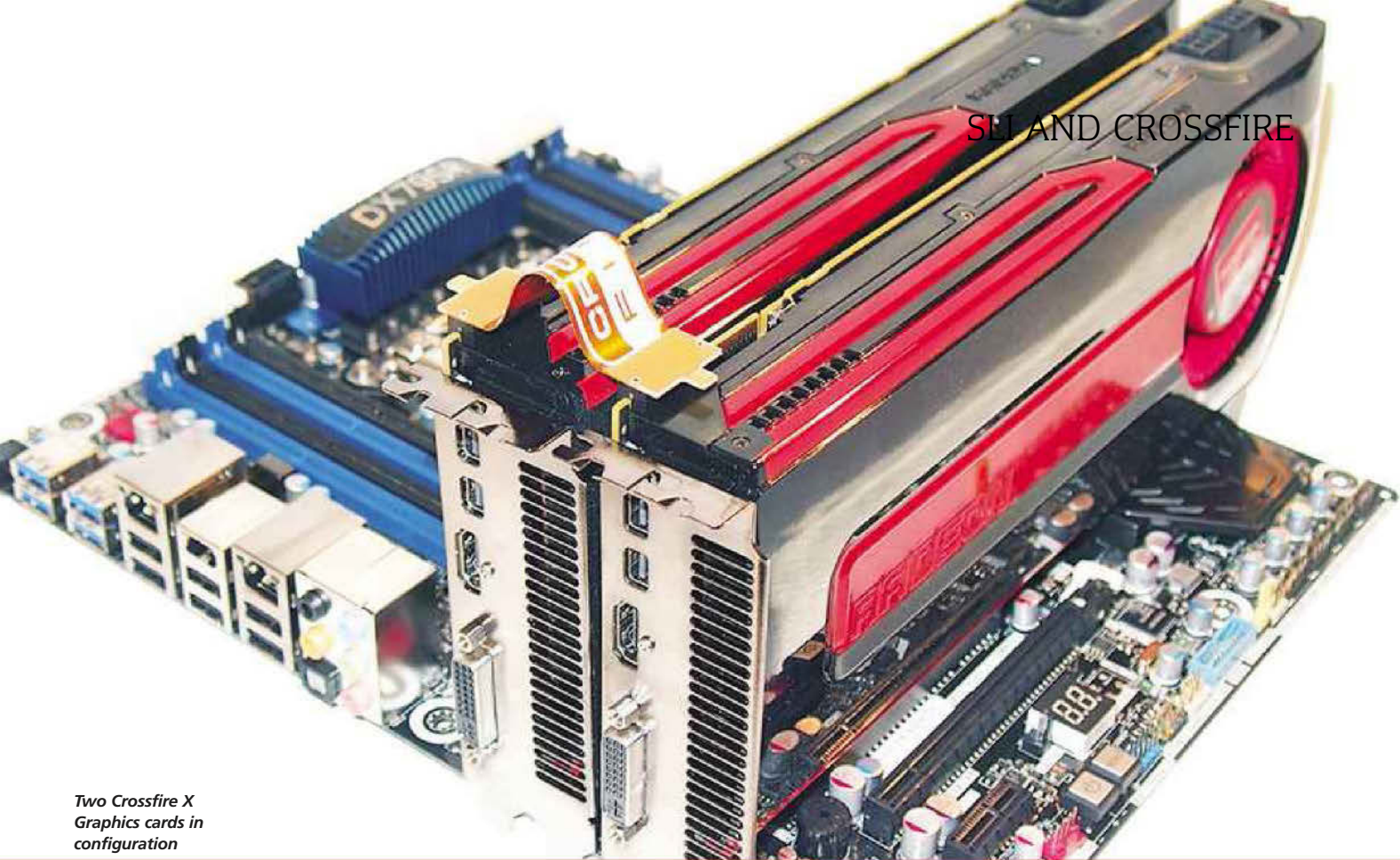
Furthermore, two GPUs don't ever give double the capacity of their single incarnation. This is because a portion of their processing power (sometimes as much as 10-15%) is used to communicate and coordinate with the other graphics card. You don't get double the performance from having double the cards.

But if single card systems have fewer problems and make more sense long-term, why do multi-GPU systems exist at all?

For a start, buying two cards instead of one is usually slightly cheaper than a single-card solution, which means you can save your money or spend it beefing up another part of your system instead. In the majority of cases, the price to performance ratio of two SLI cards is cheaper – at least in the initial case. Running them may be another matter, but it depends how much power they draw and how you use them!

It's also easier to scale if you're buying mid-range cards. If you want, you can buy one mid-range card, then add a second, third or even a fourth in future without having to spend a lot of money. If you start with one very expensive graphics card, adding another will cost a lot more, making upgrades harder to achieve.

Multiple cards also make multi-monitor and high-resolution gaming easier for your system to do. In a single-card system, there are bottlenecks inherent in shifting data from RAM to screen which are halved in a dual-card system. And if you have two



Two Crossfire X
Graphics cards in
configuration

monitors, performance will obviously be better if you have one card assigned to each monitor rather than a single card trying to service two.

Is It Worth It?

The answer, perhaps unsatisfyingly, is 'it depends'. Specifically, it depends on what you value most in a system.

If you want to get the best performance for the best price, immediately, then a multi-GPU system will allow you to avoid paying the premium on high-end cards.

If you want to get the best upgrade for the least amount of money possible, then adding an extra GPU to your system will represent better value than replacing the existing one.

If you want to avoid possible misconfiguration and incompatibility issues, paying for a single card makes more sense.

Similarly, if you're worried about practical issues (system noise, heat generation, power draw and space usage), then a single card will let you get the optimum performance while reducing these factors.

If we had to recommend anything, we'd say this: don't start with a dual-GPU system. If you're building a new PC or buying one fresh from a builder, go for a single-card solution. SLI and CrossFireX are best used as an upgrade that allows you to stretch an aging system's capabilities – especially because the card you need will have dropped in price in the intervening years.

Ultimately, whichever setup you go for, the important thing is that it fits your



Bitcoin Mining With Multi-GPU Systems

Bitcoin mining, in case you're unaware, is the term used for the process by which bitcoins are created. By solving complicated maths problems, processors participate in the creation of new bitcoins, earning a fraction of the created coins for their owner. While the most popular method of bitcoin mining is to use your idle CPU time, it's also possible to use GPUs to run the necessary software.

In theory, it's a good idea. It leaves your CPU free for more important tasks, and your GPU – which is largely idle when you're not playing a game – earns you money (even if it is crypto-money). Indeed, a year or two ago this was such a popular method of generating bitcoins that people would build multi-GPU systems specifically to mine bitcoins on, never once thinking of using them to play a game.

Unfortunately, anyone learning about this now has missed the boat. The way Bitcoin's creation system works means that each wave of coins takes more effort to 'mine'. Combine that with an increase in the number of people mining, and it's become the case that creating bitcoins using GPUs is now too inefficient. Those mining the currency will spend vastly more than they can earn just powering their hardware, and even banking on Bitcoins' legendary fluctuations to earn money in the long term is a huge risk, given the minuscule amounts you'll receive for your work.

So while multi-GPU systems might be great for gaming, they no longer have a secondary application in the bitcoin mining field. But all isn't lost. Cryptocurrency alternatives such as Dogecoin and Litecoin are still in their early stages, and unlike Bitcoin, they can be mined on multi-GPU systems. It's a gamble, given that they're already much less stable than even Bitcoin – but it's one that could just pay off!

needs and abilities. If you know you'll struggle to tweak and configure two cards, that takes precedence. Similarly, if you're intrigued by the challenge of setting up two cards in an attempt to save money,

that might be the overriding factor. We hope we've straightened out the positive and negative features of both types of system. It's up to you to choose which is best for you! **mm**



3D GAMING

WHAT DO YOU

James Hunt looks at how to take your gaming into the third dimension

Home 3D never quite took off in the manner that the industry hoped, and several years after the introduction of 3DTVs and monitors, they aren't exactly common in every household. Indeed, they've almost stopped rolling off the production lines altogether. But that doesn't mean 3D gaming is completely dead and buried. It may not have gone mainstream, but it's still something that people are interested in, and it's still available to those who want to try it out.

Just in case you're one of those people interested in adding 3D to your gaming system, we've put together this guide to the technologies you might encounter and the hardware and accessories you need to get a 3D gaming system up and running in 2014.

In the most basic sense, you need four things: a 3D-ready monitor, a 3D-capable graphics card, something to connect the two (such as an HDMI cable) and the glasses to let you view 3D images. We'll now examine these requirements in more details.

A 3D-ready Monitor

Choosing a 3D monitor is the most difficult and expensive part of the process. There are two kinds of 3D technology you can find support for: active and passive. While both allow you to view a 3D image, the two are quite different from one another, and your monitor will only support one or the other. In basic terms, active 3D means the glasses are putting work into filtering the image, while passive 3D means the image is filtered purely by the lenses without extra effort required. Let's examine the situation in more detail.



NEED?

Active 3D

In an active 3D setup, the monitor screen rapidly flicks between the 'left' and 'right' images. In sync with that, the glasses turn the relevant lens on or off by using a battery power source to alter their ability to let light in. This happens too quickly for most people to notice, but it ensures that the 'right' image only reaches the right eye, and the 'left' image only reaches the left eye.

For active 3D to work, your display needs to support a 120MHz refresh rate. Any 120MHz screen can be configured to work with active 3D glasses, since the images displayed are otherwise normally. Rather than showing one image at 120MHz, the displays show two different images at 60Hz each, which is the same as a standard, non-3D monitor.

Active 3D is considered the superior technology, because it ensures that the 3D image is displayed at full resolution, at a full frame rate. That said, it's not without its problems. The glasses are bulky and expensive, and have the inconvenience of requiring their own power source. The flickering lenses can give some people headaches or eye strain, though the majority of people won't notice it.

For 3D gaming, you should look for a 120Hz monitor that is specifically compatible with Nvidia's 3D Vision 2 system. A full list of compatible laptops and monitors can be found on the Nvidia site here: bit.ly/1f7dl4D.

Passive 3D

In passive 3D systems, the glasses have permanently polarised lenses, and instead of alternating between two images, the screen displays both at once. The screen outputs two images at different polarisations, and the lenses ensure that the correct image reaches the correct eye, without any battery component required. The polarisation of the display is what makes the difference; only compatible monitors can display an image that the glasses are able to filter.

The disadvantage of a passive/polarise screen approach is that the two images are shown at a lower resolution, because the display can only assign half as many pixels to each one. Rather than flip rapidly between two full images, passive 3D assigns even lines of pixels to one eye, and odd lines of pixels to the other. When the image combines in your head you get a 'full' resolution, but each eye is only seeing half an image. The result is a lower-quality, less precise image, but one which doesn't have any chance of causing a problems through flickering, since no shutters are being turned on and off as with active 3D.

The best thing about passive 3D is that once you have the display, it's cheap to expand. New glasses cost less than a tenth of what active 3D glasses do, because they have no expensive components. If you've ever watched a 3D movie at the cinema, you've probably used passive 3D, purely because it's financially impractical to give active 3D glasses to an entire audience. Of course, the loss of resolution isn't particularly noticeable at the long distances you view from in a cinema, but close up on a computer screen you may be able to better discern it.

The passive technology for gaming monitors is called 'TriDef', and you can find a list of laptops and monitors that have the necessary capabilities here: bit.ly/PwLnCQ.

LightBoost

Starting with Nvidia's second generation of 3D specifications, monitors also had the capacity to add 'LightBoost' technology. Before LightBoost, 3D Vision-compatible monitors left their backlights on all the time. To prevent ghosting, the active glasses would 'close' both lenses while the display changed frames. On a display that supports LightBoost, the glasses flick straight from left to right, and the monitor backlight switches off momentarily while the frame changes.

This doesn't cause any problems for the viewer (it happens too quickly for you to notice), but it does mean that your eyes spend less time looking at a closed lens. This is important because it makes the images look brighter as a result. This effect is further improved because when the monitor backlight is turned off half of the time, it can go brighter when it's turned on without exceeding the monitor's power rating.

Notably, LightBoost technology can also be used in combination with other 3D systems, since the effect isn't specific to the glasses but the panel itself.



A 3D Graphics Card

To run stereoscopic 3D, you need have at least one graphics cards in your system. On-board GPUs are simply not powerful enough to render both halves of an image at once, so while a powerful CPU is advisable, you can't rely solely on one if you want fully 3D images.

Depending on which technology you want to use in your monitor – passive or active – you'll need to also have a graphics card that's compatible with one of the two main 3D technologies: Nvidia's 3D Vision system or AMD's HD3D.

Now that it's a few years old, 3D Vision support is available in virtually all of Nvidia's line. All you need is a compatible monitor and glasses kit.

It's important to note that Nvidia's 3D Vision system is not compatible with AMD cards, since it's a proprietary technology.

While Nvidia has its active technology, AMD cards must use HD3D and TriDef to create a 3D image. AMD doesn't make its own glasses, so you'll instead use whichever ones come with the monitor or display.

Whether you're getting an AMD or Nvidia card, running in stereoscopic 3D means you'll need to have a high-end card. You are, after all, asking it to render twice as many frames. For most current-generation cards, this means shelling out close to £200. Any less and you'll be forced to run in lower resolutions, and bear in mind that 3D comes with an inherent frame-rate hit.

A 3D-capable Video Cable

Between the graphics card and the 3D display, you need a video cable that can transmit 3D signals.

The most common type of connection is an HDMI cable, which can be used for transmitting 3D movie and game images. HDMI has been around for some time, though, so you have to make sure that your hardware specifically supports HDMI 1.4 or above, otherwise you won't be able to get a 3D image.

3D

Is 3D Going Away?

Despite the entertainment industry's best efforts, 3D entertainment remains broadly confined to the cinema screen.

In 2011, Nvidia's manager for 3D Vision, Phil Eisler, claimed that stereoscopic 3D gaming would overtake 2D gaming within five to ten years. Less than three later and it's popularity is actually in decline, with manufacturers as well as gamers.

Stereoscopic 3D gaming turned out to be a gimmick rather than a serious addition to gaming's canon. It's fun, there's no doubt about that, but in 2013 there was only one new monitor with 3D Vision 2 support: the Asus VG248QE.

Some blame the fragmentation of the market, with AMD and Nvidia's competing standards making it difficult for developers to support a niche technology. The games simply weren't there in a big enough volume to shift 3D hardware.

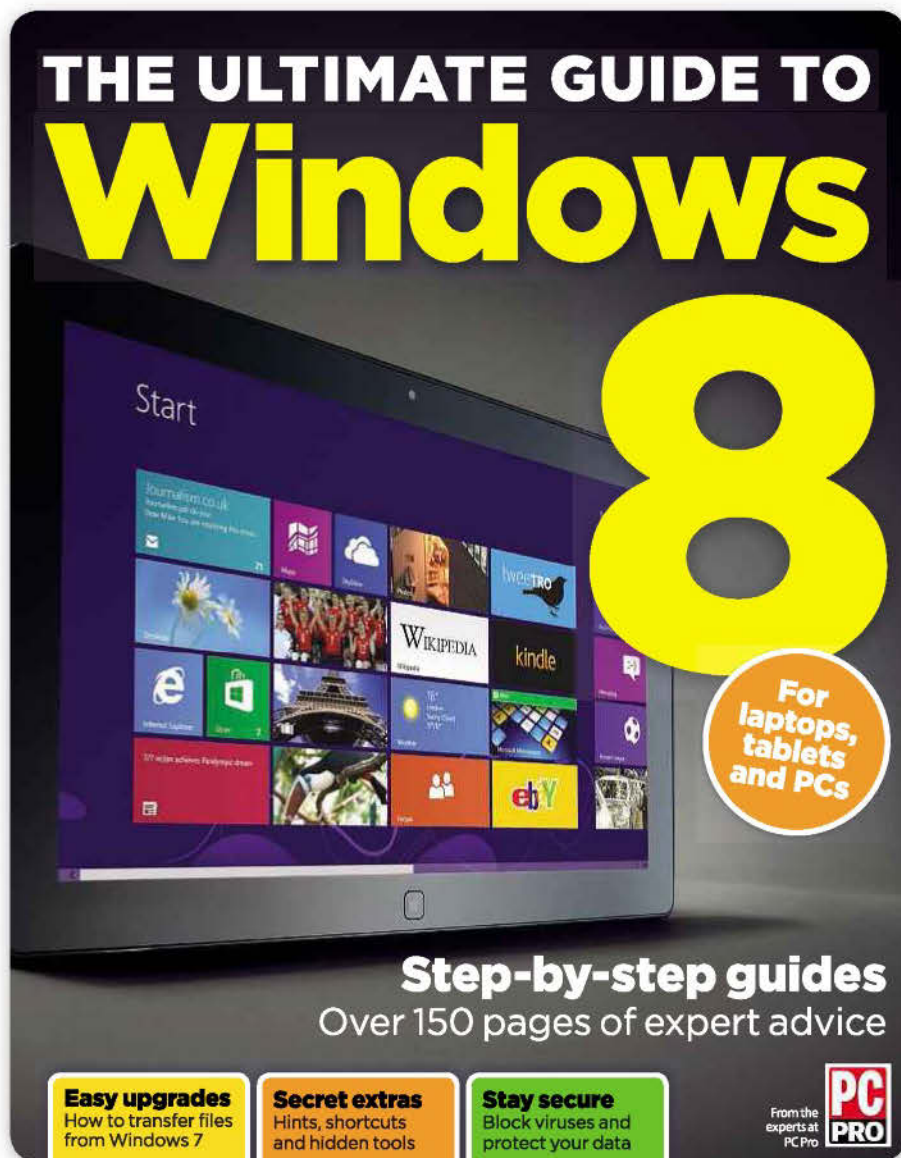
Of course, the disappointing response to the Nintendo 3DS and declining interest in 3DTVs suggest that something has failed to capture the public's imagination more generally. You might blame uncomfortable eyewear, uninteresting use of the technology or even the lack of 3D content for the public's disinterest, but the fact remains: the public has all but rejected it.

That's not to say that 3D gaming isn't ever going to take off. The likes of the Oculus Rift and Sony's Morpheus project prove that there's interest in 3D technologies. It may be that, for now, 2D is just more attractive to people. Maybe in another ten years, things will change.

Everything you'll ever need to know about **Windows 8**

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For the most part, it shouldn't be a problem. If you have recent hardware, then you should already have HDMI 1.4 support. This version of the standard was released in May 2009, so almost anything purchased after then will be compatible with it. The latest hardware will probably even support HDMI 2.0, which was released in September 2013.

Despite that, it's always worth checking the compatibility of both your devices *and* your cables. 3D signals can only be transmitted over HDMI 1.4 or better, so if any part of your system supports an earlier version of the standard, you'll only get a 2D signal.

Alternatively, if you're using DisplayPort for a connection, make sure your hardware and cables have support for DisplayPort 1.2 or above. As with HDMI 1.4, this is the minimum version of the standard necessary to support 3D signals.

“ Choosing a 3D monitor is the most difficult and expensive part of the process ”

If you attempt to use any other kind of cable, there's a chance you'll only get a 2D image, if you get an image at all. Other types may also fail to include HDCP (high-definition copy protection) support, so if you try to watch a Blu-ray movie, you won't be able to see the full resolution of the video, let alone a fully 3D image!

A 3D Vision Kit/Glasses

As well as the monitor and graphics hardware, you do of course need the 3D glasses. Although glasses-free technology exists in certain TVs and consoles such as the Nintendo 3DS, it isn't yet common, nor is it found in any consumer PC monitors (in the UK, at least).

If you're using a passive 3D system, then any set of polarised glasses will do. Compatibility is widespread, so you shouldn't have trouble finding the glasses you need.

However, active 3D systems are more popular in the gaming industry, and to use those you'll need glasses that are specifically compatible with your 120Hz monitor. In practice, the best way to achieve this is to use a 3D Vision kit from Nvidia. A 3D Vision kit includes a pair of USB-rechargeable active shutter glasses and an IR emitter in case your monitor doesn't have its own. The emitter can be used to turn the 3D on and off or alter the depth of the 3D effect, and it syncs the glasses to the image on screen.

Is That Everything?

For the most part, yes. You may find that you need additional software or drivers, but these shouldn't be hard to obtain compared to assembling the right configuration of hardware. We recommend going the 3D Vision kit route, since the compatibility is more clearly defined, and the pictures are broadly superior to the alternatives. It's not the cheapest technology available, but if you're looking to create a system with support for stereoscopic 3D, price can't be your primary concern.

One last thing: since 3D's popularity has actually declined over the last year or so, finding the necessary hardware is getting more and more difficult. Don't be afraid to look around for the best deals, and don't be surprised if you have to work a bit to find a vendor that sells what you want. It's available if you want it, but don't expect to stroll into your local shop and find everything you need straight away. Happy hunting! [mm](#)



Tech Origins

Word Processing

David Briddock reveals the early days of word processing software

The ability to compose, edit, store and print text documents is an indispensable computing task. Yet while simple text editors have existed since the dawn of the computer age, it was years before more sophisticated tools started to appear.

The Electric Pencil

Altair enthusiast and programmer Michael Shryer wanted to create manuals using his PC. However, the simple editors available at the time simply weren't up to the job, so he decided to write a new application.

The result was a word processing program called Electric Pencil. Released in 1976, it required just 8K of memory to run on an Intel 8080 or Zilog Z-80 processor. After strong sales from PC owners, Shryer ported the initial code to dozens of other operating systems.

WordStar

Seymour Rubenstein's official position was director of marketing for IMSAI. However, he'd also started to develop a word processor for the company's IMSAI 8080 computer. Determined to pursue the idea further, he left and piled his savings into a start-up called MicroPro International and, in the process, Rubenstein successfully headhunted IMSAI software programmer Rob Barnaby to join

his embryonic company. Barnaby would later create the 1979 version of WordStar for CP/M (a popular operating system of the time developed by Gary Kildall, the founder of Digital Research).

Rubenstein then asked team member Jim Fox to port the WordStar code from CP/M to Microsoft's PC DOS, and when WordStar 3.0 for DOS hit the shelves in 1982, sales started to climb. By the mid-1980s WordStar became the most popular word processing system in the world. One of its advocates was Arthur C Clarke, who suggested it reignited his passion to write.

MultiMate

At around the same time Softwood Systems were promoting a word processing application called MultiMate for Microsoft DOS. The market plan revolved around business users, with a focus on insurance companies, law firms and similar companies.

A key sales driver was that MultiMate enabled customers to migrate from expensive, single-purpose Wang Word Processor workstations to the much cheaper and more versatile PC platform, so the application's keystrokes were specifically designed to be familiar to Wang users. Riding on the back of strong IBM PC sales, orders soon reached \$1 million a month.

WordPerfect

Yet the marketplace was easily big enough to support another competitor. WordPerfect started life as a university project by student Bruce Bastian and professor Alan Ashton. In 1986 the IBM PC version 4.2 soared in popularity it introduced features critical to law and academic customers. WordPerfect 5.1 enhanced its reputation with an improved user interface and support for embedded tables, while version 6.0 incorporated dual graphical editing and print preview modes. In fact, WordPerfect became so successful that for years rival applications were obliged to support the WordPerfect document file format.

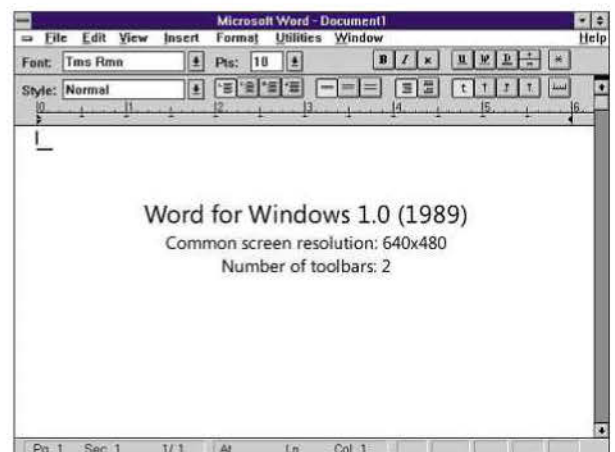
WYSIWYG

The widespread adoption of bit-mapped screens and graphical user interfaces changed the game, though. Programmers could now create 'What You See Is What You Get' (WYSIWYG - or Wizzy-wig) document views. Two leaders of this trend were Apple's MacWrite and Microsoft Word.

MacWrite only ran on Apple Macintosh computers and supported just a few Apple printers. However, Microsoft ensured Word was available for IBM PCs, PC clones, Apple Macs and the Atari ST. Word also supported printers from a wide range of manufacturers – tactics that led to worldwide domination.



▲ WordStar



▲ Microsoft Word



Cybertime

Does The Time Fit The Crime?

With an increasing movement of criminals into the digital realm, Mark Pickavance asks whether the authorities are taking modern criminals seriously

As a technology journalist, I have a natural hate of the term 'cyber' when put in front of any other word. That's mostly because fraud is plain fraud regardless of if you use bits of paper or a computer to perform it.

And, I don't recall that people call bank robberies 'car crime' because they use a getaway vehicle.

However, for sloppy journalistic reasons, people now understand that cybercrime is something that involves a computer at some point. In reality, given that phones are computers too, that probably encompasses almost every crime at some stage.

So what types of crimes are really 'cyber' and how are the authorities tackling them?

Communication Crimes

Technically, this topic is the theft of communication services and illegal communication intercepts, and it covers a myriad of sins.

At one level it could be the illegal use of the digital infrastructure to make long distance calls for free or phone hacking. With the advent of Skype, the first crime isn't one that many people bother with, though the second one is taken very seriously, as those who once worked for the News of the World have recently discovered.

The problem with detecting this type of crime is that unless one of those involved admits it happened or information is disclosed that could only have come from an intercepted communication, it's pretty hard to prove wrongdoing.

The spate of high-profile interception cases we've seen in recent years is probably more to do with the hubris of those publications involved and the distress they've caused to well-known personalities than it is about addressing organised criminality.

The flipside of this crime is the wholesale interception of communications by the security services regardless of the legality of what they've been doing.

To really clamp down on these types of activities would probably annoy those who work at GCHQ, and because of that, there aren't any really firm plans to address the problem for public digital communications, and there aren't likely to be any.

Despite repeated requests, the security services will not discuss what they consider they're legally entitled to do or the legal advice they've been given in this respect.

Their view is that this information would aid those wishing to evade them, although it also rather conveniently avoids them being accused of acting illegally, if only they know when they are.

For the rest of us, the breaking of these laws is more transparently trouble, though the penalties for doing so seem light in the context of what money can be made from personal information in some quarters.

In the USA, the theft of communication services is only a misdemeanour, and illegal interception is a Class D felony with a maximum sentence of five years and a fine.

Here in the UK the law involved is the Regulation of Investigatory Powers Act 2000 (RIPA), and its powers can be used to hand down a two-year prison sentence.

That might seem modest, but when you actually look at those who have abused these laws the most excessively, it's no wonder they've been broken so often.

The two employees of the News of the World who have been so far prosecuted, Glen Mulcaire and his cohort Clive Goodman, got six and four months respectively for phone hacking.

Part of the problem with getting any prosecution under RIPA is that there are provisos under the heading of 'in the public interest' that those in the media can offer as a defence. There's also a huge list of public agencies with 'investigative powers' that can intercept communications if they believe crime is being committed.

“ **Most legal systems are controlled by people who aren't computer literate** ”

These include such critical security services as the Postal Services Commission and the Food Standards Agency. It also includes local councils, some of whom have taken it on themselves to use RIPA powers to chase people over dog fouling and school catchment area disputes.

While brought in under the auspices of defending against acts of terrorism, organised crime and paedophilia rings, it's now often used to infringe on the civil liberties of individuals suspected of minor rule breaking.

Even if publishers are concerned about the loss of press freedom, the penalties are still very limited, and the impact of RIPA on the general public is probably more concerning.

Digital Downloads

Piracy of digital content on the internet is a chestnut that returns to the headlines as often as the roasted ones we see at Christmas. The downloading and distribution of music, software and movies is something that many people are involved in at some stage, but very few people are ever prosecuted.

Much of the reason that the success rate for this type of crime is so low is the exceptionally high number of people involved, because giving 50% of the public a criminal record isn't a realistic proposition.



▲ Clive Goodman, who hacked peoples phones and voicemail for the News of the World. He got just four months in jail after pleading guilty to intercepting phone messages



▲ Put a threatening image like this one on Google+ and it could easily cost you your job

The government has taken attempts to address this crime at source, by getting ISPs to block torrent sites and putting entirely meaningless messages on the front of legally bought digital content, which pirates are hardly likely to heed.

The major underlying problem with this crime is that most of the public don't actually believe it should be illegal, so they entirely ignore it.

The content industries don't really help their argument in many respects, as they claim that the music/film industry is being destroyed by downloading and then post figures that show that they've sold more music and movies in the past few years than ever before.

If they have lost out (and by how much is very debatable), it's been through their reluctance to embrace the opportunities that digitally distributed media availed to them.

Where they've had some success is in getting the copyright period for music extended to silly levels so that aging rockers can tan themselves through their octogenarian years on songs they published in the 1950s.

The fact that 'Jingle Bells', written in 1939, is still under copyright says more about how messed up those laws are than the need to hunt anyone down who sings it each year and doesn't cough up.

The French HADOPI legislation for repeat offenders was seen as a model for curbing the download culture. Backed by President Nicolas Sarkozy, the bill became law in 2009, after a bumpy ride through the French National Assembly. Under the scheme, offenders received three warnings, followed by disconnection from the internet.

After four years, the act was revoked, as disconnection was deemed to be in contradiction of the EU law on civil rights and disproportionate to the wrongdoing. In that time, it had been only used to this extent once, and that person was only disconnected for 15 days.

HADOPI had all the elements of classic French farce, culminating in the revelation that the agency used a font for its logo that it wasn't licensed to use and then had to redesign it to avoid being prosecuted for copyright infringement.

Dissemination Of Offensive Materials

There are images and other content which, if possessed, will result in a mandatory custodial sentence. Exactly how bad things get will entirely depend on exactly how offensive we're talking, but being

caught with child pornography will almost certainly result in severe penalties and being added to the sex offenders register.

The problem with this crime is that unless the person involved disseminates those images to others, thereby creating a digital 'paper-trail' for those fighting this type of crime, then it can go on very much under the radar. And unless they're complete nutters, paedophiles don't generally advertise themselves in this way.

In the full gambit of computer-related crime, this is one of the few areas where effort and resources do appear to be delivering results. However, most stories related to it usually admit that 'suspicions were raised when the defendant's PC went in for repair'. Fewer random events and more proactive policing is probably not a bad thing.

Where this area falls down massively is that in the recent rush to block illegal sites from UK ISP access, they managed to disconnect a good number of sites that were there for people to report these activities or abuse or get information about sexual health.

As with RIPA, it appears that these crimes are providing a tipping point where we sleepwalk from protecting children into wholesale censorship of the internet. Sites can be blocked purely on the say so of a copyright holder, and complaints have been slow to be addressed. The irony is that the really unpleasant end of this business

“ Low-level e-crime goes largely unreported and therefore wasn't reflected in published crime figures ”

is submerged. Therefore, it's unaffected by site blocking, which comes out as window dressing for political purposes.

Fraud

The success rate for fraud prosecution was pretty low before the digital era, and computers haven't exactly made things easier or better for the National Crime Agency. These days, they're asked to contend with digital currencies like Bitcoin and the widespread laundering of illegal earnings through the likes of Paypal. They also have the dubious pleasure of chasing money through electronic bank transfers that might be made to avoid tax or to facilitate VAT fraud.

Despite some high-profile success, many in the police are disappointed by the sentences ultimately handed down to people who committed very large scale fraud.

In 2011, Yevhen Kulibaba, a 33-year-old Ukrainian, was jailed for his part in a £3m global cyber fraud for just four years and eight months, and his Latvia-born wife, Karina Kostromina, got just two years. Had these not been considered cybercrime, many believe they would have got as much as ten years for the same level of conventional fraud.

According to Det Supt Charlie McMurdie, head of Scotland Yard's e-crime unit, "Sentencing powers are sufficient, but it's the appreciation of the harm these individuals are causing that is lacking." That strongly suggests that the law is sufficient, but the understanding by sentencing judges is at fault for not providing the right level of discouragement to those who might commit these crimes.

It's also been admitted by the Home Affairs Select Committee that low-level e-crime goes largely unreported and therefore wasn't reflected in published crime figures.



▲ Karina Kostromina got just two years for being a conspirator in a cyber-fraud that netted millions

In 2013, the Police Central E-Crime Unit and the Serious Organised Crime Agency (SOCA) cyber team were merged into the National Cyber Crime Unit (NCCU). The NCCU consists of some 4,000 officers, of which 2,000 are being trained to be 'digital investigators'. According to the latest figures, these are pitted against at least 1,300 organised e-crime gangs committing regular online fraud.

Those who think that the box marked e-crime is therefore ticked should take a trip to the National Crime Agency website at www.nationalcrimeagency.gov.uk/news.

There are 50 current news stories listed, of which one is about cybercrime, and that's an educational story.

Online Bullying

Under this general section you might also add the vandalism of social media and extortion through the revenge release of intimate content. However it's classified, targeting people through social media isn't acceptable or legal.

From a legal standpoint, these actions could be construed as harassment, but that's assuming you can get the police interested in your case. As one legal expert put it, "Victims need to be aware that police officers are not always sufficiently expert or sufficiently interested in internet harassment to properly investigate and present a case to the CPS."

One of the problems that people run into is the legal semantics between being just 'offensive' or 'grossly offensive'. One you just need to take on chin, and the other has legal implications if you can present that you were offended and the intention of the remarks was for you to be so.

And that's the rub, because it's all about interpretation, which is why the likes of Twitter can't easily apply yes/no rules to what people say on its site. Because of this, there is plenty of buck passing going on in this respect, with the service providers reminding everyone that they're not the police and the police not wanting to substantially add to their workload.

Online harassment is real, and there are relatively few prosecutions, but it's not the whole story. There's a danger here in criminalising people who make poorly chosen remarks or even mistakenly key a word when another was intended.

A classic example of this happened recently in the USA (where else?), when Francis Schmidt, who teaches art and animation at Bergen Community College in New Jersey, posted a picture of his daughter doing a handstand.

That innocuous act ended with him being suspended from his job on administrative leave without pay, because on the T-shirt she was wearing was the *Game of Thrones* line "I will take what is mine with fire and blood." According the college, the word 'fire' could be a metaphor for 'AK-47s'.

With such a flexible interpretation and no contextual understanding, pretty much anything posted online could worry or offend anyone.

There's a balance to be made, and it seems we're a long way from that currently.

Final Thoughts

There are big issues developing here, in respect to how these crimes are viewed and the efforts that are being made to pursue those who commit them.

The chance of being caught and prosecuted in the UK is rather low, but if you're located outside this country, it's almost nil.

If you live in a location that doesn't have a UK extradition treaty, then you can pretty much do what you like without fear of prosecution, and even if it does, then you're reasonably safe. Statistically the majority of cybercrime comes from the USA, with which we do have an extradition treaty.

However, the USA doesn't give up its citizens to other states, regardless of what treaties they've signed, so while they'll regularly ask for our miscreants, theirs stay firmly stateside.

With rather one-sided deals like that in place (nice one, Mr Blair), then unless you really upset somebody with local influence, the system effectively protects cyber criminals. But that's just the first issue.

The second is that most legal systems are controlled by people who aren't computer literate and can't really understand some of the technical points being made in court. This has allowed unscrupulous copyright lawyers to bring court actions against people purely based on an IP number as evidence, but it's also allowed serious cyber fraudsters to go free. Both those investigating the crimes and testing their legality need to be held to a much higher standard than they're currently achieving.

And finally, if the first two weren't bad enough, we have governments riding roughshod through laws they've created themselves when it best suits them.

In numerous cases, including the infamous Dotcom case in New Zealand, authorities have acted outside the law, negating due process and beyond their remit seemingly without any recourse. Flashing a badge with CIA, FBI, NSA or GCHQ on it apparently allows you to be an entirely immune cybercriminal, often based on legislation that was passed in secret, and the public can't officially be made aware.

When governments treat the laws they put in force with such disdain, it's easy to understand why the general public doesn't follow why they should stick to them either. Surely no one is above the law, cyber or otherwise?

The reaction to cyber criminals is very flexible, being often dependent on who those in power would like to be chums with at the time. So expect more download legislation just before the next election, when Number 10 would like music and film personalities to promote their political agenda.

As for cybercrime, it's a growing business where the limited resources given to fight it aren't remotely enough and the understanding of those in power insufficient to comprehend it. [mm](#)

Your Letters

In-app Rip-off

I've been playing games on my phone ever since the days of *Snake* on my trusty Nokia 3210 (which I still have in a drawer – and it still works!). These days, I have an Android phone, which is getting a bit long in the tooth, but it still plays some fine games. I've bought all kinds of games over the past few years and generally been quite happy with my purchases.

More recently, though, I've been struggling to find to find things to play. Why? Because everything is free. Sounds great,

that have the option to spend over £100 on virtual money, it's just taking the pee. I wouldn't even spend that much on a 'proper' console or PC game.

Speaking of PC games, the whole 'free to play' thing is fast becoming a problem there too. Developers are frequently overpricing 'micro transactions', to the point that I just don't bother. For example, I played the game *Path Of Exile* quite a lot recently, and I have to say the developer did a good job of letting you play the game without paying any

“ I'd much rather pay three or four pounds and get everything the game has to offer ”

doesn't it? However, you then have to deal with the inevitable evil that is in-app purchases.

This would be fine if it was a case of paying a couple of quid to unlock the full version of the game, but no, this is full-on greed from developers, where you're encouraged to spend ridiculous amounts of money for in-game currency or features. Even some paid-for games include this kind of content, and usually games are virtually impossible without paying.

If it was a reasonable amount, that would be fine, and I would happily pay to support the developers, but when you're talking very simple puzzle games

money. So good, I thought I'd pay some money to unlock some of the extra features, which are all visual only. The problem was the things I wanted were so hugely overpriced, I kept my wallet in my pocket, so instead of getting the £20 from me, they got nothing.

If in-app purchases were priced realistically, I'd be happy to download 'free' games, but right now I'd much rather just pay three or four pounds and get everything the game has to offer.

If anyone's to blame, though, I guess it's the people who are stupid enough to actually pay these extortionate prices.

Jon Bryce

Heartbleed

Thankyou for David Crookes' interesting and fully comprehensive article on the Heartbleed bug within OpenSSL.

As David points out, many companies are currently in the process of renewing their certificates once Open SSL has been patched – what he did not mention, though, is that unless they also revoke their existing certificates they are still open to abuse.

I also get the impression that the great British public think that this only applies to PC's and is not a problem that can effect mobile phones. I would suggest that they are wrong in this assumption.

Finally, owners of many commercial websites are not helping their customers by remaining quiet on the subject of whether their online concerns are now safe to use again. I can understand that there could be considerable financial ramifications to instilling doubt, but I personally would rather know if the problem has been fixed so that I can continue to buy online safely after changing my password.

Frank Everett

Good Day

I'm Mr Terry, a crud oil dealer in Sudan, I have an interest to invest in your country, and i need you support and assistance to guide me in it, if you would be interested, will wait to hear back from you soon. Regards

Mr Terry

Why Not Here..?

I've just come back from a couple of weeks in Germany. In Saturn, Mediamarkt (huge electronics retailers) and Aldi (which shifts cheap, but excellent, Medion PCs fast like they do in UK), most Windows PCs were offered with a choice of Windows 7 or Windows 8!

Which begs the question: if they can do it why can't we?

Dick Pearson

GET IN TOUCH...

By email

letters@micromart.co.uk

By post

Micro Mart
30 Cleveland Street
London
W1T 4JD

Online

forum.micromart.co.uk

Component Watch

This week, James picks out a selection of AMD processor deals

AMD processors often get short shrift, not least because Intel's are wiping the floor with most of them. But there are times when AMD's latest Fusion APUs actually make more sense than an Intel one, particularly if you want competitive gaming performance from an integrated GPU. For all you AMD fans, we've looked at some of the best prices on a variety of FM2/FM2+ APUs.

Deal 1: AMD A8-6500

RRP: £80.58 / Deal Price: £70.14

Arguably the cheapest APU that can still be described as high-end, the AMD A8-6500 is a socket FM2 chip, which uses a 32nm process in conjunction with four hardware cores and a Radeon HD 8570D GPU clocked at 800MHz. Gamers might be upset that it isn't unlocked, so you won't be able to overclock it, but if you're looking for a mid-level system on one chip, this is a good place to start.

Where to get it: Pixmania - bit.ly/1fTfxaz



Deal 2: AMD A10-6790K

RRP: £93.24 / Deal Price: £87.99

It's the slowest A10 APU currently on the market, but the A10-6790K is still a pretty strong piece of kit. Four hardware cores based on the Richland platform and a core frequency of 4GHz mean it has plenty going for it, while the Radeon HD 8670D clocked at 844MHz keeps its graphics competitive even at this end of the market. It's even unlocked in case you want to push it harder. Not bad for under £90.

Where to get it: CCL Online - bit.ly/R7glm1



Deal 3: AMD A10-6800K

RRP: £114.80 / Deal Price: £104.37

The AMD A10-6800K is the fastest socket FM2 chip you can buy. A quad-core APU clocked at 4.1GHz, it has the same Radeon HD 8670D GPU as the A10-6790K, but the CPU itself

is slightly faster. If you're able to overclock the hardware yourself, get the cheaper chip, but if that's not an option for any reason, the A10-6800K provides a performance boost without any risk of damage.

Where to get it: Ebuyer - bit.ly/R7gSoa



Deal 4: AMD A10-7700K

RRP: £119.99 / Deal Price: £107.46

The AMD A10-7700K is one of the small number of Socket FM2+ Steamroller APUs, running the latest generation of AMD hardware. AMD's GCN (Graphics Core Next) technology provides a substantial boost to the GPU, and in this case it's running a high-end Radeon R7 chip capable of running *Battlefield 4*. The improved architecture means it has great quad-core performance even at 3.5GHz thanks to the Kaveri platform, and even the TDP is lower than earlier chips, at just 95W. Nothing to complain about there.

Where to get it: Ebuyer - bit.ly/1fTgjY



Deal 5: AMD A10-7850K

RRP: £135.99 / Deal Price: £124.99

The fastest FM2+ chip available at time of writing, the AMD A10-7850K is unlocked, runs its four Kaveri cores at 3.7GHz and has a Radeon R7 GPU running at 720MHz. It's good enough to run an entire gaming system on, and while it can't quite stand up to an Intel CPU when it comes to CPU performance, that GPU blows anything Intel can muster up right out of the water. Not a bad price either!

Where to get it: Dabs - bit.ly/1hhlhv4





Trend Micro Makes Heartbleed Scanner

Tool released for scanning bug

Acer Announces Snapper Phone

Liquid's the name

Now available in the UK, via the Three network, Acer's Liquid E3 smartphone promises to take great photos even in low light. Certainly, the camera is the main draw here, as the phone couples an advanced 13MP rear camera with a 2MP front-facing camera equipped with flash. It's designed for capturing everyday moments in an instant as the quick-launch button on the back quickly wakes the phone up, takes you straight to the camera to take the perfect shot, or launches your installed apps.

Aside from the cameras, the Liquid E3 features a 4.7" HD display and a front-facing speaker powered by DTS Sound. If you are in the

market for a new phone, then, and you want to move away from the likes of HTC and Apple, take a look at this in your nearest Three store.



Deezer Makes It Personal

Beta features improve service

In the online music streaming space, Deezer is perhaps a lesser-known quantity than Spotify, but it's trying to up its offer with a bunch of new features intended to "redefine how you discover music". Essentially, this is all based around personalising the Deezer experience thanks to 'Hear This', a personal music feed that offers up music recommendations based on what you're listening to, so the more you listen, the better your music feed.

Deezer has also added the Explore feature, allowing users to filter by region to find recommendations from a particular part of the world. The service has also added a bunch of other features including preview tracks, search and filter music via your Library, plus the Deezer for Mac app for Mac users everywhere.

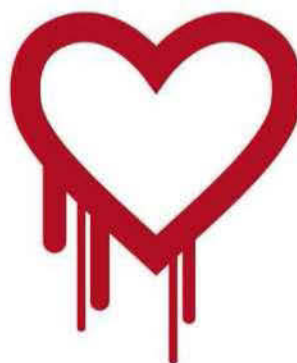
At the moment, both Hear This and Explore are limited to a private beta but users will be able to take advantage of them from November.



As the Heartbleed bug continues to cause bother amongst web admins and systems the world over, security bods at Trend Micro have come up with free scanning tools for computers and mobile phones that will quickly let users know whether they should be concerned.

The scanning tools will help verify whether you're

communicating with servers compromised by the bug – which has made headlines the world over. So if you're concerned about the security of the sites you frequent online, the Trend Micro Heartbleed Detector, which is a Chrome-based browser plug-in, plus the Android mobile app are both available from the Chrome Web Store and Google Play app store respectively.



I recently decided to look into upgrading my work laptop, a 2012 Macbook Pro and, happily enough, found that inserting more RAM and an SSD would be fiddly but not completely beyond my abilities.

However, I also found plenty of results for some of Apple's more recent computing products, and it seems upgradability in many cases is either difficult or impossible (with some components being soldered to the board).

While I cursed Apple, though, it did remind me just why I love my PC. I often use it for gaming, and although the graphics card might not be the best on the market, I do at least have the option of adding a better one later, should I want to and should I be able to afford it.

Being able to upgrade your system like this is why the PC is such a compelling platform, not to mention how much more open it is than others. And even if you're not a gamer, owning a powerful PC is something anyone can benefit from.

Until next time,

Anthony

Editor

Xara Web Designer Reaches Tenth State

Premium version creates 'Supersites'

Xara has announced a new release of Xara Web Designer 10 Premium. This programming-free, WYSIWYG web design tool now features the company's Xara Supersites publishing technique, which is essentially a different way of publishing a site as it offers instant navigation between pages instead of being confronted with a separate set of web pages. Naturally, navigation through them comes with the usual slick animations and the process is intended to make looking through your website design a smoother one.

Alongside this headline feature, the package includes SmartShapes, which allows users to draw text panels, speech bubbles, arrows and more without the need of any drawing knowledge. Additionally, there is free 2GB web hosting for Premium users, a new online content catalogue, new templates and widgets and various other improvements for the £90 outlay. A basic standard version is also available for £40 while upgraders from a previous version can

have the full Premium package for £40. The website for interested parties to find out more is www.xara.com/uk, as you'd expect.



Meanwhile... On The Internet...

Last week was probably pretty fraught in certain corners of Redmond, Virginia, after it was revealed that a critical exploit in Internet Explorer versions 6-11 was leaving millions of computers around the world vulnerable (tinyurl.com/Motl1310a). The exploit, which has been used a limited number of times (tinyurl.com/Motl1310b) was eventually patched last Friday, but only after a few days of intense speculation about whether or not Microsoft would make good on its decision not to support Windows XP anymore and leave its now-disowned OS out of any fix.

In the light of the terrible publicity surrounding the flaw - including the US government effectively telling people not to use the browser (tinyurl.com/Motl1310c), it appears that the company blinked. When the patch did appear, it was also effective for XP too (tinyurl.com/Motl1310d), somewhat making a mockery of Microsoft's decision to cut it loose. It's a climb-down that could potentially come back to bit it at a later date, one suspects - though it was undoubtedly the right thing to do, seeing as the fix would have had to have been created for its paying customers anyway (tinyurl.com/Motl1310e).

The Webby Awards (tinyurl.com/Motl1310f) have now been honouring the best of the internet for the last 18 years (crikey). While this year's ceremony, hosted by Twitter-savvy comedian and writer Patton Oswalt (@pattonoswalt/ tinyurl.com/Motl1310g), will take place on 20th May (tinyurl.com/Motl1310h) the winners were announced last week. Notable winners included one of the men behind Creative Commons, Laurence Lessing (Lifetime Achievement), Kickstarter (Breakout), the Crowdfunder/ Dogecoin-funded Jamaican Bobsled team, rap group De La Soul (which gave its entire back catalogue away to fans online), the BBC for its mobile news platform and three for the *Guardian* (tinyurl.com/Motl1310i) including best online newspaper. All the winners can be found at tinyurl.com/Motl1310j, a location that doubles as a great 'What's best' on the web too.

In honour of the fact that we often consider this little grey box to be something akin to an infographic corner, we'd like to offer you searchfactory.com.au's Crazy S**t People Search For On Google (tinyurl.com/Motl1310q), which notes the 1,000 people a month that ask Google exactly how they go about Googling something... Which is pretty meta, when you think about it. It does kind of remind us of College Humour's *If Google Was A Guy* (tinyurl.com/Motl1310r), in that it also makes us despair for humanity... But I suppose we should do something more constructive, like point everyone in the direction of Hackcollege's excellent guide to getting more out of everyone's love/hate home page (tinyurl.com/Motl1310s).



We have talked about Wikipedia edit wars and vandalism before; we've even been around long enough to remember some of the noble attempts there have been to wipe out problems with the now-ubiquitous online encyclopedia (tinyurl.com/Motl1310k). This last week, however, has seen ill-advised changes to the site cause rumblings not just online but in the halls of Westminster.

According to the BBC, "appalling" rewrites to the site have been made from government computers, including potentially incendiary changes to entries covering Muslim dress and the removal of information from the site covering Cherie Blair (tinyurl.com/Motl1310l). Who's making these changes is unclear, but the problems caused by them shine a light on how important sites like Wikipedia can be in political campaigns.

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

Okay, yes, we admit it... we're going to show you Tiny Hamsters Eating Tiny Burritos. Of course we are... How could we not. Seriously, if you haven't seen these little fellas stuff wraps sideways into their chubby little cheeks, you really haven't lived (tinyurl.com/Motl1310t).

At the moment, there's only one thing that's making us happier than actually watching this video, and that's the fact that it's labelled Episode 1, which means there's hopefully more to come from this little guy. It's better than *The Phantom Menace*, that's for sure...



Aaaaaaaaand Finally...

Firstly, we'd like (through gritted teeth) to thank Mashable for ruining our productivity this week by posting its 50 Sites To Waste Your Time On feature (tinyurl.com/Motl1310m) and to *The Guardian* for introducing us to the new

Pronunciation Book (tinyurl.com/Motl1310n), in the form of Webdriver Torso (tinyurl.com/Motl1310o) before putting us at ease. Then we'd like to point you in the direction of some arty GIFs produced as part of a global competition backed by the Saatchi Gallery (tinyurl.com/Motl1310p) - definitely no cats here.

Finally, finally... you can download this page with links at tinyurl.com/MeanwhileDownload. We recommend it.

Caption Competition

"The BASS on this is really attacks you"



It seems Micro Mart readers rather like fish. We got quite the response to the picture above. Let's have a look see:

- **Rob Clark:** "Beach Head never looked this good on the Spectrum."
- **Nigel Palmer:** "I think you have the scale setting too high."
- **Nigel Palmer:** "That fish-eye lens is very realistic."
- **Frank Everett:** "The 3D screen on Fred's new laptop had a bit of extra bite."
- **Thomas Turnbull:** "This is what you get for using a net book."
- **Alastair Wilson:** "Phishing goes to a whole new level."
- **PlaneMan:** "Jaws 6 the Oculus Rift way."
- **doctoryorkie:** "Latest phishing scam - in 3D."
- **John Davies:** "The latest piranha app - for tidying touch screens."
- **sgb101:** "Harry Ramsden's new online delivery service is really quick!"
- **EdP:** "I threw away my Miracast and bought an AnglerCast!"
- **ZX81:** "That laptop looks fishy to me."
- **Ritasueandbobtoo:** "How did that get into my water cooling."
- **Ritasueandbobtoo:** "Introducing the new Cod Core."
- **Darren Hart:** "This is why I never date a pisces."
- **Darren Hart:** "This Plenty of Fish site is more literal than I expected."

However, there has to be a winner and this week it was m4rmite, with "The BASS on this is really attacks you."

If you have something funny to say about the picture below, get yourself to the 'Other' section of our forum (forum.micromart.co.uk), where you can see the picture or email us at caption@micromart.co.uk.



Denmark: Meet Minecraft

Virtual recreation a thing of beauty

As our Meanwhile... page so regularly states, the power of the web never fails to amaze – and it's with this in mind that we doff our collective cap to the Danish government, which has taken the time and effort to faithfully recreate its entire country within Minecraft.

Yes, the government is actively encouraging its residents to explore Denmark within the game and to "build and tear down" as they please. The project was part of an educational experiment as the

government has said that these virtual field trips around the country could prove popular among students.

The virtual recreation has been carried out to 1:1 scale using the government's mapping data, and will be available to download until 23rd October this year.

Will our own government take up the challenge and render this sceptred isle in block form? Could we very soon be able to wander around the streets of Dudley whilst online? Here's hoping...

Warhol Art Found On Amiga Disks

Three-year project recovers lost works

This is quite an amazing find. Digital artworks created by Andy Warhol – yes, THAT Andy Warhol – have been found on a bunch of 30-year-old Amiga disks with the digital delights originally created by the artist as a commission from Commodore itself.

To help with the launch of the Amiga 1000, Commodore paid him to produce the art, and a project from the Carnegie Mellon University's computer

club, which has taken three years, has now recovered these images. At that aforementioned launch event, Warhol painted a portrait of Blondie's Debbie Harry using the Amiga's graphics program and the results of his work are actually pretty amazing – they're certainly worth hunting down on the web.

With the data copied using magnetic imaging tools, this project has finally come to fruition. Well done, chaps.

Snippets!

Toshiba Begins 15nm NAND Flash Production

Good old Toshiba has announced that mass production of the world's first 15nm process technology would begin at the end of April. Why is this important? Well, it marks an advance in the memory that's used in our smartphones and tablets and will basically help to significantly increase data transfer rates to 533 megabits per second, apparently 1.3 times faster than current 19nm-process technology. Applied to 2-bit-per-cell 128-gigabit NAND Flash memory, this can only good news for Toshiba.

Facebook Gets Fit

Facebook has now added fitness tracking app firm ProtoGeo to its family of acquisitions. The Finland-based firm created the Moves app which uses a phone's built-in sensors to track activity and any calories burned. We don't know how much the firm paid for ProtoGeo, but it's not thought to be anywhere near the sums paid for the likes of Oculus VR and WhatsApp.

PhotoDirector Mobile Now On Android

CyberLink has announced that its PhotoDirector software is now available on Android mobile phones, following its release for Android tablets back in March. With an interface optimised for mobile screens, the tool's key features include control over creation and adjustment of HDR effects, removal of unwanted objects with the CyberLink Content Aware Removal technology, and editing and sharing via Facebook and Flickr.

Available entirely free, with additional features added via in-app purchases, you can find it in the Google Play Store.

Lenovo Launches Two New FLEX Models

Dual mode laptops offer flexibility. Hence the name

The laptop is far from dead, despite the rise of the tablet. Perhaps this is in part down to manufacturers' desire to up the ante in the laptop stakes.

Lenovo has certainly realised the need to offer consumers something a bit different as it's doing with the launch of two additions to its FLEX family of dual-mode laptops. Available in 14" and 15.6" models, the FLEX 2 laptops offer users 300° flexibility with a couple of modes – Laptop and Stand – which basically means the best of both worlds. Starting at £300, users can enjoy the Windows 8.1 touch-centric experience via the 10-finger multitouch screen and also flip the keyboard from underneath the screen into the traditional Stand mode for watching movies and the like in Full HD.

Under the hood, users can choose up to 1TB storage, NVidia GeForce graphics with up to 4th

generation Intel Core i7 processors or opt for dynamic AMD Radeon R5 M230 discrete graphics and AMD APU processors. Dolby Advanced Audio v2 technology comes as standard while an optional dual-array digital microphone will help with video calls via the 720p HD webcam. The website for more on the FLEX 2 laptops is www.lenovo.com.



Microsoft Warns Over IE Vulnerability

US government has its say

Microsoft let loose an almighty warning to consumers everywhere who are fond of its Internet Explorer browser as it transpired that there was a vulnerability present that could let hackers cause all sorts of trouble.

Affected versions of the browser are said to be versions 6 through to 11 with Microsoft taking note of the "limited, targeted attacks" that could exploit said vulnerability, which encompasses possible access to and hijacking of a user's PC. How serious is this? Serious enough, given the rampant popularity of the browser. The flaw could have allowed hackers to access user rights on a system and, while we expect MS to have issued an update by now, that could have left XP users in the lurch.

With no official support left for XP, of course, that means no security patch for this in theory, although will Microsoft really leave consumers high and dry? This is still, after all, an obscenely popular browser. The upshot of this threat, however, is that security experts and even the US government itself are warning XP users to switch browsers. Yes, no less than the the U.S. Department of Homeland Security has advised consumers to consider making the switch until this flaw is fixed. Wow.

Who knows what the ultimate consequence of this flaw could be for IE?



Community Corner

Announcements and other stuff

This is the part of the magazine that belongs to you. If you'd like to send us a picture of your messy computer desk or a photo of you holding Micro Mart on holiday or in a strange place, this is where we'll print it. And should you fancy sending us pictures of cats reading MM... well, let's just say we won't be displeased. Email us at letters@micromart.co.uk or get in touch via the forum.

MM Forum: Head to forum.micromart.co.uk for discussions about all things PC, networking, OS, mobile, and tech related.

MM Folding Team: With a home on the forum, the Micro Mart folding team is a productive part of Stanford University's distributed computing project. To find out more about folding, and to put your spare GPU or CPU cycles to good use, head to tinyurl.com/MMFolds, say hi and help us fold!



The Micro Mart community forums are powered by InstantForum.NET the leading ASP.NET discussion forum platform from InstantASP. Learn more at www.instantasp.co.uk

Driver FaceTimes Behind The Wheel Seriously

A short story now that we first saw reported on the BBC website. A motorist on the Surrey roads was caught using Apple's FaceTime video chat app while driving. Said driver was using a laptop on their lap while driving

and this was all part of a pilot scheme in the area in which an unmarked HGV tractor was used to target lorry drivers breaking the law.

When you read stories about people doing such blatantly stupid things, you really need to share it.

Atari ET Games Found!

They exist. They really exist

You may recall that we have previously told you about a dig that was taking place in New Mexico to see whether or not the oft-repeated rumours of there being thousands of copies of Atari's mega-flop *E.T. The Extra Terrestrial* buried in landfill there were indeed true.

Well, the good news – and we're just so pleased to be telling you this – is that the team has literally dug up evidence that that was indeed the Atari cartridges. The guys

behind this discovery are now busy putting together a film on the whole process of finding the evidence, but have said that the Atari 2600 cartridges were dumped there out of "shame" – which is a strong word, but then this is a game that is considered by many to be quite the worst ever made.

We're so pleased that this project hasn't been fruitless. What a story and we're looking forward to the finished documentary, which will be for Xbox users.

Skype Frees Up Group Calls

Former Premium-only service made available to all

Good on Skype for allowing the rest of the world in on its group video calling service, which is now available for free for Windows, Mac and Xbox One Live Gold subscribers. Before now, the service has been available to Skype Premium subscribers only so this is a welcome move

for Skype users the world over. This means that Google Hangouts now has a direct competitor with Skype's offer supporting anywhere between three and 10 participants.

This news also follows Skype's talk of including deeper Skype functionality for Windows 8.1 users when it launches later this year.



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Add Free Apps To Microsoft Office

Office 2013 has an online app store containing lots of useful add-ons and tools. Roland Waddilove shows how to access them

In the last five years or so, we've all become familiar with apps. There are apps for mobile phones, tablets and even Windows if you have the latest version installed on your PC. An app is a mini application, and although they generally aren't as powerful or packed with as many features as desktop software, they can provide useful functions and features, and even entertainment too. It is not surprising that apps are as popular as they are, given that many are free and often they're really useful or simply good fun.

Microsoft Office is the latest platform to get in on the popularity of apps. They come in many different forms, and they're basically like add-ons or extensions that work within some framework, and in this case it's the Office applications Word, Excel, PowerPoint, Outlook, Project and SharePoint. Many apps are specific to one application, but a few are shared, such as a dictionary.

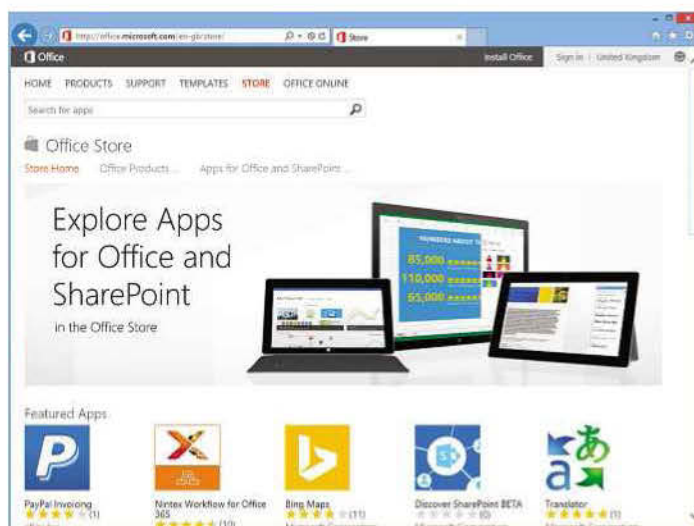
“ Microsoft Office is the latest platform to get in on the popularity of apps ”

You probably wouldn't have imagined that Office was a platform for apps, but if you have the latest version, then buried within its ribbon toolbar is a function to access an online app store. You can browse the apps, get more information on ones that might interest you, download and install the apps you want, and run them within Microsoft Office applications.

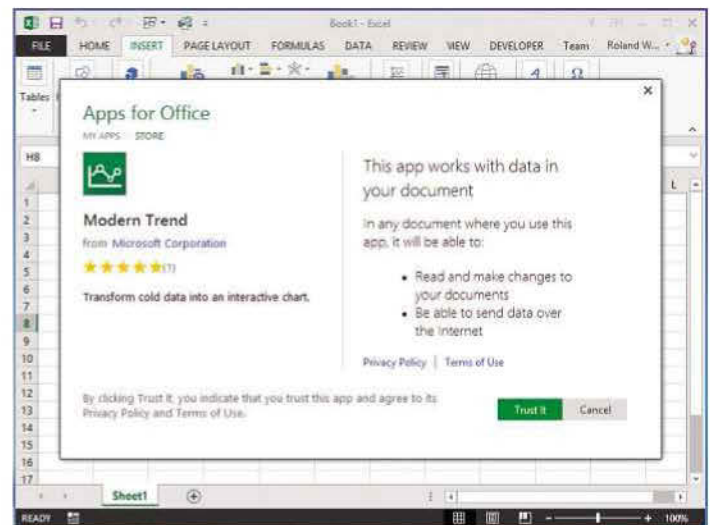
Adding apps to Office is easier than you might think, and many of them are free of charge. Not all are free, but the prices for paid ones are generally quite low, as is common for apps on other platforms. Let's take a look at how to install and use apps for Office.

The Apps For Office Store

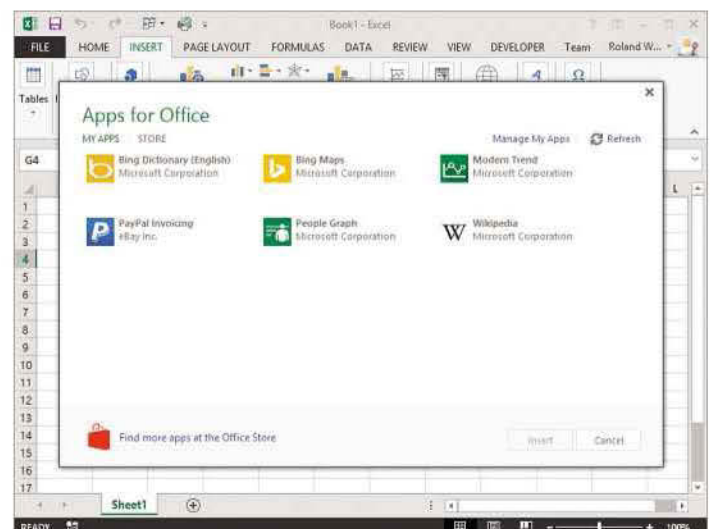
If you haven't used Office apps before, you might be wondering where to get them from and, as mentioned earlier, there's an online store. One way to browse the store is by going to the



▲ The Office Store has a useful collection of apps to boost the features in Office



▲ Apps can be installed from within the Office application. Click the Trust It button



▲ Go to My Apps in the Apps section of the Insert tab in the ribbon to see installed apps

Office website using a browser. Go to **office.microsoft.com/store**, and the front page displays a small selection of featured apps. Using the menu at the top or the links at the bottom of the page, you can go to each Office application's home page, such as Word, Excel, PowerPoint and so on.

Word is a word processor, designed for handling text, so an app that runs in Word is very different to one that runs in Excel, which is a number-crunching spreadsheet application. This is why there are separate sections in the Office Store for each application.

Although you can use a web browser to access the store, you can also do it from within each application. Start Word 2013, for example, and select the Insert tab in the ribbon bar. If the Word window is sufficiently wide, there's a Store button in the Apps section. If the window isn't wide enough to fit all the ribbon icons on, click the Apps button and then Store from the menu that appears below.

It's the same procedure with the other Office applications: you go to the Apps section of the Insert tab of the ribbon bar and click the Store icon. This displays a pop-up window that shows the Editor's Picks. All app stores have featured or recommended

apps, and Apps for Office is no exception. There's also a More Apps link too. This opens a web browser window to show the relevant store section.

If an app in the store is free, there's a simple Add link to add it to the relevant Office application. If it's a paid app, though, there's a Try link so you can try it before buying it. Clicking the app icon in the store opens an information page that displays a description, a rating from people that have used it, privacy/security information and a button to install it.

This button doesn't have Install or Download on it; it has Trust It instead, and you will see a notice that the app can read and make changes to your documents and can send information over the internet. Should you be worried by this? It's unlikely that there would be a malicious app in the store, but security and privacy is certainly something you should think about.

It's hard to see how many apps could work if they cannot access your documents, though, and frequently they require

internet access too, as we will see when we look at a few apps. If you're concerned, there's a developer's link, and clicking this displays information about them. Bad developers can be reported using the Report a Violation link, app scores show what other users think of each app, and there are links to the developers' websites so you can check them out.

As you add apps to Office applications like Word and Excel, they're added to the ribbon bar. Go to the Insert tab, the Apps section, and click the My Apps button to display a pop-up window that lists all the apps that are available in that application, or click the down arrow to see recently used apps.

If you have Office installed on more than one PC, the apps you install on one are synced to the others and are automatically added. This is a useful feature that saves you having to individually configure each PC. Install an app once and it's made available everywhere.

Use An Office App

The way that apps are accessed depends on the Office application and the nature of the app. Some apps can be accessed by right-clicking the mouse in a document or on an object. For example, there's a Bing Dictionary app, which enables you to right-click a word in a Word document and select Define to see a dictionary definition.

“ Adding apps to Office is easier than you might think, and many of them are free of charge ”

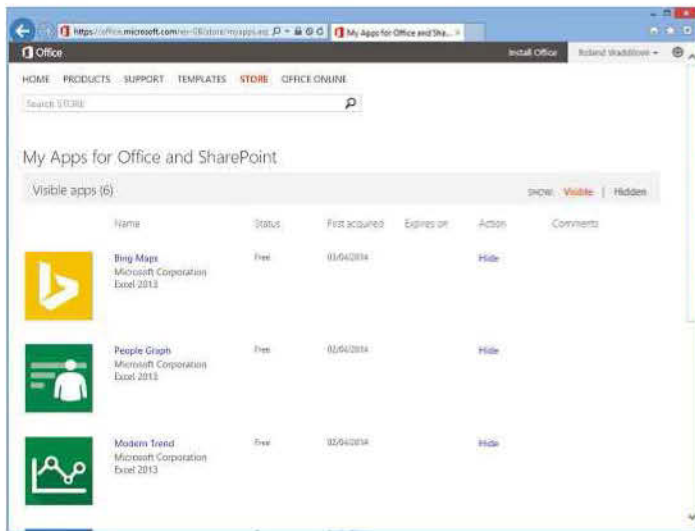
Apps can add icons to the Apps section of the ribbon bar on the Insert tab, and you might be able to start an app by clicking the icon. If the icon is grey, though, it means that it cannot be accessed for some reason. This might be because it does not apply to the current situation, or it could be because you need to select something first. An app in Excel, for example, typically works with the data in cells. You might therefore need to select a range of cells before an app's icon can be clicked in the ribbon bar. This is sometimes the case with Excel apps that display charts or perform some sort of analysis on cells.

Yet another way to access certain types of app is by creating a new document and selecting the template the app has installed. The PayPal Invoicing app for Excel works this way, and creating a new spreadsheet and selecting the PayPal template opens a new sheet with the app activated. An Outlook app might only be accessible when an email message is displayed. The Bing Maps app, for example, is activated if an email contains a postal address.

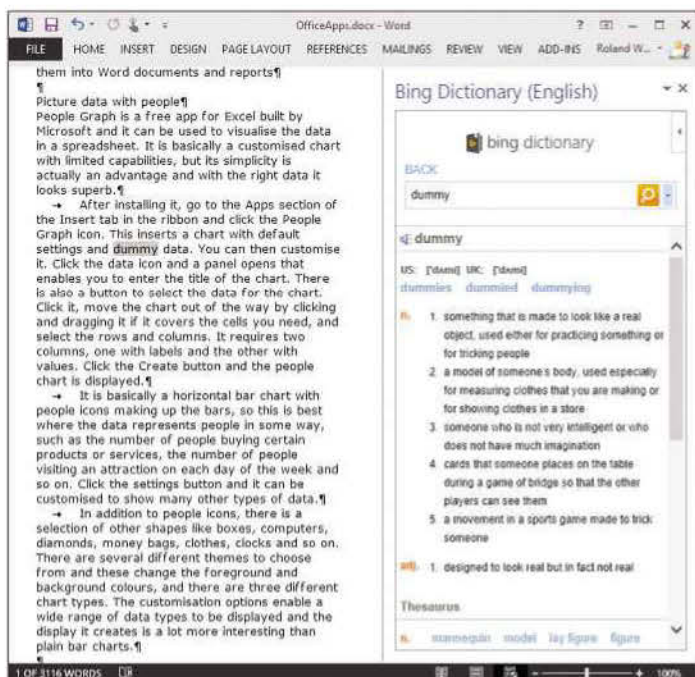
Not having a standard way of accessing an app can be a bit confusing at first, but if you cannot find an app or access it after installing it, it may help to think about what function the app performs. Does it work with data? Is the right data selected? And so on.

Hide Unwanted Apps

After discovering the Office Store and downloading and installing lots of apps, you will find some great ones, but there may be one or two you don't need. These can be hidden so



▲ Apps that you don't want can be hidden at the office.microsoft.com website



▲ Word doesn't have a dictionary; it is added as an app from the Office Store

they don't appear in the Office applications like Word, Excel and so on. In the application, go to the Insert tab in the ribbon bar and the Apps section. Click Apps if necessary and then My Apps. In the Apps for Office window, click Manage My Apps. This opens a web browser window and logs you into your Office account using your Microsoft ID (Outlook.com email, Office 365 subscription).

The Office website lists all the apps that are installed and in the Action column is Hide. Click it to hide an app. There are links to show visible and hidden apps on the web page. Afterwards, go to My Apps in the Office application and if the app is still there, just click the Refresh link and it will be removed. You can unhide the app through the website and then use the Refresh link in the Office application to make it accessible again.

Outlook is slightly different, and if you want to disable an app and prevent it from being used, click File, Manage Apps. In

Outlook Web App, click Settings and then Manage Apps. The app can then be selected and the Disable link clicked.

Add A Dictionary

There was a time when Microsoft Word came with a built-in dictionary, but things are different now. There isn't a dictionary, and the first time you try to access it by right-clicking a word and selecting Define, you're taken to the Office Store so that you can choose a dictionary app. In the store are several, and you can choose the one you prefer.

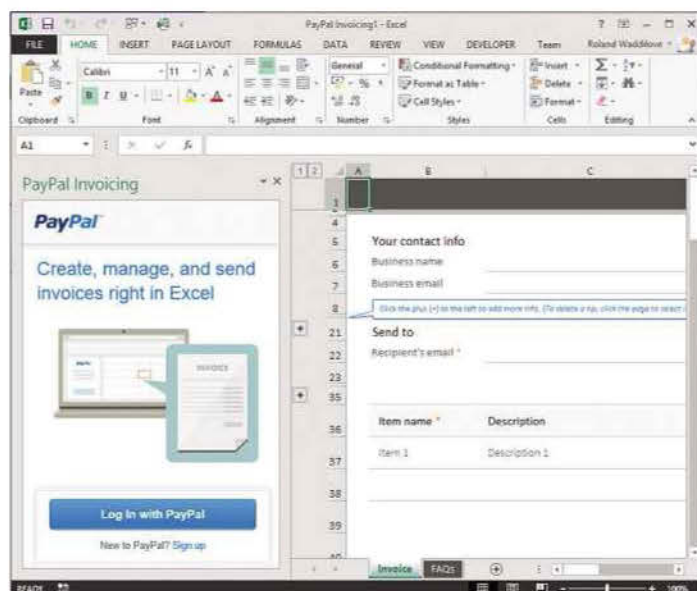
“ The way that apps are accessed depends on the Office application and the nature of the app ”

Bing Dictionary is an obvious choice and after adding it to Word, you can right-click a word in a document and select Define on the menu that is displayed. This opens an app panel on the right to display the dictionary definition. Click the See More link, and a lot more information is displayed. You can hear the word spoken out loud; a thesaurus provides synonyms, which are all links to more dictionary definitions; and there is a collection of sample sentences and phrases in which the word is used.

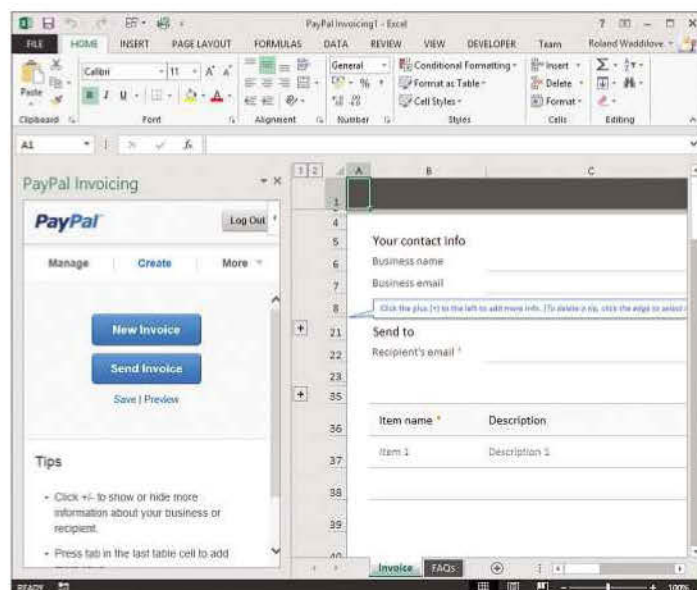
The dictionary information provided by the app is actually superior to that displayed in previous versions of Word that had the dictionary built in. It might seem like you're getting less with no dictionary, but once you've added an app, you actually get more than you used to. It is an essential app to add to Word.

Send Invoices

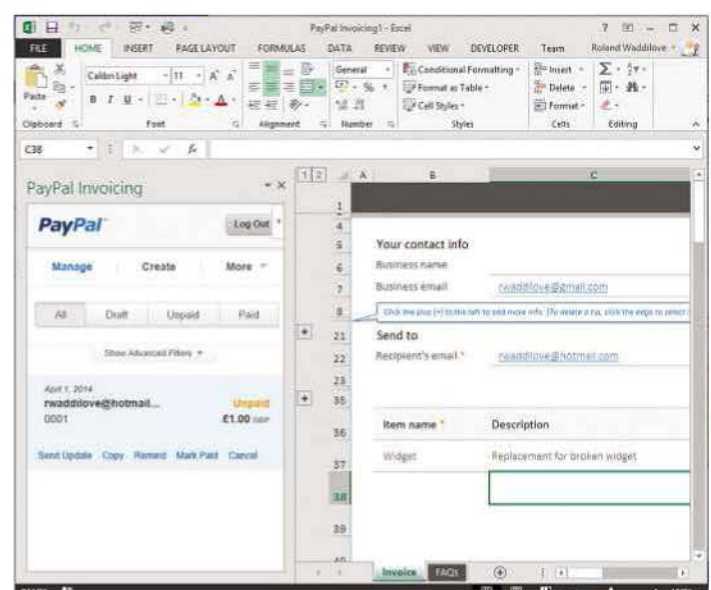
PayPal Invoicing is a very useful app for anyone that accepts payments through their PayPal account. It can be used by small businesses, sole traders and home users to generate invoices



▲ Create a new spreadsheet using the PayPal Invoicing template and then click the button to log into the service



▲ Click the new Invoice button and fill in the blanks in the invoice template. Click the Send Invoice button afterwards



▲ The app keeps track of all the invoices sent, drafts, and who has and hasn't paid their invoices. You can send a reminder

for products they've sold or services provided. This extension is designed for Excel, and it's added to the spreadsheet application in the usual way through the store.

After installing it, you might be a little confused because accessing it on the Insert tab in the ribbon bar doesn't get you very far. It's an Excel template and it's accessed by clicking File > New and then selecting it in the template gallery. This creates a new invoice that you can simply edit. It's more than just a simple invoice template, though, and on the left side of the window is a PayPal Invoicing app panel. This is used to log into your PayPal account, and then you can use the management features. There are four tabs: invoices, drafts, unpaid and paid invoices.

Clicking the New Invoice button automatically adds your email address to the invoice template, sets the invoice number (it auto-increments), sets the currency to pounds and adds today's date. All you then need to do is to enter your business name, the recipients email and invoice due date. There's a dummy entry that you overwrite with the product or service being invoiced for, and you can add extra lines for however many items you need. Shipping and discounts are optional, and the grand total is automatically calculated. You just need to click the Send Invoice button when you're done.

“ As you add apps to Office applications like Word and Excel, they're added to the ribbon bar ”

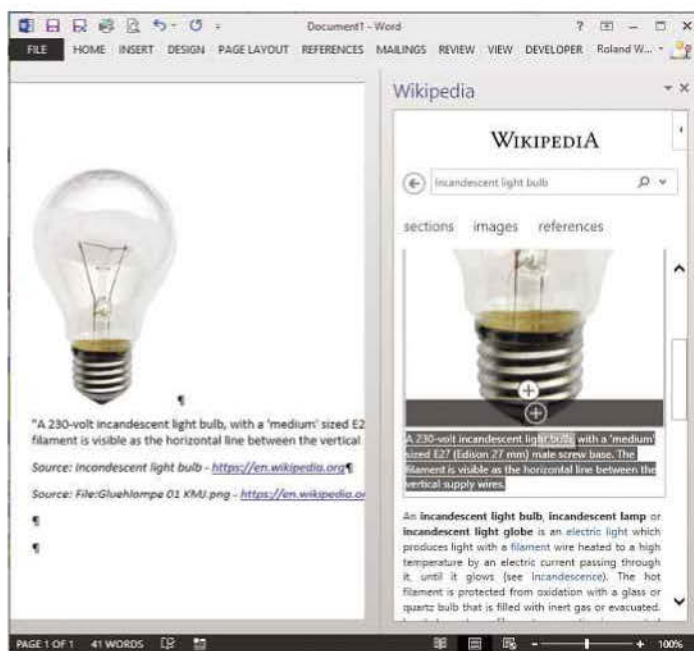
PayPal invoicing does not require an email program or require you to mess around with creating an email, attaching a saved invoice file and so on. Just click Send Invoice from within Excel, and the app does it for you. It is a handy time saver and you'll see in the app panel when the invoice has been paid. It's free to use.

Quote From Wikipedia

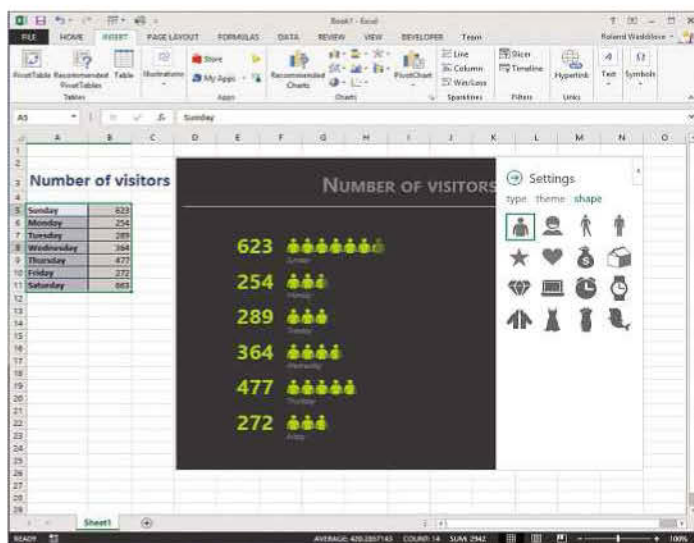
The free Wikipedia app works with Word and other apps but is clearly more use in Word. When you're writing a report or document of some kind and need some information, you can easily add it from Wikipedia. Of course, you can do this by having a web browser window open at the same time, but it's easier and quicker with the Wikipedia app for Word.

Install it from the store, then open the Wikipedia app panel by going to the Insert tab on the ribbon and clicking the W icon in the Apps section. There's a search box at the top of the app panel, which is used to look up encyclopaedia entries just as you would at the website.

The advantage of the app is that it's very easy to copy text and images from the Wikipedia entries. Select an image, for example, and a plus button appears next to it. Click it, and the image is inserted into the Word document at the cursor point. A nice feature is the photo credit that is automatically added to the photo and the hyperlink back to the website. Text is the same, and you can select any word, phrase or paragraph in the Wikipedia panel. A plus button appears, which inserts the selected text into the document at the cursor position. Quotes are automatically placed around it, and a credit and hyperlink are added too.



▲ Copy images and text from Wikipedia and insert them into Word documents and reports



▲ The People Graph app enables you to turn spreadsheet data into custom charts that look great

The Wikipedia app isn't for ripping off huge chunks of text and lots of images of course, but it is a great time saver when you need to add the odd quote or illustration to your documents and reports.

Picture Data With People

People Graph is a free app for Excel built by Microsoft, which can be used to visualise the data in a spreadsheet. It's basically a customised chart with limited capabilities, but its simplicity is actually an advantage, and with the right data it looks superb.

After installing it, go to the Apps section of the Insert tab in the ribbon and click the People Graph icon. This inserts a chart with default settings and dummy data. You can then customise it. Click the data icon and a panel opens that enables you to enter the title of the chart. There's also a button to select the data for the chart. Click it, move the chart out of the way by clicking and dragging it if it covers the cells you need, and select

the rows and columns. It requires two columns, one with labels and the other with values. Click the Create button, and the people chart is displayed.

It's basically a horizontal bar chart with people icons making up the bars, so this is best where the data represents people in some way, such as the number of people buying certain products or services, the number of people visiting an attraction on each day of the week and so on. Click the settings button and it can be customised to show many other types of data.

In addition to people icons, there's a selection of other shapes like boxes, computers, diamonds, money bags, clothes, clocks and so on. There are several different themes to choose from, which these change the foreground and background

“ It's hard to see how many apps could work if they cannot access your documents ”

colours, and there are three different chart types. The customisation options enable a wide range of data types to be displayed, and the display it creates is a lot more interesting than plain bar charts.

Map Your Data

Bing Maps is another great free app from Microsoft, designed to show numeric data on maps. It needs a table of cells with one column containing locations and one or more columns containing data. For example, the spreadsheet might contain sales data for different areas of the country, population figures for different cities and similar geographic information.

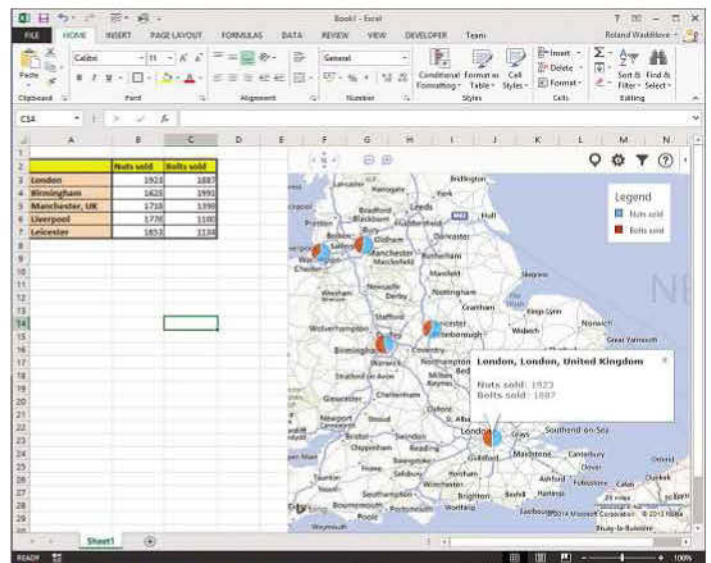
Select the cells of the table and click the icon in the ribbon to insert a map of the world in the current spreadsheet. There are several icons in a toolbar at the top of the map, and clicking the first shows the locations on the map. Small pie charts are drawn at the locations to indicate the values, such as sales. Clicking a pie chart shows the numbers in a pop-up information panel.

You will probably need to zoom into the map before you can see the data properly, and double-clicking or spinning the mouse wheel magnifies the view. UK cities can sometimes be confused with US ones where the name is the same, so you might need to make a slight change to the source data. Use 'Manchester, UK' instead of just Manchester for instance, because there's a Manchester in the US.

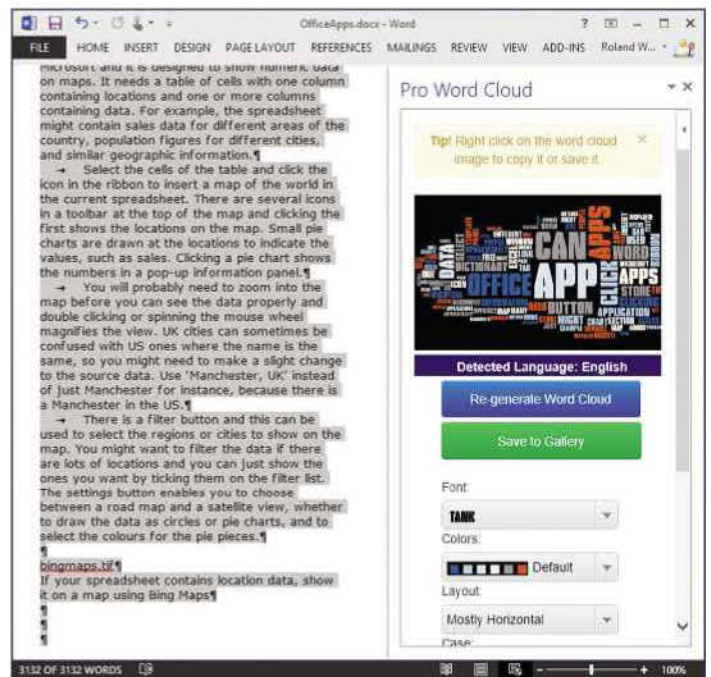
There's a filter button, which can be used to select the regions or cities to show on the map. You might want to filter the data if there are lots of locations, and you can just show the ones you want by ticking them on the filter list. The settings button enables you to choose between a road map and a satellite view, whether to draw the data as circles or pie charts, and to select the colours for the pie pieces.

Create Word Clouds

Pro Word Cloud is a free app that creates fascinating images from your Word documents. The images are word clouds and they show the most common and frequently used words. It's an unusual way to visualise the content of a document. You might have seen similar things on websites where they have a tag cloud that shows the tags that are linked to web page content, and the



▲ If your spreadsheet contains location data, show it on a map using Bing Maps



▲ Create a word cloud from the text in a word document

bigger the font for a word, the more articles are tagged with it. Pro Word Cloud is similar.

A tag cloud is created by selecting part or all of the document. Then go to Apps on the Insert tab in the ribbon, click My Apps and click Pro Word Cloud. There are several options: you can choose the font to use (about a dozen are on offer) and the colour scheme. There are several different layout options, such as Mostly Horizontal, Mostly Vertical, Higgledy Piggledy and others. The word case can be selected and the maximum number of words to include in the word cloud.

The result is an image, and the size can be set and the image saved to disk afterwards. It could be used for illustration purposes, an advert and so on. It's a really good app, but you should use it sparingly and certainly not with every document you write. [mm](#)

GROUP TEST

Projectors

Projectors have evolved over the years to become one of the most sought after items of technology. Their potential is huge, and they fit into a wide range of environments, from the classroom to the office and the home theatre setup.

David Hayward tests six available candidates to see which are worth forking out for and which aren't.

Projectors

Philips PPX2480 PicoPix Pocket Projector

DETAILS

- Price: £260
- Manufacturer: Philips
- Website: goo.gl/4RA9n2
- Required spec: VGA, HDMI, composite video, USB



▲ A diminutive projector that's got a lot going for it

The Philips PPX2480 PicoPix Pocket Projector is more than just a mouthful of Ps; it's an LED projector that can display images up to a 120" in full, glorious 1080p resolutions.

Measuring only 105 x 31 x 105mm, this wee projector has a host of features that you wouldn't normally expect to see on something of this size. There's an internal battery that can last for up to two hours on ECO mode, an 80 lumen (when running on AC power) LED light source, connectivity for SD/MMC cards and USB, 2GB internal memory, a mini-HDMI socket and a built-in 1W sound-bar. These all suggest a much bigger unit, but somehow Philips has managed to cram all this into a small package.

Setting up the projector with a laptop is an easy three-step process. Simply hook up the included mini-HDMI to VGA cable to the projector and laptop, provide power to both and sort out your screen from within the laptop's operating system. Of course, with the projector having an internal battery, you could easily cut this down to just two steps, and similarly, you could just insert an SD card containing images, movies or music, power up the projector and point it at a convenient wall.

There is of course the issue of heat and consequently fan noise, as with most projectors. The PicoPix is no exception to this, and after a minute of use, it will start to heat up and kick in the

internal fan, which can otherwise ruin the viewing pleasure of a home entertainment setup. Granted, the fan needs to extract as much heat as possible, and it is a little noisy at times, but once the volume is turned up, the noise of the fan is soon drowned out. Ideally, you wouldn't be using this projector in an eight-by-eight living room, and in reality you would require a reasonably dark environment to get the full benefit of the 120" projected screen. However, while the PicoPix may not be a contender for the full-time post of large projected screen entertainment, it does an admirable job of polished presentations and brief moments of picture and movie enjoyment.

The build quality of the projector is generally very good, with a sturdy piano-black casing, easily accessible ports along the rear, a tripod attachment on the base and power slide-button on the side. There are menu controls on the top of the unit, to navigate the internal operating system and a focus thumb wheel. The menu navigation buttons have a rubberised cover over them but feel a little too flimsy when compared to the rest of the unit. However, the included remote control is solid enough and can operate the projector from an angle of 60 degrees and within three metres.

You're provided with enough cables to establish a connection to a VGA and composite output, along with two USB cables, a female to mini-male USB and a standard mini-USB. But connection to another HDMI output or iPhone would require the correct cables, which aren't included in the box.

The projector worked extremely well. The menu system was easy to navigate, and the built-in media player ran through a selection of different video formats without any issues – with the brightness dropping to 55 lumens when used via the battery, which was still enough to enjoy a movie. Connection to a laptop was straightforward, and we didn't experience any terrible trapezoidal keystoneing, as with other projectors.

On the whole, a great pocket-sized projector, ideal for presentations on the go and sharing moments of family entertainment.



ViewSonic PJD7820HD Projector

DETAILS

- Price: £697
- Manufacturer: Viewsonic
- Website: goo.gl/9iocAH
- Required spec: VGA, HDMI, composite video, USB

Projectors seem to fall into two distinct categories; one for the business user, the other for the home cinema user. What usually works well with one tends to fail with the other, with it being, most of the time, down to a simple lack of connector, high noise levels or resolution. However, the ViewSonic PJD7820HD projector ticks the boxes for both business and home.

The PJD7820HD is an impressive full HD 1080p DLP projector, which offers a list of features long enough to make other models pale into insignificance. The images projected are crisp, crystal clear and can produce a maximum 300" image with virtually no loss of definition. In addition, at 3000 lumens and with a 15,000:1 contrast ratio, you'll find the image projected remains high quality even when the room is well lit, making it ideal for the modern meeting room or the living room.

Putting the image quality to one side for the moment, the PJD7820HD is a surprisingly compact unit and one that's also remarkably light. To the rear of the unit you'll find a decent mix of ports ranging from the standard VGA to S-Video, HDMI, RS-232, mini-USB, audio-in and -out and composite input. On top there are button controls for the on-screen menu, selecting the source and the power, with



▲ Viewsonic's all-powerful 3D-enabled projector is great but expensive



▲ There's plenty of connectivity, and it would a fine home theatre

the focus and zoom wheel toward the front.

When powered up, the PJD7820HD surprised us in a number of ways. First, it was very quiet, one of the quietest projectors we've ever tested. And secondly, it fired up almost instantly and auto-selected the correct source, so we were watching the screen within a minute of powering up both the source and projector. Another factor that put a smile on our faces was the power off time; it was, like the start-up, almost instantaneous. No more hanging around for five minutes waiting for the lamp to cool before the fans shut down. These points alone were enough to convince us of ViewSonic's entry into the home cinema league, although these

are also factors that would greatly improve the business user's presentation. It's also worth noting that the included remote control was of a decent build quality, with solid buttons and a good range of use.

Moving back to the image quality, the PJD7820HD integrates DLP BrilliantColor technology, bringing a vibrant, rich picture performance with a much improved colour depth and very good darker shades. Moreover, the PJD7820HD also brings 3D to the table, so for those who have the correct hardware, the 3D image projected is of a very good standard, although it did tend to lessen in quality when we spread it out to the maximum.

The lamp life is measured at around 5,000 hours for

normal use, but ViewSonic has incorporated a DynamicEco technology that will automatically adjust the lamp brightness to help prolong its life up to an estimated 8,000 hours and use up to 70% less power than normal.

In conclusion, the ViewSonic PJD7820HD is an astonishingly good projector. The picture is as near to perfect as you could wish for, and it's viewable even in well-lit environments. However, it's horrendously expensive and the speakers aren't up to much either. Generally, it's a good projector, but there are others available that are just as good and that cost a lot less.



Projectors

Acer C120

DETAILS

- Price: £184
- Manufacturer: Acer
- Website: goo.gl/W1rmdp
- Required spec: Two free USB ports

The Acer C120 is another ultra-portable, fit-in-your-pocket projector that's ideally aimed at the business user on the go. The fact that you're quite able to whip one of these out alongside your laptop and get it up and running in a matter of minutes is a great selling point, but there are some significant setbacks along the way.

It's very small, measuring just 120 x 82 x 26mm and weighing only 300g. The microscopic projector manages to squeeze out a meagre 854 x 480 resolution at around six feet from the wall with a 50" image, although it's advertised as being able to produce a resolution of 1280 x 800 pixels – although we never managed to get it up that far for some reason. The bulb itself is also pretty weak, and at a hundred lumens you would expect to at least offer a better and more clear image, but that's not the case. However, it is pretty quiet in its operation, hitting an average noise level of around 30 to 35 decibels.

The minimalists among you will certainly appreciate this projector. The left side of the unit has a small focusing wheel, while the right-hand side has the ports for USB and power. The lack of an on/off button, menu button or anything else is actually quite off-putting to some degree, because you always feel like you're about to break the unit when plugging it all in

▲ *Acer's tiny projector needs only USB to power it – two USB ports to be exact*



▲ *But it's not the greatest projector from Acer, admittedly*

and having it lurch into use. Likewise, you just it when you're done, which again goes against everything you've ever learned regarding proper power-down procedures.

In terms of the design, it's generally okay but nothing too astounding or aesthetically splendid. The top is a glossy black and quite flimsy plastic that's a magnet for fluff, fingerprints and cat hairs. The sides have a series of ridges running down, which break up the heat output vents, and the bottom of the unit is a matt-black affair with a set of sturdy rubberised feet to stop

it from sliding off the table and an absolutely useless, tiny kickstand. Functional, yes, but hardly a design innovation.

Connecting the projector is a little different from the norm. There aren't any video ports to plug anything into, just a simple USB 3.0 arrangement. The C120 comes with a USB Y-shaped cable, which is required to plug into two USB ports on your PC or laptop. From this, both the video and power are fed via your computer, which is a bit of a pain, as you've already lost a couple of USB ports in just the setting up. Owners

of Chromebooks or ultra-slim laptops, be aware.

You do get an external power supply as standard, though, but the way in which the cable arrangement is dealt with means you have to have everything really close together – power, computer and projector – which isn't always an option.

The Acer C120 will no doubt suit someone who needs to move their projector around a lot and who doesn't necessarily require a superb image quality, just something to plug in and go. The compact design is good, as is the ability to do away with the power pack, but in all honesty, there are too many problems and not enough quality to warrant the spending of £184.



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Projectors

Philips Screeneo Ultra Short Throw HD 3D Projector

DETAILS

- Price: £1,600
- Manufacturer: Philips
- Website: goo.gl/xMDcLm
- Required spec: HDMI, VGA, USB, composite, wi-fi, Bluetooth, Ethernet

Most projectors are loud, expensive to maintain and offer very little other than the expanse of screen on the wall opposite. However, times have changed, and with that comes the newest range of Ultra Short Throw Projectors, in particular the Screeneo.

The Philips Screeneo HDP1590 Projector is an all-in-one unit that offers the user an experience never before found from a home projector. In this 339 x 287 x 148mm unit you'll find a wealth of features that put most other entertainment systems to shame.

The Screeneo has 4GB of internal memory, which is more than enough to power the customised version of Android 4.2 that runs every aspect of the projector. From within the UI you can enable the dual-band wi-fi function, enable or disable the Ethernet port, browse for media content on your home network, browse the internet, install third-party APKs and fine-tune the screen output. It's DLNA certified, Bluetooth enabled, Miracast enabled and can stream virtually anything from any NAS unit you have installed.

In terms of hardware, there's plenty of connectivity around the back: a pair of USB ports, two HDMI ports, VGA, Ethernet, RCA analogue, digital optical out, DVB-T tuner, AV in and a trigger out for controlling projection

▲ *The Screeneo is the crown jewel in Philips crown. A very, very expensive jewel*

▲ *If connectivity were king, the Screeneo would rule absolute*

screens. Around the front, located by sliding the brushed aluminium Philips logo faceplate down, you'll find yet another USB and HDMI port, along with an SD card slot and a manual focus slider.

The projector itself is built on a set of Dolby 26W speakers with a subwoofer, and from a mere 44cm from the wall it can project an image of up to 100 inches at 1280 x 800/720p HD resolution – or from just 10cm can project a 50" display. And if all that wasn't enough

already, it's 3D capable, supporting all 3D modes as well as on-the-fly conversion of 2D to 3D.

Build quality is excellent; from the leather carry strap on the back of the unit to the spring loaded faceplate at the front, the Screeneo oozes a quality of its own that's going to be hard to beat. The only off-putting element in the design is the dust- and fingerprint-attracting glossy black finish.

In operation, the Screeneo is as silent a projector as

you could ever wish for. The 2.1 built-in speakers easily mask any sound the fan makes during playback and do a superb job of filling the average-sized living room with some clear, sharp and impressive sounds. The RGB LED light source has a 30,000 hour lifetime, with a contrast ratio of 100,000:1, and it's more than capable of holding its own against a similar sized LED TV.

There's really so much going on with the Screeneo that's it's difficult to sum up its collective features and capabilities. Suffice to say, it played everything we could throw at it, and thanks to the Android OS there's a lot of scope for further entertainment options available.

Naturally, a device of this calibre is going to cost you a pretty penny or two. In fact, at £1,500 you can be forgiven for looking elsewhere, but bear in mind you won't find this level of connectivity or quality in the competition. If it's an all-in-one entertainment system you're after and you have the wall space to project a 100" image onto, then you really should consider the Philips Screeneo as the hub of your living room. However, it's magnificently expensive, and you have to question whether it's really worth the expense.



Benq MS504

DETAILS

- Price: £210
- Manufacturer: Benq
- Website: goo.gl/V1pPZN
- Required spec: VGA, composite, S-Video, USB

Benq products usually come in two possible flavours: really good or really bad. Thankfully, the Benq MS504 projector falls into the former of those two categories, but there are a few oddities involved.

It's a fair-sized projector, measuring 283 x 95 x 222mm and weighing 1.8kg. It has a decent native resolution of 800 x 600, up to a maximum of 1600 x 1200, along with the usual array of HDTV-compatible resolutions up to 1080p. There's a nice 3,000 lumens 190W lamp installed, a contrast ratio of 13000:1 and an impressive lamp life of up to 10,000 hours. The image size displayed can be from 30 inches up to a staggering 300 inches, provided you have the space, and it dishes out a reasonable 33 decibels under normal operational parameters.

There's plenty of connectivity too, in the form of two VGA-in ports, a VGA monitor out, composite video-in, S-Video, audio-in and -out, a mini USB port, RS232 and an IR receiver. This little lot take up the entire back plate of the projector, with the kettle lead power port in the bottom left of the unit. In essence, there's plenty of room to have every port hooked up to something without having to remove them all to get to the middle port. It's a little issue but one that's well thought out.

The MS504 also incorporates Benq's now legendary SmartEco Lamp

▲ *The Benq is a surprisingly good projector and worth every penny*

▲ *It does have its limitations, but it's a great classroom addition*

“Benq has produced a very good product and one that'll last for quite some time”

Saving Technology, which in turn offers a max power saving functionality while still delivering a decent quality picture. The SmartEco Mode will in fact enhance the image detail in darker scenes, while dropping the power consumption from a normal mode 296W to 163W. In real-world terms, this means you still get a good viewable image and an extended lamp life and somewhat reduced electricity bill.

Additional to this is an Eco Blank Mode, which is ideally

aimed at teachers who can blank the projection screen to bring the focus of the lesson back to them. When in this mode, the lamp power drops and total power consumption is down by 70%. Plus when there's no source input detected, the lamp power is dropped to just 30% and is able to snap up to 100% power when the source input is finally detected.

In terms of design, the MS504 is very functional and well laid out. Menu buttons are located in a recessed area

on the top of the unit, along with an easy lift access panel to swap out the bulb when needed. The sides are all vented, and although the top is of the glossy black plastic type, it doesn't quite attract the same amount of dust and fingerprints that other devices tend to. The included remote is also of a good standard and easy to use.

Oddly, though, the MS504 is supposed to be equipped with 3D projection technology, but we couldn't find where to enable this feature, and there weren't any 3D glasses in the box either. Naturally we put this down to a mistake or typo on the part of the marketing department, but perhaps there's an option to include this in future models?

Clearly the Benq MS504 is aimed at the classroom; there are, after all, plenty of teaching functions included. But the image quality is good enough to warrant this as a workable home theatre projector too. Either way, for just over £200, Benq has produced a very good product and one that'll last for quite some time as well.



Projectors

Infocus IN122

DETAILS

- Price: £245
- Manufacturer: Infocus
- Website: goo.gl/FwO5JA
- Required spec: HDMI, VGA, composite video, S-Video, USB

Infocus's range of office and classroom projectors (the IN122, 124 and 126) are considered as being some of the more reasonably priced and well-designed projectors available. Each has a wealth of connectivity, good lamp life and great brightness, but they differ in the image resolution and aspect ratio projected.

The entry-level IN122 may well seem like the bottom of the range, but it has some surprisingly good features. For starters, it measures 235 x 284 x 70mm and weighs an impressive 2.2kg. The 3200 lumens is great for a large meeting room or classroom and manages to achieve a good and sharp quality image in a room with a fair amount of ambient light. The DLP technology brings out the colours in both the native resolution of 800 x 600 and when moved up to the HDTV standard of 1080p and WUXGA 1920 x 1200. The throw distance of between five feet and 39 feet offers a projected image size of 40 inches up to a very impressive 303 inches.

The 230W bulb has a normal lifespan of 3,500 hours, with an Eco Mode lifespan measuring 5,000 hours, and the fan noise is cut down to a manageable 30 decibels in normal mode, with a slight drop to 28 decibels when in the Eco Mode.

Connectivity is good too, with a single HDMI port, two



▲ The Infocus IN122 is one of the best all-round projectors we've ever used



▲ There's something for everyone here, including 3D

VGA-in, composite video, S-Video, RS232 service port and a VGA-out. There's also mini-USB and audio-in and -out to improve the specs, but the built-in speakers only manage to squeak out a meagre 2W mono. The included remote is generally okay, although the buttons are a little squishy and need to be firmly pressed before they register.

The IN122 actually looks a rather sleek unit. The top front half of the projector is a matt-black design and houses the lens focus adjustment slider. The back half is a glossy black finish that contains the touch-sensitive menu controls. The rest of the projector is of a

ridged design that covers the vents, and it's worth noting that despite the general low cost of the product, none of the parts involved feel cheap in any way.

This is also a 3D-enabled product, and when displaying 3D content it does a very good job of keeping the screen clear and free from any noticeable lag. However, you don't get any 3D glasses in the box, most likely because it's not initially aimed at the home theatre crowd, but we think a pair or two of glasses wouldn't go amiss.

However, despite the good points, the Infocus IN122 does tend to vent out a fair amount

of heat, far more than the others we tested so far. If you're unfortunate enough to be sitting near it when viewing something, then you'll feel like there's a hairdryer at work on the back of your neck. In fact, the heat built up so much at one point that we couldn't pick the projector up for a few minutes, until it had cooled down.

Saying that, and if you're not bothered by the heat issue (if the projector was going to be ceiling mounted, for example), then the overall quality of the Infocus IN122 is really quite good and well worth considering.





Infocus IN122

The Infocus may not have the quality or lifespan of the Screeneo, but it's only £250, and you get so much from such a well-designed unit.

There's pretty much something for everyone with the LN122, from home theatre use to business and classroom. A clear winner in our books.



Philips Screeneo

Complain about the price all you like, you have to admit that the Screeneo is the king of the projectors at present. Mind you, the Benq and the PicoPix all score the same, so like most technology products, you take what you want from them and what you can afford.

How We Tested

Each projector was tested with a variety of connections to a desktop PC, laptop and Blu-ray player, with HDMI, VGA, S-Video and composite video used.

We tested both PowerPoint presentations, Word documents and a collection of HD content, including 3D where possible.

	Philips PPX2480 PicoPix	Viewsonic PJD7820HD	Acer C120	Philips Screeneo	Benq MS504	Infocus IN122
Price	£259.99	£696.99	£184	£1,599.99	£209.99	£244.98
Dimensions	105 x 31 x 105mm	268 x 84.4 x 221mm	120 x 82 x 26mm	339 x 287 x 148mm	283 x 95 x 222mm	235 x 284 x 70mm
Weight	270g	2.1kg	300g	5kg	1.8kg	2.2kg
Lumens	80	3000	100	700	3000	3200
Native Resolution	854 x 480	1920 x 1080	854 x 480	1280 x 800	800 x 600	800 x 600
Projected Image Size	120"	300"	50"	100"	300"	303"
Bulb Lifespan (Normal)	30,000 Hours	4000 Hours	20,000 Hours	30,000 Hours	4500 Hours	3500 Hours
Noise Levels	33 dBA	35 dBA	30 dBA	25 dBA	33 dBA	30 dBA
3D	No	Yes	No	Yes	Yes/No	Yes

Philips 234E5QHAW 23" IPS LED Monitor

Surely it's not possible to offer a Philips quality panel at this low a price?

DETAILS

- Price: £129.99 (PCWorld)
- Manufacturer: Philips
- Website: www.philips.co.uk
- Required spec: Computer or device with VGA or HDMI output or mobile device with MHL (Mobile High-definition Link) HDMI



Spending less than £150 on a monitor can be something of a lottery. While it's possible to get lucky, they don't usually come with a wide selection of inputs, or they suffer some other significant limitation.

Traditionally, the Philips brand has stayed out of the cheaper end of the market, where price is the primary objective, but the 234E5QHAW dips its toe in those chilly waters.

However, Philips cleverly insulated it against direct comparison with the majority of similarly priced displays, with some impressive features.

By far the most critical of these is the stunning 23" AH-IPS 1080P panel used, which is one of the best IPS designs I've seen so far. This technology gives exceptional colour representation and when using it for photography and graphics work, the hues and shades really zing. The quoted brightness of 250 cd/m² is adequate, though I suspect that the W-LED backlights actually produce even more luminance.

While this is all good for general work and playing movies, the only downside is that the typically low refresh of IPS isn't ideal for gaming. In my testing, this wasn't a huge issue, but

hardened gamers would probably want a TN technology panel.

The flipside of that argument is the excellent viewing angles on offer here (178 degrees horizontal and vertical) and the great contrast ratio.

What I also liked was the very thin bezel design and the VESA 100 mounting points that Philips included. The bezel is just 11mm sides and top, though this spacing isn't maintained along the bottom edge, for no obvious reason.

The VESA option might be critical to many users, because in the list of weaknesses in the 234E5QHAW, I'd include an excessively flexible stand. It makes the whole panel sway when you try to operate the menu buttons and should be substantially more ridged.

In general, to get this product down in price, it's been built to a lower standard than I expect with Philips. That's not to say it's junk,

but it's not built to take much abuse either.

The other snag is that you get just VGA and HDMI inputs, with no DVI. With the MHL version of HDMI, you actually get two of those ports, so why didn't Philips sacrifice one of those for a DVI?

Even with those two issues, this is a fine monitor, which delivers much more than I'd anticipated for the asking price. It would make a good display for a bedroom system, especially if you wall mounted it. You could even implement rotational swivel for portrait mode by doing that.

The review model was white, but it also comes in black for those who want the super-thin bezel to look even more minimalist.

Despite the lowered build quality used, this is still desirable panel and a notch above most displays at this price.

mm Mark Pickavance

An excellent IPS panel in an affordable package



Highlights

- 1920 x 1080p full HD panel
- AH-IPS display
- HDMI (x2) and VGA Inputs
- Mobile High Definition Link (MHL)
- VESA wall mountable
- Built-in stereo speakers for multimedia

Roku Streaming Stick

The Roku range expands with something very discrete

DETAILS

- Price: £49.99
- Manufacturer: Roku
- Website: www.roku.com/uk
- Required spec: HDMI TV or monitor, broadband

I've covered other Roku products for Micro Mart previously and they're great tools for those who want a good selection of streaming TV, music and movie services and have the bandwidth to run them.

When I first opened the Streaming Stick, I made a fundamental guess about it, based on the tiny size of the adapter, which turned out to be 100% wrong. While it is almost the same size as the Google Chromecast, it's certainly not been designed to complete with it.

Yes, they both go in a HDMI port and they use a headphone USB power supply to get power, but they're radically different in the way they're meant to be used.

If you compare it with the other devices in the Roku range, this has all the features of the Roku 2 box but without the neat remote control that has a headphone jack.

If you're a fan of Netflix, iPlayer, Sky Now or some of the weirder streamed channels on this platform, you'll probably enjoy this device. It works smoothly and, unlike the Chromecast, you get a real remote and don't need to involve a PC or a mobile device to use it.

Where this device doesn't excel is in casting content to a TV from another device.

There are Roku apps for both iOS and Android and some interfacing with YouTube and Netflix, but it's not well implemented. For example, I set the Roku Streaming Stick as a TV on YouTube and then sent a video I was watching on the PC to it. Where I was watching it in 1080p on my PC, the resolution automatically dropped globally to 720p. Until I unpaired that device, I couldn't play 1080p on the PC at all. That might be YouTube's fault or Roku's, but whoever is responsible, it's not desirable.

With the Roku app installed on Android, I can present pictures in well below full quality and play music, but the tool isn't well designed and assumes we all work in

portrait mode. There's also no video file streaming support of any kind, if you wondered.

The issue here is that Roku makes money through enabling streaming of paid content and therefore won't want to encourage too much watching of things that don't make it any cash.

In terms of the hardware, there's only one hiccup and that's the assumption it makes that the TV or monitor you use it with has enough space to accept its insertion into the HDMI port. Google provided a small flexible extension with the Chromecast, but Roku decided this was wasn't necessary, when it really was.

The Roku Streaming Stick is an alternative to the Roku

1 and 2 boxes and the price reflects that, being identical to the Roku 1. That could be a good deal if Roku would accept at some point that pound sterling and the US dollar aren't worth the same, since it costs \$49.99 stateside.

Those thinking that it's a device for casting will be disappointed. Those wanting a very portable streaming video service access device will not be. **mm Mark Pickavance**

A tiny streaming TV box and remote from Roku.



“ It works smoothly and, unlike the Chromecast, you get a real remote ”



Canon PowerShot G16

Canon refreshes its PowerShot G Series with something spectacular

DETAILS

- Price: £299
- Manufacturer: Canon
- Website: www.canon.co.uk

Bridge cameras fit neatly between the compact designs that are purely for recreational shots and the semi-pro DSLRs and because of that they can often offer the worst of both worlds.

I'll be up-front about the Canon PowerShot G16 and say

a few that have now returned with this model.

On paper, this looks like a nice but possibly unexceptional camera. It uses a relatively small 12.8 megapixel sensor to deliver 12.1 megapixel stabilised shots using a 5x optical zoom lens. That lens is 6.1 – 30.5mm (35mm equivalent: 28 – 140mm) and f/1.8-2.8, so there's plenty of light being captured for indoor/night shooting.

Many compacts might match this spec, but where the G16 really starts to show its superiority is in how clean the images are and how little light it needs to work with.



“ A full spectrum of manual options, which is as comprehensive as many lens changeable cameras ”

that this is such a good camera that it made me entirely reassess why I need a DSLR in the first place.

Canon's PowerShot G series are large by compact sizes and small by DSLR and they've drawn praise and brickbats with each new generation. The G15 that preceded this one took some justified flak for having features removed from the G14,

And if fast shooting is your thing, like in sports photography, the G16 is exceptional. This is the first bridge design I've seen that can fire continuously at 9.3 fps until the memory card is full – something many DSLRs couldn't sustain. That's great and with a target-following auto focus, they're mostly going to be perfectly sharp.

Technical Specifications

- Bright f/1.8-2.8, 28mm, 5x zoom lens. 10x ZoomPlus
- HS System: 12.1 MP CMOS, DIGIC 6 for stunning results up to ISO 12,800
- Intelligent IS for sharp shots with five-axis Enhanced Dynamic IS for steady movies
- Superfast performance with high-speed AF and 9.3fps sustained continuous shooting
- Large 7.5 cm (3.0") PureColor II G LCD; optical viewfinder

In an attempt to please both the semi-pro and the snapper, Canon has included a huge array of features on the G16, some of which are wonderful and others that are really silly.

In the wonderful pile is some stunning night photography modes designed to capture stars and even make night sky time-lapses. There's also the now ubiquitous triple-frame HDR and special options for snow and even underwater shooting. That last feature needs an expensive underwater Canon housing that is rated to 40m depth.

For those used to DSLR, there's also a full spectrum of

manual options, which is as comprehensive as many lens changeable cameras and there's even a stop adjustment wheel.

I like that side of the G16 personality most, because some of the compact feature side leaves me cold. Why anyone would select to have their images converted into B&W in-camera is totally beyond me.

More useful are the face recognition modes, which include not only the ability to avoid shooting people with closed eyes but can also initiate a self-portrait after detecting a wink.

Actually, Canon takes these features a bit too far. With the

G16 it's possible to identify people with a photo, provide their birthday and then it knows who to focus on in a group on that special day. That's spooky.

Whatever it's doing and however it does it, there's a common thread here and it's the delightful quality of the pictures it takes, even in challenging light environments. After using it for a week, I became confident that Auto mode generally made good choices and it's relatively simple to select special scene modes if you want them. There's

a flash built in and a flash shoe, but it rarely a necessity to deploy either.

For someone who takes lots of technical shots, the G16 is nearly perfect, being able to focus down to just 1cm and Canon even makes a special ring flash attachment extra for close work.

After such a glowing report, I need to mention a few things that just don't work like I'm sure Canon intended. There's a viewfinder, the inclusion of which is marred by it being



partially obscured by the lens shield when it's extended.

I was also disappointed that Canon didn't place the tripod mount directly under the optical focal point, for panoramic shooting. And at this price, most customers might be disappointed to discover that the display isn't touch sensitive.

However, what irks me more than anything else is that Canon included wi-fi without actually considering how people might actually use it practically. What most photographers want is the ability to take a shot and have it then automatically appear on their laptops or tablets for higher resolution reviewing. You can do this with the G16, but only if you've got connection to the internet and the Canon Image Gateway. That necessitates a wi-fi access point, making it unworkable for locations shoots.

Those points aside, this is a remarkably good design, which is probably only surpassed by the Sony RX100 II in this market sector, but that costs much more.

As a significant trade up from my trusty Canon IXUS, the G16 has plenty to offer at this new competitive price.

mm Mark Pickavance

An easily pocketable camera with many DSLR-like features





Filco Majestouch MiniLa Air Bluetooth Mechanical Keyboard

David Hayward checks out a portable Bluetooth enabled mechanical keyboard

DETAILS

- Price: £100 via The Keyboard Company
- Manufacturer: Filco Diatec
- Website: goo.gl/CTEb8b
- Required spec: Any Bluetooth enabled device, Bluetooth receiver otherwise



▲ The Filco Majestouch MiniLa is compact and clever



▲ The Cherry MX switches make for a lasting and effective keyboard

The benefits of Bluetooth keyboards are not lost on Filco Diatec. It took its original MiniLa design, shortened it slightly, changed a few of the key legends and, of course, installed the advertised Bluetooth connectivity. The result is a very fine Bluetooth mini keyboard with some extra special qualities.

This is an very small portable keyboard measuring just 297 x 124 x 40mm and weighing a solid 680g. Essentially, you could argue that it's a little heavy to classed as truly portable, but consider the technology involved with the keyboard and the fact that a decent weight is necessary (in our opinion anyway) for proper keyboard use.

Beyond the obvious Bluetooth connectivity, the Majestouch MiniLa Air features Cherry MX Brown switches, with a 55g actuation force and good tactile feel, replaceable keycaps, a 68-key layout and double-function keys. These double-function keys are located either side of the spacebar and work by using the lesser-used thumbs in conjunction with the FN keys to access the cursor arrows, function keys, Del, Home,

End and so on. It takes a little getting used to, admittedly, but once you get into the double function way of typing you'll soon find it a more efficient and effective way of typing.

The keyboard itself is quite stylish. The matt-black finish, laser-printed keys and compact design are impressive selling points alone. When you include the DIP switch on the bottom of the keyboard, which will change the various key code settings (disable the Windows and App keys, change the left/right FN key into the space, etc.) and the fact that this keyboard takes just a couple of AAs batteries,

then the whole package begins to become a little more alluring.

Pairing the keyboard with a Bluetooth device, be that a tablet, headphone, laptop or PC, is extremely easy and involves pressing the relevant pairing button on the keyboard and finding it from the Bluetooth device. The pairing is steady, with no signs of lag or dropped connections, and it takes but a moment or two to re-initialise after a reboot.

Looks and features are one thing; how the keyboard works and 'feels', though, is something else entirely and is the only reason why

we choose one model over another. Thankfully, the Majestouch MiniLa Air responds wonderfully, is quick to use and type on, and it 'feels' splendid. The Cherry MX Brown switch version we used was light and less 'clicky' than its Blue or Red cousins, which didn't disturb those around us while we tapped away furiously.

We were also pleasantly surprised by how long the batteries lasted. Even after spending a week with the keyboard, using it daily, we were still on the same batteries that came supplied. The only downside is the lack of a Bluetooth adapter, but since this keyboard is designed with portability in mind, this hardly constitutes a negative impact on the overall score.

To conclude, the Filco Majestouch MiniLa Air Bluetooth keyboard is an excellent keyboard. It ticks all the boxes a mechanical keyboard should, and it offers extra portability and the ability to be used with any Bluetooth-enabled mobile device.

mm David Hayward

An excellent keyboard for those on the go



Canon IXUS 155

Canon expands its point-and-shoot range with a new IXUS design

DETAILS

- Price: £129.99 (Currys)
- Manufacturer: Canon
- Website: www.canon.co.uk
- Required spec: SD, SDHC or SDXC card

I'm a big fan of the Canon IXUS series. They generally offer plenty of features and excellent picture quality for the price.

The new IXUS 155 fits neatly into Canon's compact camera range below the high-end 265 HS and 255 HS models and above the IXUS 150 and below entry-level options.

On paper, the IXUS 155 features a 20-megapixel sensor, 10x ultra-wide optical zoom and Canon's latest image stabilisation technology. This all in a pocketable 142g package that can capture 720p video along with still images.

And given the very attractive price for an IXUS design, there's obviously a market for this camera for those that don't have a decent one on their headphone.

The 155 plays to that market, including all the mess-my-

image-at-source filters and face recognising cleverness. Scene modes can be automatic or manual, and there's also an ECO mode designed to squeeze out more shots from the small battery. Canon quotes just 230 shots on a full charge or 310 if you use Eco mode or less than you can fit on a 2GB flash card in both cases.

Where this design is best suited is for quick ad hoc images, as it wakes rapidly and responds very smartly to the shutter button being depressed.

However, compared with the more expensive HS designs, the build quality of the 155 does leave a little to be desired. It's a

mostly plastic construction that needs protection if it isn't to suffer abuse floating around in a bag.

That's one issue, but the major one for this writer is the 20MP sensor, which seems ludicrously high for the optics and their light gathering capability. As a result, any ISO level above 200 introduces significant amounts of processing effects. Below that it's good, especially if there's plenty of light available.

I'd much prefer that this had a 12MP sensor and better low light capture than a 20MP sensor that generates grainy indoor photos.

What compounds this issue is that the view screen is small, low resolution and not much use for reviewing your shots. Looking at your photos some hours later on a PC is never the best time to discover that they're not very good.

While £129 might seem a bargain for a middle order IXUS, the 155 reminded me that spending another £60 on the new Powershot S200 model



will repay you in better results. The S200 might have fewer megapixels, just 10.1 and only a 5X zoom, but in terms of taking pictures you'll be happy with, I know what I'd be using.

The IXUS 155 falls into the trap that many compact camera makers seem to be vulnerable to, where they want to offer a crazy number of megapixels at the expense of all other considerations.

In this respect, it doesn't offer a balanced design, and it's outperformed by other cameras with less ambitious qualifications.

A camera that proves great specifications aren't everything

Specifications

- 20-megapixel CCD image sensor.
- DIGIC 4+ digital image processor.
- 24mm wide-angle 10x optical zoom lens with lens-shift type optical image stabiliser (IS).
- 1cm macro shooting.
- Creative Filters including fish-eye, miniature and toy camera modes.
- 2.7 (230k) inch LCD.
- Scene detection technology for maximum up to 32 different scenes and supporting movie shooting.
- HD movie shooting with Dynamic IS and Powered IS.
- Low light shooting mode and live view control.
- Smart shutter with face self-timer.
- ECO mode for power saving.



Microlab T1 headphones

A slim, light, wireless set of headphones with some great features

DETAILS

- Price: £54
- Manufacturer: Microlab
- Website: goo.gl/KUr1MP
- Required spec: Bluetooth, spare USB for charging/playback, 3.5mm audio jack

Microlab is rapidly coming to be a one-stop shop for all your PC and mobile audio solutions. Its clever use of technology within simple but stunning devices has secured its place in the hearts of the buying public.

Its latest entrant in the audio arena is the T1 headphone set, a trendy-looking set of headphones available in a range of different colours with Bluetooth connectivity, a good ten-hour battery life (with two-hour charge), micro-USB, 3.5mm stereo jack, built-in microphone and surprisingly good quality audio via the aptX codec.

The tough outer plastic shell of the headphones supports the soft polyurethane headband and ear cup cushioning and is flexible enough to allow the headphones to fold in on themselves so that they can easily be carried around in a jacket pocket, for example. The large ear cups are comfortable over the ear, and due to the fact that these are quite a lightweight, there's no gradual discomfort over time.

The 50mm Neodymium drivers produce, as we said, a surprisingly good level of audio quality. The lower bass frequencies are meaty enough and the mid to high frequencies come across clearly. Voice in particular is very good, due to



▲ The Microlab T1 headphones are a nice, light design with good sound quality



▲ Thanks to their Bluetooth connectivity and ability to fold up, they're extremely portable

the fact that these are also communication-style headphones that can be used in conferencing, answering your headphone when paired or even gaming to some degree.

Pairing with a Bluetooth device is a speedy and painless affair and is accomplished by holding down the volume

controls on the right-hand side of the ear cup. These media controls are fairly basic, with play/pause, skip next/previous and volume buttons. They do admittedly take a little getting used to, especially if you're new to ear cup controls, but it doesn't take too long to grow accustomed to them.

The built-in microphone is pretty good quality when the conditions are perfect. However, if there's some background noise or you're out and about, the wind and other noises tend to get picked up over your voice – despite your mouth being closer. It's not a huge issue to some degree; if the person on the other end of the call is also wearing headphones, then they could easily pick up your voice through the interference, but on a phone we found it fairly difficult to hear what was being said.

Other than having a retractable microphone to bring it closer to your mouth, there's probably not much that can be done about that. In a high percentage of the cases, the user will more than likely be communicating via this headset indoors, which makes for a far clearer experience.

For around the £50 mark, we were fairly impressed with the overall quality of the Microlab T1 headphones. The style, lightweight design, great battery life, good audio and wireless connectivity make for an ideal set of headphones for a younger person or while exercising and taking calls.

mm David Hayward

A good headset that ticks all the boxes



ZyXEL NSA325v2

A NAS unit that just keeps getting better and better

DETAILS

- Price: ~£94.98
- Manufacturer: ZyXEL
- Website: goo.gl/V4Sry9
- Required spec: Windows XP or later for Utility, any up to date browser for webadmin



▲ Improved drive bay access is just one of the many fixed features

▲ Its design has improved and now looks more modern

ZyXEL would appear to have a bit of a problem on its hands. How do you improve something that's already as near to excellent as is humanly possible? The NSA325 two-disk NAS unit we reviewed some time ago came out as being one of the best in its class, with only a few minor issues that we nit picked over. Now, however, we have in our hands the NSA325v2 and once more, we're pretty impressed.

As with its older brother, the NSA325v2 is a two-bay NAS unit, which can take up to 4TB 3.5" or 2.5" SATA I/II drives in either RAID 0, 1 or JBOD configurations. There's a single gigabit Ethernet port around the back, alongside two USB 2.0 ports, pinhole reset and the power input. The front of the unit houses a single USB 3.0 port, power button and the copy/sync button that's commonly found on the ZyXEL range of NAS units.

Inside the 1.6GHz Marvell CPU and 512MB of memory keep the data flowing nicely and process the many features of the NSA325v2 without any hint of a drop in performance.

As for the design, there are some alterations from the previous NSA325. For starters, the look of the unit has changed slightly, with ZyXEL forsaking the grooved lines of

the drive access front door to a polished, mirrored black effect and incorporating a nice aluminium-effect strip down the side for the various LEDs and control buttons. In addition, the swing and release door of the NSA325, which was a particular bugbear of ours as it always felt very flimsy, has been updated to a push and slide removable cover, which we're pleased to say feels much better and a lot more solid than the previous model.

The drive bays are also updated, this time with a proper hot-swap-like tray and handle system combined with a release button on the bottom. This makes removal, replacement and just general access to the interior of the unit much better, cleaner and probably improves the airflow around the installed drives. It's a little bigger than the previous model too, but rounded corners, sleek lines and a matt-black finish make it like a more compact unit.

Once the drives are fitted and the NSA325v2 is hooked up to your network, it's simple

enough to get everything up and running through the included software and the ZyXEL NAS Starter Utility. Also, the web configuration and admin side of things appears to have seen a facelift and is now a lot easier to get to grips with.

As with the previous version and most of ZyXEL's range, the list of things this unit is capable of is quite simply staggering. The usual DLNA, FTP and web server all are present, as well as smart device application support and phpMyAdmin/MySQL support. There's also a hybrid cloud feature present which, like most modern devices, allows you to create your own cloud system with access locally or remotely in a flexible and secure environment.

ZyXEL has done a sterling job here. It's taken an already excellent product, listened to feedback from users and has improved it significantly. For around a £100, you're getting a superb product that's not only technologically future proof but will also give you many years of service.

mm David Hayward



▲ The gigabit Ethernet port makes for quick access to your media

A well-designed and affordable NAS unit that offers a great deal



The Download Directory



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

This month's applications include: HardWipe Portable, a fully portable program that can remove files from your hard drive (or other storage media) forever; Geo-Tag Mapper, an application that plots your photos on a world map; QuickMove, a program that helps you automatically organise your hard drive, and OpenELEC, a stand-alone Linux-based implementation of popular media centre software, XBMC.

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 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, as the case may be. Let's get going then...

Hardwipe Portable 4.0.3

Release Type: Freeware

Official Site: www.hardwipe.com

You may not realise, but when you delete a file it isn't really gone until the space it occupied is used for something else. This means if you accidentally delete something, there's a chance – a fairly good one – that you can get it back if you

act quickly. While that might be a good thing if you've deleted something by accident, it's potentially much worse if you deleted it on purpose and someone else tries to get it back.

To wipe files completely, you have to overwrite them at least once, and maybe even two or three times if you want to get them out of reach of a forensic recovery. Hardwipe is a program that'll help you automate this process, ensuring that no-one with the wrong motivations can get at files you thought were out of reach.

It's not the only program like this in its class. As with others, the software accomplishes its goals by repeatedly writing random data over the space used by files that you delete. Depending on how sensitive your data is, you can set the file space to be overwritten up to 35 times. Slight overkill, perhaps, but there's no arguing with that sort of strength.

The deletion process works on any storage device, from hard drives to SSDs to memory cards. If you've decided to sell a PC, laptop, USB key or flash card, it's an absolutely essential step. Wipe entire drives or one folder at a time, but don't give anyone access to your former hardware if you can't be sure that it's been wiped clean of your personal data. The risk is too great!

The best thing about Hardwipe is that you don't have to actively run the program for it to wipe a file, although you



can do it that way. A more convenient method involves the program's context menu integration in Windows explorer, allowing you to perform a secure wipe in just a few clicks.

Other features include a secure swap file wipe, and the ability to automatically shut down your PC when a particularly long wipe is complete. As tools go, it's both useful and hugely secure, easy to use and yet superbly powerful. It's available as both an installable and a portable version, and can be downloaded entirely for free. Definitely a good place to start if you're thinking of getting rid of old storage media.

Pros: Simple, powerful, free. Exactly the qualities we like

Cons: Some wipes can take a long time

Rating: 5/5

Geo-Tag Mapper 1.1

Release Type: Freeware

Official Site: www.it-digin.com

Whenever you take a photo using a smartphone, tablet, or digital camera it's a safe bet that the image is also being seeded with tonnes of extra information. This is called 'metadata' because it describes things about the image it's attached to. Everything from the data a picture was taken, to the type of camera used, and even – if it's available – the location the photo was taken in.

In most cases, this information is easy to read. It's just text, after all. That isn't true at all of the location data, though. Some, rather than naming a specific location, gives you a set of GPS co-ordinates that are virtually meaningless without the right way of interpreting them. Which is where Geo-Tag mapper comes in. This is a piece of software which can read the metadata on a photo and plot the images on a globe, so that you can tell exactly where they were taken.

To load images in, all you have to do is select a starting folder and let it scan the contents. Any images it finds with the necessary metadata will be plotted onto a globe, which you can then drag around or zoom in and out of to find out where

the pictures were taken. Any location with a matching photo is shown with a red 'P', and you can click on the letter for a thumbnail of the image in question.

To be fair, there's nothing within to Geo-Tag Mapper that's particularly impressive or complicated. However, at the same time, it's not something anyone else seems to be doing as a desktop application. That means it's a niche that's being filled, which in this day and age is enough to justify its existence, especially when it's free and easy enough for amateurs to use.

“ It's good, yes, but you can't shake the feeling that it could also be so much better with a little more imagination ”

In that sense, we simply can't fault what it's doing or the way it goes about it. It would, however, be better if it had support for social media or rudimentary metadata editing to increase its usefulness even further. There's nothing wrong with being basic, but just because you're the only entry in your particular niche that's no excuse for a lack of effort. It's good, yes. But you can't shake the feeling that it could also be so much better with a little more imagination and focus from its creators.

Pros: Fills a somewhat neglected niche

Cons: Lacking in features

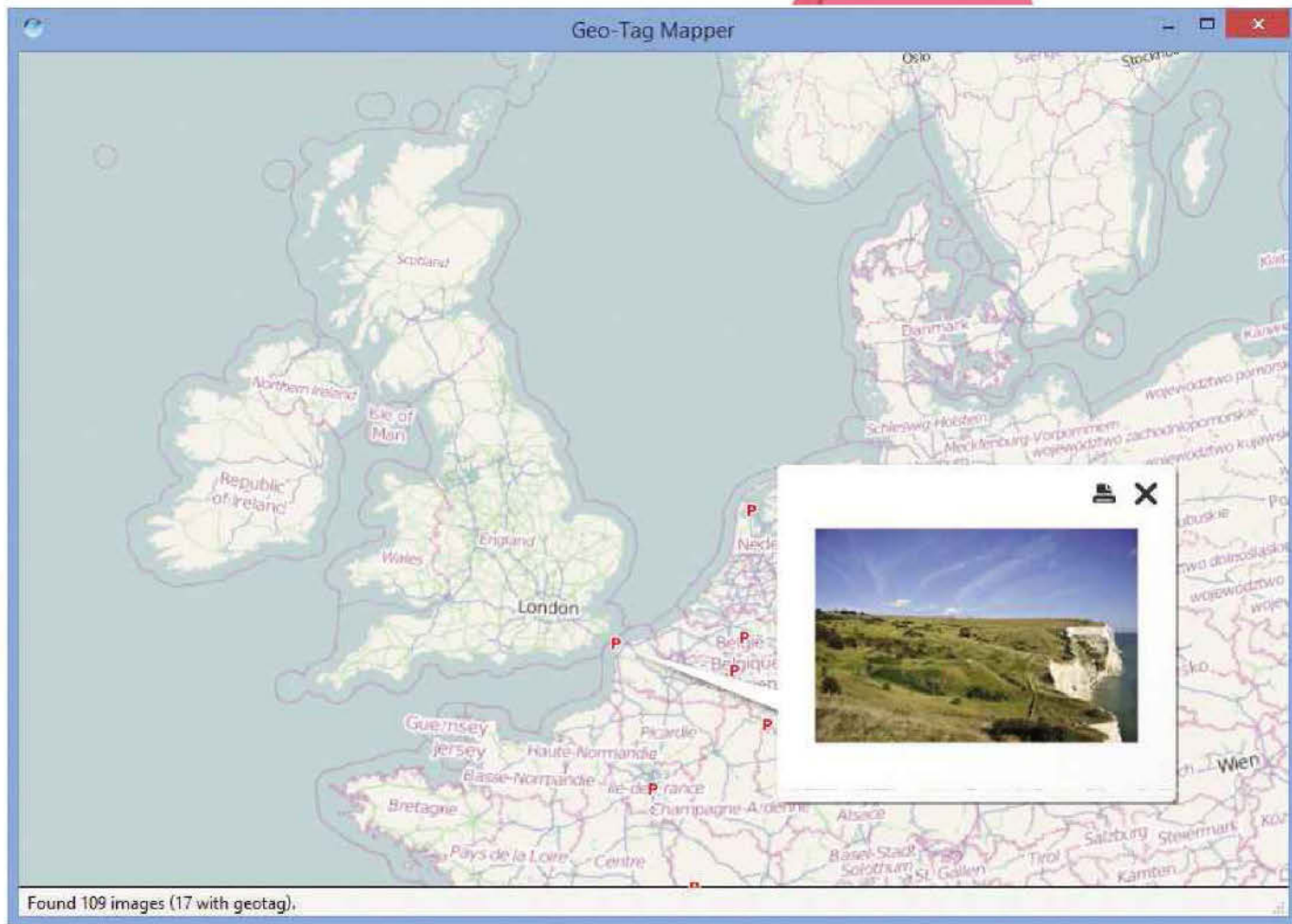
Rating: 3/5

QuickMove 1.5.5

Release Type: Freemium

Official Site: www.thecodeline.com

These days, hard drives store more information than most of us would have thought possible when we began using computers.



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!

LibreOffice 4.2.4 RC1

www.libreoffice.org/download/pre-releases

The latest version of open-source office suite LibreOffice is nearing release, and that means you can test it out at home with this release candidate build. As well as almost a hundred fixed bugs, LibreOffice 4.2.4 offers new symbol service debugging, a freshly signed installer, improvements to the Linux package and more besides.

Crucially, the makers of LibreOffice are keen to stamp out incompatibilities with their former selves, OpenOffice, so if you've still got the latter installed and want to contribute to their efforts, you should download and install the latest beta and watch out for any times the two suites seem at odds with one another. Submit the problems you find as a bug and they'll be added to the to-do list of fixes. Finally, a chance to genuinely influence the development of a beloved software suite, even if you can't program!

Chrome 35 Beta

www.google.com/intl/en/chrome/browser/beta.html

It's been a few months since we looked at the changes made to Chrome – which like its chief competitor, Firefox, seems to be in a constant state of flux as new versions of the software are released thick and fast. This latest beta release introduces a bunch of new features and additions to the Chrome we know and love, many of which you probably won't notice, but a significant few are definitely worth looking out for.

Chiefly, we're thinking of support for touch-action CSS properties. It's now possible to disable things like touch-scrolling, punch zoom and double-tap zoom to create a less frustrating mobile experience on sites. Desktop users also get an update that allows web apps greater mouse access to ensure the behaviour of the page is correct when, for example, you use the mousewheel. JavaScript support has also been updated for compatibility with the latest functions.

This release also removes several features from the browser – primarily support for old, largely unused APIs – in an attempt to simplify Chrome's codebase and remove potential vulnerabilities. Admirably secure behaviour from Google.



While thousands of gigabytes can be stored in a single unit, though, most files haven't gotten any bigger than they were. Indeed, some have actually shrunk thanks to improvements in codecs and compression.

This means that hard drives have become an organisational nightmare. Staying on top of your file organisation can be a full-time job, and if you let it go for a week or two, it could take days to clean up. The idea behind QuickMove is that

“ Windows never seems to learn what's best for your files, so why not use QuickMove to tell it? ”

certain tasks in this area could quite easily be automated. If you're always copying MP3s from stray locations into your music folder, QuickMove can do that for you. If you always delete install programs from your downloads folder when you've used them, QuickMove can do that too. Windows never seems to learn what's best for your files, so why not use QuickMove to tell it?

The core applications allows you to set up a variety of rules and behaviours that can be applied to files of a specific type, when found in a specific location. Never again will you

find yourself dragging and dropping or cutting and pasting. QuickMove will take care of it for you. Additionally, if you want to apply a specific rule to a file, you can select it from the context menu in explorer. Creating new rules is just as easy. Find your file, tell QuickMove how to match it and where to send it, then save the rule for future use. Clicking the QuickMove menu item will instantly apply the correct rule, and you don't have to worry about anything else.

Features include a list of recent target directories, for finer control over where programs end up, the ability to run the program on startup, and the ability to leave it minimised in the system tray so that it's instantly available to you.

The basic software is free, but if you enjoy QuickMove there's a Pr version which gives you the ability to create more powerful rules using regular expressions. The price is impressively fair, at just \$5, so if you try it out and enjoy the way QuickMove feels, it's definitely worth bumping yourself up to the better version.

Pros: Simple but effective idea, well executed

Cons: Slightly clutters up context menu

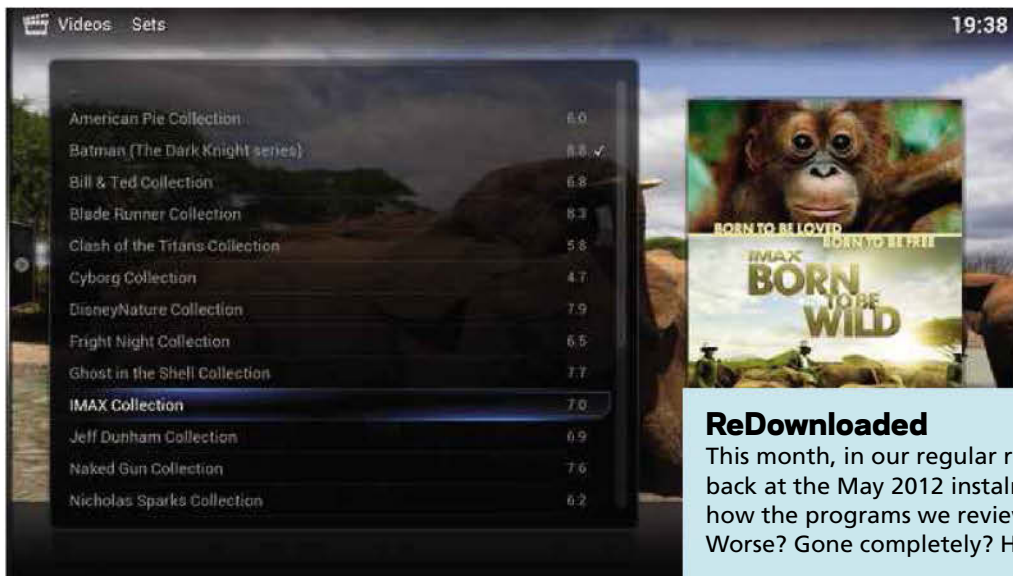
Rating: 4/5

OpenELEC 3.2.4

Release Type: Freeware

Official Site: openelec.tv

Old PCs sometimes look a little sad if they're left abandoned in the corner of a room somewhere, but what's the alternative? They seem too valuable to throw away, but not good enough



to sell. Could you instead try and salvage what's left for another purpose entirely?

One popular way to rehabilitate an aging PC is to turn it into a media centre. There are plenty of programs out there to aid this sort of transformation, but OpenELEC is specifically designed to be simple to administer and run entirely off a USB drive, making it easy to manage, update and install.

OpenELEC is actually a build of the popular open-source media centre application XBMC. It fits on any piece of storage that's 256MB or larger, alongside the media you want to view. Download the installer, set up the software, plug it into your old system and boot it up. You'll be ready to go in seconds.

Using OpenELEC is basically identical to using XBMC, so it shouldn't be difficult to decipher. One benefit is that you don't need to create an underlying Linux installation to run the software; it's essentially its own stand-alone Linux installation designed to do just one thing. OpenELEC actually stands for 'Open Embedded Linux Entertainment Center'. Because it's self-contained and self-limiting, there's no danger that you'll end up causing any substantial trouble. Indeed, even if you badly misconfigure something, you can unplug the storage to get back to the original system.

The list of benefits is extensive. The software is free, it needs no more than 125MB free space to install, hardware requirements are incredibly low, such that if a system can play HD video then it can run this software, and it's very simple to set up and use. There are built-in file-sharing features, and if connected to the Internet OpenELEC will even download media information and artwork automatically.

It's obviously not the simplest program to set up and install, but nor should it be beyond most people's abilities. There's extensive help online and if you get it right, the rewards are substantial. If nothing else, it's better to try than leave a perfectly good PC gathering dust.

Pros: Versatile XBMC implementation

Cons: A little complex. Could be beyond beginners

Rating: 4/5 [mm](#)

ReDownloaded

This month, in our regular retrospective section, we're looking back at the May 2012 instalment of Download Directory to see how the programs we reviewed have fared. Are they better? Worse? Gone completely? Here, we find out.

Sticky Password

www.stickypassword.com

Reviewed Version: 6.0, Current Version: 7.0.531

In the wake of the heartbleed bug, an improved password manager might seem like exactly the thing you need. Sticky Password is a freemium application that fills in forms for you and, crucially, allows you access to the stored passwords. The app was good at the time, but since our initial review they've released apps for iOS and Android and improved the web component. You still have to pay for full functionality, but when a program is this good you probably won't mind.

Free USB Guard

www.myportablesoftware.com

Reviewed Version: 1.20, Current Version: 1.57

Not, as the name suggests, a program for protecting the contents of a USB key, Free USB Guard actually just warns you if you try to shut down a PC with a USB key still plugged in or a disc still in the drive. We weren't particularly impressed at the time, and little has changed. Most of the updates have been bug fixes or related to purchase methods, which isn't very encouraging. Still not worth looking at.

WriteMonkey

writemonkey.com

Reviewed Version: 2.3.5, Current Version: 2.6

WriteMonkey is a 'focused writing' application that removes distractions, tools and analysis, stripping down a word processor to just the things necessary to write: you and a blank screen. We thought it was great at the time, and the latest version is better, with more keyboard shortcuts and a plug-in engine. If you find it a little difficult to keep your mind on the task at hand, we'd recommend giving it a try.

BurnAware Professional

www.burnaware.com

Reviewed Version: 4.9, Current Version: 6.9.4

Even though it's shareware, BurnAware is one of the best disc-burning apps we've ever tried out. The latest version continues that trend, with a stack of new features, loads of bugfixes and updated language libraries. We understand you might be reticent to pay for CD burning software, but if you're going to, this is the one to spend your money on.

PC Tip of the Week

Windows Command Prompt, Part 2

More Windows Command Prompts this way come

This week, we'll finish off our brief look at the Windows Command Prompt with a few extras you may not have come across before.

Long Commands

If you have entered a long command into the prompt and you've made a mistake – 'nslookup www.microosomaert.co.uk', for example (note the typo) – rather than retyping, or hitting the up arrow then moving through the text to edit, you can try this instead: press F2 and a dialogue box will appear asking for a character to copy up to. Type in 'r' (to copy up to the first 'r' in the command) and after that you can alter your mistake, and press F3 to complete the rest of the command (providing you only had one typo, that is).

Customise The Title

You can customise the title of your command line window, should you wish, by typing 'title David' (for example, other names are available) at the command prompt, and press Enter to change the window title to 'David'. If you want to include the current time, then try 'title Bob %time%', followed by Enter. You can also customise with different system variables: i.e. 'title %USERNAME%, %time%, %date%', and press Enter. For the full range of options available, you can type in 'set' to see the list of current system variables.

Run Multiple Commands

Next, we come to a feature that many of you Linux Terminal users will have used countless times in the past: the feature

allowing you to run multiple commands by adding a double ampersand (&) in between the commands. For example, if you type 'cls && dir/w' it will clear the screen, and then display the directory listing with the 'W' switch.

Note, though, that the command after the double ampersand will only work providing the first command completes without an error. Should you, for example, type in 'cld && dir/w' (note 'cld' not 'cls'), and press Enter, you'll receive an error regarding the 'cld' part.

To run the command even if you create an error the first part, use a single ampersand. Do the same again – but in this case you'll still get an error, but the second command will execute anyway.

Interestingly, you can run a second command only if the first command creates an error. It's done by using a double pipe '||'. Try this:

From the root of C:, type 'dir Windows && echo Windows found! || echo Windows isn't there', and press Enter. You should get a directory listing, followed by 'Windows found!'. Now change directories to a new folder, where Windows doesn't exist, and run the command again by using the up arrow and you should then get 'File not found' and 'Windows isn't there'.

Find Text In A File

If you have loads of text documents in a directory and you want to look for a particular word in amongst the plethora of files, then instead of using the bloated Windows search, try this:

Command Line Extras

The Windows Command Prompt continues to surprise us with its power. There's a lot hidden under the surface of this shell, despite Microsoft's best attempts at trying to do away with it.

You can certainly search high and low for those hidden extras, but this entry from Lifehacker (goo.gl/7Zojke) goes into detail regarding a few well-known commands and leads you onto one or two not-so-well-known ones as well.

Open up a command prompt and navigate yourself to the directory where the text documents you wish to search are stored. Once there, type in 'find "word" *.txt', and press Enter. This will then search for the word 'word' in every text file. Again, other words are available.

You can also include '/l' to ignore the case of the characters, or pipe the output into a new file and open it via Notepad.

Try this as an example: type 'find /l "word" *.txt > found.txt && notepad.exe found.txt', and press Enter.

Lovely Command Line

The command line is a lovely place to visit from time to time, especially when you are more at ease with what it can do. Personally, we feel it gets you back to your roots and helps keep those rusting keyboard skills up to date. Give it a go next time you get a chance! **mm**



```
Microsoft Windows [Version 6.0.6002]
(c) 2013 Microsoft Corporation. All rights reserved.

C:\Users\David>nslookup www.microosomaert.co.uk
Server: ns01.cyberghostvpn.com
Address: 95.169.103.219

*** ns01.cyberghostvpn.com can't find www.microosomaert.co.uk: Non-existent domain
in
C:\Users\David>nslookup www.mic
```

Enter char to copy up to:

▲ Mistakes on long commands can be easily rectified by hitting F2



```
22/08/2013 16:36 <DIR> Ueh
22/08/2013 14:48 157 win.ini
20/04/2014 07:55 1,463,970 WindowsUpdate.log
22/08/2013 04:57 18,752 winhlp32.exe
22/04/2014 16:10 <DIR> WinStore
25/04/2014 13:56 <DIR> WinSxS
18/06/2013 15:54 315,640 WMSysPr9.prx
22/08/2013 12:22 18,752 write.exe
25 File(s) 5,995,257 bytes
67 Dir(s) 79,276,154,248 bytes free

Windows found!
C:\>cd "Documents and Settings"
C:\Documents and Settings>dir windows && echo Windows found! || echo Windows isn't there
Volume in drive C has no label.
Volume Serial Number is 4B2A-4C73

Directory of C:\Documents and Settings

File Not Found
Windows isn't there
C:\Documents and Settings>
```

▲ You can chain several commands, and make complex but useful entries

Building A Steam Box

Mark Pickavance walks through building your own Steam Box and talks about the practicalities of this new platform

The growth of the Steam gaming portal and platform has been an interesting evolution. Valve Corporation started it as a distribution network in 2002, and it has since transformed into a major gaming community, content showcase and hub for independent software developers.

The idea behind Steam is to allow gamers to buy a range of new and innovative content, maintain that title through a Steam account and provide a central management resource for digital rights.

Once you've bought a game (or downloaded a free one) on Steam, you're free to play that on multiple machines using your login, and any achievements will be attributed to your account, regardless of what system or platform you're on.

Initially on Windows and then Apple Mac, it's now looking to expand into mobile platforms, and it's also developing its own operating system, SteamOS.

The SteamOS is based on Debian 7 kernel Linux, so it could be used as easily to run an office application as play games. But it's been built specifically to support gamers, and a number of hardware manufacturers are actively developing Steam Box systems that package sufficient PC hardware to run the OS.

Kindly, Valve Corporation hasn't restricted SteamOS to commercial companies, and it's possible to get the software and build your own Steam computer. What I've detailed here is my own Steam box experience, as a guide for anyone who's interested in creating their own.

Preparation

All system builds begin with a little preparation, and this one is no exception. Much of my preparation time for this one involved thinking about what hardware I'd really like to see in my Steam Box.

The minimum requirement for SteamOS is pretty loose, but Valve dictates the following:

Processor: Intel or AMD 64-bit capable processor

Memory: 4GB or more RAM

Hard Drive: 500GB or larger disk

Video Card: Nvidia or AMD graphics card (or Intel/AMD integrated)

Additional: UEFI boot support and USB port for installation

The only reason that would stop you using virtually any PC from the past ten years is the UEFI boot requirement. That's something that's only been on motherboards more generally in the last five years.

My thoughts on this were heavily coloured by AMD, and a recent press afternoon I'd spent with them and their new APU range of processors. What I didn't really want to do was build a Windows gaming system and then stick SteamOS on it. The whole point of this operating system is to provide a very efficient platform for gaming, and in that respect I wanted something modestly specified but with enough performance for enjoyable gaming.

Another factor pushing me in this direction was cost, because I didn't want to spend any more than I'd reasonably pay for a next-generation console for this system.

In the end, I went for an AMD APU system, even if at the time I wasn't entirely convinced it would have enough power to do the job.

Projects like this always flirt with the possibility of failure, but when I started this, I was only 50% certain it would work. That wasn't only because of the hardware but also because SteamOS is only a beta and not a finished product.



Actually, when I first installed it, I think it was more alpha than beta, but it's getting better by the day. Because of that, I wouldn't let this anywhere near a system with an existing OS on it, which is why I built the Steam Box.

Here's how I got on.



▲ **1.** The case I picked is too big. But I had it spare, and it's a really lovely design by Corsair that takes a micro-ATX motherboard. It's an Obsidian 350D and has plenty of room for whatever other gear you might want to include. This model can be bought with or without a windowed side for about £87. It doesn't come with a PSU.

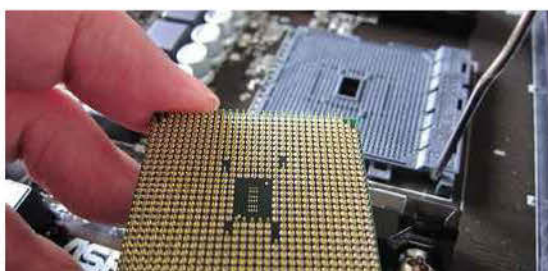


▲ **5.** Another Corsair part! This is a Hydro Series H75 Liquid CPU Cooler, and it's ideal for making a quiet system. The sealed cooling solution circulates water between a CPU cooling head and a radiator that's cooled by two 120mm fans. It works with AMD and Intel systems, and offers good cooling to combat the heat of long gaming sessions.

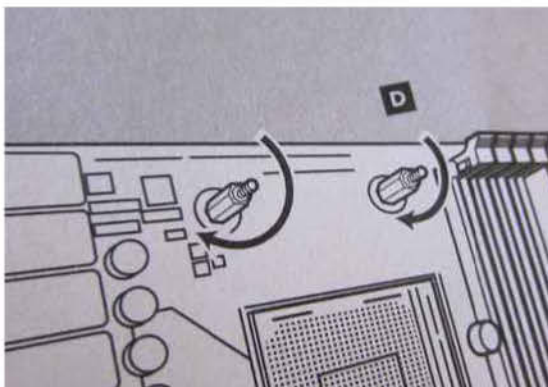


▲ **2.** As I'd used a Corsair case, it seemed logical to use other Corsair parts, including this lovely CS550M modular PSU. For a gaming rig, 550 watts might seem modest, but with SteamOS I'm not looking to build anything with CrossFireX or SLI ambitions.

In the 350D case, the PSU goes at the bottom of the case, not the top.



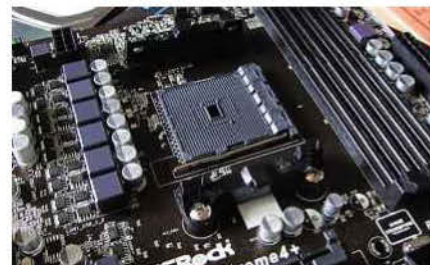
▲ **4.** Just checking the pin layout before inserting this AMD APU in the socket. My original plans were to use a new Kaveri A10-7850K or A10-7700K, but AMD didn't have either of those available at the time. Instead I used this A10-6790K, which I had spare. The A10-6790K is Richland cored and is clocked at 4.1GHz with four cores.



▲ **6.** To mount the H75 requires you to remove the AMD cooler attachments and replace them with these hexagonal threaded extensions. You retain the AMD back plate, so this can be done without rear access, if you're careful. It's better to do this outside the case if you can. Once complete, the motherboard can be installed.

Steam Box Build

Most people who read Micro Mart have built their own PC, so I'm not going to cover all that ground again. Instead I'll focus on some of the special features I put in this one, and a few of the challenges it represented.



▲ **3.** My motherboard of choice; the ASRock FM2A88M Extreme4+. I used this board a while back for something else, and after it returned to ASRock, I bought this one to support new AMD FM2 processor releases. It's got a bucket of features, and for about £55 delivered, it's something of a true bargain.



▲ **7.** Before installing anything into the case, it's my usual practice to strip all the side and front panels off it. It's a better plan than trying to remove things as you need them, and most of these bits will need removing at some point. The cardboard box in the drive tray is where Corsair puts all the screws and extra cables in this model.



▲ **8.** Oops, nearly forgot. You need to put the I/O shield in place before the motherboard. I can't count the number of times I've forgotten to do this, and then been forced to remove the board to put it in. The 350D has pre-installed offsets, saving time on the motherboard installation. It's just a matter of putting the screws in and tightening them.



▲ **9.** With the motherboard mounted I installed the RAM. Amazingly, I didn't use Corsair but some 1866MHz modules that are branded to AMD. Valve only asks for 4GB, but I threw twice that in here for good measure. I later realised that the slots are paired 1-3,2-4, and had to move one of these to get dual channel mode to work.



▲ **10.** Modern cases are much neater because they've got cable paths and rubber grommets. Here I'm pushing the ATX24 connection through a hole at the bottom of the case, so it can re-emerge through another further up and not block the drive area to the left of the motherboard. By doing this, the whole system looks neater.



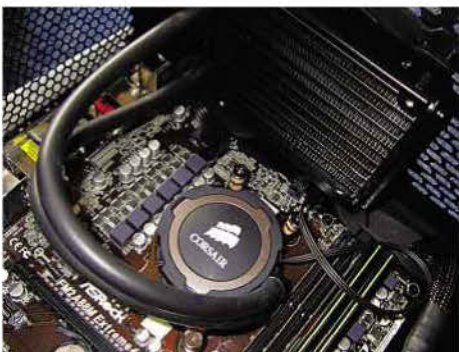
▲ **11.** In this angle, you can see the various ATX lines and the paths they take under the motherboard. Once the system is working I'll tie-wrap this back here, so they don't end up touching the hot underside of the socket area. This case has excellent rear access for cooler installations, as you can clearly see.



▲ **12.** Initially I placed the radiator, sandwiched with two fans to the rear of the case, as shown here. The problem with doing this was that the open fan was far too close to the APU, concerning me that the blades might strike the rubber water lines, and rupture them. I played with a number of possibilities to resolve this problem.



▲ **13.** As the H75 had been used for review testing previously, I needed to put some fresh thermal paste on it to deploy in this system. After placing a blob of compound on there, I then used an old credit card to create a thin film across the whole surface. Use too much and it won't transfer heat efficiently between the APU and the head.



▲ **14.** This was my final choice for installation, using the roof to mount a single fan and the radiator. I can't say that I'm totally convinced by this choice, but it was the best option of those available. This case would probably have worked better with the H100 double width radiator, I've since concluded.



▲ **15.** Some storage is needed to put SteamOS on, so I went with this Seagate Desktop SSHD 2TB. Because it's a hybrid design, it's fast, and 2TB is plenty of space for games. Normally, I'd also put an optical drive in a PC, but there seemed little point in doing this here. All the software is installed online, so I didn't bother with a DVD-RW.



▲ **16.** All that's now required is to attach the SATA cable and front panel controls before I test that the system runs. The front panel are fiddly, and it's easy to get them in the wrong places. Once this is done, and I'm confident the computer runs, it's time to start thinking about SteamOS and how I might install that.

Steam OS

Since I did this work Valve have now offered an ISO version of SteamOS that has a Windows installer that can implement dual-boot functionality. Unless you really understand what you're doing I'd avoid that, and instead install it on a computer that's dedicated to its use.

That's what I've documented here, and I recommend you do.



▲ **1.** The first job, obviously, is to acquire SteamOS. You can find it at store.steampowered.com/steam-os/download.

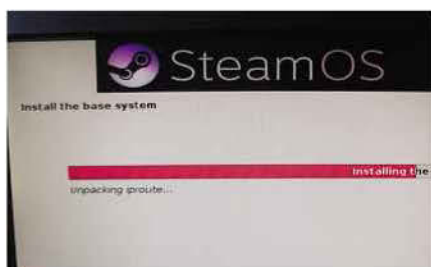
Once you've agreed to the SteamOS licence, you'll be able to get a zip containing the files, the size of which is about 1GB. Find a friend with a fat broadband pipe, if you don't have one.



▲ **2.** Once you have the files you need, copy them on to a USB key, formatted in FAT32. I used this old promotional stick sent to me by Nero. To boot from it you'll need to press F12 (usually) when the PC powers up, then select the UEFI boot with the name of the USB key option. Timing is critical for this menu, so just reset and try again if you miss it first time.



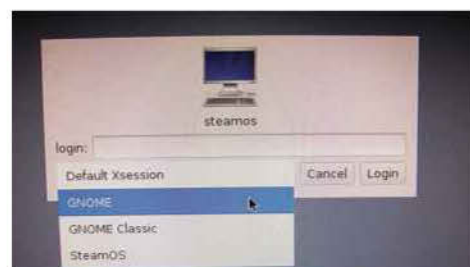
▲ **3.** A successful boot will be greeted by this menu. There's an 'Expert Install' that asks all manner of annoying questions, so ignore that and instead head for the 'Automated Install'. Note, this will erase the hard drive, so make sure it didn't contain anything critical before you commit to this. The installer will now begin to put SteamOS on the PC.



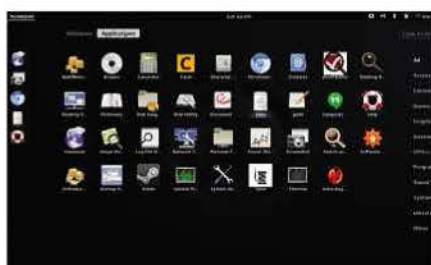
▲ **4.** This stage of the installation doesn't take much time at all, especially compared with any Windows installation I've done. I've heard that there's a bug where it will try to install to the USB drive and not the hard drive, but I didn't encounter this. If you do get an error, Google for 'SteamOS / dev/sda error' to find the potential solution.



▲ **5.** With the primary installation done, you get a message that you need to remove the USB drive and the system will reboot when you click 'Continue'. It should work if you leave the USB key in there, but to avoid any possibility of it not rebooting correctly, I'd yank it out. If this was a commercial product, we'd be done, but this is a beta, so there are a few more stages.

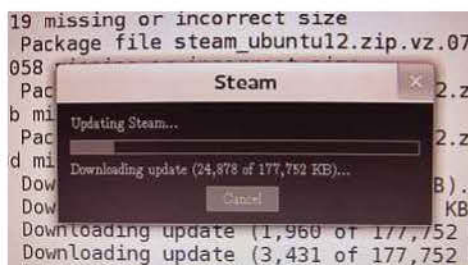


▲ **6.** You first log in. Change the drop-down from the Default Xsession to GNOME, and enter 'steam' followed by the password 'steam'. When I first did this, I thought it wanted my Dteam account info, but if you enter that, you'll just get an unknown user error. Entering the correct login will take you to a Linux desktop environment.



▲ **7.** There's an icon 'Return to Steam' on the left of the desktop – ignore that. Click instead on Activities (top left) and from the Applications collection launch a Terminal.

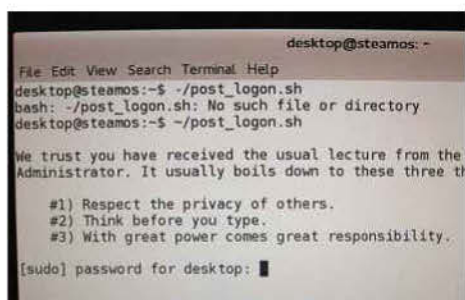
In the Terminal, you simply enter 'steam' and press return. You'll be given the option to disagree with the Install Agreement, and if you don't take that, you'll be installing Steam on this kernel.



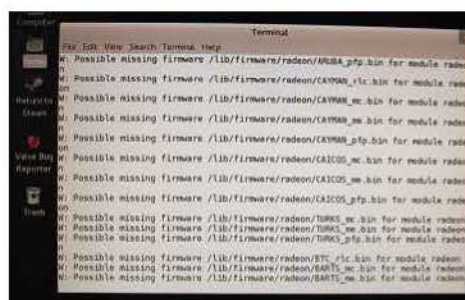
▲ **8.** During this phase, my system downloaded about 178MB of new files from Valve, because as improvements, fixes and drivers are made available, the Steam system will automatically build them into the OS. Once the system is fully installed, it continues doing this almost on a daily basis, showing the amount of work Valve is doing with SteamOS.



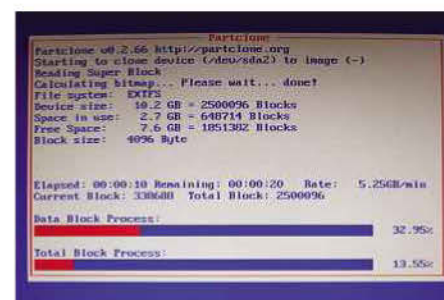
▲ **9.** With all the updates complete, you finally get a chance to log in to steam for real. If you don't already have a Steam account, then you can create one here, but otherwise just use your regular Steam name and password. It then sends an email to you, so you can authenticate the new computer using a 'Steam Guard' code.



▲ **10.** After that you need to log out using the 'SteamOS Desktop' menu, and then log in again, but this time using a different account 'desktop', with the password 'desktop'. This will take you back to the now familiar desktop, and you need to again open up a terminal. This time you enter the command '~/post_logon.sh' and then return.



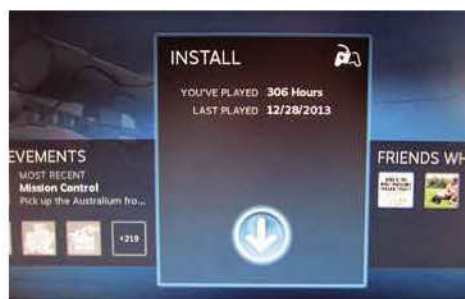
▲ **11.** You provide the 'desktop' password, and the script executes. From the messages it provides, it looks like it's trying to identify the hardware in the PC and make sure it has all the correct drivers it needs. When it's done, it reboots into a recovery utility so that it has a fall-back position should the installation mess up in the future.



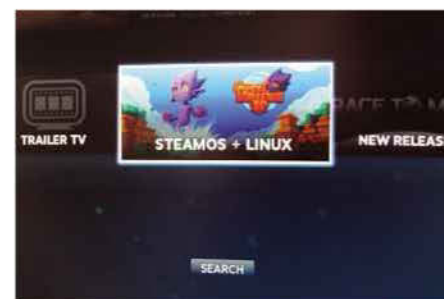
▲ **12.** After this, it asks one final question: 'Do you want to continue?' Answer 'y', and the recovery partition is built, and it then offers you a simple set of choices to which you select 'Reboot'. All being well, the system will now reboot into an operational SteamOS, where you'll be asked for your steam login.



▲ **13.** If you've ever run the 'Big Picture' mode in Steam on a Windows PC, you'll be familiar with what you're presented here. It's broken into three sections: Store, Library and Community. If you've used Steam before the games you've installed should be in the library. You can view videos and connect with your steam friends.



▲ **14.** What is obviously missing here is your games, even if the placeholder in the library will list the ones you play. Once you click on them, an installation will start. Depending on the size games you play and the speed of your broadband, you could be looking at a few minutes or a few hours of waiting before they're available.

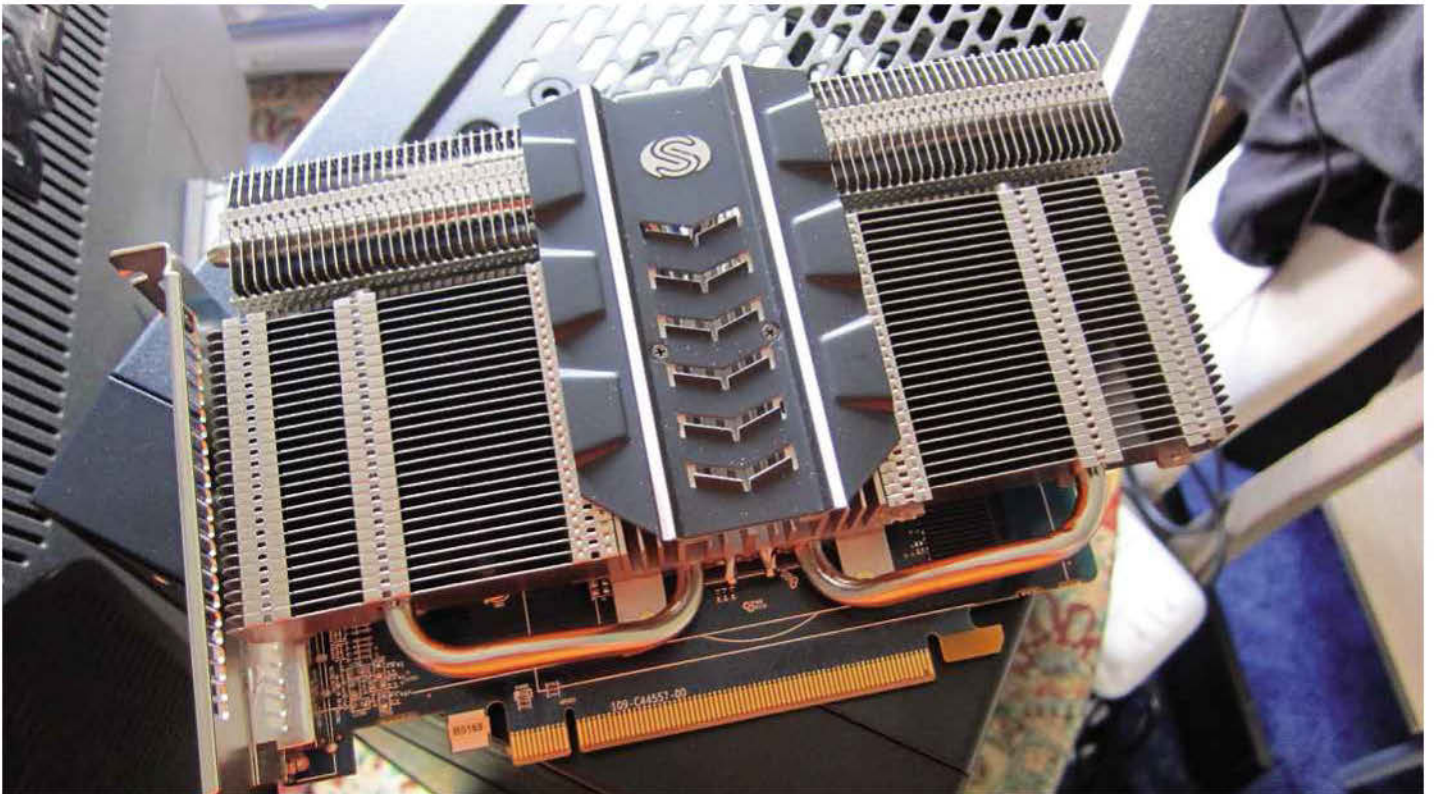


▲ **15.** Downloading can take place in the background to playing, thankfully. More of an issue is the limited title selection for Linux, which doesn't include the latest games like *Thief*. There's a menu option to show you just SteamOS and Linux, and it's worth plundering until the developers catch up with this option and its customer base.



▲ **16.** After adding a gaming keyboard and mouse, both by SteelSeries, the system is ready for business. I've not yet put the PC case side on, because I'm still admiring my cabling handwork. In use this is a remarkably quiet system, and it boots into SteamOS in just a matter of seconds. Total cost, about £350.

Steam Box Parts List	
Hardware	Cost
AMD A10-6970K APU	£90
Corsair CS550M PSU	£68
Corsair Obsidian 350D (no window)	£87
ASRock FM2A88M Extreme4+ motherboard	£55
8GB DDR3 RAM (2x 4GB)	£65
2TB SSHD SATA drive	£90
Corsair Hydro Series H75 Liquid CPU cooler	£70
Total	£525.00



▲ To boost GPU performance, a passive video card like this Sapphire R7 250 Ultimate might be ideal for Steam Box builders

Aftermath

It became apparent after I'd built the system that it really wasn't powerful enough for some of the games and needed marginally more GPU power. This would have been a less pressing problem had I used a Kaveri-based APU like I'd originally intended. The integrated GPU in the A10 6970K isn't as powerful as the one AMD put in the new Kaveri APU, and in many games the frame-rate isn't high enough.

What's slightly frustrating about this is that where the Linux versions of the games diverge from their Windows counterparts is in respect of the video performance controls. Some have no controls, and others just have a very simple low/medium/high setting. Because of this, it's very difficult to tweak the system for optimal gameplay.

The best solution is to overpower the machine with a powerful GPU, but this seems to fly in the face of SteamOS being a tight and efficient system. Just as I was about to complete this work, Sapphire sent me a R7 250 Ultimate video card, and this is probably the way to get enough GPU power. Because this is a passive design, it also doesn't require additional power lines or make the system noisier.

If this system became a permanent feature, I'd be tempted to give it an AMD R7 260, though more than that would seem excessive for a system that can only render OpenGL under this OS.

However, with over £500 spent already, without mouse, keyboard or monitor, this isn't a cheap system when compared with the PS4 or even the Xbox One.

That said, I made this mostly with parts that I had sat around my office, some of which were undoubtedly over specified for what I needed. Ditching the Hydro cooler for the stock fan, and a putting in a 1TB conventional HD drive reduces the cost to under £400, and there's certainly fat to trim in terms of the amount of RAM and cable managed PSU. If you cannibalise an

existing PC and just buy the motherboard and APU, that's about £150, and you could buy an A10 7700K Black Edition APU for another £10 that would boost performance significantly.

Valve did suggest that people should wait a while before diving into SteamOS with both feet, and the current installation sequence isn't really ready for the non-technical. Nevertheless, its ability to now handle AMD video hardware in addition to Nvidia is progress, and there's a distinct movement towards something more user friendly.

It's been estimated that the final version of SteamOS won't be completed until the middle of this year and possibly later, but once you've built a working system it should automatically upgrade itself to keep pace with developments.

This was an interesting project, and for the moment I'll be experimenting on it to get a better understanding of what makes SteamOS tick. [mm](#)



▲ DOTA 2 – one of the free games to download and play on SteamOS



iOS Cloud Apps

Take control of your cloud data with Keir Thomas's look at six apps for the most popular services

Even if you don't subscribe to the view that we will store all our data in the cloud, you'll have to admit that cloud storage can be useful. Unsurprisingly, most cloud providers have been keen to provide iOS clients for their services to provide 24/7 ubiquity.

We take a look at the client offerings of some of the most popular services this month. We're not reviewing the services themselves. Instead we're looking at app features, which in itself may affect which service you hand over a monthly or yearly subscription fee to.

Bear in mind that Apple places limitations on how cloud apps can work. They're unable to access the main file system, for example, although they can access the camera roll. Nor can any app access files stored by any other app, so a cloud app can't access Pages' files, for example. However, the app developers have found some clever ways around this, as we'll see below.

As usual, all the apps mentioned here are available through the App Store and are free of charge.

Dropbox

Dropbox (www.dropbox.com) is the king of the cloud storage heap. Most would agree the title is deserved. Other services might offer more free storage but Dropbox focuses on a simple, fast and

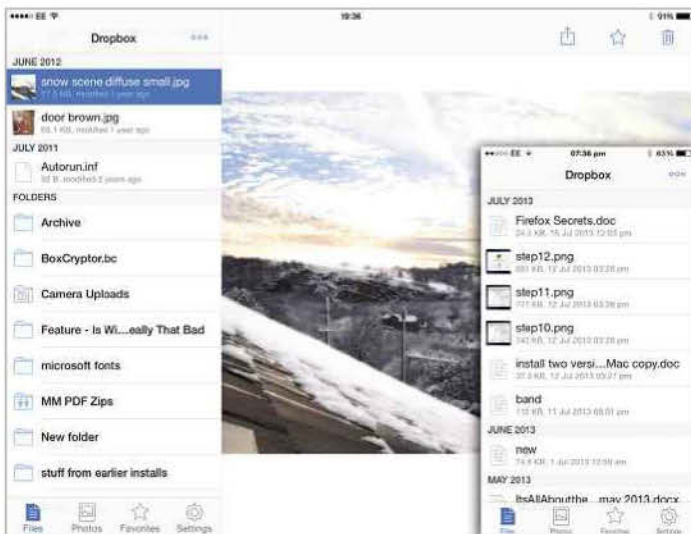
ultra-reliable upload/download service that's widely supported in the business community, as well as among home users.

Because of Apple's restrictions within iOS, the Dropbox app offers an 'alternative API', which is to say it offers a way for third-party apps to dip into your Dropbox and access its files. Typically, an office suite or image editor can use the Dropbox app to let you work from the cloud – you simply give permission once, and Dropbox takes care of access in the background.

On an iPad, the left third of the screen in both landscape and portrait mode shows the list of Dropbox files, and the right shows a read-only preview of the currently selected file. On an iPhone in either mode, the default view shows a file listing, and this slides out of the way for any file preview.

For obvious reasons relating to the limited storage capacity of phones and tablets, Dropbox only downloads each file on demand when you tap it within the list. However, the app incorporates a fairly decent file viewer able to understand popular office file types as well as images and movies. In our test there appeared to be no zip file support, though, which is an annoyance, although again not unknown among the apps reviewed here.

You can manually upload files using the app, but again because of Apple's restrictions, this can only be items from your camera



▲ The Dropbox app for iOS is as simple and functional as the service itself, and a joy to use

roll. The optional Camera Upload feature automatically uploads any snaps or videos you take, which is very useful, and you can set it to only upload if there's a wi-fi connection. Apple blocks apps from automatically uploading images if they're running in the background, but here again Dropbox's developer has figured out a crafty way around it using iOS's built-in location awareness – a change of physical location will prompt Dropbox to rescan your camera roll and upload photos without the need for the app to be running.

Other useful features include the fact that files can be favoured, so they can be found easily by tapping the Favourites button, and you can also set a passcode lock to stop snoopers getting to your files. We suspect there are some easy ways around this, but the app will sign out automatically after ten failed attempts.

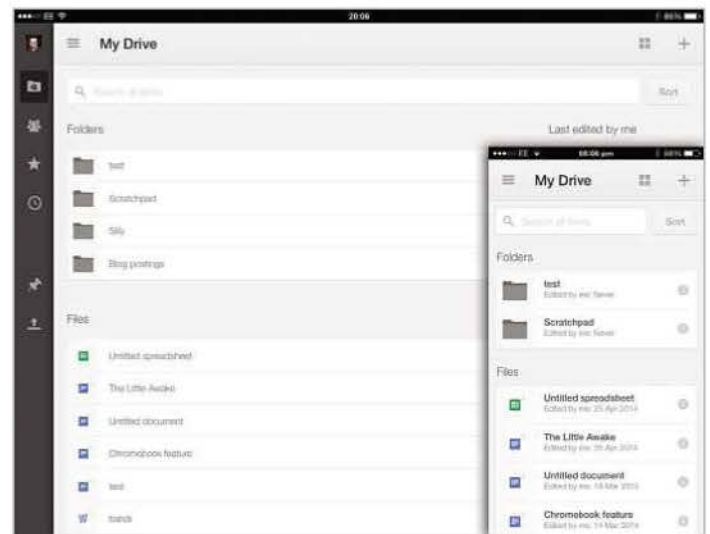
Dropbox's iOS app is as polished and easy to use as the service it represents. There's really nothing to complain about and lots to appreciate.

Google Drive

Google Drive (drive.google.com) started out as a mere Dropbox competitor but was merged with the Google Docs project to the extent that today it can be difficult working out where one starts and the other stops. This has serious ramifications for the iOS Google Drive app, because it not only provides access to your Google Drive space but is also a basic office suite in which you can create and edit Google Docs files.

On both the iPad and iPhone, the default view in both landscape and portrait orientations is to show the basic file listing. Icons identify each file, and here it gets a little complicated, because there you might see a Google Docs word processing file alongside a Microsoft Word file. They have different icons that it takes a while to get to grips with but, crucially, different things happen when each is tapped. The Google Docs file is opened for editing, of which more in a moment. The Microsoft Word file is opened read-only, although you can select and copy text. Strangely, there didn't appear to be any way to convert a Word file to a Google Docs file, as can be done at the Google Drive website. Document previews are very good, and we suspect Google has incorporated elements of QuickOffice, which is one of the best Microsoft Office-compatible apps.

Tapping the small (i) button to the right of each file lets you view information and perform actions such as renaming or deleting the



▲ Google Drive incorporates not only access to your cloud files but also basic Google Docs editing capacity

file. You can also set the file to be downloaded and stored on the device itself and set who the file is shared with – and here's one area that Google Drive undoubtedly wins over the likes of Dropbox because it's built around the idea of sharing files with others, such as colleagues.

Files can be printed too, and you can choose between Apple's built-in AirPrint system or Google's own Cloud Print. This means you can easily output files to a printer attached to a PC or laptop running Chrome.

Photos and videos can be manually uploaded from your camera roll, and you can also create from scratch new Google Docs files. The editing feature for Google Docs files is functional but basic. You'll have to type formula manually in spreadsheets, for example,

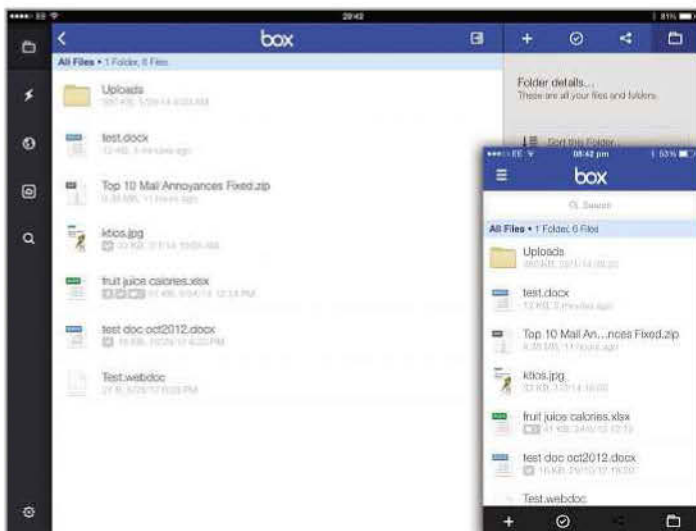
“ Bear in mind that Apple places limitations on how cloud apps can work ”

and charts aren't yet supported. Still, for tweaking documents or creating basic items from scratch it's good enough, and one extremely useful feature is that Google Docs supports multiple user editing. While this means several people can literally work on a document at the same time (each cursor has a name attached), it also means that you can work on a PC, then pick up your iPad and iPhone and continue working instantly. To our knowledge, no other cloud service is genuinely this seamless – usually there's a short delay while files sync.

There's much to like in Google Drive, and it's a very polished app. For some people, the Google Docs editing is compelling enough in and of itself.

Box

If Dropbox is VHS, then Box (www.box.net) is Betamax. It's an arguably superior service that's locked in battle with the market leader, but that's where the analogy ends. Nobody would claim that this particular market can support only one winner, although both Dropbox and Box are eying the potentially lucrative business market.



▲ Box's iOS app has a handful of unique features, such as the ability to attach comments to file, and OneCloud extensions

On the iPad in both landscape and portrait orientation, the Box app displays a list of your files on the left and a panel showing actions on the right. This list of actions varies depending on which icon you select on a short toolbar at the top right. On an iPhone, in either orientation, the list of files fills the screen, and the toolbar is shown at the bottom.

And it's those toolbar choices that mean Box does things a little differently. For example, clicking the plus icon lets you create a new folder or add items from your camera roll (or take a new snapshot). However, you can also create a new word processing document, spreadsheet or presentation. How this is done is clever. Box can only preview files, like most other apps reviewed here. Tapping on the create button shows a submenu listing any OneCloud apps you have installed. These are third-party apps that use Box's API to work in the cloud. On my iPad, for example, I saw a menu offering to let me create a new document in CloudOn and Notability. The key thing is that tapping either icon creates the new file within your Box space automatically. Once you've finished working in the other app, just tap the Box icon and you'll switch back to Box.

The list of OneCloud apps is extensive and can be viewed in the app by tapping the OneCloud icon in the vertical toolbar at the left (or the menu icon on the iPhone version of the app).

Files can be shared with other Box users, and a particularly good feature is the ability to attach comments to each file. This lets you keep a written log of what's happening to the file or make notes about what needs doing.

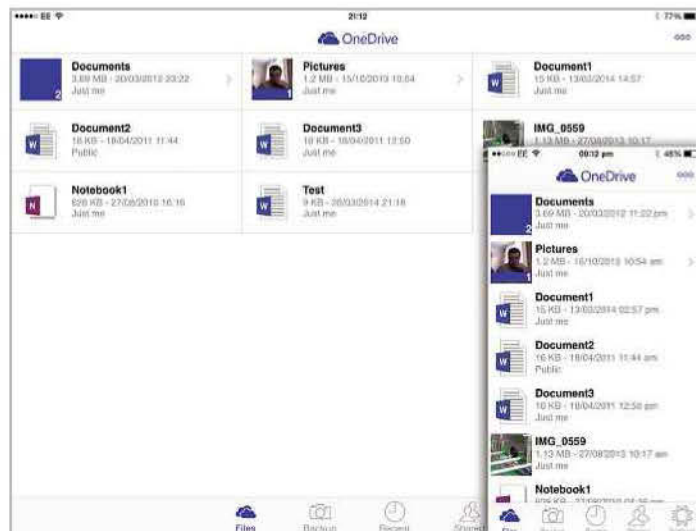
As with the other apps reviewed here, Box will show a preview of most common file formats, including office files, and no files are stored on the device unless you tap the Offline button when viewing a preview. Swiping left on any file in the main listing shows a toolbar full of options, such as deleting or renaming files, and files can be opened in any compatible app that's installed.

You can set a passcode and configure Box to automatically log out when you switch away from the app for maximum security.

There's much to like in Box's iOS app. It doesn't definitively solve the Dropbox versus Box quandary facing businesses, but it'll certainly give an IT manager food for thought.

Microsoft OneDrive

Microsoft's cloud offering – formerly SkyDrive – has taken on new importance in the world of iOS with Microsoft's introduction of the Office 365 apps. Put simply, very functional versions of Word, Excel



▲ Microsoft OneDrive isn't as feature packed as some other apps here but if you're an Office 365 subscriber, then it's a must-have choice

and PowerPoint are now available for iPad, and all rely on OneDrive (onedrive.live.com) for storage.

On first login with the OneDrive app, you're asked if you want to turn on the Camera Backup feature. Like Dropbox's similar feature, this will automatically sync your camera roll photos with OneDrive whenever you open OneDrive, but there's a neat little difference: should you activate the feature, Microsoft will add 3GB to your account free of charge. It'll depend on you much you snap away with your iPhone or iPad, but this might be just about enough to accommodate an average camera roll.

“ But Dropbox focuses on a simple, fast and ultra-reliable upload/download service ”

On both the iPad and iPhone the default view is a listing of files. You can switch between list and icon view, with list view showing details such as filesize plus modification date, as well as whether the file is shared with anybody.

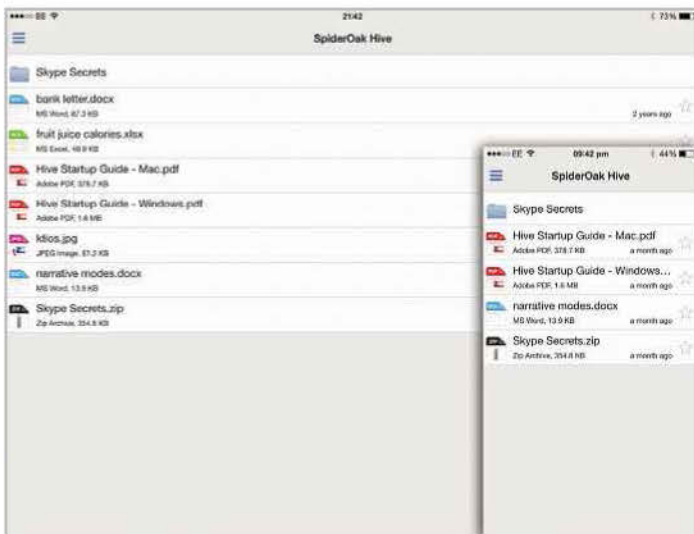
Four icons run along the bottom of the screen: Files, Backup, Recent, and Shared. Each changes the file listing to a different view: Backup shows the backed-up camera roll, Recent shows the most recently modified files, and Shared shows any files that are shared (either by you or files from others that you're able to access).

Tapping each file opens it for full-screen previewing, provided it's an office file, picture or movie. Tapping the pencil icon at the bottom of a previewed office file will attempt to open it for editing in the relevant Office 365 app but, of course, this will only work if you're an Office 365 subscriber. Otherwise the file will be read-only (although in our brief testing the Office 365 app simply crashed – but then we're not a subscriber.)

Once opened for previewing, files can be opened in other apps, trashed, renamed or moved. For some reason it appears these actions can't be performed from the file listing.

Files can be manually uploaded from your camera roll or you can take a new snapshot/video straight to OneDrive.

And that's about all you get. The OneDrive app's list of features is a little short compared to other apps and – unlike Dropbox and



▲ Sadly, the Spideroak iOS client continues the tradition of Spideroak clients being slow and less than feature-packed

Box – it's unlikely Microsoft will want to partner with others to share functionality.

None of this is to say the OneDrive app isn't useful, however, and if you're using Windows 8 or are a heavy Office 365 user on mobile or desktop, then it makes a lot of sense.

SpiderOak

SpiderOak (spideroak.com) is an encrypted backup service. Install the client on your PC and it'll automatically scan your files and back up those you select to SpiderOak servers, where a zero-knowledge policy is in place. Put simply, your files are encrypted before being uploaded, and the keys are never shared with SpiderOak directly, so there's no way anybody at SpiderOak will ever be able to view your files – even if the government put a proverbial gun against their heads.

SpiderOak also features a Dropbox-like Hive folder, designed to facilitate the quick sharing of files between devices. The iOS app allows access to this, along with the data of any computers that are backed up on the account, and also ShareRooms, which allows you to share files online with others via web browser, unencrypted.

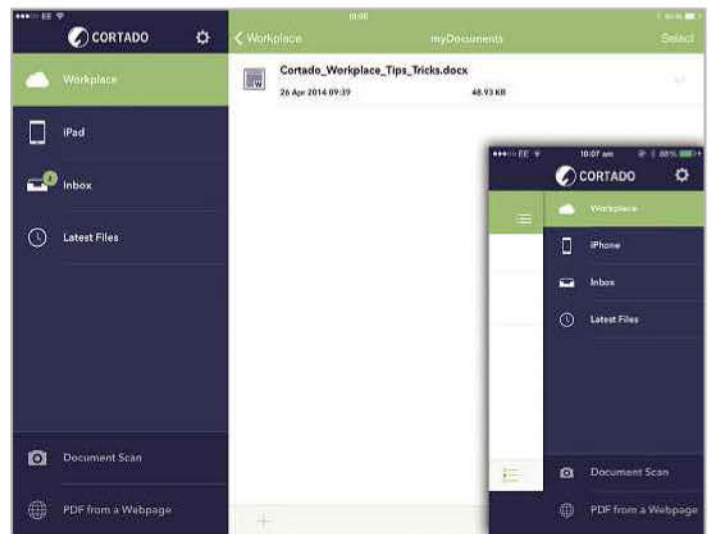
On both the iPad and iPhone the default view is a file listing, and tapping any file opens it for full-screen previewing. You're not able to delete, move or rename files, but you can mark them as favourites for quicker access via tapping the Favourites icon in future, and select to open them in other apps. Rather unusually, the drag-down-to-update gesture doesn't work here, and it seems the only way to force SpiderOak to refresh a file listing is to switch to the menu view, select a different file listing (i.e. switch to viewing a computer backup after viewing the Hive), and then switch back.

The app can be protected with a passcode and you can configure it to automatically log out should you switch away from the app.

You can't upload files from your phone or tablet, either, which is frankly bizarre because it's when backing up personal data such as pictures that we might wish for an encrypted backup service.

However, the SpiderOak app's biggest drawback is that it's slow. Tapping any file for viewing on the app leads to a pause of around 10-20 seconds, for example. Sometimes longer. Even on the desktop SpiderOak is slow; adding files to Dropbox causes a near instant sync, but adding a file to SpiderOak's Hive puts into action a scanning, preparation and encrypting process that can take minutes to complete, and that's assuming a backup isn't already underway.

If you're already a SpiderOak user, then the app is a useful addition if you'd like to access your files while out and about.



▲ Aimed at businesses, Cortado Workplace includes some intriguing features, such as the ability to scan pages to cloud storage

If you're simply looking for an encrypted Dropbox-like service, however, then the Spideroak app doesn't make a compelling case for signing up.

Cortado Workplace

Cortado (www.cortado.com) is a business-oriented service from Germany that's included here to show what's being achieved by smaller names in the cloud arena. Signing up gives up a humble 2GB of free space in which to play with the service, and this can be upgraded to 5GB or 10GB for \$2.59 (£1.54) or \$3.99 (£2.37) per month.

With Cortado Workplace, a lot of the appeal is in the apps, and in particular the ability to 'scan' documents using the phone or tablet's built-in camera. These are then automatically uploaded to your Cortado space as PDF files. This approach is nothing new – various apps like Genius Scan offer similar functionality – and here it isn't implemented very intelligently. You can't resize/skew, crop or otherwise correct the scan, for example. It's literally stored as a basic snapshot. There's no OCR either, as there is with apps like Evernote.

Cortado's other impressive boast is that documents can be printed to any network-attached printer and also to printers attached to PCs/Macs via its ThinPrint client. In other words, there's no need to use Apple's proprietary AirPrint solution. We tested this with a Brother MFC-5890CN printer attached to the same network as an iPhone, and it didn't work too well – printing the default 'tips and tricks' .docx document printed just the header of the page but nothing else.

Other features include the ability to turn office documents into PDFs via an Export button, and the ability to zip files. Web pages can be turned into PDFs too but only if you pay 69p for the add-in Page2PDF app. Still, this isn't going to break the bank, and it adds a serious amount of usefulness to the app if you're a researcher.

Needless to say, there are Cortado Workplace clients for just about every device and platform.

In many ways, Cortado Workplace is the diametric opposite of an app like Dropbox. Dropbox keeps things simple and lets you create your own ways of using it. Cortado Workplace keeps things sophisticated – here's a little bit of Dropbox, here's a little bit of Evernote, here's a little bit of Genius Scan. The result is that a handful of people are going to think it's the best thing since sliced bread, while most others will be left scratching their head. mm

How-to Basics

Windows 8.1 PC Settings

We have a look at Windows 8.1 PC Settings and see what's behind the options within

Although we've used Windows 8 since its launch, and since then Windows 8.1 along with the new Update 1, we've never really dug too deep within the new interfaces way of setting up the PC.

True enough, we've loitered around the settings to some extent, but we've generally dropped into the more traditional Control Panel to get the things we normally do done. It's seems a bit of a waste, admittedly, and although we don't mind the UI so much, since we've configured it to our particular liking, we find that there's more to the PC Settings than we first thought.

PC Settings

The PC Settings we're referring to is accessed either via the Charms menu, by clicking on the 'Change PC Settings' link or by simply typing in 'PC Settings' from the UI Start screen (the one we're not supposed to call Metro anymore).

Once in there, there's a surprising amount that can be done to further tweak and customise your Windows 8.1 PC.

Lock Screen Settings

Although a little superfluous on a home PC, the Lock Screen Settings is accessed through PC Settings > PC and devices > Lock Screen. From here you can configure the image for the Lock Screen or whether you want to play a slideshow while locked. You can choose which Windows Apps you want to run in the background and show notifications, even while the screen is locked (for example, incoming Skype calls).

Alongside this, you can choose a particular Windows App to display more detailed information with or an app to display any alarms or important email or calendar entries. Also, you can choose to activate the camera/webcam if you swipe

down the lock screen – obviously only if you have a webcam and you have a touch-enabled device.

Microsoft Accounts

With Windows 8.1, Microsoft wants us to use a combined, all-powerful Microsoft account, spread across all Microsoft devices, from desktops to laptops, to tablets, phones and even the Xbox 360 and Xbox One.

From the root of PC Settings, the Accounts option allows you to change the image of your account, either through an uploaded or previously downloaded image or by activating the webcam on your PC and taking a mugshot.

The Sign-in Options link will allow you to change your account password, set up a picture password or a four-digit PIN, for use when logging into your computer. There's also an option to require a password for

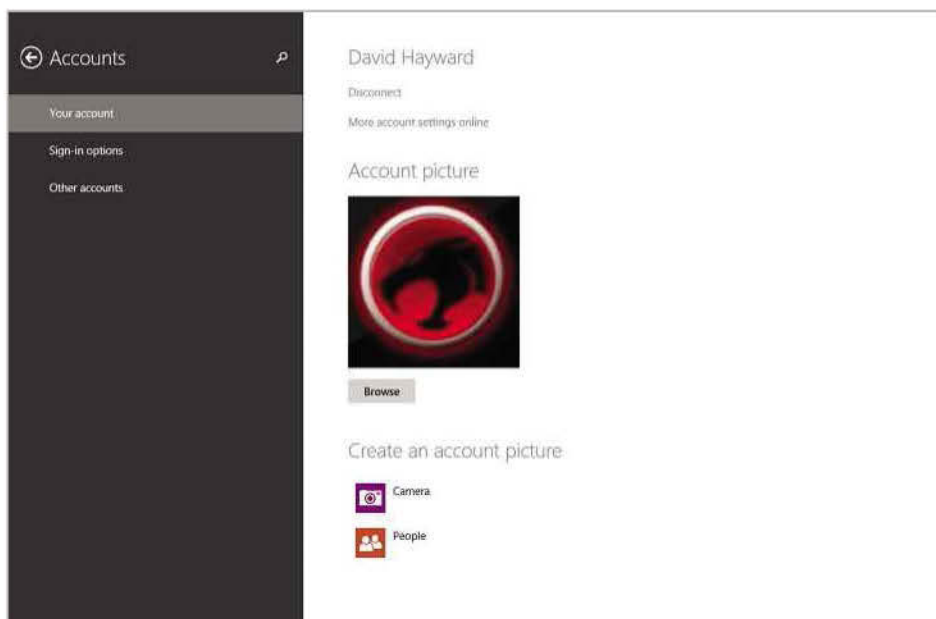
when waking the PC up from sleep mode, for extra security.

Finally, there's an option for Other Accounts, whereby you can add additional Microsoft accounts to the PC and keep your settings synchronised for all users across all your Microsoft devices.

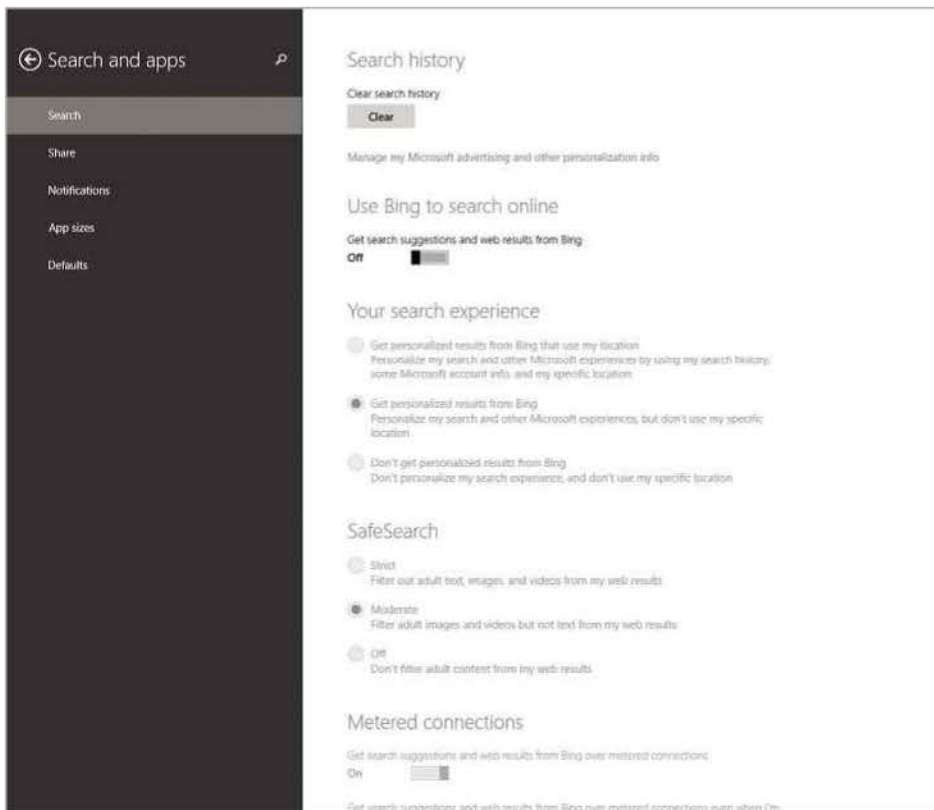
OneDrive

Below the Accounts option you'll find the link to customise the newly named OneDrive, once Sky Drive, the Microsoft cloud storage service.

OneDrive may not be everyone's cup of tea, and what with talk of the service secretly modifying your backed-up files (link thanks to Shaun Bebbington: goo.gl/Kla3o9), there's plenty out there who really wouldn't touch OneDrive with a 12-foot barge pole. However, for those of you do use it, in these settings you'll find all sorts of helpful links to make OneDrive work better for you.



▲ You can personalise your accounts from within the PC Settings pages



▲ You can opt to include the watchful eyes of Bing, should you wish

You can see the file you have stored on OneDrive, buy more storage and set an auto-save function of your chosen documents to OneDrive.

In the Camera roll option, you can set an automatic upload of your photos and videos, and you can change the quality settings depending on the amount of space you have available.

The Sync settings page allows you to further synchronise not only the files you've opted to upload to OneDrive but also the Start Screen settings, Windows appearance, desktop personalisation, apps and app settings, IE settings, passwords and a host of other account specific settings so you can move from one Windows machine to the next.

And lastly, you can change how OneDrive operates on metered connections to the internet, so you'll never upload more than your data allowance will allow.

Search And Apps

The Search and Apps option allows you to customise how Bing integrates itself in your search history online, either through IE or through the Windows Store.

Naturally, you can opt here to turn off Bing's ever-watchful eye, but if you don't mind the prying nature of it, then you can further customise the personalised results you'll receive from your searches.

You can opt for a localised search setting, where only personalised items in your vicinity are displayed. You can restrict the type of result with SafeSearch, by removing any adult-related links or content.

“ You can opt here to turn off Bing's ever-watchful eye ”

And you can cater the personalisation for metered connections, so you're not using up your data allowance on advertising results instead of the actual searching.

From within these settings, you can share your most used Windows Apps, get notifications from the various apps you already have installed – or from the Alarms you've set up. You can also get details on the amount of space each of the Windows Apps is taking up on your system, plus you can choose to uninstall them if you want.

Privacy

The Privacy option goes some way in an attempt to try to stop Microsoft knowing everything there is about you and what your browsing and app preferences are.

We're not overly happy with any information about ourselves going beyond

Deeper Into PC Settings

We've barely scratched the surface when it comes to the PC Settings menus in Windows 8.1. If you want to delve a little deeper, check out these links:

goo.gl/X5OdA3 – From Microsoft's own words, the Getting Help section of PC Settings.

goo.gl/dKPWut – A number of interesting extras from How To Geek here on PC Settings.

goo.gl/K3dTjX – A section on synchronising with OneDrive, from Microsoft.

the boundaries of our PCs, especially if we don't necessarily want it to, but there can be a legitimate reason too.

Through these options you can opt to have Windows apps use your name, picture and account information to help rate and target the best apps for you. There's also an option to turn on or off the SmartScreen Filter, which can check the web content on Windows Store apps, and to allow other supported sites access to your content in order to provide a more personalised experience. If that lot isn't enough to scare you, then we don't know what will.

In here are also options to access geolocation specific data, such as for the Maps app. And there's an option to allow

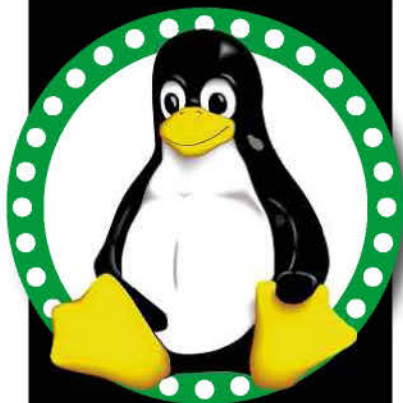
apps to use the webcam or microphone on your computer, such as for Skype.

Basically, if you want to have a full Microsoft personal experience, then here's the place to visit. Otherwise, if you value your privacy, make sure everything is turned off.

There's A Lot More

Needless to say, there are many more options and sub-options you can trawl through in the Windows 8.1 PC Settings pages. Some of which are well worth having a little look through, especially if you're interested in having a more secure and thoroughly private PC.

If you're interested in a more detailed look, check out the boxout for a list of links we've found to help you better navigate the PC Settings and understand their meaning. [mm](#)



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

Linux

The Beginning Of The End?

Micro-Nokia, and is the PC dead?

With the buying of Nokia by Microsoft there have been a few comments bandied about regarding the fate of the desktop PC. Naturally, we don't always agree with such comments and rumours, but it makes for interesting reading nonetheless.

In recent years, Microsoft has made it appear that it no longer has any love for the humble desktop PC. Windows 8 was the nail in coffin, with its UI catering more for tablet and all-in-one machines, as opposed to the traditional desktop. However, the recent purchase of Nokia has led to another comment, this time from Stephen Elop, the former CEO of Nokia and now executive vice president of the Microsoft Devices Group.

"The vast majority of people do not have, nor will they ever have a personal computer," he said during a press conference. "They

haven't been exposed to Windows or Office or anything like that and in their lives it's unlikely that they will." Of course, it's all about connectivity and the services surrounding that connectivity, and this is where Microsoft is now concentrating its vision, finances and effort.

The mobile market is something that Microsoft have wanted to be a big part of for a number of years. It's the new area of technology and communications that's worth billions in revenue – far more than what the home desktop market can offer at present.

Satya Nadella, the new CEO of Microsoft, also mentioned the PC market in his session with the Earnings Conference a couple of weeks ago. He continually referred to the PC in a past tense and added, "Fundamentally, we participated in the PC market. Now we are in a market that's much bigger than the PC market."

What Of Linux?

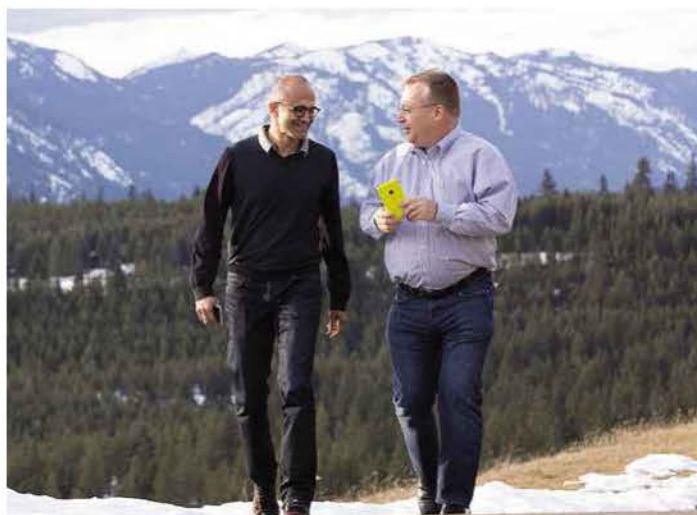
Interestingly, if Microsoft is slowly scaling down its involvement in the desktop market, then there's a golden opportunity for someone to step up and take the weight of the users who will still require a desktop and who refuse to allow it to curl up and die.

Obviously, it won't happen tomorrow, nor will Microsoft leave the desktop in the next five years, but within the next ten years we could see Microsoft leave the desktop PC market and make room for the open-source community to take over.

Of course, now all we have to do is make sure that Linux stays firmly on the desktop and doesn't try to enter the mobile market. What? It already has? Oh dear...

Seriously, though, we reckon there's a heck of a lot of people out there who still rely on and generally always will rely on a proper desktop computer to do their work or play on. A tablet or powerhouse phone is okay and good for certain things, but in terms of sheer usability and power, you can't beat a PC.

Let's assume a future without a Microsoft's presence on the desktop. Will the desktop PC still be available to buy? Will Linux be able to step up and take over? And if there's no desktop PC to speak of, what on earth will we be forced into using? The mind boggles.



◀ *Satya Nadella and Stephen Elop close the deal on a mountain pass*

Spring Cleaning

Starting from scratch can be cathartic, but it can leave a Mac bereft of personality

I'm not the most organised of people. I live in a state that can best be described as 'contained chaos'. At any given moment, my desk looks like a small tornado has blown through the office, dumping various bits and bobs in random places, and the same is true of my digital life. I have an iPad and iPhone that are full of apps, folders stuffed with products I should get round to checking out at some point, and others I've happily checked out but not gotten around to filing. If anything, my main Mac was recently even worse: the victim of a half-dozen years of review cruft and lackadaisical maintenance, the poor thing finally grinding to a halt under the strain and practically screaming that enough was enough.

Occasionally, I'll blitz the office, a cathartic whirlwind of tidying up that leaves the space oddly barren, but rather more comfortable, until the piles begin to build again. And I've just done the same with the Mac via a clean installation; it's now very tidy but also an oddly unsettling virtual experience.

This all came about from something I mentioned when I last wrote this column. I grabbed a TB Samsung SSD to upgrade my iMac, instead of replacing the entire machine. My rationale was that the drive and installation cost less than just the difference between a 512GB and 1TB SSD upgrade on Apple's own website for a new Mac. I figured I'd be better off eking a year or more out of my existing machine, in the hope of a Retina iMac somewhere down the line.

The refreshed iMac is certainly a lot quieter and seems more responsive, and it's very much devoid of junk. But vanilla OS X is an odd place and one I don't experience that often outside of reviewing software on my Mac Mini. The iMac no longer felt like it was mine; instead, I was sitting before an alien contraption masquerading as something I had once owned — an interloper clad in aluminium.

Although technology is not actually sentient (although Google's probably working on that), we do tend to project onto the machines we own — or at the very least attempt to

personalise them, thereby making the cool touch of technology rather more comforting. A computer becomes yours by the way in which you organise things or through little add-ons that you weld to the operating system. Without such adjustments, you have the computing equivalent of a 'clean desk', but that isn't necessarily the best place in which to work, and it's certainly rarely the most pleasant.

So I'm now engaged in a delicate balancing act, bringing back some of the personalisation and life to my Mac but taking care to ensure that I don't end up back where I started, with a computer that wheezes and groans under the strain of dozens of add-ons that I never really needed in the first place and very rarely used. My technique has been to install everything I know I use at least weekly, but avoid anything else. I'll install anything further as and when I need it, and even then only if there's no alternative already available. I won't have the sparse, minimal Mac that perhaps would gain the approval of Jony Ive, but nor will I be trudging my way through the aftermath of a digital tornado every day, stuck in the mire. It's something of a compromise, but then so is the Mac itself, a new drive in an old shell, destined to battle on until the point Apple releases something new and suitably shiny.

< A refreshed iMac, no longer grinding to a halt every day. Hurrah!



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



Mac



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

Nokia's Ten Moments

Ready your Zeppelin / Phil Lynott/ Paul Hardcastle music, Ian McGurren brings you Nokia's 10 most notable moments



By the time you read this, Nokia as was no longer is, and the one-time mobile giant from Espoo is now part of the massive Microsoft machinery. With it being a byline in the last few years, it's very easy to forget just how big Nokia once was. In fact, for most of the 90s and much of the 00s, Nokia was the mobile phone industry. So while we mourn the passing of a legend, let's take a look at ten of its most notable events. Cue the Top of the Pops countdown music (Gary Davies' voice optional)...

In at 10, it's Nokia's first big hit, the 101:

Until the early 1990s, mobile phones were little more than radio transmitters and mostly the preserve of the rich. In 1992, Nokia released the 101, one of the first mass market handsets. It was big, analogue (so calls could be snooped on) and insecure, but for many the 101 was a whole new age.

At 9 there's its greatest hits:

As mobiles became mainstream in the late 1990s with the introduction of Pay As You Go, it was Nokia that made the most hay in this sunshine. A triple whammy of 1998's 5110, 1999's 3210 and 2000's 3310 firmly established it as leading mass market phone maker. All three were seemingly indestructible, had swappable covers and – most importantly – they introduced the world to *Snake*.

An impressive debut at 8 for the smartphone:

Arguably the first proper smartphone (sorry, IBM), 1996's Nokia 9000 Communicator was the first device to offer web, email, fax and terminal software on the move. Looking like a fat Nokia 2110, it opened in the middle to reveal a QWERTY keyboard and mono screen. Be assured that in 1996, this was

amazing. The 9000 was also featured in the movie *The Saint*. That was terrible.

At number 7, it's down to business with the 6210:

If you were issued a mobile phone by your employer since 2000, there is a very high chance you had a Nokia 6210. The business community's 3210, the 6210 is responsible for 'Bluetooth headset man' among other things, while also packing a modem usable via a serial cable. Again, bulletproof; in fact, many are still working today, 14 years later – this is a world where many modern devices don't work 14 months later.

Stick a minus in front of that 6 – it's cool in here:

Point of fact: after it appeared in *The Matrix* in 1999, everyone wanted a Nokia 8110, even if the spring loaded cover was an aftermarket add-on made by the props crew. Nokia's coolest device yet.

It's the 7650 getting snap happy at 5:

In 2002, people started doing something odd with their mobiles: taking pictures. The 7650 was Nokia's first device with a camera, as well as being the first Symbian S60 device. This was also Nokia's first mainstream smartphone, though the term wasn't in heavy use then, especially with Windows Mobile being the only real rival. The 7650 wasn't great, but it pointed to the future.

The N Series is in at n-n-n-number 4:

Nokia's last great devices, and latterly its downfall, were the N Series. Launched to great fanfare in the mid 2000s, these Symbian smartphones were the logical conclusion of the featurephone design, with the N95 being the pinnacle. Then the iPhone happened, and Nokia's retort, the N97, showed just how ill-prepared it. Resistive screens? The

descent started here.

N9 doesn't quite hit the top spot at 3:

The 'Look at what you could have won' smartphone, the N9 was Nokia's long-awaited Meego-powered handset. Beautiful, innovative, smart, it was everything Nokia needed to beat the iPhone. Sadly, it launched in mid-2011, four years after the iPhone. Even Nokia had no faith in it, reusing the polycarbonate shell for the Lumia 800, the company's first Windows Phone product.

The view from number 2 is very pure:

Arguably the company's last genuine innovation, Nokia's leading edge PureView imaging technology is considered the industry's best, and with devices like the Lumia 1020 additionally bolstered by an excellent 20MP camera, the PureView Lumias were regarded as the best Windows Phone had to offer and were more than enough competition for Apple, HTC, Sony and Samsung.

And at number one, X marks the hit:

Just to show that Nokia is still capable of being unpredictable (hello, 7280 lipstick phone...), its last pre-MS products were three budget Android smartphones, the Nokia X series. While ostensibly replacements for its Asha budget devices and running a forked and locked-down version of the OS, the very fact Nokia flirted with another so close to the wedding was quite unexpected.

So Nokia is no longer a player in the smartphone game. It will live on in featurephones for the developing world, but no longer will it be a name people ask for when looking for a new device. Still, the company can hold its head up high, as many of us will have some sort of Nokia memory, and that's a pretty decent legacy.

Charmed

This week, Shaun is reminiscing about BASIC programming

The Spanish independent label Retro Works has uncovered and released two games at once for the 48K and 128K Sinclair ZX Spectrums, respectively. The one from 1991 is called *The Chard*, and a title based on it developed in 2014 called *The Charm*.

The original game tells the story of a brave knight of the realm known as Sir Oup, who has been summoned by King Chardy to defend his kingdom and repel evil from it for ever more.

Both versions are presented as an explorer-type 2D platform game, which has many roaming nasties to negate or dismiss with a limited supply of magic; simply cast a spell in the direction of the foul creature. You're also on the lookout for various charms strewn about the place, which will either replenish your magic or go towards finishing the game.

The original 1991 release that wasn't has some shortcomings. For instance, sprite flicker restart points (after energy is lost) sometimes aren't very helpful.

The new version resolves some of the problems with what are, in my opinion at least, more pleasing visuals (without flicker), no set-in-stone restart points and an excellent title and in-game tune utilising the AY chip of the newer machines.

Antonio Carayol Martínez was responsible for the programming and development of *The Charm*, with design and music provided by Juan Carlos Soriano R. Further information about this release may be obtained from retroworks.es/php/game_en.php?id=12.

Happy Birthday BASIC

I write this column on the eve (according to time.com/69316/

basic) of the 50th anniversary of the computer programming language BASIC (Beginners All-purpose Symbolic Instruction Code), the mainstay language of at least the first two generations of personal computer, from the Commodore PET through to the Sinclair QL.

Apart from the fact that BASIC is what you're greeted with on nearly all of the computers that I've ever written about through these pages over the past 12 years (even making cameo appearances on the Atari 2600), it had great influence on my formative years. I got to know it better than any other aspect of my Commodore 64 or its collection of games, and I would type away for hours in the hope of being able to create a playable game for the small group of peers who were interested in programming. We'd swap tips, and through them and the BBC Micros at school, I learnt other dialects as well.

BASIC, along with the affordable computing that Jack



▲ *The Charm*, a remake of *The Chard*, a lost 2D platform game of *Knights and Valour* for the Sinclair ZX Spectrum



▲ A quick bit of BASIC on the Commodore PET – celebrating 50 years of the once popular computer programming language

Tramiel, Chuck Peddle and Sir Clive Sinclair insisted on, spurred my interest in computing and computer science, eventually leading to this column and my current gainful employment as a web developer. Happy birthday, BASIC. Here's to another 50 years!

Check Out The Competition

RGCD.co.uk has launched its fourth 16K games programming competition for the Commodore 64, which invites independent developers to create entertainment software that will fit and run on a C64/128 cartridge.

Each entrant who completes their project will have the privilege of seeing their title physically published and available to buy from the RGCD website.

The competition has proven to be very popular, and has become an important event for C64 developers, collectors and enthusiasts alike, with brownie points given for support for the C64GS and C128 (okay, that last bit won't get you any further in the competition – the brownie points come in the form of my adoration). To find out more about this, head over to rgcd.co.uk/2014/04/c64-16kb-cartridge-game-development.



Shaun has a passionate interest in 8-bit computing and gaming and has been finding novel ways to use retro technology since 1994

Retro



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*

Gaming

Reach For The Stars

Players shepherd humanity from the stone age to the space age in the ambitious planetary management god game, *The Universim*

This week, Ryan checks out the potentially brilliant planet management god game, *The Universim*, and looks at the first in-game footage from the multiplayer shooter, *Evolve*...

Plug & Play

Videogames commonly allow us to take on the roles of super-adept beings of every kind – soldiers, assassins, military leaders and the like – but none provide a greater sense of power than the god game. A genre that sprang to prominence in the 1990s thanks to ground-breaking titles like *Populous* and *Mega Lo Mania*, god games provide us with a top-down perspective of worlds that are ours to sculpt and control.

Pioneering designer Peter Molyneux recently returned to the genre he helped to define with *Godus*, his spiritual successor to *Populous*. Now another similar project that, like *Godus*, is being funded via Kickstarter, looks even more ambitious – Crytivo Games' self-described 'planet management god-game', *The Universim*.

Apparently taking as much inspiration from such seminal games as Sid Meier's *Civilization* and Will Wright's *SimEarth*, *The Universim* puts players in charge of a fledgling society on an Earth-like planet. The game begins in humanity's early history, where players coax their subjects through the iron age of fire, wheel inventing and weapon crafting, right up to the space age and its exploration of

other planets. The player won't have direct control over the tiny humans scuttling around on the surface – instead, *The Universim* is like "managing your own ant farm," Crytivo say.

Your decisions as to what technology the humans research, and when, will have the greatest bearing on the game; early on, for example, the invention of fire and weapons – in order to make food and defend from vicious animals and rival tribes – will have the priority over the wheel or more advanced buildings.

As humanity makes its climb to scientific enlightenment, the player will also have to deal with war, disaster, disease and famine – and again, their decisions will greatly affect how well human life fares in a cold and unforgiving universe. The game gets really interesting once the puny humans clamber into their rockets and start exploring other worlds, though; according to Crytivo, "every planet you encounter will be as unique and different as the last", with some being rich in resources and minerals, while others are teeming with life, some hostile. There's intelligent life lurking in certain corners of the universe, too, and the possibility of invaders visiting your home planet and attempting to destroy it is a very real one.

We certainly can't fault Crytivo's ambition, nor the quality of its game's presentation; although we currently only have its own footage to go by, the remote in-game perspective of Earth as a tiny sphere bristling with skyscrapers is a great one, albeit similar to Uber Entertainment's forthcoming RTS, *Planetary Annihilation*. Unsurprisingly, all this ambition isn't cheap; Crytivo are looking for a not-insignificant \$320,000 for *The Universim*, though a pledge of \$15 will give you access to a DRM-free download of the finished game. We'll have to wait and see whether the studio can deliver on the huge scale it's promised but, if it can, then *The Universim* could offer an innovative twist on the genre.

You can find out more about *The Universim* at kck.st/QEVxID.

Online

In recent months, we've seen a range of interesting multiplayer games appear on the horizon, from EA's recently-released *Titanfall*, to the online stealth game *The Flock*, which we covered in these pages last week. Another forthcoming game that tries to do something new with the multiplayer shooter genre is *Evolve*, the next game from



One player's the boss, the other four players are the puny humans in *Evolve*, the promising multiplayer shooter from the creators of *Left 4 Dead*

Left 4 Dead developer Turtle Rock Studios. In it, teams of four human soldiers hunt down a much larger and extremely powerful alien creature, controlled by a fifth player.

Evolve was announced a few months ago, and in late April, Turtle Rock showed off the first gameplay (bit.ly/1rwRx88) from its work-in-progress. Right away, it's easy to see some common elements between *Evolve* and *Left 4 Dead*. The alien creature shown in the footage has the lumbering movement and mass of the Tank zombies from Turtle Rock's breakthrough hit, and like *Left 4 Dead*, the action in *Evolve* is violent and filled with sudden shifts in fortune. The humans are armed with weapons like machine guns and laser blasters, while alien gets by with powerful

shields and sheer brute strength; it can punch humans clear across the map, pick them up and smash them into the ground, or fling rocks at them with arms like big, fleshy catapults.

There are some other interesting ideas in here, too; as the name implies the alien can increase in size and strength by hunting and eating the smaller, non-player creatures scuttling around the planet. So far, Turtle Rock are only showing us what the leafy, *Avatar*-like maps look like, though we're told there'll be other kinds of terrain to fight across, and different types of alien to control or fight against - we suspect we'll be seeing more of these in the coming months.

The question we're left with, meanwhile, is whether Turtle Rock can balance the power

and speed of the four-player squads and their alien rivals. Too much strength given to one faction or the other could quickly lead to frustration and broken keyboards. On the plus side, the idea of participating in what is essentially a multiplayer boss battle - with players taking turns playing the mighty boss - is quite an exciting one. Can Turtle Rock repeat the success of *Left 4 Dead* with *Evolve*? We'll find out when the game launches this autumn.

Incoming

Described as "the ultimate driver journey", Slightly Mad Studios' forthcoming *Project Cars* already looks like one of the prettiest racing sims for the PC. In the game's latest trailer (bit.ly/1k6Z2f2), cameras linger lovingly over the glistening

curves of hugely expensive supercars, or show off the golden light of a sun setting over a race track as a Lamborghini slithers past. We're told that *Project Cars* will boast a hefty 60 cars and 35 tracks at launch, a range of single and multiplayer competitions, and that the game runs on Slightly Mad's own proprietary game engine. The most obvious question is, can the game handle as crisply as its graphics? Given the developer's experience in racing games - they've previously brought us *Need For Speed: Shift* and its sequel, *Shift 2: Unleashed* - we've high hopes that they can provide a more refined, improved iteration on those earlier games.

We'll know for sure when *Project Cars* appears, which is due to be this November.



The latest trailer for *Project Cars* shows off Slightly Mad Studios' glistening proprietary game engine. The best-looking racing sim for PC? Quite possibly

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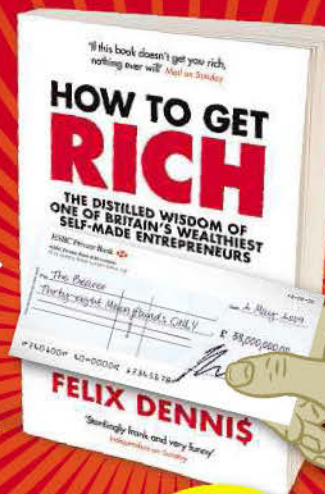
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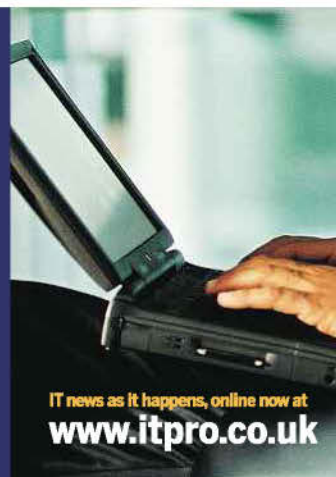
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Rugged Magnesium Alloy cased HP 5101 Business Netbook. 120GB HDD 2GB Ram, running Linux Mint 16. Excellent for Uni, Holiday or just as a spare machine. Complete except for PSU. £60 plus £8 P&P
Tel: Fred Lemont (01892) 833413 Email: fwkent@gmail.com

Mid 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 MHz CPU 640MB RAM. OS (Tiger) 30GB HDD batteries ok m/Chargers, nice machines. £105 each or £200 for the two.
Email: mickscarp@live.co.uk

XFX Radeon HD 6870. 1GB GDDR5. Original packaging, never overlocked. £75 plus £6.95 pp.
Tel: Simon Hardwide (01536) 724334 Email: simon.hardwide@ntworld.com

Asus Sabertooth 990FX Mobo. £100 plus £6.95pp (with Phenom II 980 add £50).
Tel: Simon Hardwide (01536) 724334 Email: simon.hardwide@ntworld.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 on. Postage £3.
Tel: Mick Young (02072) 321695 Email: mick.young@o2.co.uk

Funai D50M-100Y VCR recorder, 6 head A2 stereo. New boxed. £90 on. Postage £4.
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.
Tel: Ken Driver (01890) 820295 Email: kens@stonehaven2.plus.com

Gaming PC. HAF-X case. ASUS P6X580-E, i7 930 4GHz, 6GB Corsair i7 mem, gigabyte gtx470, Asetek CPU LLC 240mm radiator + watercooling. Two 12cm fans, PSU needs replacing. DVD/CDRW, networking, original software, extra cabling. £390 ONO
Tel: Alex Thomas (01842) 813630 Email: chadpobly12@hushmail.com

Novatech Bundle Gigabyte GA-M61PME-S2P M/board. AMD2 Quad Core 630 processor 2.8ghz. 2x2gb ddr2 800mhz memory. Black atx case. 400w psu. Good working condition. £120 on. Tel: (01964) 622867 Email: ian.macklin@mystoffice.co.uk

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.
Tel: Mike Whittington (07533) 270020 Email: mike.whittington@blueyonder.co.uk

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 Soward (01354) 656578 Email: steven_soward@sky.com

16GB Corsair Vengeance DDR3 RAM (2 X 8GB). £120 ONO. Brand new and unopened
Tel: Chris Paul (07827) 447779 Email: cmppaul25@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.
Tel: Carole Walker (07551) 293083 Email: omendata@gmail.com

Arima HDAMA rev G serverboard. Dual Opteron 250 cpus included. Totally unused stock. Extended format. 4GB SDRAM, Socket 940. Updated bios to 2.18b. Windows 7 compatible. A real bargain. £45 courier incl.
Tel: (01223) 360986 Email: jthunter77@outlook.com

ASUS P5N-SLI Motherboard with SATA and IDE sockets. Includes manual cables and Intel 2 core panel, cables and Intel 2 core 2.4 ghz. CPU cooling fan and 4GB RAM. £75 including postage.
Tel: (01359) 270218

Gateway MT6220G Laptop. Dual Core CPU, 2GB memory, 200GB HDD, 15.4" WXGA screen, Vista license. Excellent condition long battery life. Wireless superb, some disks. £120 with free postage.
Tel: (01619) 501218 Email: medicinemann@ntworld.com

Toshiba Satellite L350-159 17 inch screen laptop. 320GB HDD, Vista license, 4GB memory. Restore disks, charges, WED lightly. Wireless excellent, long battery life, excellent condition. £165 with free postage.
Tel: (01619) 501218 Email: medicinemann@ntworld.com

ASUS P8B75-m socket 1155 motherboard. With Pentium 620 processor and 4 gigs memory drivers for XG7.8 on disk. Original box and rear 1/0 cover £50. Free postage, please ask questions.
Tel: (01619) 501218 Email: medicinemann@ntworld.com

Be Quiet Power Zone 750W 80 Plus Bronze Fully Modular Power Supply. I won this in a competition, brand spanking new. This PSU normally retails for £100, selling for a bargain-bastic £75.
Tel: Martin Welch (07971) 528739 Email: welch_martine@yahoo.co.uk

Mini-USB finger optical laser mouse. Attaches to your finger and has two side buttons - great replacement for standard mouse. £10 p&p included.
Tel: Gary Gemmell (01415) 712822 or (07551) 293083 Email: omendata@gmail.com

HP P02015dn extra lower 250 page feed tray. £20.
Tel: Gary Gemmell (01415) 712822 or (07551) 293083 Email: omendata@gmail.com

500GB SATA drive for sale. Perfect working order. Formatted ready to use. Only £21 plus £4 p&p. Genuine Windows XP with Certificate of Authenticity can be pre installed for an extra £10.
Tel: (01942) 706572 Email: davethomas96@aol.com

New, boxed Belkin 24-Port CAT 5e Patch Panel. Part # F4P338-24-ABS. The RJ45 CAT 5 patch panel is 19 inch rack mountable and supports both 568A and 568B installations. Compatible with both T10 and Krone punch down tools. £15.00.
Tel: Robin Hewlett (02083) 930301

TP-Link TD-W8968 wireless N USB ADSL + Modem Router. Unused, boxed, with all cables and set up CD and installation guide. £20.00 plus postage.
Tel: (01748) 886885 Email: hstumer@hotmail.co.uk

ALPS floppy drive (3.5"). Originally purchased as one of a batch for spares but never used. £5.00 plus £1 for P&P.
Tel: Alan (01258) 446500 Email: alan@asandco.co.uk

SATA/6MB Cache, Model No: WD20EARS. £40.00 inc p&p.
Tel: Michael (01452) 303732

HD S850 XFX Black Edition for sale. It has been flashed with the ASUS BIOS and can be made to run as fast as a HD S870. This is a high end card, has no problems playing all the latest games. Comes with box. £65 including P+P.
Tel: Martin Welch (07971) 528739 Email: welch_martine@yahoo.co.uk

Nvidia GeForce GTX 670 2GB. Made by MSI O/C model. Not overlocked. VGC. £110 plus postage.
Tel: Tim Stirkand (01623) 624509 Email: tim.stirkand@btinternet.com

4 Belkin Master Cube Surge protectors. Not only mains but telephone line protection too. Three were used for a short time, one is brand new. The part number is P911 10UKCW. £15 inc p&p.
Tel: Alan (01258) 446500 Email: alan@asandco.co.uk

1TB SATA drive 3.5 inch, formatted ready for use. I can load genuine XP Professional from Microsoft with genuine Certificate of Authenticity for an extra £10. Refurbished. £35 + £3 p&p.
Tel: Dave Thomas (01942) 706572 Email: davethomas96@aol.com

Dell OptiPlex 745 (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. £60 plus £10 for delivery.
Tel: Dave Thomas (01942) 706572 Email: davethomas96@aol.com

Intel Core i3 3220 3.30GHz processor. Pulled from working PC due to upgrade. Will be provided in anti static packaging. £50.
Tel: Mark Sullivan (01142) 745864 Email: mark.sullivan34@aol.com

Toshiba Satellite L350. 17 inch screen laptop. 4GB memory. 300GB HDD vista license and Vista installed. Ready to use. Excellent wireless, excellent condition. Please ask any questions. £165.
Email: medicinemann@ntworld.com

Two laptop hard drives, formatted and ready to go. 100GB, 2.5 inch and 120GB and 2.5 inch. The smaller is a WD1000BEVS. The other, Toshiba mk 1255GSK. £35 with free postage.
Email: medicinemann@ntworld.com

Gateway MT6220G Laptop. 15.4 inch screen. 200GB HDD 2GB memory. Dual core CPU. Excellent condition, wireless superb, £129.95. Tracked post, £7.50. Please ask any questions.
Email: medicinemann@ntworld.com

MSI KT4W-L Socket A motherboard + Athlon 2200 CPU + 1GB DDR memory. 1 X AGP slot, 6 X PCI slots, 3 X DDR DIMM slots. Excellent condition, £25 + P/P.
Tel: Rod Theobald (01706) 345418 Email: mail@rotheobald.force9.co.uk

ASUS Fonepad with neoprene slip case. 16GB 7" Android tablet with Wi-Fi & unlocked 3G phone functions. Micro SD slot, Model K004 (ME371MG). Warranty to 31 May 2014. £135 plus P&P.
Tel: Ian Bennett (01932) 856971 Email: a2345@btinternet.com

Dell Ultra small form factor G620. Pentium D 2.8 /512/80 CD includes AC adaptor. Fantastic small machine that is very powerful ONLY £25 plus £8 for p&p. I can upgrade the memory and hard drive for an extra cost. You will need to load the drivers yourself. Refurbished.
Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

11 Quality Peach compatible sealed CLJ-8 cartridges. Yellow (3), magenta (2), cyan (2), black (2), PG-5 black (2). Won't fit new printers. £11 plus £3 postage.
Tel: John Beech (01928) 733622. Email: johnbeech@dsl.pipex.com

E6300 CPU with stock cooler. Fully working, available due to upgrade. £10 plus £3 postage.
Tel: John Beech (01928) 733622. Email: johnbeech@dsl.pipex.com

Intel Core i3 3220 3.30GHz processor. Pulled from working PC due to update. Will be provided in anti-static packaging. £50.
Tel: Mark Sullivan (01142) 745864 Email: mark.sullivan34@aol.co.uk

PC for sale. Athlon Dual Core 3MHz CPU, cooler, Asus M3A board, 2GB DDR2, Nvidia G18600 500MB, 750W PSU, XPSP3, Sony 17" Monitor, £150.
Tel: Ray Dawson (01202) 893997 Email: ray.dawson02@btinternet.com

Gateway M16220G Laptop. Core 2 CPU 2 GB memory, 100GB HDD, excellent 15.4 inch WXGA screen hinges. Excellent condition, excellent battery lasting 2 and a half hours. Wireless. £129.
Tel: (01619) 501218 Email: medicineman@ntworld.com

ASUS P5QLD Pro motherboard. 3GB. Dual core CPU, 6GB man memory, set up disk and I/O plate. Heatsink and fan, comes in brown box £70 plus £5 postage.
Tel: (01619) 501218 Email: medicineman@ntworld.com

Toshiba L350-169 17 inch screen laptop. 2 GHz Core 2 processor, 120GB HDD, 4GB memory. Windows Vista. Excellent condition, lightly used. £170 post free, email me any questions.
Tel: (01619) 501218 Email: medicineman@ntworld.com

PC with AMD Athlon 6000+ dual core 3MHz CPU, quality cooler with external speed control, Asus M3A motherboard, 2 GB DDR 2 RAM, Nvidia G18600 graphics 500MB, 750W PSU, Audigy sound card, case fans front and rear, XP with SP3 and original XP CD - together with Sony 17" LCD Monitor (no missing pixels). £150, sensible offers considered.
Tel: Ray Dawson (01202) 893997

Enemmax Galaxy 1000 watt Gaming PSU. Modular, 80+ Gold with all accessories, boxed. Perfect for bitcoin mining, not new but unused. VGC. £80.00.
Tel: Tim (01892) 689054 Email: wryrote@hotmail.com

Antec 900 ATX Gaming Case. Not new but unused, VGC. Boxed, with all accessories. £57.00.
Tel: Tim (01892) 689054 Email: wryrote@hotmail.com

Free CPU and RAM. Athlon 64 3200 socket 939 CPU and 4x 512MB ddr 333 strips. SAE and I will post back to you.
Tel: Jo Barden (01255) 870690 Email: comsnake@comsnake.plus.com

Sapphire Radeon HD 6770 1GB in original box with power supply conversion cable and driver CD. £50 inc P&P.
Tel: John O'Regan (01525) 862933 Email: c2o@greenbee.net

MSI Motherboard G41M-P28 LGA775 socket. Also two 2GB matched Kingston DDR3 1333 RAM. Both unused in original packaging. £35, inc postage.
Tel: JG Moorhead (01606) 852461 Email: moorhead373@btinternet.com

3x Devolo dLAN Highspeed II adapters (used, working, unboxed). CD containing software utilities and documentation. £17 collection in Oldham or £20 posted to UK.
Tel: Ken Vickers (01616) 78 6139 Email: mail2luz3y-gym@yahoo.co.uk

Linksys WMP54G Wireless PCI card. £8 collection in Oldham or £11 posted to UK.
Tel: Ken Vickers (01616) 78 6139 Email: mail2luz3y-gym@yahoo.co.uk

USB printer cables, assorted. Blue see-through with silver tips, black with gold tips. 1.8m, £1.00 each. IDE cables, grey, £1.00 for 2. Some round, black and colours £2.00 each.
Tel: (01582) 612716 Email: alex.1922@hotmail.co.uk

Gateway Dual core laptop excellent condition. 100 GIG HDD 15.4 inch WXGA screen. Long battery life, 2GB memory, charger, legal Windows Vista. £129.95 plus £10.95 postage.
Tel: (01619) 501218 Email: medicineman@ntworld.com

PNY Europe GeForce GT520 DDR3 1GB PCIe 2.0. £22.
Tel: (02393) 117877

TP-LINK 32-BIT PC 10/100M fast Ethernet adapter TF-3239D. £11.
Tel: (02393) 117877

Belkin 32-Bit boot Rom socket desktop network card F505000. £11.
Tel: (02393) 117877

Mini-USB Finger Optical Laser Mouse. Attaches to your finger and has two side buttons. Great replacement for standard mouse. £10 p&p included.
Tel: Gary Gemmell (01415) 712822 Email: amendata@tiscali.co.uk

500GB IDE drive 3.5 inch formatted ready for use. Only £20 plus £3 for p&p. Refurbished.
Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: dave.thomas96@aol.com

Creative Gigaworks T40 Series 2 PC Powered Speakers. As new, fully operational. See reviews and prices on Amazon. My price £40. Delivery £6.
Tel: Peter Van Win (01702) 559210 Email: vanpwin1@googlemail.com

E-mu 0404 PC Professional Audio card. Works perfectly with Windows XP, 7 and 8.32 and 64bit OSs. Optical, Co-ax, MIDI inputs/outputs as well as analogue. Price £50, delivery £3.50.
Tel: Peter Van Win (01702) 559210 Email: vanpwin1@googlemail.com

Alkal Apc40 MIDI Controller. As new, in full working order with software, paperwork, etc in original carton. £240 o/mo Delivery £6
Tel: Peter Van Win (01702) 559210 Email: vanpwin1@googlemail.com

Hitachi Deskstar T7K250 HD T7225S0LA380. 250 GB, Internal, 7200 RPM, 3.5". Used only for storage, taken from working PC, no bad sectors. £20, price includes P&P.
Tel: (01202) 826057 Email: geoffandynith@themailspot.com

Dell G4240 S.F.F. Intel P4/1.6, 768MB RAM 80GIG Hard Drive, CD-ROM, Floppy, network, sound, XP Pro fully updated, Office, Anti-Virus, utilities, £35.
Tel: (07710) 348638 Email: pat4cars@aol.com

Dell G3020 SFF Desktop, P4/3.2 Hyper-threaded 2 GIGS RAM, 80 GIG hard drive, CD-RW-DVD combo, network, sound, XP Pro, COA, reload disk, ready to use, £45, PayPal OK.
Tel: (07710) 348638 Email: pat4cars@aol.com

HP DC-7100 S.F.F. P4/3000 H.T. 80 GIG Hard drive, 1.5 GIGS RAM, CD-RW, Gigabit network, on board sound, front USB, £45.
Tel: (07710) 348638 Email: pat4cars@aol.com

250GB SATA drive 3.5 inch formatted ready for use. Only £14 plus £3 for p&p. Refurbished.
Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: dave.thomas96@aol.com

iMac G4 15 inch. Iconic Mac PC, unique design, 700mhz CPU, 512MB RAM, 80GB Hard Drive, DVD/CD-R, Apple USB Keyboard & Mouse, OS X 10.4 Tiger with other software installed. Boxed with disks. £80.00 Buyer collects.
Tel: Wayne Deeky (07748) 70828 wdz255@gmail.com

Toshiba laptop. SP 6100L, complete except no HDD, unable to boot, charges. Windows 2000 installed. Wi-Fi, RAM, DVD all present, good screen. Buyer collects. Spares or repair £15.
Tel: Keith Turner (07799) 041618

Desktop computer. With Intel Core 2 Duo E7200, 2.53 GHz, 2 GB RAM, 75 GB HD, DVD/CD-RW, keyboard, mouse, 17" monitor. £120 plus delivery (free in London).
Tel: Mr. Mahra (02075) 610584 Email: xasan68@hotmail.com

Sapphire HD6670 Ultimate graphics card. 1GB, passive, boxed, new. £55 inc post.
Tel: Mick Young (02072) 321695 Email: mick.young@o2.co.uk

Blackmagic Design Intensity Pro video editing card. Boxed, new. £100 inc post.
Tel: Mick Young (02072) 321695 Email: mick.young@o2.co.uk

Hitachi Deskstar T7K250 HD T7225S0LA380 250 GB hard drive. Internal, 7200 RPM, 3.5". Used only for storage, taken from working PC, no bad sectors. £20, price includes P & P.
Tel: (01202) 826057 Email: geoffandynith@themailspot.com

NASTwo Bay Server. Zyned 221. Complete with 2x Samsung 1TB hard drives, installed. All new, not been used. Ready to go. Price includes courier delivery. £200
Tel: Mick Sharp (01162) 696813 Email: m.sharp026@btinternet.com

Apple G4 dual tower. 1GHz processor system, 756mb ram, DVD SuperDrive, OS 10.4 E100 or nearest offer.
Tel: Paul Brogren (07545) 496002 Email: paulbrogren2007@hotmail.co.uk

Apple iMac G4 for sale. 2004, 1.25GHz G4 processor, 17 inch screen, 1.25GB RAM, 75GB hard drive, OS 10.4, DVD SuperDrive. Comes with keyboard, mouse, and speakers. £150 or nearest offer.
Tel: Paul Brogren (07545) 496002 Email: paulbrogren2007@hotmail.co.uk

Apple iMac Intel 2006 for sale. 20 inch screen, 1TB hard drive, 2GHz processor dual core, DVD SuperDrive, 2GB ram, OS Lion. No keyboard or mouse included. Mint condition. £400 or nearest offer.
Tel: Paul Brogren (07545) 496002 Email: paulbrogren2007@hotmail.co.uk

AsRock mobo N68-S. Original box and contents. £20 P+P extra at cost.
Tel: (01842) 879932 Email: mmadds@btinternet.com.

Lenovo ThinkPad X220. Brand new in box. 2nd Gen Core i5 processor, Intel i5-2520M / 2.5 GHz (Max Turbo Speed 3.2 GHz), Windows 7 Professional 64-BIT (SP1). Open to offers of £425 o/mo.
Tel: Tim Wright (01268) 472483 Email: tim20k@tesco.net

Dell Inspiron 1525 laptop. Spares or repair £65. Has faulty screen and cracked bezel otherwise perfect working order. Works with external monitor. New PSU & battery. No hard drive. Email for full details.
Tel: Kevin Cozens (01792) 581036 Email: kevin_cozens64@hotmail.com

HP Slimline (S3150) computer. NVIDIA graphics, Intel core2, 2GB RAM, 250GB HDD built-in freewheel card with remote KB, mouse, WiFi, MS office 2007 home. £120 including postage.
Tel: (01324) 562722

500GB IDE internal drive. Western Digital (or other brand, please contact me for other brands). Perfect working condition, ready to load your own operating system on or I can load XP Pro or Vista Business edition including a certificate of authenticity for an extra £10. £22, plus £4 for delivery. Excellent condition.
Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: dave.thomas96@aol.com

Lenovo ThinkPad X100e Laptop. Model 2876-ZFG Athlon MV-40 1.6GHz, 250GB HD, 11.6in 1366x768 LCD, ATI HD3200, 802.11bgn wireless, Bluetooth, 1Gb Ethernet, Windows 7 Professional 32 bit installed. Upgraded to 4GB SDRAM. Works with Windows 8. £125
Tel: Ian Bonnett (01932) 856971 Email: a2345@btinternet.com

Acer Aspire V5-171. Unwanted gift - as new. Intel i3, 6GB Ram, 500GB HDD, boxed and ready to go. £300, offers welcome.
Tel: Tony Lloyd (07800) 565456 Email: Tony-Lloyd@hotmail.com

Dell Poweredge 1800 server for sale. 2x3GHz Xeon processors, 12 GB RAM, 3x 160GB hard drives, 6CH SATA RAID controller. £200.
Tel: Kevin Gracie (07506) 685879 Email: kgracie12@gmail.com

Main bits of a quick rig for sale. Asus PK5SE 775 mobo, Core 2 Quad 6600 G0, 8GB Patriot DDR2 memory. £125 plus postage for the lot. Will not split the CPU/mobo.
Tel: Pat Casey (07532) 387078 Email: patgerry@goolemail.com

Foxconn Nvidia GeForce 7200 GS video card. £15 plus postage.
Tel: Pat Casey (07532) 387078 Email: patgerry@goolemail.com

Palit Nvidia GeForce 9600 GT Sonic video card. Factory overlock to 700MHz. £40 plus postage.
Tel: Pat Casey (07532) 387078 Email: patgerry@goolemail.com

Palit Nvidia GeForce 450 GT video card. £50 plus postage.
Tel: Pat Casey (07532) 387078 Email: patgerry@goolemail.com

Fujitsu PSU model DPS-210 1b +3.3v 7.5A +5A, +12v 15.3A, -12v 0.3A, AUX +5v 2A AS new. £4, postage £4.75. PayPal only.
Tel: (02082) 246541 Email: KJRider@yahoo.com

3 HP 338 and 1 HP 334 remanufactured inkjet cartridges for sale. All brand new and unopened. £10 including P&P.
Tel: Roger Edwards (01383) 736399 Email: redwards14@virgin.net

AMD A8 5600K 3.6GHz Processor. Was going to upgrade a PC but it was the wrong socket for my motherboard. It is a socket FM2 motherboard. Comes retail boxed. £50. Would prefer cash on collection.
Tel: Alice Higgins (01279) 851122 Email: a.higgins@inbox.com

Apple G4. 400MHz, 768MB RAM, 40GB hard disk, ATI Rage 128MB (AGP), Tower (graphite), M7824LL/A, DVD-ROM, zip drive, USB key, mouse. £55. East London, must collect.
Tel: Tony (07506) 553871 Email: patterson@hushmail.com

Various parts: 10GB (E3), 20GB (E5), 40GB (E8), 80GB (E10), 160GB (E20), DVD-writer (from E10), ATU/TNT cards 64MB (E8), 128MB (E12), 256MB (E15), 512MB (E20), AGP/PCI-E, PCI Sound (E5), PCI LAN/ire (E5), Zip Drive (E5), Pentium II, III, 4 CPUs, mobo, AMD CPUs, bundles, SD RAM/DDR. Ask for email list.
Tel: Tony (07506) 553871 Email: patterson@hushmail.com

HP G6 laptop. Intel Core i3-380M 2.53GHz, 8GB RAM, 640GB disk, 15.6 LED, DVD-RW, HDMI, wi-fi, webcam, multi-media reader, Windows 7 64bit. £210.
Tel: Mark Ferns (02089) 321897 Email: mark@ferns16.plus.com

500GB IDE internal drive. Western Digital (or other brands - please contact me for other brands). In perfect working condition, ready to load your own operating system on, or I can load XP Pro or Vista Business edition including a Certificate of Authenticity for an extra £10. Only £20 plus £4 p&p.
Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: dave.thomas96@aol.com

3GB of Micron DDR2-667, PC2-5300, 240 pin, C15 desktop RAM in the form of one 2GB and 1GB sticks. Tested and removed from working upgraded PC. £30 delivered. Payment via PayPal only.
Tel: Stuart Wattie (07761) 071075 Email: stuart.wattie@btinternet.com

Intel Core 2 Quad Q6600 G0 stepping CPU 2.4ghz socket 775 65nm. No cooler as removed from upgraded PC. Never been overlocked or resealed. Only £45 delivered. Payment via PayPal only.
Tel: Stuart Wattie (07761) 071075 Email: stuart.wattie@btinternet.com

16GB DDR3 RAM by Corsair. 2 X 8GB card CL10. CML16-G3M2A16 Corsair. £50 including insured post.
Tel: Nigel Chaffey (02082) 910504 Email: dmjchaffey@aol.com

MSA78L-MAUSB3 AM3+ motherboard for sale. Brand new, £35 including p+p.
Tel: Martin Welch (07971) 528739 Email: welch_martin@yahoo.co.uk

Acer TravelMate 371Tm laptop. Standard spec which includes wireless and CD/RW with 2GB memory upgrade. Good clean condition complete with original discs etc. All sensible offers considered.
Email: peterm@tsitid.uk.com

Corsair 4GB DDR3 1333MHz RAM. One stick of RAM used for about 3 months, selling due to upgrade. The RAM is XMS branded. £15.
Tel: Sean O'Connor (07838) 064800 Email: seanooconnor@hotmail.co.uk

Tower PC with Windows XP and Office XP loaded. Certificate of Authenticity for Windows XP included. HP Photosmart printer and Canon scanner, with all discs for hardware. £50.
Tel: Alan Phillips (01745) 354614 Email: alan.phillips74@talktalk.net

Asus M5A78L-MAUSB3 motherboard for sale. Unwanted birthday present, brand spanking new. Normally retails for £59.99 on overlockers.co.uk. £35.
Email: welch_martin@yahoo.co.uk

Amstrad CPC464, Monitor, Printer, Covers, Games. VGC. £18.
Tel: (01245) 264327

4x 1GB Gell. Memory PC2-600 DDR2-800 for sale. Taken from my old computer and no longer required due to upgrade. £35 including recorded delivery postage. Pay by PayPal. Will split if required.
Tel: (01299) 823518 Email: abberley1@sky.com

Intel core 2 quad processor Q6600 socket 775 2.4ghz x 4 8mhz 12 cache 1066. I will fit an asus P5QLD pr motherboard working perfectly. Please email questions £35, £2.95 postage.
Tel: (016190) 501218 Email: medicineman@ntworld.com

Asus P5QLD motherboard with core 2 duo processor 2 gigs memory dimm and original setup disk also rear I/O cover, all working fine, email me with questions £39.95 plus £5.95 postage.
Tel: (01619) 501218 Email: medicineman@ntworld.com

FREE 15" and 17" CRT monitors. Collection from Sherbourne, Dorset. Email 78453316@gmail.com for the list.
Tel: Matthew Green (01935) 814972 Email: matt@configured-computers.co.uk

2x Intel Core 2 Duo CPUs in excellent condition and perfect working order. Both socket LGA775 chips: one is an E6550 2.33GHz/4m/1066fsb, the other is an E6750 2.66GHz/4m/1333fsb. £38 including recorded delivery.
Tel: Huseyin Huseyin (02088) 899344 Email: hichibright@hotmail.com

Retro desktop MicroATX, baseunit, p3/1000, 256MB RAM, 40GB hard drive, CD ROM drive, floppy, sound network, clean install windows 2k-pro, copy of install disk, working key, ideal for older games. £15.
Tel: (07710) 348638

Dell G6260 SFF Intel Celeron D 2.8, 1.5GB RAM, 80GB hard drive, CD-ROM, Gigabit network card, Windows XP Pro, office utilities, anti virus, legal COA reload disk, ready to use. £45 (p&p £11)
Tel: (07710) 348638

IBM Lenovo NTM-8183 SFF P4/3000 HT 768 MB 40 GIG, CD-ROM, network sound clean install xp pro SP3, COA copy of disk & reload, ready to use, £45.
Tel: (077103) 48638

Laptop for sale. eMachines E510 (Model: 1A2G16M) Intel T400 CPU - 1.7GHz Dual Core Celeron, 60GB SATA2 SSD drive plus spare 160GB HDD, DVD rewriter, 3GB DDR RAM, Wireless LAN, external Logitech mouse (badpad not working), Windows Vista Home Premium, recovery CDs plus manual. £100 o/mo.
Tel: (01564) 200162 or 01564 702018 Email: priddling@blueyonder.co.uk

Gaming PC: AMD 1090 CPU, Asus Crosshair IV motherboard, MSI 6950 GPU, Kingston HyperX RAM, OCZ 650 watt modular PSU, 1TB HDD, CoolerMaster CM II advanced case, LG DVD drive, 3 case fans and spare windowed side panel. £600 ono plus carriage.
Tel: Geoff (01228) 543406 Email: soulie69@hotmail.co.uk

Apple MacBook Pro 15.4" Laptop - MC7218/A (February 2011). Quad Core, 4GB RAM, 500GB HD OS X with original discs etc. Pristine condition. £875 own Full details / pictures if required.
Tel: (01415) 694117 or (07870) 627677 Email: jimthechemist@hotmail.com

Digital LCD PC Diagnostics Computer Post Card. This is the latest design with screen which displays the error and the solution rather than the old type which only has LEDs and a two digit post code display. Essential tool for any computer tech. Brand new in box. Price includes postage and packing - £15.
Tel: Gary Gemmell (01415) 712822 Email: omendata@tiscali.co.uk

Universal laptop power supply. Comes with all converters for all laptop power jack connections. Unused spare. £20.
Tel: Gary Gemmell (01415) 712822 Email: omendata@tiscali.co.uk

Power Over Ethernet (Poe) Injector / Splitter plugin adapters x2. Allows you to connect a power supply to a device such as an IP Webcam over 50 metres using a standard Cat5 network cable. Plug in your power adaptor to one end and the network cable will carry both the network data and the power to the device on the other end. Ideal for installing powered surveillance IP webcams, IP telephones, wireless LAN access points to places where no power socket exists. Brand new still boxed. £15.
Tel: Gary Gemmell (01415) 712822 Email: omendata@tiscali.co.uk

IBM Thinkcentre S51 (8171-21G) Intel Dual Core PC with new Windows 7 Professional, Microsoft Office, flat screen monitor, keyboard and mouse. £70.
Tel: Gary Gemmell (01415) 712822 Email: omendata@tiscali.co.uk

Apple Imac G3 - (Blue/White) complete with keyboard and mouse. Completely new installation of Mac OS. £50.
Tel: Gary Gemmell (01415) 712822 Email: omendata@tiscali.co.uk

Cheetah Hard Disk 10.2GB - SCSI 10,000rpm - U/wide - £10.
Tel: Gary Gemmell (01415) 712822 Email: omendata@tiscali.co.uk

Computer Case UV Cold Cathode Tubes x2 - with inverter, on/off switch and all cabling. New unused spare - £10.
Tel: Gary Gemmell (01415) 712822 Email: omendata@tiscali.co.uk

Zalman 120mm Silent Fan - Molex Power Connector - £7.
Tel: Gary Gemmell (01415) 712822 Email: omendata@tiscali.co.uk

20cm Wireless Antenna Booster with cable, magnetic base and TNC Connector - New - £10.
Tel: Gary Gemmell (01415) 712822 Email: omendata@tiscali.co.uk

Does anyone want a collection of computers? Many types and makes including AS400, RS6000, VAX, Alpha, Terminus, PET, Sinclair, ZX81, Sharp MZ80K, terminals, SGI, HP UX, 486, 386, 286, 80's computers, Amstrad, and it goes on. If you're interested you're welcome to view the collection and make me an offer. Cherry pickers welcome to see what you want. West London.
Email: optium_deny@yahoo.co.uk or slub1x101@gmail.com

MSI Twin FrozIII. Excellent performance/speed & quality and less than two years old £175ono. Contact Dave.
Tel: (0161) 2235944 Email: Dave.G@sky.com

GTX 580 Graphics Card. Working perfectly. £140 plus P&P. Local pick-up also welcome (Manchester).
Tel: (07720) 209164 Email: Dave.G@sky.com

Refurbished Dell Ultra Small Form Factor G620 P4 3.0/512/80 CD includes AC adaptor. Fantastic small machine that is very powerful ONLY £25 plus £8 for p&p. I can upgrade the memory and hard drive for an extra cost. You will need to load the drivers yourself. XP pro and genuine Certificate Of Authenticity can be loaded for an extra £10.
Tel: Dave Thomas (01942) 706572 Email: davethomas96@aol.com

Midtower PC AMD Athlon 1.7 system. 2x DVD drives, 1x FDD drive, Canon scanner, Iiyama monitor, HP PhotoSmart printer, mouse, keyboard and speakers. XP SP3 with office XP loaded. All relevant discs. Suit student or first time user.
Tel: Alan Phillips (01745) 354614 Email: alan.phillips747@talktalk.net

Belkin powered IDE USB external hard drive with a 300GB Maxtor drive, no bad sectors formatted to NTFS - with power lead and USB cable. £15 includes postage. I have been on the forum for 10 years and have sold through the classifieds so you can buy with confidence.
Tel: Alan Walker (0121) 5598269 Email: al_walker@blueyonder.co.uk

EPSON Pigment Ink X2 520ml. I have these inks for sale these are of High Grade CIP Pigment made in Germany, there is 1x Black, 1x Cyan, 1x Magenta, 1x Yellow, 1x Light Cyan. Very cheap price: £45.00 plus £5.60 postage.
Tel: (01795) 470227 Email: keithheathfield2@hotmail.com

Gateway ML6227G Laptop, excellent condition, good battery charger. Dual Core Win Vista. Pick up, or £10.95 P&P. Price: £129.95.
Tel: (0161) 9501218

Over 100 computer mags: Micro Mart, Computer Active & Web User. Over £250.00 shop price. Pick up only, due to weight: £35.00. Open to offers, may do a swap for a monitor.
Email: paul1827@icloud.com

Kodak Easyshare 4MP camera and printing dock. Very robust, silver colour, takes excellent Pictures. Nothing missing, fits easily in pocket, prints directly from camera or computer. Picbridge compatible. £30 or do swap for monitor.
Email: paul1827@icloud.com

802.11b/g/802.11g Broadband Wireless Router (Windows XP, Vista and Windows 7). Brand New unused undamaged in maker's retail package, complete with installation CD, instruction manual, AC Mains adaptor, 2x ADSL filters, telephone line cord, RJ45 LAN link cable. All for only £10.00 plus postage £2.20p.
Tel: Paul Mohan (0113) 265 5971 Email: phmohan@aol.com

PNY GT220 1GB DDR2, Silent Edition £20 inc P&P Pay by PayPal
Telephone: (02380) 510790

Laptop RAM 1x DDR3 PC3-12800, DDR3 (non-ECC) 4GB £22 & 1x 2GB £12. From a new HP laptop that was immediately upgraded on purchase. Both units placed in Crucial static safe packaging. P&P included.
Email: anton.d@blueyonder.co.uk

Sapphire Radeon HD4350 512MB DDR2 silent. £20 inc P&P Pay by PayPal
Telephone: (02380) 510790

High Performance PCI Express 3D Graphic Card; low profile DDR3 1gb; Win7... £20.00 inc Postage.
Tel: Paul Mohan (0113) 265 5971 Email: phmohan@aol.com

ADATA 2x 1GB DDR2 Memory. £12 inc P&P Pay by PayPal
Telephone: (02380) 510790

Many spare parts for sale: Drives: 10GB (E3), 20GB (E5), 40GB (E8), 80GB (E10), 160GB (E20). CD-Writer (from E6), ATU/TNT Cards: 64MB (E8), 128MB (E12), 256MB (E15). AGP/PCI: PCI Sound (E5), PCI Lan/S6K (E5), ZipDrive (E8), PCI Firewire (E5). Pentium III, 4 CPUs (ask), M680 (ask), AMD CPUs (ask). Bundles (ask), SD Ram/DDR (ask). Email for full list.
Tel: Tony (07506) 553871 Email: patterson@hushmail.com

AMD Athlon 64 X2 4800+ AM2 includes a Alpine GT 64 cooler. £13 inc P&P Pay by PayPal
Telephone: (02380) 510790

XFY GEFORCE 7800 GTX (256MB) fitted with Zalman Quiet VGA cooler with fan controller. £13 inc P&P Pay by PayPal
Telephone: (02380) 510790

Pinnade TV tuner card PCTV + FM tuner. £10 inc P&P Pay by PayPal
Telephone: (02380) 510790

TP LINK TL-WN781ND 150Mbps Internal Wireless Network Adapter PCI Express Card. £12.00 inc postage.
Tel: Paul Mohan (0113) 265 5971 Email: phmohan@aol.com

Saitek R440 Force Feedback Racing Wheel. Plus six games: Race07, Kart 002, TOCA3 Colin McRae 04 GTR 2 TOCA2. First Class condition, works with Windows 7. FREE POSTAGE. £38.
Tel: (01358) 722 629

Apple G4, 400MHz, 768MB RAM, 40GB Hard disk, ATI Rage 128MB (AGP), Tower (Graphite), M7824LL/A, DVD-Rom, Zip Drive (100), USB Key/Mouse. £70 (Must collect from East London).
Tel: Tony (07506) 553871 Email: patterson@hushmail.com

185GB USB2 external hard drive complete with USB lead and mains adaptor. Ideal for backup/storage files. £15.00 plus postage.
Tel: Paul Mohan (0113) 265 5971 Email: phmohan@aol.com

500GB, 1TB & 2TB Western Digital SATA II internal drives. Excellent condition. Perfect working condition ready to load your own operating system on. 500GB only £24 (+£4 delivery), 1TB only £35 (+£4 delivery), 2TB only £50 (+£4 delivery)... Less than ebay or amazon prices.
Tel: Dave Thomas (01942) 706572 Email: davethomas96@aol.com

Dell G240 S.F.F. Intel P4/1.6, 768MB RAM 80GB Hard drive, CD-ROM, floppy, network, sound, XP-Pro fully updated office, Anti-Virus, utilities, XP-Home C.O.A. £35
Telephone: (07710) 348638

Retro Desktop Micro-ATX Baseunit, P3/1000, 256MB RAM 40GB hard-drive, CD-Rom, floppy, sound, network, clean instal Windows ZK-Pro, copy of instal disc, working key, ideal for older games. £15.
Telephone: (07710) 348638 Email:

Used laptop memory for sale - removed from ASUS KS 2F. 2GB 1333Hz DDR3 PC3-10600 SoDimm, Part number - ASiNT S5Z3128MB-EDJEE. £4.00 inc postage
Tel: (07989) 333 145 Email: s9solutions@dsl.pipex.com

Belkin Powerline HD Gigabit 1000Mbps Single Network Plug Adapter (1 x FS04076). Never used, £20.00 inc postage. (Please note: this is a single plug).
Tel: (07989) 333 145 Email: s9solutions@dsl.pipex.com

8X 100ml High Grade Dye Ink for Epson refillable cartridges. 2x light magenta, 2x Yellow 1x light cyan, 1x black, 1x cyan, 1x magenta. Price: £30.
Tel: Keith Heathfield (01795) 470227 Email: keithheathfield2@hotmail.com

P4/3000 Midi-Tower ATX case, P4/3000 Hyper-threaded, 2GB RAM, 2x 80GB drives, CD-RW, floppy, network, FXS700 256MB video, Windows 7-Pro activated, updated, working CD-KEY, No Disks, £64.
Tel: (07710) 348638

Toshiba Satellite Pro I450D 1GB DDR2 RAM, 149GB SATA hard drive, Athlon CPU, DVD-RW webcam, wireless LAN Windows XP Pro, there is no sound perhaps an easy fix. Two keys missing, battery not charging otherwise laptop ok. £40.00 pick up only please.
Tel: Darren Raymond (07715) 344675 or (01494) 722929

For Sale: All sorts of ADSL equipment (e.g. modems, routers, filters etc.) Email for the items you require.
Tel: David: (0161) 6888119 Email: pcmadness@tiscali.co.uk

P4/3000 Midi-Tower ATX Case, P4/3000 Hyper-threaded, 2GB RAM, 2x 80GB drives, CD-RW, floppy, network, FXS700 256MB video, Windows 7-Pro Activated, updated, working CD-KEY, No disks
Tel: 07710348638

HP G62 Core i3 laptop, 15.6" LED display, 6GB RAM, 500GB Hard Disk. Win-7 Premium 64-bit. Wi-Fi, LAN, 3x USB 2.0, 1x VGA, 1x HDMI, 1x Headphone, 1x Mic, 5-in-1 PC Card Reader, PSU+Plug. Excellent condition, Win 8 Compatible.
Tel: Mark (0208) 9321897 Email: mark@ferns16.plus.com

Different types of RAM (SDRAM, SIMM, DIMM, DDR, DDR2, DDR3) call or email me for the RAM you require.
Tel: David: (0161) 6888119 Email: pcmadness@tiscali.co.uk

Viliv S5 Tablet PC, Windows XP, wi-fi, bluetooth enabled. Immaculate condition comes with all accessories and spare battery. £130. Location: Derbyshire.
Tel: (07792) 846582.

For Sale: lots of computer parts call or email me for a list or to ask me what you require.
Tel: David: (0161) 6888119 Email: pcmadness@tiscali.co.uk

P4/3000 Midi-tower ATX case, P4/3000 hyper-threaded 2x GB RAM 2x 80 GB drives, CD-RW, floppy, network, FXS700 256 MB Video, windows 7-PRO activated, updated, working CD-KEY, No disks. £64.
Tel: 07710 348638

Various spares for sale: Writemaster DVD writer SH-S183 (E5), Seagate Barracuda 7200.9 160 Gbytes (E11), Kingston 8GB MicroSD card and adaptor (E6).
Tel: (02393) 117877

Asus EAH5770Cu Core 1GB graphics card. Used but in excellent condition. Boxed with disks and some connectors (missing 2x4=6 pin). Great card for those on a budget. Never overclocked. £50.00 plus £3.50 postage. Pay by paypal.
Tel: Chris Edwards (01737) 556297 Email: chris-e1@talktalk.net

IBM/Lenovo MTM-8183 SFF P4/3000 HT, 768 MB, 40GB, CD-ROM, Network, sound, clean instal XP-PRO SP3, C.O.A copy of disk and reload, ready to use £45.
Telephone: (07710) 348638

Belkin Powerline HD Gigabit 1000Mbps Single Network Plug Adapter (1 x FS04076). Never used, £20.00 inc postage. (Please note: this is a single plug).
Tel: (07989) 333 145 Email: s9solutions@dsl.pipex.com

8X 100ml High Grade Dye Ink for Epson refillable cartridges. 2x light magenta, 2x Yellow 1x light cyan, 1x black, 1x cyan, 1x magenta. Price: £30.
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Tel: (07710) 348638

Toshiba Satellite Pro I450D 1GB DDR2 RAM, 149GB SATA hard drive, Athlon CPU, DVD-RW webcam, wireless LAN Windows XP Pro, there is no sound perhaps an easy fix. Two keys missing, battery not charging otherwise laptop ok. £40.00 pick up only please.
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All sorts of ADSL equipment (e.g. modems, routers, filters etc.) Email for the items you require.
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HP G62 Core i3 laptop, 15.6" LED display, 6GB RAM, 500GB Hard Disk. Win-7 Premium 64-bit. Wi-Fi, LAN, 3x USB 2.0, 1x VGA, 1x HDMI, 1x Headphone, 1x Mic, 5-in-1 PC Card Reader, PSU+Plug. Excellent condition, Win 8 Compatible.
Tel: Mark (0208) 9321897 Email: mark@ferns16.plus.com

Different types of RAM (SDRAM, SIMM, DIMM, DDR, DDR2, DDR3) call or email me for the RAM you require.
Tel: David: (0161) 6888119 Email: pcmadness@tiscali.co.uk

1x 2GB Buffalo DDR2 800MHz memory for sale. £10 inc p&p.
Tel: (01642) 898269 Email: caleyb@ntworld.com

3x 1GB Kingston DDR PC3200 memory for sale, £12 a stick or all 3 for £30 inc p&p.
Tel: (01642) 898269 Email: caleyb@ntworld.com

Viliv S5 Tablet PC, Windows XP, wi-fi, bluetooth enabled. Immaculate condition comes with all accessories and spare battery. £130. Location: Derbyshire.
Tel: (07792) 846582

Lots of computer parts call or email me for a list or to ask me what you require.
Tel: David: (0161) 6888119 Email: pcmadness@tiscali.co.uk

Writemaster DVD writer SH-S183 (E5), Seagate Barracuda 7200.9 160 Gbytes (E11), Kingston 8GB MicroSD card and adaptor (E6).
Tel: (02393) 117877

Asus EAH5770Cu Core 1GB graphics card. Used but in excellent condition. Boxed with disks and some connectors (missing 2x4=6 pin). Great card for those on a budget. Never overclocked. £50.00 plus £3.50 postage. Pay by paypal.
Tel: Chris Edwards (01737) 556297 Email: chris-e1@talktalk.net

Dell Optiplex 360 PC. Intel core 2 duo 2.80 GHz (e7400). 80GB hard drive, 1GB DDR2 RAM, DVD LG speed multi drive, on-board sound/graphics, LAN, Windows XP Pro, Norton 60 day trial. 17" LCD, keyboard/mouse. £75.00 buyer to collect.
Tel: (01633) 241722 Email: damenaymond@hotmail.co.uk

3.4GB P4 512MB Motherboard bundle 3.4 GHz P4 CPU (new type) + fan 512 MB DDR ram (max 4GB) motherboard 3xPCI 1xPCI-E 4xSATA 4xUSB(int) 4xUSB(ext) 2xFirewire 5.1 surround sound LAN + backplate was used until recently as my main setup until I upgraded still in good working order it is ready to hook up and go could be used gaming, surfing the net, download server, office work etc can add more ram if needed £35 + p&p £35
Tel: (0161) 6888119 Email: pcmadness@tiscali.co.uk

Away from home and out of power? You need a standalone power bank that can charge your phone/tablet! For details of this 12000mAh backup.
Tel: (07733) 241722 Email: sparker86@blueyonder.co.uk

RW/Asus Toughbook 15.6" widescreen laptop, Intel Pentium P6200 2.13GHz dual core, 4GB RAM, 160GB hard drive, Wireless, HDMI ports, USB 2.0, Windows 7 Pro 64-bit (activated), Office 2007, AVG etc. Fully working laptop, no cosmetic damage. Comes with charger. Battery holds excellent charge.
Tel: (07885) 766950 Email: crosswords@hotmail.com

10GB, 20GB, 40GB, 80GB and 160GB desktop IDE hard drives. All clean pull (little to no use), no bad sectors, tested. All you need to do is plug in and go. Email or call for a price.
Tel: David (0161) 6888119 Email: pcmadness@tiscali.co.uk

Dell XPS Pocket PC, with touch screen & stylus, two batteries fully charged, Mains & Car chargers, Car Mount, Belt pouch, manuals etc. I'm retired so I no longer need it. Would exchange for reasonable size PC-e Video Card or other offers.
Tel: (01890) 820295 Email: ken@stonehaven2.plus.com

Kodak and Advent inks at bargain prices. Either email me, or go to Googlesites photopressentials.
Tel: (01580) 830446. Email: jinghouse386@live.co.uk

Refurbished 250GB (£18), 400GB (£20) and 750GB SATA (£30) drives for sale. 3.5", formatted and ready for use. Add £3p&p for each.
Tel: (01942) 706572 or (07828) 982930 Email: dovethomas96@aol.com

Phenom II-X6 1075T 3.0GHz (BE) overclockable to 4.5GHz. ASRock M3A770DE AM3 Mobo, 8GB CRUCIAL DDR3 (PC3-12800) UD RAM, Akasa Y4 cooler. £180ono + P&P. Will accept Paypal.
Tel: Terence (01293) 551405 Email: terence.fisher@f3.com

Fujitsu 30GB IDE Laptop Hard Drive for sale/offers & no bad sectors, WD Scorpio Blue 500GB SATA Laptop Hard Drive (Manufacturing date: 27 April 2011). For sale/offers as I've upgraded to an SSD Drive.
Tel: Ken (01890) 820295

Refurbished 160GB SATA drive, 3.5" formatted, ready for use. Only £10 plus £3 for p&p.
Tel: (07828) 982930

HARDWARE WANTED

Trying to breathe life back into an old machine? Why not submit a wanted ad to **MicroMartClassifieds@adverts@gmail.com** and see if any of the thousands of computer enthusiasts who read the magazine each week have what you're looking for?

Wanted: A socket LGA 775 motherboard to enable me to build a computer for a local Royal British Legion member. He's able to pay for a 2nd hand board as long as it's not too expensive. I've got the other components.
Tel: Ken Driver (01890) 820295

Wanted: Gigabyte G41MT-D3 1.3 motherboard in good condition. Please notify price and postage.
Tel: 0121 455 8526 Email: ldeary@virgin.net

Wanted: I am looking for 2gb (2x 1gb) of Muskin Redline PC3200 at 500MHz.
Tel: (07817) 861011

Wanted: 2 sticks of 2GB - PC2-4200 (533MHz) desktop memory, 2 of 1GB. To complete a computer for a disabled ex-serviceman who has little money. Any other donations of bits & pieces of computers would be most welcome as I put together units for hard up ex-service people. Free of charge.
Tel: Ken Driver (01890) 820295 Email: ken@brampton.plus.com

WANTED: Foxconn H61MDL-K V0 backplate. Please state price & postage cost.
Tel: Steve Wilson (01617) 93906 Email: sh.wilson1@ntworld.com

Wanted: Texas Instruments Laptop Power Supply Cable. Mine has failed and without it, I cannot use or charge batteries. Have complete working system with all software.
Tel: (01525) 288072 Email: jauung2@btinternet.com

Wanted: DDR2 800mhz, 4GB, 2x2GB.
Tel: (07817) 861011

Wanted: The Pet Companion. Has anyone a copy of the 1981 book "The Pet Companion"? This book collected the first 12 issues of Microcomputer Printout Magazine. Will pay £20 for a copy.
Email: Thomas Turnbull@btinternet.com

Wanted: A fully working and proven Compaq (HP) DC7600 PSU. HP part number is 462434-001. Also a Compaq (HP) DC7900 PSU. HP part number is 379294-001 381023-001. Both must be 365 watt, not 240 watt versions. Must also be correct fit for SFF, not tower, CMT or USFF models. Thank you.
Tel: Mr Earl (07872) 495140

Wanted: Motherboard with 3GB CPU or higher wanted. Must have AGP interface.
Tel: (07817) 861011 Email: medicanman@ntworld.com

Wanted: SDRAM laptop modules. Either PC100 or PC133 for elderly Dell Latitude C71 C Series Laptop. Wanted x2 SDRAM modules up to 254 MB for Dimms A + B (Non Parity).
Email: cjevans@btinternet.com

Wanted: AMD Opteron or FX Processor wanted. This does not need to be socket 754.
Tel: (07817) 861011 Email: richardhvnland@gmail.com

Wanted: Motherboard for Toshiba laptop. Model S460-302.
Tel: Edward Usher (07708) 235768 Email: e.usher@yahoo.co.uk

Wanted: Advent 6553 working motherboard.
Tel: Sean Lavelle (01614) 280430 Email: sean-is@ntworld.com

Wanted: XD picture memory cards for Fujifilm digital camera.
Tel: John McNeill (07835) 441956 Email: jmcneill@live.co.uk

Wanted: PC case and PSU suitable for Intel 775 mobo, or complete 775 system, memory and HDD not important.
Tel: Caz Hough (07900) 531125 Email: carolinehough@outlook.com

Wanted: Motherboard for ASUS X55U Notebook. Hannstar J MV1 also known as ASUS SX0080 has AMD Dual Core C60 Pross.
Tel: (01284) 752291 Email: colingrey@aol.com

Wanted: 128MB, 256MB and 512MB USB sticks. Will pay £1 each and organise the postage. I will send a prepaid envelope with the payment.
Tel: (01642) 898269 Email: coleby@ntworld.com

Wanted: Internal Floppy Diskdrives.
Tel: (01296) 580579

Urgently Required: Samsung 15" LCD monitor - it must have a DVI input. Preferably within a short distance of Woodford Green, Essex. Collection possible.
Email: philip.hennessy@hotmail.co.uk

Wanted: Patriot 3070 laptop. Working or repairable.
Tel: (07899) 886952

WANTED: Slide and negative holder for an Epson Perfection 1650 scanner. Will accept other holders from Perfection 1250 or possibly from different manufacturers and models as I can modify them to fit.
Tel: (01642) 898269 Email: coleby@ntworld.com

I am looking for an Epson Stylus D120 Inkjet printer in good clean working condition.
Tel: George Aldridge (01573) 224632 Email: keesago@primusbroadband.co.uk

Will pay up to £50 for any quad core AMD FM1 chipset processor. Fan not required, but would prefer it.
Tel: Robert Allen (07891) 848134 Email: rob94.allan@googlegmail.com

DDR4 modules. DDR2 pc8500 (1066) CL5 240pin. Looking for a pair, either 2x2GB or 2x4GB (depends on price).
Email: nick01chalk@yahoo.co.uk

WANTED: Working Intel Clarkdale I3 - 550 or 560 CPU. Willing to pay a fair price.
Tel: (01529) 505325 Email: Llad@live.co.uk

WANTED: Motherboard for a Targa Traveller 1574*2 laptop. It's an S1 socket board and takes the AMD Turion 1.6 processor.
Tel: (07522) 189503 Email: azimuth123@gmail.com

Wanted cables for internal floppy disk drive.
Telephone: (01296) 580679

Wanted, Dell Inspiron 1520/1525 screens Urgently
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Tel: (07979) 011037 Email: carpmaries@aol.com

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Trend Micro Titanium Maximum Security 2014. Genuine licence key directly to email. 3 devices for 1 year, for smartphones, PC, and Mac. £6.50 incl delivery.
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Windows Vista Business edition disc and certificate of authenticity. New and 100% genuine. Only £15 including postage and packing.
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Microsoft Office Professional 2007. In original wallet with original licence code. £100. Price includes P&P.
Tel: Carole Walker (07551) 293083 Email: omendata@gmail.com

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Cyberlink Power2Go XP 4.0 Cd In Original Unopened Wallet With Original Licence Code. £5. Price includes P&P.
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Cyberlink Power2Go XP 4.0 CD. In original unopened wallet with original licence code. £5. Price includes P&P.
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PCBCAD50 printed circuit board design program. With 127 layers and autorouter. Design rules checking. £20.
Tel: Nigel Wright (07967) 527693 Email: cresswellavenue@talktalk.net

SOFTWARE WANTED

Wanted: SmartDisk HD250 Installation CD. Novice Linux CDs with instruction manuals reasonable prices will be paid.
Tel: Alun (01525) 288972 Email: jauung2@btinternet.com

Wanted: Microsoft Works. I have recently reloaded Windows XP on my desktop and have discovered my Microsoft Works disc is missing. Would anyone with a usable Works disc please contact me at the following email address with a view to purchase.
Email: Pwjbrown@btinternet.com

Wanted: Sage Line 50 Accountant Plus. Has anyone a set of disks, CD/DVD/Floppy for Sage Line 50 Accountant Plus, please? I want to transfer to new computer but have lost disks. Thank you.
Tel: (01373) 462051 Email: Roy5051uk@gmail.com

Wanted: Windows 7. Second-hand copy wanted, must be legal, to install on PC instead of XP.
Tel: Eric Willis (02920) 890770 Email: Carolepc@aol.com

Wanted: Adobe Illustrator CS5. Pensioner wants Adobe Illustrator CS5 for Granddaughter college work.
Tel: Colin (01725) 862221 Email: colingardener43@yahoo.co.uk

Wanted: CD DVD (pref Blu-ray) copying software on CD or DVD, pref Nero.
Tel: (01208) 817966 Email: aconwall2013@gmail.com

Wanted: installation CD-ROM for an HP Pavilion Media Centre Tower. Model No: m7000. I've downloaded all the drivers for it from the HP website but XP Device Manager still shows an unknown item marked. Can anyone help me please? I'll pay postage and any small charge.
Tel: (01890) 820295 Email: stonehaven2@hotmail.co.uk

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- Keep copies of all correspondence
- When sending out goods, at the least obtain a certificate of posting from the Post Office

If in any doubt, feel free to mail us at editorial@micromart.co.uk. Every year, thousands of successful transactions take place through our classifieds, and that's just how we like it. Help us help you keep them one of the safest and most secure places to buy and sell computer kit.

ASK AARON



Meet Aaron Birch. He's here to help you with any general upgrading, software and system building problems. He's got advice aplenty, and you're very much welcome to it!

Send your questions to:
Aaron Birch
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Aaron by email at:
aaron@micromart.co.uk

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

Silver Lining

Some time ago I was asked by a website to install Microsoft Silverlight, which I did. Since then, I've stopped going to the site and, as far as I know, have never needed to use the program again. It's just sat there, taking up space and resources on my system.

As I understand it, Silverlight is basically similar to Flash, and does many of the same things, but isn't anywhere near as common. I'd like to remove it, as I don't think I need it, but as it's a web technology, I'm reluctant to do so.

Can I uninstall Silverlight, or will doing so cause too many problems?

Ron

You're correct with regards to Silverlight being similar to Flash. There are differences but, like Flash, it is used to deliver special web content. To view this content, you would need the Silverlight plug-in. Without it, you simply can't.

Uninstalling Silverlight won't actually cause any real issues, it'll simply prevent you from seeing any Silverlight-dependant content. You'll still be able to visit websites, but there are a few notable programs and sites that make use of it.

Netflix uses Silverlight, and even recommends it, but I've also seen that many people have trouble. If you don't use this service, though, and don't frequent websites that use it, then go ahead and remove it. You can always install it again if you need it.

➤ **Microsoft's Silverlight isn't essential, unless you want to view**



Java Palava

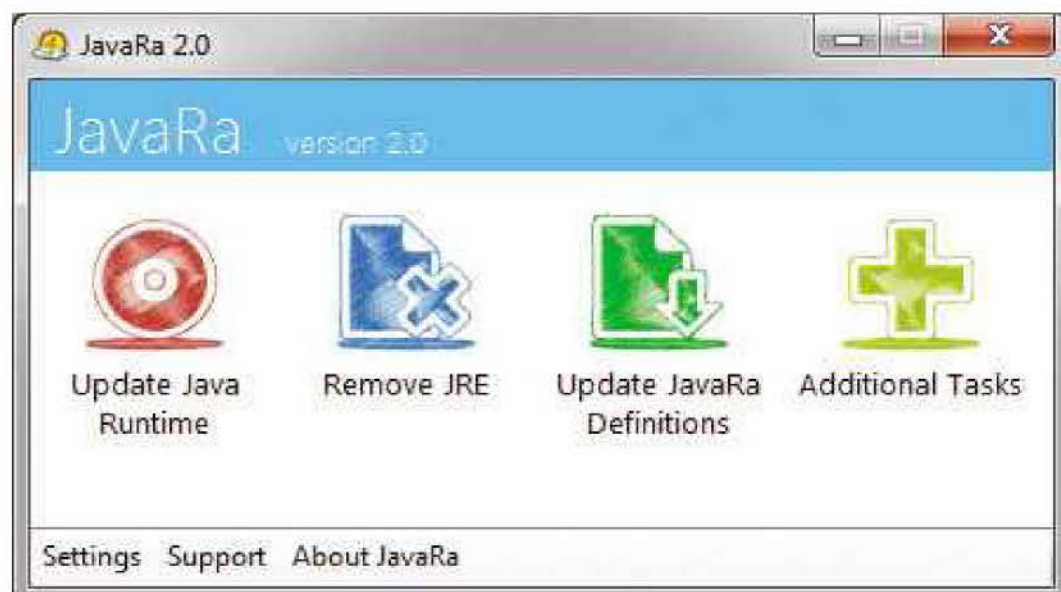
For some reason, I seem to have all sorts of issues with Java, and I've had these for quite some time. I've had failed Java installs, corrupted Java setups, inability to update and/or remove it, and more. As I've had issues, I've tried all sorts of things to solve the them, including total removal and reinstall of a fresh, update copy of Java, System Restores, Microsoft FixIt tools, and I've even formatted.

I'm not sure why I have so many issues, but all I want is some way to manage Java with a bit more ease, and Sun doesn't seem to provide anything like this. Are you aware of such a program?

As you've provided little information about the actual issues or your system specifications, I can't really help with specifics, but I think you'll find a tool called JavaRa quite useful. Available from singularlabs.com/software/javara, it's a small Java management app that can be used to quickly update or remove Java, as well as other tasks, including the clean up of logs, which Java likes to pump out.

Hopefully, this will be of some help to you. If not, some more details would help us to focus on the specific issues you're having.

▼ **JavaRa makes it far easier to manage Java, and is useful if you have Java install-related issues**



Power Line Limitations

Well done for singing the praises of power line network adapters in response to David's query. I have been using them for years and the performance boost over that of wi-fi is outstanding. I must add, however, that my house is modern with modern wiring – essential for good performance.

I feel you missed an important issue when commenting on performance, however. You should have mentioned the existence of pass-through adapters, which are necessary when there is a shortage of power sockets. Power Line adapters suffer really, really serious performance degradation if used on multi-way adapters, and not quite so bad (but still serious) degradation if used on multiple sockets. Devolo and TP-Link quote about 70-50% for the former and 40-25% for the latter. The pass through adapters get round this problem. In fact the illustration you showed is a perfect example of how not to install one!

Dick

It's true that power line network adapters need good wiring, which I mentioned in my answer to David, and plugging units into extension or multi-way power boards can greatly affect performance. The latter of these facts is always mentioned in device documentation, and not all suffer from the same level of performance drop. In fact, the one I

have (which is actually pictured, in less than ideal conditions) works perfectly, even though it's not directly plugged into a wall, or via a pass-through adapter, with its own power socket.

However, the general rule is to only use power line adapters in wall sockets directly, and this is certainly the best way to use them. If you can't spare the power socket due to limited space, a pass-through power line networking device is recommended.

▼ **Use a dedicated power socket for power line network adapters**



Share And Share-alike

I run Windows 7 (Home 64-bit) and have a home network set up with several PCs and laptops (all of these run Windows 7 also). As I have so many systems, used by myself and family, I have to share files between each. I have done this before, but recently I've been getting an error message. The error reads, "Your folder can't be shared".

I've tried various things, but just can't seem to get my folders shared, and so would appreciate any help you can provide.

Kim

Sharing files should, theoretically, be very easy, especially with an OS as user-friendly as Windows. Sadly, in actuality, this can sometimes be far from the truth, and there's a whole selection of things that can go wrong, including permissions, user accounts, services, and more. These are things that many casual, everyday PC users just don't know about, compounding the problem.

The usual advice many provide is always worth taking, and that's to try turning off security tools like antivirus programs, as these can interfere with file sharing and other network functions. So, start there. Also ensure file sharing is enabled in Control Panel too.

Windows has a built-in sharing wizard that may make things easier. To find this, go to Control Panel > All Control Panel Items > Administrative Tools > Computer

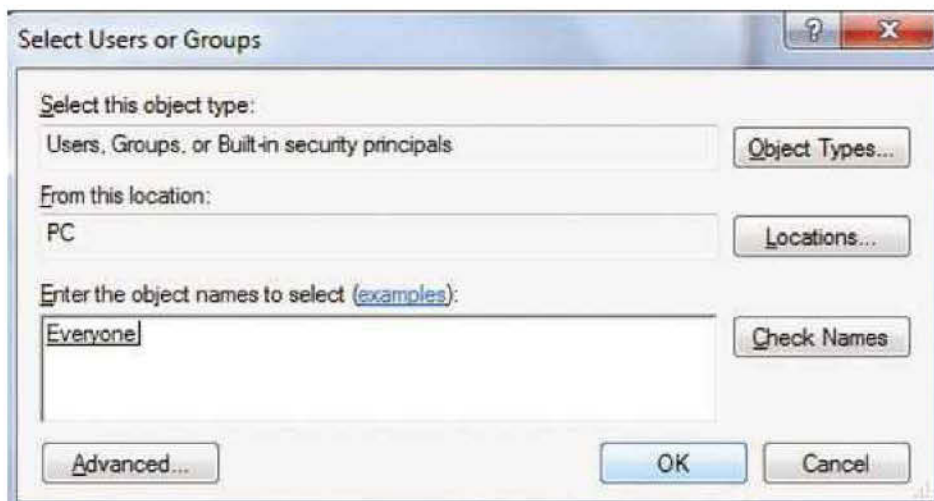
Management. Then, go to System Tools > Shared Folders > Shares' and select the option to create a 'New Share'. A wizard will then guide you through the process.

If this doesn't help, have a look at some of the advanced settings. Right-click on the folder you're trying to share, select Properties and go to the Sharing tab, then click Advanced. Now, try using the 'Share this folder' option by checking it, and ensure the user you want to access the folder is in the permissions list. Remove 'Everyone' otherwise anyone on the network will be able to access it. If this is how you want it, though, leave it as is, as everyone should be included by default. Now, click OK and see if the setting take effect correctly (you may want to reboot to make sure).

This may be something you've already tried, so let's try something a little more complex. On the Desktop press Windows+R and in the text box type 'services.msc' and press Return. Some services listed here can cause issue if they're not running, and the culprits can vary from issue to issue. Known problems include UPnP Device Host, DHCP Client, and DNS Client. Ensure these are running, and try sharing again.

Of course, you should attempt all of this as an administrator account, otherwise you may not actually have the permissions to share files.

▼ **File permissions aren't the only thing you need to worry about when sharing folders**



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

Send your questions to:
Jason D'Allison
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Jason by email at:
jason@micromart.co.uk

Whilst 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

Ready To Snap

Please tell me how to get rid of Snap.do. I'm running Windows 7 on a self-built PC, and my browser's infected. Being retired (I'm 84), I use the web a lot, though at least Snap.do has got me outside doing more gardening!

Roy Street, TalkTalk

Snap.do is a browser hijacker – one of hundreds, sadly. It alters the browser's homepage and search engine and also bolts on a silly toolbar. It's probably more of a nuisance than a security threat, though its refusal to allow easy removal definitely ranks it as nastyware. Also, no-one's quite sure what it does with the user's search data.*

Getting rid of Snap.do follows the usual basic pattern: uninstall it via Control Panel; remove any associated add-ons in the browser; and run an anti-malware scan. It's a stubborn old devil, though: you may well have to reset your browser's settings too. Snap.do can point its horns at Firefox, Chrome, and Internet Explorer, so do the business on all three if necessary. I won't detail the full process here, Roy, but there's a comprehensive guide on this MalwareTips page: [bit.do/k3TM](#).

The last step recommends a scan with a tool called

HitmanPro. I'm not familiar with that, and to my eyes it looks a bit dodgy. No other site about Snap.do mentions it, so I have to wonder if it's somehow linked to the guide's author. My advice is not to download it. Run scans with Malwarebytes' Anti-Malware and maybe Xplode's AdwCleaner and stop there.

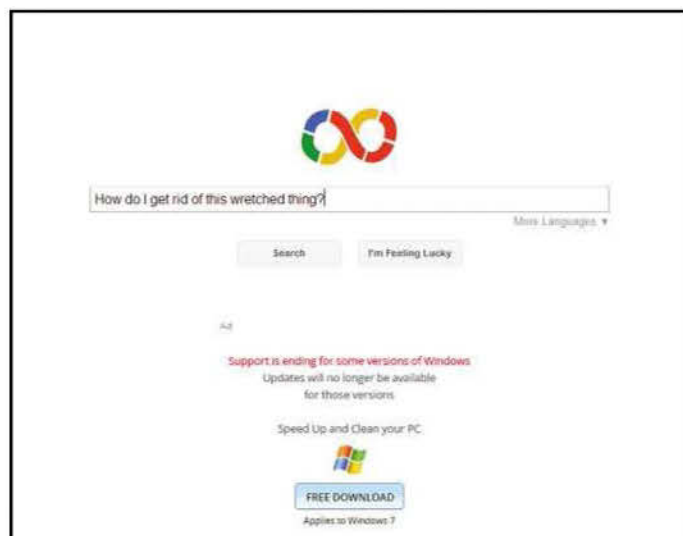
I'm not familiar with this last tool either, but it's mentioned in numerous similar guides.

But how does Snap.do infect a PC in the first place? The chief problem is that many legitimate freeware programs have setup routines that offer additional, not-so-legitimate programs (to generate some revenue). Installation of these is usually opt-out rather than opt-in, the theory being that

most users are impatient and will click past all the setup windows without paying attention. Take care, then, friends and neighbours. When installing anything, spend a couple of seconds glancing over each window and be sure to untick anything you don't like the look of.

** In Googling to see if 'nastyware' was a recognised word (it is, sort of), I discovered that Nasty is an actual place. It's a hamlet in Hertfordshire, just outside the town of Ware. So, do any readers herald from Nasty, Ware?*

▼ **You really do not want to find this on your homepage (so, support for Windows 7 is ending, is it?)**



Reset Riddle

My father recently phoned me regarding a problem with his D-Link DSL-2740R router. He thought it had broken, as he could no longer get his laptop to connect to the Internet. When I visited him, the router appeared to have undergone a hard reset, as if someone had pressed a pen into the button on the back. But no one had.

I've now set everything back – a strong password, custom SSID, and so on – and he's online again. But I'm concerned. My father lives in the town and has many neighbours, broadcasting their own SSIDs, and he also has a desktop PC connected to the same router via cable. This PC

runs Windows 2000. Is that an issue, even with a firewall and anti-virus program in place?

Steve Brissenden, TalkTalk

Having a Windows 2000 machine connected to a network with Internet access is a major, major concern. Support for Windows 2000 ended on 13th July, 2010. Even at that point it had several severe and unpatched security holes. Most of these related to remote attack. So there's certainly a possibility that your father's been the victim of malicious activity, whether he knows it or not.

In truth, Steve, I doubt the problem with the router is anything to do with this. I suppose it

could be, but most likely the router has simply overheated, thrown a wobbly, and reset. I've had this happen personally. Perhaps it's old and beginning to give up?

Even so, that Windows 2000 machine should be taken off the network immediately. There's a real risk of theft of your father's site passwords and card numbers. Neither a firewall nor an anti-virus program will be much help. Exploitation of Windows 2000's inherent flaws will probably go undetected by both. This is exactly the position Windows XP users are now finding themselves in.

Even if nothing of importance is held on the Windows 2000 system, and if it's not used for online purchases or to log into password-restricted sites, its mere presence on the network is leaving every other device vulnerable to attack. Hackers could utilise it as a conduit. Get it off the network, Steve. It should be used only offline, in isolation, or else it should be put out to pasture.

► **Never mind Windows XP – some users are still running Windows 2000**



Think Of A Number

I have an IBM ThinkPad bought second-hand in 2006. Now Microsoft has dropped support for Windows XP, I'm going to replace it, as I doubt it'll run Windows 7, never mind Windows 8.x.

I'll mostly be using the music-notation program Finale. So I can get the best from this, the new laptop needs to have a keyboard with an integrated number-pad. Also, as my storage requirements are modest (I've not exceeded 35GB on the ThinkPad), an SSD makes sense, perhaps a 128GB unit. However, according to the expert in my local big-name computer shop, finding such a laptop could be quite a challenge. For instance, most models seem to come with standard HDDs with enormous capacities – wasted on me. Only very expensive models have SSDs.

Are there any laptops with HDDs that can be replaced? Can an SSD be fitted by anyone with reasonable experience in laptop repair? According to the guide at www.crucial.com/uk, my ThinkPad can't have one. Or how about a Windows tablet with a USB keyboard attached? Is that the way to go?

Ken Moore, via email

I think you're worrying unnecessarily, Ken. First, are you sure the ThinkPad won't run Windows 7? Without knowing the model, I couldn't say. Even if it's not a goer, Vista

might be. Don't laugh! Brought fully up-to-date, Vista's a decent OS. Importantly too, extended support doesn't end till 11th April, 2017. One way or another, you should be able to pick up a Vista licence on eBay for nothing more than the change in your pocket.

*If you've set your heart on something new – or something newer than the ThinkPad but second-hand – you'll almost certainly be able to swap out the HDD. Flip the laptop base-up, unscrew the appropriate cover, unplug the HDD, plug in the SSD, and screw the cover back on. It'll take five minutes.**

When buying a new laptop, a popular site among Micro Mart readers is www.saveonlaptops.co.uk. Other sites are available, of course. The cheapest model with a number-pad is the Asus X55A-SX203H, yours for three pennies below £250. I reckon it would meet your requirements. You could whip out the 500GB HDD and sell it on eBay for £30. A 128GB SSD can be had for £50. For a total net expenditure of £270, then, Ken, you'd be laughing.

One snag with the above is the need to transfer the OS from the HDD to the SSD. With Windows 7, you can use any of the free cloning tools. EaseUS Todo Backup is a favourite: bit.do/k5SY. With Windows 8.x, however, you could experience a bit of a nightmare. Cloning is possible, but there are many gotchas. A ton of help is available

in the following threads on the Micro Mart forums: bit.do/k5Ui and bit.do/k5Ue.

Regarding a Windows tablet, you'd need a full-fat x86 model, one with an Intel or AMD processor. A Windows tablet using an ARM-based processor – running Windows RT – won't touch Finale (or any other x86-only software). I'm not sure even an x86 model will run it, to be honest. Anyway, as your plan would be to plug in a USB keyboard and use the tablet like a laptop, just buy a laptop.

** So why won't your ThinkPad take an SSD? Well, most likely its HDD uses the IDE/ATA interface, and all mainstream SSDs use the SATA interface. That's all.*

▼ **Johnny Ball was never short of a number-pad or two**



Crowdfunding Corner

Here are a pair of security related project looking for backing

This week, we're all about security. How you get it, how you keep it and, more specifically, what crowdfunding projects are out there to help you do both of those things? We've taken a look and sorted two lovely bits of wheat from the chaff so that you don't have to.

LogMeOnce: Secure USB + Password Manager

If you're concerned about your password following the news about the Heartbleed bug, you might be looking to upgrade your approach to security. If that's the case, then LogMeOnce might be exactly what you need.

LogMeOnce is a computer security platform that offers secure and encrypted storage for everything from emails to games to documents to media. You can use it on individual folders to protect them, or as the gatekeeper for an enhanced USB storage drive which will act as a secure file locker. 26-layer military protection means no one but no one will be able to look at your files without the password.

As well as securing software from prying eyes, LogMeOnce can be configured to work with Dropbox, which mean it'll keep secure backups online in the cloud, where you can decrypt them but no one else can.

The project is well on its way to completion with a month still to go at time of writing, and there are plenty of reward tiers available depending on what aspect of the project intrigues you most. \$65 (plus \$15 international shipping) gets you a 16GB LogMeOnce Secure USB and the chance to purchase a second at a reduced price of \$54. For \$72 you can get a 32GB version with extra USB lanyard. More expensive packages offer yet larger USB sticks and the chance to add even more peripherals to your reward set, such as a Power bank and multiple units. Looks like and intriguing project!

URL: tinyurl.com/kdtvwne

Funding Ends: Mon, 2nd June 2014

Just Mail: Safe And Secure Communications

It's rarely acknowledged, but email is one of the least secure modes of communication ever devised for computers. Even before you account for things like NSA backends, advertising profiles and backups, it's still a pretty unsecure method of sending information. JustMail is an attempt to create a mail platform that allows people to communicate over an email without any chance that their messages and personal details will ever be accessible by others, whether that's one snooper or a large organisation. According to the company's proposal, even Just Mail's owners can't analyse or copy files sent using the service, and all data stored on its platform can be erased in seconds.

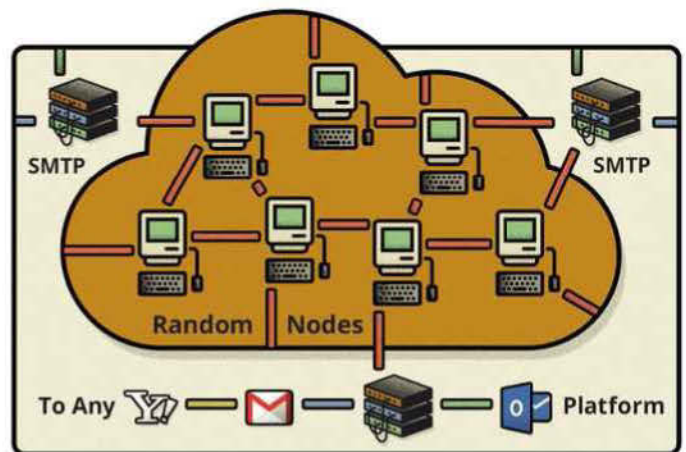
Based on the I2P network, with proven AES algorithms, sent mails are split up into chunks and then saved to a distributed system in a similar manner to a torrent file. The recipient receives a Magnet link that allows them to collect the mail. Once it's read, it disappears from the network and until that time, it's only available in hundreds of tiny, encrypted chunks, meaning it's impossible for anyone else to intercept.

Most pleasingly, Just Mail messages can even be sent to people who don't have the relevant software installed on their systems – with notifications delivered by standard email, social network message or SMS text. Recipients can then sign up for a temporary account with the service to read any messages they receive, so it's not only available to people with the right software!

Just Mail is already well into its development and the kickstarter campaign is apparently just designed to allow its developers to finish the project off with an injection of cash. You can get a beta-testing account with the service by pledging as little as \$5, with higher tiers offering multiple account invitations and merchandise as incentives for you to part with your money. This one looks really promising!

URL: tinyurl.com/m3h7juw

Funding Ends: Sat, 24th May 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

Gardenate

Use technology to help cultivate the perfect garden this summer

A few weeks ago, we had a look at a vegetable-planting app, which proved to be quite good. This week, we thought we'd take a look at another gardening orientated app.

The garden is a wonderful place of tranquility and peace, but in order to make it that idyllic sanctuary of nature, one must have a basic knowledge of what to plant, when to plant it and where to plant it.

Having more digital fingers than green ones, we tend to leave the planting of the season's produce to our better halves, who appear to be in possession of some arcane knowledge of how to grow something from the tiniest of seeds. But being the sort of people we are and thinking we can use modern technology in order to aid us, we set about working out which end of the shovel to stick in the ground. Then, armed with our smartphones, we went forth and attempted to put Percy Thrower in his place.

Gardenate

Welcome to the splendid Gardenate, winner of the 2012 Northern Inland Innovation Awards Professional Services and highly recommended in the New

York Times. Gardenate is a detailed guide on how to grow and cultivate the most popular of tasty garden veg, with local planting and sowing information for the USA, Australia, Canada, New Zealand, South Africa and, of course, the UK.

It lists the best choices of veg for planting right now, according to the date and time on your phone and is packed full of helpful and useful hints, tips and advice on getting the best possible use of available sunlight and feeding techniques for each item of your crop.

How It Works

You start by selecting which of the international zones you live in, then you access the Planting Now screen to browse the list of vegetables and plants that are recommended for planting during the current month.

When you've found a suitable plant to grow, tap the item and you'll get a more detailed view of the plant in question, along with planting advice, germination temperatures, how many weeks until harvest and so on.

In addition to the detailed information about a particular plant, you can also access the Gardenate community forum, whereby you can gain all sorts of useful

and practical hints and tips from fellow gardeners from your locale or from around the globe.

Within Gardenate, you'll also find a full list of plants that are recommended and will grow in your local conditions, plus you can monitor and record your planting details, which will link with your calendar and remind you when you need to cultivate something or when best to harvest for the optimum taste.

Conclusion

Whether Gardenate will make us into top horticulturists and help us grow prize-winning veg remains to be seen, but it's fun and it's nice to get out and enjoy the garden after all that hard work. For just 99p, Gardenate isn't too bad, and it can help those of us not blessed with natural gardening prowess to actually grow something worthwhile.

Features At A Glance

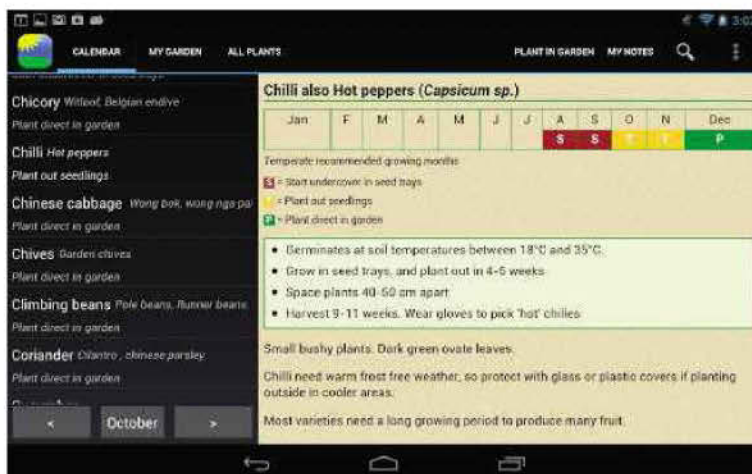
- Localised planting calendar.
- Detailed information on over 100 popular garden vegetables.
- Add your own plants.
- Helpful forum and community.



▲ Plan the perfect time to plant and harvest



▲ Use the community to get hints and tips on planting



▲ Get detailed info on the more popular veg

Logging Off

For numerous reasons, everyone these days is getting mindful of security, probably long after that particular pony went for a canter.

With the likes of Heartbleed and the activities of the media and security services, everyone has been given a timely reminder that no security is truly safe. I've also noticed a few friends who are refusing to use cloud-based technologies, because they don't trust that their information will be secure on them.

There's a basic misconception in this, because the idea that the likes of Google or Microsoft are less secure than your home network is silly. What's more likely to reduce them to your level is repeatedly using the same password – and a really obvious one at that.

There are those that just don't trust these companies, and think they're colluding with government agencies. This is entirely true, they are. However (and we need to remember this), they're required to deny it repeatedly, as part of that special relationship.

Still, you'd need to be pretty paranoid to think that the NSA or GCHQ has the manpower to trawl through the sort of stuff that most people communicate to others, unless they're somehow connected to the wrong people.

Okay, I accept that because they don't always employ the smartest people, that 'connection' might be tenuous, like you order pizza from the same deliver service. But they'll eventually work out you like different toppings and therefore probably aren't part of that terrorist cell.

For those like me who use these cloud services, there's really no other choice. And if there was, how would I know if it wasn't equally compromised or security flawed?

Rather than beating myself up about it, I've come to the conclusion that the positive aspects of cloud technology outweigh the pitfalls, for now.

However, in an attempt to be more proactive, I've recently implemented two-factor authentication. That's a feature that both Microsoft and Google are now offering, where access to your account is protected with an extra layer that usually involves a code number sent by SMS to your phone.

As with any security solution, it's flawed, because malware on your phone might be able to intercept the message or duplicate the tokens stored on it, then hand the unlock numbers to those wishing to control your account. For it to be effective, I also have to

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PUBLISHED BY Dennis Publishing

30 Cleveland Street

London

W1T 4JD

Tel: 020 7907 6000

www.dennis.co.uk

PRINTING

Printed By: BGP

Distributed By: Seymour

Certified Distribution:

13,712 average copies

Jan-Dec 2010



secure my phone with a password and preferably not mislay it.

In fact, the more I've used this scheme, the more I wonder what it really does other than force me to carry my phone everywhere I'd like to use my email.

Where I'd normally leave my phone on charge upstairs, now I must have it handy if I want to use a laptop or my tablet, even if I don't expect any calls.

And I'm told by Google that I need to print out some emergency codes just in case I go abroad and can't get data access, which doesn't sound remotely secure to me.

I'm going to try this for a month, if I can stick it that long, and see if it makes me feel any more secure and less irritated.

On paper, two-factor authentication sounds good, but the reality appears to be a tiny bit more secure for substantially greater hassle.

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: 7 Conjunction, 8 Reggae, 9 Phonic, 10 Faraday, 12 Proof, 14 Taper, 16 Smacker, 19 Factor, 20 Chippy, 22 Interpolate.

Down: 1 Acme, 2 Enigma, 3 Numeral, 4 Scope, 5 Vigour, 6 Antinode, 11 Anabatic, 13 Omicron, 15 Entity, 17 Climax, 18 Frore, 21 Peer.

DISCLAIMER

The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. There's nothing quite like a spot of astronomy to make you feel hopelessly insignificant and puny. The sun is about 93 million miles from the Earth, but light only takes about eight minutes to get to us, which gives you an idea of just how fast it is. Now think about the fact that you'd have to travel at that speed for more

than four years to reach the nearest star to our solar system. By now your head should be spinning faster than the Earth itself (about 1,000mph). We really are but a drop in the ocean compared to the vast space all around us. Clearly, the chances of us ever reaching the furthest corners of the universe are practically nil. Right now, it would take us over a year to get as far as Mars which, astronomically speaking, is basically down the road. We're not gambling men, but we'd put money on the human race being extinct long before we ever get to travel even one light year, let alone anything further. Of course, we wouldn't be around to collect our winnings and, come to think of it, neither would anyone else.



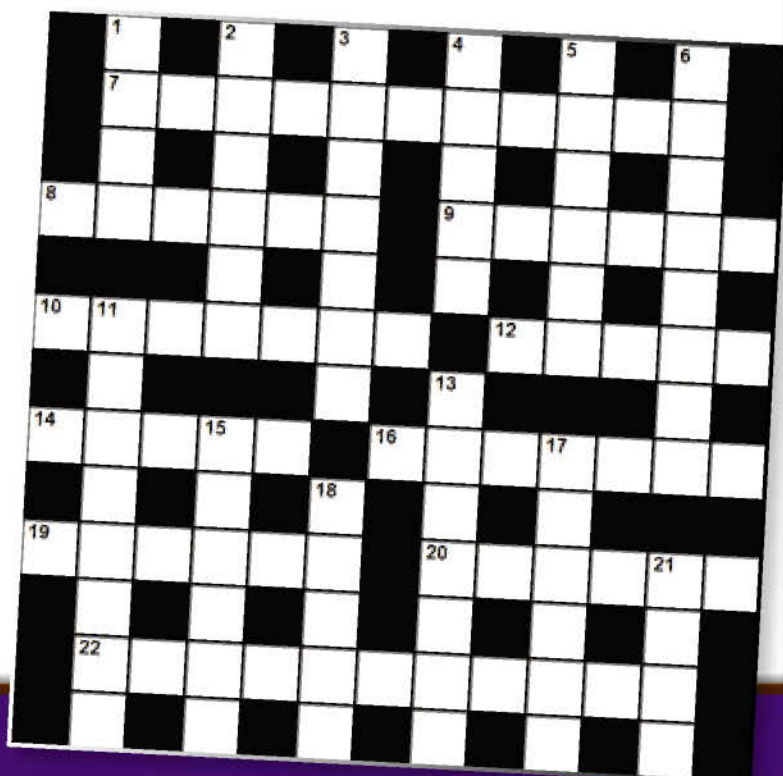
THIS WEEK'S CROSSWORD

Across

- 7 A function in which an independent variable appears as an exponent. (11)
 8 A Unix program that converts tab characters into groups of space characters. (6)
 9 Sequence of a eukaryotic gene's DNA that is not translated into a protein. (6)
 10 A system for matching colours, used in specifying printing inks. (7)
 12 A small zodiacal constellation in the northern hemisphere; between Pisces and Taurus. (5)
 14 Engage in petty or small-scale swindling. (5)
 16 The last generation of Pentium D branded processors, identified by the product code 80553. (7)
 19 A very small computer application, especially a utility program performing one or a few simple functions. (6)
 20 A Linux distro that provides a free enterprise class computing platform with 100% binary compatibility with its upstream source, Red Hat Enterprise Linux. (6)
 22 The branch of economics concerned with the use of mathematical methods in describing economic systems. (11)

Down

- 1 Programming language developed in the early 80s and considered to be a precursor to Tcl and Python. (acronym) (4)
 2 A person who chooses or has chosen. (6)
 3 Unlikely to cause offence or debate. (7)
 4 A ludicrous or grotesque act done for fun and amusement. (5)
 5 The coldest season of the year in the northern hemisphere. (6)
 6 The period in the geologic timescale that extends from 5.332 million to 2.588 million years before present. (8)
 11 The rate at which an aircraft flies relative to the air in which it is flying. (8)
 13 Software modified by criminals to avoid licensing fees or activation procedures. (7)
 15 Subscribe to others Tweets or updates. (6)
 17 An automatic near-Earth asteroid collision monitoring system. (6)
 18 The thought processes characteristic of an individual or group. (5)
 21 On one occasion or for one time only. (4)



Company Profiles

Oculus VR

How quickly can a new company become notorious? Very, very quickly – as Sarah finds out...

You don't own an Oculus VR product yet, and you won't be able to buy one for at least another six months. We'd bet you already know the name, though. The virtual reality company has made a hell of a splash through what it's revealed of its work so far – and through one massive deal they made. Let's start at the beginning, shall we?

Palmer Luckey has been a virtual reality enthusiast for a while. Although he's only 21, he's an electronics enthusiast who was always into tinkering with things, and head-mounted virtual reality devices were one of those things. Having started community college young (around 14), he'd learned quite a bit about mathematics and engineering, but was planning on studying journalism. However, when he got an idea for how he could create a new virtual reality device in 2012, he gave up on that plan, dropped out, and founded Oculus VR.

Luckey had already built several prototypes of the device that would become known as the Oculus Rift, but he didn't really know much about starting a company, so he brought in people who did: Brendan Iribe, Mike Antonov, Nate Mitchell, and Andrew Scott Reisse, all formerly of UI software company Scaleform. The next step was to raise funding, which the company initially did through a Kickstarter page. The massive response to the project (it raised more than \$2,000,000, with an initial goal of \$250,000) proved they were onto something, and also allowed Oculus VR to buy all the parts they needed to build and ship their initial units to developers.

From there, the buzz was pretty incredible. Further funding rolled in from investors, and it looked like it'd be plain sailing from there on. But then the company was hit by a tragedy: in May 2013, Reisse was hit by a car and killed. Several of the employees had known him for years, and his death was a massive blow.

The show went on, however, and development of the Rift headset continued. Oculus VR announced that it planned to make the headsets available to consumers in late 2014 or early 2015, and that its goal price was around \$300. Speculation ran wild, and the device became the most anticipated bit of gaming hardware in years.

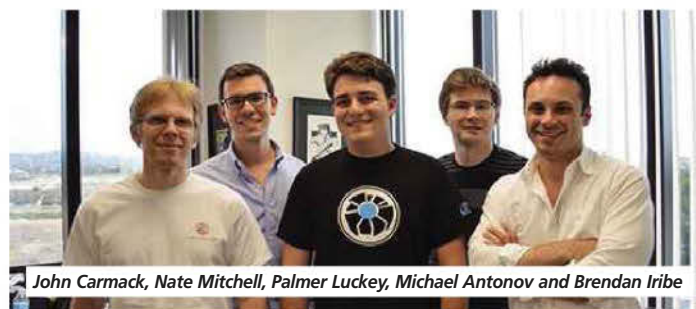
Then Oculus VR was made an offer its founders couldn't refuse: Facebook wanted to buy it. In March, Mark Zuckerberg announced that "Mobile is the platform of today, and now we're also getting ready for the platforms of tomorrow. Oculus has the chance to

create the most social platform ever, and change the way we work, play, and communicate." He's obviously pretty confident about it, because the acquisition was worth \$2 billion – twice as much as Zuckerberg and co. had previously handed over to acquire Instagram.

Not everyone was happy about the deal, though. Markus Persson aka "Notch", the developer of *Minecraft* – immediately announced that he was cancelling a previously agreed project to bring his game to the Oculus Rift platform. In a tweet, he explained his move by simply saying "Facebook creeps me out."

Other so-called fans of the Oculus brand went further, sending messages of rage and disappointment to the founders, even going so far as to send them and their families death threats. Which seems like quite the overreaction, considering the Oculus Rift system isn't even available yet.

Still, assuming the outrage dies out – which it inevitably will, in the same way millions of users decided not to quit Instagram after all – the future's possibly quite bright for Oculus VR.



At A Glance

Founded: 2012

Founders: Palmer Luckey, Brendan Iribe, Michael Antonov, and Nate Mitchell

Based in: Irvine, California

Known for: The Oculus Rift

Annual turnover: N/A

Staff: 30

Website: www.oculusvr.com

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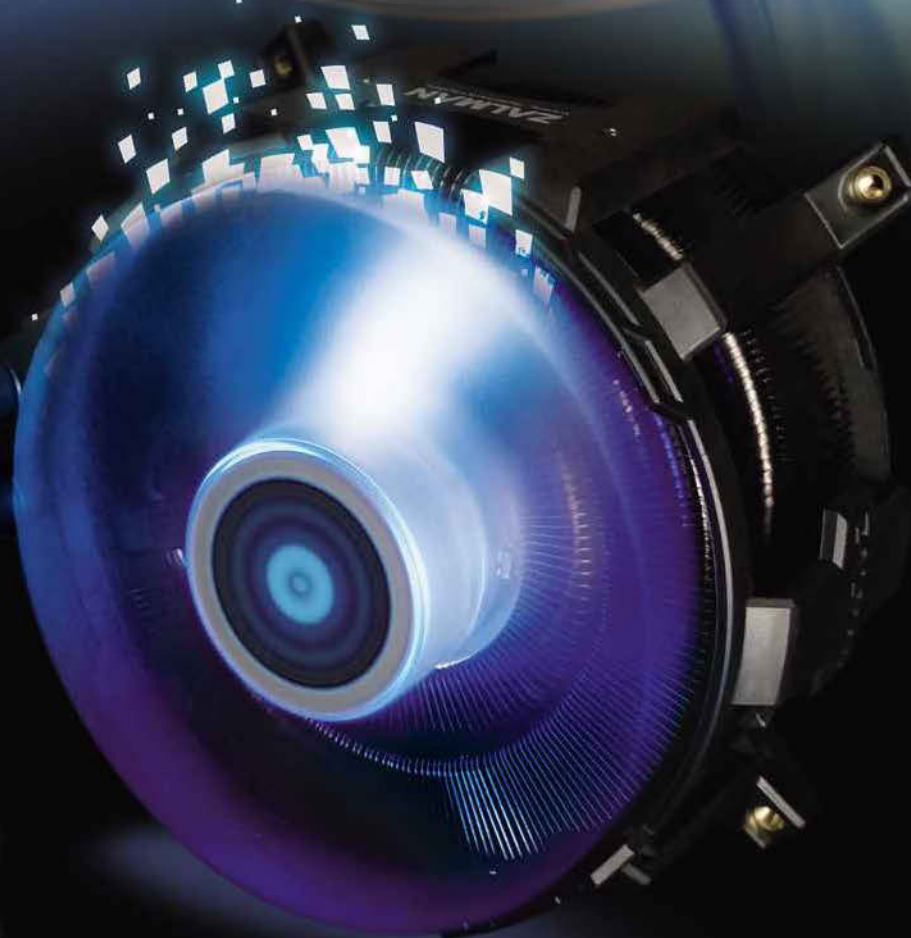
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