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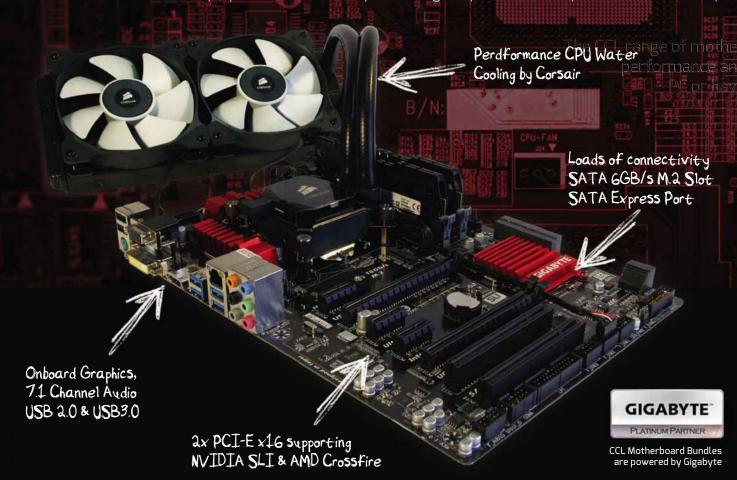


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It's normally a question that gets asked about Google, thanks to its now infamous company motto, but more recently it's the actions of Amazon that has been generating a lot of negative headlines. Isn't it just doing what any company would do, though? Simon Brew reports

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Sometimes market forces beyond the control of companies bring them down. Other times, however, it's just pure hubris, plain and simple. Mark Pickavance looks at how various technology firms have grown too big for their boots

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If you have the money, you can quite easily find yourself a car with a computer setup fit for Michael Knight himself. If, like most us, that's beyond your budget, there are other ways to add technology to your motor vehicle, as James Hunt explains

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It is axiomatic that lengthy, printed explanatory terminology tomes are somewhat moribund and no longer au courant. And if you didn't understand most of what that last sentence meant, then this week's look at iOS dictionary apps is probably just what you need

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Is Amazon Evilue

Preorder scandals. Questions over its tax affairs. Margin pressures. Is the world's biggest online retailer edging towards the dark side, wonders **Simon...**

t was Google that infamously launched under a banner guiding policy of 'Don't be evil'. Since those early idealistic times, Google has found that the pressures of being a multi-national, multi-billion dollar business don't exactly align with a resistance to exploring the darker side of the world. Therefore, whether fair or otherwise, Google's guiding philosophy has come back on several occasions to bite it on the backside.

When Amazon launched online in 1995, there was no such guiding philosophy. Amazon was always designed to make money and now makes lots of it. Founded by Jeff Bezos, he set the company up off the back of a report that suggested online retailing was going to undergo huge expansion. Bezos wanted a part of it. Scouting around for potential products to sell, he homed in on books, and the Amazon story began. Through aggressive discounting and a huge library of available stock, the firm started making a significant dent in the book market. Try as they might, nobody has caught up since.

Unlike many dot.com enterprises of the time, Amazon was a fairly instant hit too. Notwithstanding the fact that profit would be some way behind, within just a couple of months, Amazon was generating tens of thousands of dollars a week in revenue.

The Silkworm is published by Hachette, and Hachette is a company that's been in a high-profile dispute with Amazon for some time. The publisher was in disagreement over how to split the revenues from lucrative ebook sales for one thing. Ebooks is a market that Amazon pretty much dominates, courtesy of its Kindle ereader platform. It's got some competition from Apple and Google, granted, but the Kindle continues to see off rivals such as the Barnes And Noble-backed Nook platform. In the UK, the backing of WH Smiths is at least giving the Kobo range of ereaders a sporting chance of competing, and yet when it comes to the pricing of the books themselves, Amazon routinely trumps its competition. Those wanting to move away from Kindles soon find themselves returning when the price of a new release proves to be notably less.

Even when others compete on price, Amazon can flex its financial muscles. At the start of the year, for instance, Sainsbury's ran an online promotion for ebooks, reducing a bunch of books a day to 99p for rival ereader platforms. Amazon promptly price matched pretty much every book every single day, and nullified Sainsbury's campaign. It deployed similar tactics a year or two

Accusations are flying that Amazon is using its dominant position in the market to squeeze its suppliers

Bezos, from the off, was playing the long game, though. He worked out quickly that this was not a business that could or should deliver instant riches (not that many dot.coms back in the 1990s were interested in green ink on their balance sheet). As such, he put in place a plan that would see it effectively work as a loss leader for four or five years, building the business up aggressively before expecting to see profits.

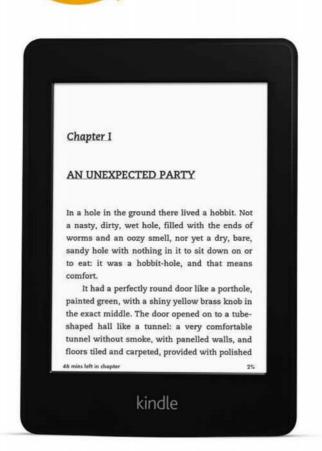
It would be fair to say that the plan worked. Now, in 2014, Amazon is the biggest online retailer on the planet. It has separate websites across the world, and in April 2014, it reported that its first quarter revenue for the year was – take a breath – \$19.74bn. That was above expectations. Tellingly, the firm's profit margin was extremely tight, at just 1% of that. And therein lies the first of many signs that Amazon may not be the friendly company that its bright, smiley logo likes to put across. Its size means that it can sell products for less and push suppliers for more.

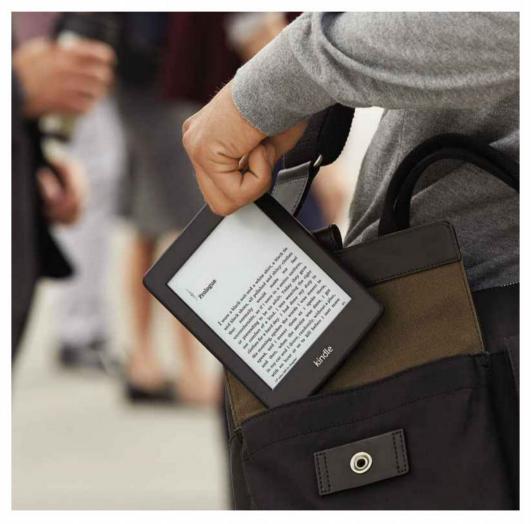
However, there are other symptoms too, to the point where accusations are flying that Amazon is using its dominant position in the market to squeeze its suppliers and make unreasonable demands. But is there any truth to that? Well, let's take a look...

The Preorder Button

The issue that's earned Amazon the most ink in the broader media of late has centred around the latest book from *Harry Potter* author JK Rowling. Writing as Robert Galbraith, her new book is the thriller *The Silkworm*. Widely expected to be a huge hit, *The Silkworm* surprisingly failed to crack the top 10 in the US on its first week of being available. Instead, it landed at number 15. But what books were keeping JK Rowling off the top spot? Plenty. Some good ones too. But as it turned out, it was more a corporate disagreement that led to her failing to break the top ten.







It's easy to paint this as a straight game of David versus Goliath, when actually there are two sizeable businesses in dispute

ago when Sony – in a drive for its own ereader devices – reduced books to 20p apiece. Amazon, with much deeper pockets, just followed suit. Sony eventually backed down.

You can see why there's so many people wanting a slice of this proverbial cake. Amazon reportedly takes up to 75% in margin from the sale of an ebook and has been working out how best to divvy that up between itself and the publisher of the book concerned.

Terms

When Hachette refused to agree to the terms that Amazon was thus asking for (the rumour was that Amazon was after the power to discount Hachette's products as and when it wanted, although this has not been confirmed), then the battlelines were drawn (Amazon was reportedly after more marketing spend from Hachette, to ensure that its books had a more prominent spot on the Amazon website).

When the two couldn't agree, Amazon unleashed a sizeable tactic: it removed the preorder button from the pages of Hachette's upcoming titles. Focusing on *The Silkworm* specifically, this meant that if you went to Amazon's page and wanted to order your copy in advance, you simply couldn't. This, in turn, meant that *The Silkworm* didn't climb the preorder chart, thus further reducing its exposure, and it dealt a fatal blow to any hopes Hachette had of it topping the bestseller list on day one. All because Amazon switched a button off.

Now we should be clear: the exact details of the breakdown between Amazon and Hachette have not been disclosed, and there are suggestions that there needs to be movement on both sides. It's easy to paint this as a straight game of David versus Goliath, when actually there are two sizeable businesses in dispute here.

Amazon's senior vice president of Kindle content, Russ Grandinetti, did talk to the Wall Street Journal to shed some light on things. He revealed that "this discussion is all about ebook pricing. The terms under which we trade will determine how good the prices are that we can offer consumers."

Now that *The Silkworm* is on sale, Amazon is stocking it, and the sales are piling up. But there's a sense that a bit of damage has still been done here, and crucially, the dispute seems no closer to resolution.

Big name authors such as Lee Child, James Patterson and John Grisham have sent an open letter to Amazon. The letter states that "As writers – some but not all published by Hachette – we feel strongly that no bookseller should block the

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Maybe Amazon is just the evolution of a status quo that has been emerging for many years

Indeed, this is about more than one book. *The Silkworm* is the highest-profile example of the pre-order button being switched off, but the profile of the title and of JK Rowling herself is still enough to get the book into the top 20. The collateral damage, it seems, is with lower-profile authors and titles, who may just have lost their shot at getting their book noticed by a wider audience. For existing titles, Amazon (and most of this action is on its US site) removed the discounting on Hachette titles, again making the books less attractive to potential purchasers.

It's worth reiterating again, though, that Hachette is no minnow, and itself was subject to an antitrust suit filed by the US Department of Justice in 2012, over accusations of – in tandem with other publishers – trying to get the prices of ebooks increased. There's an argument that this dispute has sprung up simply because Hachette is first in line to negotiate a new deal with Amazon. Yet both sides of the dispute will be only too aware that the world is watching, and that whatever deal they hammer out – assuming they do – will have ramifications for whoever gets to negotiate next.

The Pressure On Amazon

Why is Amazon being seemingly so aggressive with its negotiations at the moment? Well, some analysts argue that it's facing pressure from its own shareholders to increase its margins.

Amazon is a firm that's typically reinvested a good deal of its profit into expanding its infrastructure and reach. But reports from the US suggest that its shareholders are looking for a greater return on their investment. Therefore, they want more profit and more money to be paid back to investors.

This has, for the most part, gone against the way that Amazon has traditionally done business, and subsequently it's facing demands on its own business model. Furthermore, while it routinely brings in billions in revenue every month, it spends heavily to make that cash, so financial results from Amazon have been greeted with a degree of disappointment of late.

Everything's Not Awesome

It's not just in books, however, that Amazon's negotiating stance has been called into question. One of the biggest movies of the year at the US box office has been *The Lego Movie*. It's taken more money in America than films such as The Amazing Spider-Man 2, *Godzilla, How To Train Your Dragon 2* and *X-Men: Days Of Future Past*. Given how well family movies do on DVD and Blu-ray, it's got a strong shot at being the best-selling disc of the year.

The disc was released in America at the end of last month, but if you went to the Amazon.com website earlier in June and tried to preorder it, the option had been removed. And as it turns out, the reason for this was a pricing dispute. As Variety reported, Amazon had stopped taking preorders for a bunch of Warner Bros DVD and Blu-ray titles. These also included hits such as 300: Rise Of An Empire, Winter's Tale and Transcendence (the preorder button is back now on those titles that have not yet been released).

At the core of the dispute was reportedly an ongoing negotiation over terms, and when agreement couldn't be





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resolved in time, Amazon removed the preorder option once again (in Amazon's defence, if it had doubts that it would receive stock, it would not offer the preorder option). As a result, one of the biggest movies of the year wasn't in the top 100 sellers list for the site. Digital copies of each of the films were available, however, to be sold via the Prime Instant Video service, which we're coming to shortly.

Amazon reversed its decision not to offer preorders on assorted Warner Bros titles towards the end of June, as it edged towards a resolution with the studio. But it's a fairly hefty weapon to have in your armoury, and it's clearly been noticed that Amazon appears to have used it in two high-profile cases this year alone. Furthermore, these are the cases that have made it to the mass media's attention. Lower-profile cases may or may not exist, but given they've not had the same level of exposure, it's hard to ascertain. Amazon, however, does appear to be firmly in people's crosshairs right now.

Meanwhile, In Britain

The two issues we've explored thus far have been centred mainly on Amazon's American operations, but there have been two incidents this year that have won its few new friends in the UK.

The first, which is part of Amazon's broader international strategy, was a change in its Prime membership service and the bundling in of Prime Instant Video. For many years, the Amazon Prime service instantly upgraded every purchase to next day delivery, for a one-off annual charge of £49. Excessive? Possibly, but this proved popular, and if you do a lot of shopping at Amazon, it can prove cost beneficial over the course of a year. Whether you ordered a ball of string or a high-definition television, your product would be where you needed it the day after.

Is it actually doing anything that other big companies wouldn't do in order to maximise their profits?

However, earlier this year, Amazon bundled Prime in with Instant Video. Amazon has for some time offered DVD rentals and had been moving towards digital downloads of movies. But in an effort to take on the likes of Netflix and iTunes, it repackaged its Lovefilm service into Prime Instant Video earlier this year.

On paper, this looks interesting. As with Netflix, for a set subscription fee, you can stream as many films and television programmes as you wish, be it to tablet, computer, phone or television. Furthermore, Amazon has been investing in programmes exclusive to it, so for instance it snapped up the UK rights to the new Steven Spielberg-backed science fiction series Extant. It is also investing in original programming.

The problem was that it wrapped Instant Video up with its Prime service, and they're not exactly mutually beneficial. Prime was originally about paying a flat fee for shipping, not about streaming *Arthur Christmas* to your mobile phone. Furthermore, in bundling the two together, it added a 60% premium to the price. That £49 annual fee went up to £79, whether you wanted the Instant Video function or not. Amazon argues that many customers were pre-existing members of both Prime and the



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Acquisition

Amazon has been both ruthless and savvy in snapping up other products and services to enhance the products that it offers. Here are some – and there are many more – of the firm's key acquisitions over the years...

1998 Internet Movie Database (IMDB)

2003 CD Now
 2005 BookSurge
 2007 DPReview

2008 Audible, Abe Books, BoxOfficeMojo,

2011 Lovefilm, The Book Depository

2013 Goodreads2014 Comixology

Lovefilm service, so this would represent a saving to them. To others, it looked suspiciously like a massive price hike via the back door.

What's more, this isn't a price increase that's been reflected in the US. Amazon didn't instantly raise the membership price when Instant Video and Prime were unified at Amazon.com, although it has done since. The service costs an annual \$99 in the US. That equates to just over £57 in UK money, although VAT would need to be added to that. Even so, it'd still settle the final price under £70. The UK tax is in force.

There was some furore when all of this was first announced, although inevitably – given that this is for a premium service – it's died down a little since. What hasn't died down is the controversy over Amazon's approach to tax in the UK.

Taxing

Earlier this year, it was revealed that Amazon had brought in revenues of £4.3bn in the UK in 2013. That's more than the likes of Argos and Dixons managed. However, it was subsequently revealed that it had paid just £4.2m in corporation tax on that. That's less than 0.1%. The UK corporation tax rate currently stands at 21%, although it's important to note that this is payable on profits, not revenues.

Even appreciating that Amazon's profit margin is very low, 1% of £4.3bn is £43m. 21% of £43m is just over £9m. This is beer mat maths, certainly, but even if you take Amazon's UK profit at that 1% level – and it may be higher – there seems to be a disconnect somewhere. Amazon actually reported a UK profit of £17m in 2013 – so that's a margin of 0.5%. But why?

Well, when you buy an item from Amazon.co.uk, the payment for your order is actually taken by Amazon EU S.a.r.l. It's the letter at the end that's important there: it indicates (although doesn't stand for) that Amazon has set up this part of its business in Luxembourgh. By doing this, Amazon can reduce its UK profits and, in turn, its UK tax contribution. Appreciating that it employs thousands of people in the UK and thus contributes to the economy in other ways, this still leaves a raw taste. Not for nothing did Margaret Hodge MP, the chair of the public accounts committee, say that "it is an outrage and Amazon should pay their fair share of tax. They are making money out of not paying taxes," she argued, urging shoppers to go elsewhere.

Amazon, for its part, argues that it "pays all applicable taxes in every jurisdiction it operates within," and that it has "a single European headquarters in Luxembourg with hundreds of employees to manage this complex operation."

However, its tactics here have won it few friends, drawing parallels with the likes of Google and Starbucks in the manner it which it routes its business for optimum tax efficiency.

But Is It Evil?

Yet, taking all of this into account, is it fair to call Amazon an evil company? Is it actually doing anything that other big companies wouldn't do in order to maximise their profits? After all, under US law, Amazon is required to maximise its business for its shareholders, and should it be blamed for taking advantage of a loose tax system for its own benefit?

Answering that depends on where you stand on the line between what's legal and what's moral, inevitably. There's an argument that runs that just because you're not legally compelled to do something, it doesn't mean you shouldn't do it anyway. It's hard not to ask questions of a firm that takes many billions of pounds of business a year from the UK, and returns such relatively minute amounts on corporation tax. Not for nothing did many independent booksellers post 'We Pay Our Taxes' posters in their stores in protest, arguing that they have to pay a far greater proportion of takings in their tax than the competitor that's far richer and takes far more money.

Yet perhaps that's why this has all come to light: because of the unquestionable power that Amazon now holds. Just look at the way it used one of the most read web pages on the internet – its own home page – to aggressively, and successfully, push the Kindle range. It's now set to muscle in on the iPhone and Android marketplace with its own Fire range of phones, and it has the audience via which it can launch, and get close to guaranteeing a success of, any product it wishes. That's not to say it's bullet-proof, but right now, it feels about as close as you can get to that.

When Blockbuster Video went into administration and finally shut down its stores, there was a mixed reaction. Mixed, because on the one hand, it was sad that a physical store offering films to buy and rent was shutting, decimated by competition from online stores such as Amazon. Yet on the other hand, independent video stores were attacked by Blockbuster using the same tactics, and the chain put lots of small firms out of business via its aggressive expansion and then used that power to negotiate



more favourable terms with suppliers. This isn't confined to one market either: for years, many independent videogame retailers would go and buy their stock from Tesco, because the price the supermarket was selling it for was lower than that being charged by a trade supplier.

So maybe Amazon is just the evolution of a status quo that has been emerging for many years. Maybe it's the poster child for a system that allows big companies to dominate markets and to potentially exert levels of control that make the playing field fundamentally unfair. Amazon, at the very least, has ruthlessly benefited from this and continues to do so. Were it to suddenly disappear overnight, it wouldn't be long before another firm came in to fill the gap, using exactly the same tactics.

Something is clearly wrong, that much is clear, but it is worth remembering that Amazon, unlike Google, never tied itself to a slogan such as 'Don't Be Evil'. That would not be the last of its savvy decisions. mm

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EXPERT REVIEW

David Ludlow says 5/5 stars for the TV Bed

David Ludlow at expertreviews.co.uk tested the Azure model in the TV Bed range, assessing it for its entertainment performance but also reviewing it as a key item of home furniture. "Great-looking and incredibly well made, the Azure ships with a high-quality TV for a great price."

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The Curse of Complacency

Mark Pickavance examines the perils of corporate smugness

and how it can ultimately destroy a technology giant

t's probably one of the most commonly asked questions aimed at politicians and industry leaders: 'Are we being complacent?' Unsurprisingly, that's not usually one that gets a positive response, unless it's posed to someone looking to disrupt the official line or focus minds on environmental issues.

Instead it's usually the trigger for a wry smile followed by platitudes about the amount of money and resources being directed at the potential problem or how its importance is being inflated by others.

We've all seen this and how especially for politicians it can go horribly wrong, when they use their own child in a stunt about the safety of food stuffs or erroneously claim they weren't at the wheel when their vehicle was caught speeding.

But corporate hubris using comes when the company in question is unreservedly the market leader or at least succeeding on some level. In the minds of those guiding the company, they've made the right decisions so far, so why wouldn't they continue to do that?

That's the same logic that someone playing roulette uses to imagine that because they lost previously their chance of winning through successive bets is enhanced. It's flawed, and in the case of tech companies it also assumes the lack of external influence.

To better understand how a world beating company can be brought low, let us look at some of the classic examples and

see if there are any common threads as to where they all went terribly wrong.

IBM

Back in the 80s it was like IBM could do no wrong, as its IBM PC became the office darling and provided a stepping stone to lucrative 'big tin' investments by many large companies. In

Back in the 80s it was like IBM could do no wrong

1985, the company had 400,000 employees and a gross income of \$50bn.

Computers, it seemed, were like a licence to print money, but along with the success, IBM began to think that it was significantly more important a tech company than any other. It also thought that the PC was entirely its own property, even if many of the best ideas in it had been borrowed from the Tandy TRS-80. That made them very difficult to protect with patents,





and as IBM didn't own the 8080 CPU technology (Intel) or the OS (Microsoft), it became increasingly frustrated at others' ability to enter the PC market and undercut IBM.

However, things really came to a head when Microsoft, which had been working on IBM's OS/2 brought out Windows 3 and took the market by storm. Between 1991 and 1993, IBM lost over \$16 billion and was forced to axe half the workforce in an attempt to protect the whole company from a commercial meltdown.

What I remember most about this period was a poster that IBM used at a computing trade show with the words 'No one ever got fired for buying IBM'.

It demonstrated a level of arrogance that was at the heart of this failure, as it stuck in the throat of many like me at the time, who signed the purchase orders for their products.

IBM went to the brink, reinvented itself and got out of hardware. But it also isn't the same company that thinks it has corporate IT by the throat, like it once did.

Lotus 1-2-3

When I first got involved with PCs – and we're talking the IBM XT variety here – there were only a few apps that they were bought

to run. One of these was Lotus 1-2-3, the spreadsheet by which the world of accounting was truly revolutionised.

The big problems for Lotus began with the arrival of Windows 3.x and the advent of the graphical user interface era. Technically, it had major problems before that point. Many of these stemmed from a delay to v3 of over a year to entirely rewrite the source from assembler to 'C'. When Windows arrived it appeared that Lotus wasn't entirely convinced that the market would swing that way and continued pushing the DOS-based 1-2-3 as its primary product.

Eventually the penny dropped, but by then Microsoft Excel was becoming the de facto standard for Windows spreadsheets. It didn't help that the first Windows version of Lotus 1-2-3 was almost a complete port of the DOS version and used the GUI functionality very little. It found a small success with those unwilling to learn new key stroke combinations but didn't really justify the label of Windows application.

Ironically, Lotus did develop a good Windows spreadsheet based on work it had done for the NeXTSTEP platform created by Steve Jobs. This was a true GUI spreadsheet, offered some innovative features including the ability to sum in 3D through multiple sheets and a macro language that wasn't cell contents based.





▲ It had many, many discs but very little product development



A President Barack Obama used a BlackBerry when he took office, but he did promise change over his presidency

Lotus released Improv for Windows, and got many positive reviews but chose not to try to move its existing user base to this solution

Eventually, due to poor sales, Improv was cancelled, and Lotus focused on its DOS office suite, Lotus Symphony, which ultimately morphed into Lotus SmartSuite under Windows. It wasn't a success in this form, and Microsoft used its domination of the OS market to become the only effective player in the office application suite game, sealing Lotus's fate entirely.

By the time Windows 95 arrived, Lotus was owned by IBM. For seven years IBM allowed it to operate independently before assimilating the remnants of this once massive company in 2002. IBM discontinued development of IBM Lotus Symphony in 2012 and rebranded products like Notes and Domino to no longer include the Lotus name.

A sad end for the company that created the first true 'killer app', which sold many PCs purely for the purpose of running 1-2-3.

The irony of this story is that 1-2-3 had condemned its market predecessor Visicalc in the same fashion as it was overtaken by Excel. The world of software changed, and unable to react quickly enough, it led to evolutionary extinction.

The golden time for Lotus 1-2-3 only lasted from its launch in 1983 until the early 90s, and once Windows took hold it was commercially a dead man walking.

With Notes, Domino, and other products, Lotus demonstrated its had lots of good ideas for developing the electronic office. Its downfall was not to realise that its continued existence relied on Microsoft, a direct competitor, and the full implications of what that meant for it.

BlackBerry (RIM)

In terms of meteoric rises and equally spectacular falls, it's hard to better Research in Motion, the company behind BlackBerry phones.

Its unique product was one that was specifically aimed at business people, and initially they loved BlackBerry phones

The golden time for Lotus 1-2-3 only lasted from its launch in 1983 until the early 90s

to the point that they were often labelled 'crackberrys', as if supporting an addiction.

When President Obama came to office, he was a BlackBerry fan, and it was even reported that the CIA built him a special one with unique call encryption installed.

With the support of Obama and many high-profile business users, the number of BlackBerry subscribers rocketed.

In 2004, it boasted a million subscribers to its technology, and in the next seven years it increased that to 77 million, generating a net income of more than £2.2bn. But storm clouds were gathering in the form of Apple and Google, and soon BlackBerry wasn't the phone of choice any longer.









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A major contribution to the rise of these platforms was a very high profile worldwide service outage that struck the company in 2011. A major selling point of the BlackBerry infrastructure was its 'push' communications, where messages were routed to the devices rapidly. When this dramatically failed, while less ambitious email and messaging on other smartphones carried on working, much of the shine came off the BlackBerry brand.

If the rise was fast, the decline was even quicker. In 2010, it had 41m customers, which increased to 70m in 2011 and then the growth slowed in 2012. It added just another 7m in 2012, and then just 2m in 2013. A decline is expected in 2014, as BlackBerry has effectively left the phone market, and people are replacing their products with Apple or Google handsets.

During this period, it launched its new BM10 OS and Z10 product range, both designed to change the fortunes of the

•• In terms of corporate egos, they don't really get much bigger than this one

company. Pushing these new products, it then president and CEO, Thorsten Heins tried to suggest that the company's problems were because it innovates too much.

But being overly innovative wasn't a long-term problem, because according to Thorsten, interviewed in April 2013, "In five years, I see BlackBerry to be the absolute leader in mobile computing – that's what we're aiming for."

In the same piece he also said that tablets would be gone in five years, because they weren't a "good business model". The term 'complacency' doesn't seem to do him justice, really, because this is much more delusional.

Many people, including myself in this very publication, questioned Heins' sanity at the time, and just eight months later vindication came when BlackBerry eventually fired him.

Under his tenure, BlackBerry went from owning 50% of the

smartphone market to just 3% and stepped out of the market entirely after a rescue bid collapsed.

It could be argued that the failure of BlackBerry was due to external forces, but the BM10 products were very derivative solutions in what was a rapidly evolving market.

What was probably the defining factor was the lack of investment in infrastructure, in regard to app development and software distribution. Compared with Apple and Google, the BlackBerry app store was always a rather desolate place, the same problem that's hampered Microsoft's attempts to make its mobile platform anything more than a sideshow.

Microsoft

In terms of corporate egos, they don't really get much bigger than this one. Having started out by reselling an operating system (MS DOS) to IBM for the PC, a product that wasn't really considered important by its maker, it soon built an unrivalled software empire, featuring the two biggest selling products ever: Windows and Office.

With that sort of track record, it wasn't long before Microsoft started to believe its own marketing hype and entirely ignored those little people who actually bought the products.

Along the way, it had its failures, like the Bob interface, but the first big dose of hubris came with Vista, the OS that almost nobody wanted. When Steve Ballmer recently stepped down as CEO, he brought up Vista when asked what his greatest regret was.

The problems that Vista had were numerous, not least that it came after the generally very popular Windows XP. But those problems were compounded by the relationship that Microsoft had with its hardware partners, where labels declaring 'Windows Vista Capable' were put on machines that didn't meet the minimum specification for that OS. As a result, they ran very poorly, much worse than Windows XP on the same equipment.

The problem here was the very cosy relationship that Microsoft had with hardware resellers at the time and how that made it totally forget the actual customer.

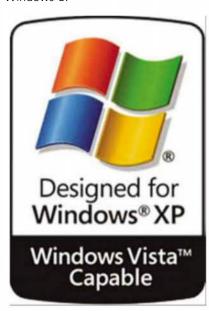
You'd think that given the bloody nose that Vista gave it, Microsoft would be putting customers first from this point onwards, but just five years later it executed an almost identical plan with the much reviled Windows 8.



▲ Ex-head of the Windows Division Steven Sinofsky waving with one hand at the Windows 7 launch, while predicting with the other how many month he'd last after Windows 8 came out.



▲ The truth ironically spoken by the man who started Intel.



Who exactly was to blame for Windows 8 is an interesting debate, but many at Microsoft point the finger at Windows' division head at the time, Steven Jay Sinofsky.

In an attempt to gauge how it was doing with a radical interface redesign, Microsoft released a preview of Windows 8, ostensibly for 'feedback'.

The information it got unambiguously told it that those who used desktop computers didn't want the touch interface or to buy a touch-screen. Sinofsky wasn't really interested in hearing this and pushed on regardless, in the complacent belief that people don't like change but they'll adapt. They didn't, and since then Microsoft has been on a journey of rediscovering the virtues of Windows 7, which it will have regressed back to by Windows 9.

Microsoft got rid of Steven Sinofsky, but not the complacency problem, it would appear. It entirely got wrong the demand for its Surface tablet range and was forced to write down a billion dollars in unsold stock. And it brought its new console, the Xbox One, to market with a boatload of negative features for gamers and was forced to rescind most of them, including the one that made the attached Kinect mandatory. Because of this, sales have been sluggish, and Microsoft trails Sony's PS4 in all the markets that matter.

By believing that its OS empire was effectively unbreakable, it's allowed both Apple and Google to wrestle away control of

When Apple launched the iPhone in Q4 2007, Nokia had 62.5% of the smartphone market

the world computing stage. The fact that the new versions of Office it has planned support operating systems that aren't its own is testimony to this fact.

The new mantra coming out of Redmond is that it's 'listening' to their customers, like that's something special that it does. It might be that it is special for a company that's been so deliberately focused on getting what it wanted and not delivering what its customers actually needed.

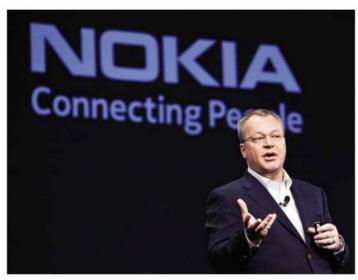
Nokia

With the recent purchase of its mobile phone division by Microsoft, it's easy to forget that for many years this was the biggest and most prestigious maker of mobile phones in the world.

Within a few short years, though, its slice of the lucrative smartphone market was decimated, and it eventually ended its own operating system projects and took Microsoft's Windows Phone instead. Further failure to make a serious dent in the market then eventually led to the mobile arm being bought and Nokia as an independent phone maker ceasing to exist.

What's fascinating about the demise of Nokia is that there were people inside the company who were innovating in much the same direction as Apple, but poor management decisions allowed those opportunities to pass by.

Ari Hakkarainen, a manager responsible at Nokia for marketing the Series 60 phone told the New York Times that



▲ Under CEO Stephen Elop, Nokia went from a company failing to address market movement to one doing the same owned by Microsoft. For doing this, he successfully connected Microsoft with his own bank account to the tune of \$33m

in 2004, well before the Apple iPhone, that the company had demonstrated a touch-driven handset to employees.

Hakkarainen explained, "It was an expensive device to produce, so there was more risk involved for Nokia. So management did the usual. They killed it."

This wasn't the last mistake it would make; another was to buy the Symbian OS, an operating system whose origins lay in the Psion mobile systems of the 1980s.

Its intention was to make this OS open source and allow a development community to grow around it. Its lack of research in this respect came back to haunt it when it discovered that parts of Symbian were licensed to other parties, scuppering any attempts to publish the source under an unrestricted public licence. By the time this was resolved it was 2010, the world had moved on and so had the developers.

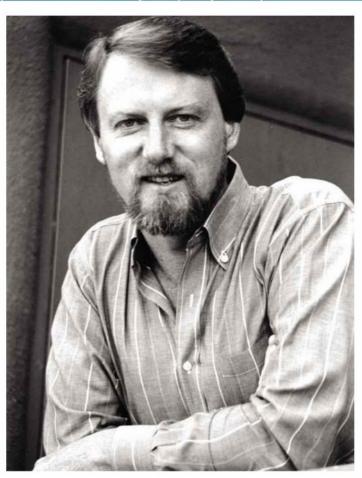
At about that time, Olli-Pekka Kallasvuo stepped down as CEO and gave way to Stephen Elop, previously a Microsoft business division head. He gave his infamous 'burning platform' speech, outlining the dire state Nokia was in and set about ending Symbian and MeeGo development. He ultimately connected the future of Nokia to Microsoft by taking its phone OS, which then appeared in the Lumia range of devices. This was a path, either by design or accident, that lead to full ownership by Microsoft in May of 2014.

The fall from 2007 to its acquisition was one of the most dramatic in corporate history and demonstrates well that the technological tide can turn on any company, however successful.

When Apple launched the iPhone in Q4 2007, Nokia had 62.5% of the smartphone market, and RIM (BlackBerry) and Microsoft each had about 12%.

A year later, that had been eroded to 40.8%, and then 32% by 2010, after a brief recovery brought on by the N97 design. From there the descent continued, with 15% reached in Q2 2011 and 5% in the middle of 2012.

Despite a \$5 billion cash injection from Microsoft and a huge marketing exercise by both companies before acquisition, it's only managed to trap 7% of the market, which is now entirely dominated by Apple and Samsung. Neither of these companies were significant in the mobile space in 2007, and now they've come to eat Nokia's lunch.



▲ Gary Kildall in 1988. The man who went on holiday while Bill Gates built the foundations of Microsoft. Copyright Tom O'Neal, Carmel Valley, CA

Giving away such a huge market lead can only be the result of either ineptitude or complacency, and given that some of the phones its launched in the past seven years have had good reviews, it looks strongly like the latter.

But don't take my word for it. In an interview, former Nokia CEO Olli-Pekka Kallasvuo gave a candid oversight to what went wrong with the phone giant. Rejecting the view of Nokia as arrogant, he entirely accepted that it became complacent, as those in dominant positions often do.

"In successful companies, it's easy for things to start to feel comfortable," said Kallasvuo. "It reduces the appetite for risktaking and innovation. It's like this in every successful large company, and it is difficult to fight against it."

What he also talked about was that he thought Nokia might have been able to fight Apple or Android, but not the rise of both technology platforms at the same time.

Complacency in a competitive industry isn't a great combination, and it turned Nokia from a household name into a division of Microsoft with an uncertain future.

Are They Really Complacent?

In writing this piece, I've tried to get a deeper understanding of the psychology of corporate entities and how they make-believe that the world is one way when it is in fact another.

I've trotted out some of the better documented and recent falls from grace, but the tech industry as a whole is littered with them. Where in the automotive industry the failure to succeed with one vehicle isn't terminal, in the world of tech, it only takes a very public failure to turn any business dream into a

commercial nightmare.

I can't help but think in many cases that companies act one way while secretly being very paranoid about their future and how long any success might last.

For example, with many tens of thousands of employees, surely somebody in Nokia had seen an iPhone and understood the potential catastrophe it might unleash on them if it remained unchecked? I'm sure someone realised, but did that message get through to those senior people, and did they act appropriately? Well, it appears not.

That does suggest hubris on their part, because however you dress it up, companies aren't actually alive, it's the people in them that give them a personality.

What seems to destroy many companies is when those leading them suddenly decide that they have the power of second sight, and they see everything working out perfect.

In mentioning Microsoft, it's worth pointing out that the very existence of this company is because of the ego of one man, CEO of Digital Research Gary Kildall.

Surely somebody in Nokia had seen an iPhone and understood the potential catastrophe it might unleash

His company made the CP/M operating system, and that was the one that IBM wanted for its new Personal Computer in 1980. It wanted it because some guy, called Bill Gates, told it to approach this company.

According to some versions of this story, negotiations between Kildall and IBM ran into difficulties over the signing of a NDA (non-disclosure agreement), and the CEO and his wife left the meeting without a contract and went on a month's vacation.

That left IBM in the lurch, as it had a computer launch rapidly approaching but no operating system to install on it. Gates was tasked with finding a replacement for CP/M and found one called 86-DOS by Paul Allen of Seattle Computer Products.

The deal was done before Kildall returned, and when the IBM PC was a success, Microsoft made billions from that one deal. DR later released CP/M-86 for the IBM PC for a whopping \$240, but that boat had already sailed by then and it never sold many copies.

In Gary Kildall's defence, IBM had tried to get into the small computer market previously and failed, so the assumption that it would again wasn't outrageous.

A much bigger mistake was the one that IBM made when it did the deal with Microsoft and gave it royalties on each copy of DOS sold rather than buying the product outright. Microsoft paid Paul Allen \$75,000 for DOS and licensed it to IBM for \$430,000. It's been conservatively calculated that licensing MS-DOS netted Microsoft at least a billion dollars in the 80s and allowed it to build future products like Windows and Office that make many tens of billions a year even now.

With success like that, it's easy to believe a company is invincible, even if much of its good fortune was because of another colossus of industry thinking it's also too big to fail. mm

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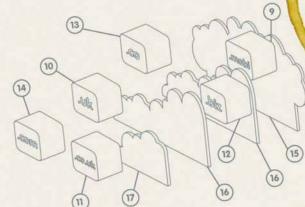
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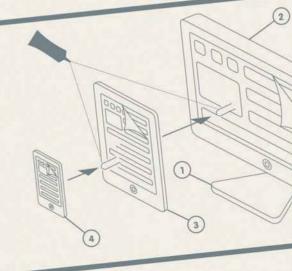
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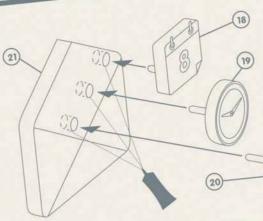
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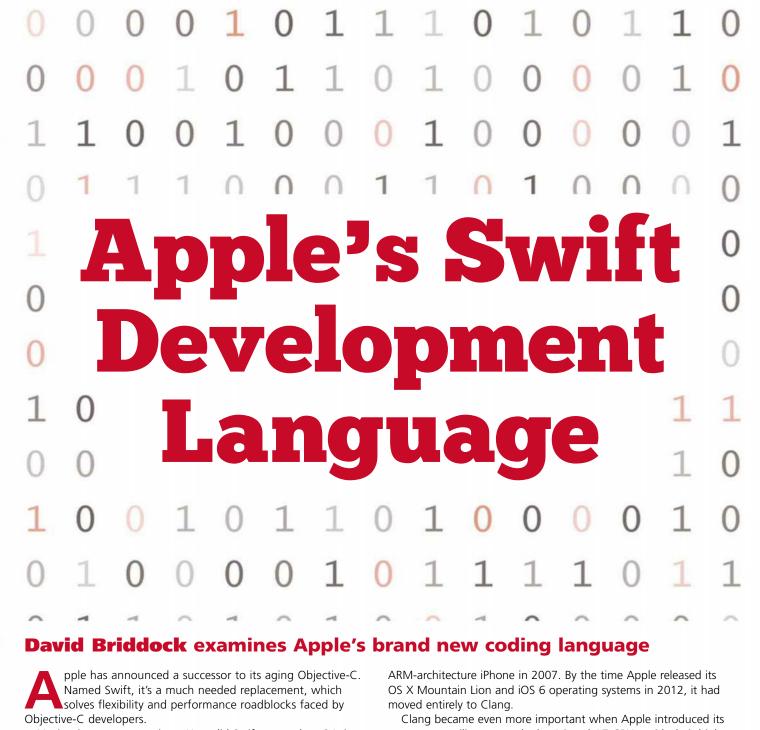
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Yet it raises many questions. How did Swift come about? Is it any good? Will it impress Apple developers? And what might it mean for the mobile developer community as a whole?

Apple's LLVM Toolchain

Objective-C, essentially a mash-up of Smalltalk and C, has been around for a very long time. It arrived on the scene in December 1996 when Apple acquired NeXT Software technology, a company founded by Steve Jobs during his enforced absence from Apple.

Chris Lattner is best known as the founder and chief architect of the Low Level Virtual Machine (LLVM) Compiler Infrastructure project. He started work on the open-source initiative during his time at the University of Illinois. In 2005, Lattner become an Apple employee.

In 2007, his team created a new front-end code parser for Objective-C/C/C++ called Clang, which had a modular library based architecture, fast compilation speed, low memory use, expressive diagnostics and tight integration with Apple's Xcode development tools.

Further Clang refinements, including integration of the OpenGL graphics stack, helped Apple migrate Mac software to Intel chips in the beginning of 2005. And the same tools delivered iOS on the

Clang became even more important when Apple introduced its own custom silicon, namely the A6 and A7 CPUs, with their high-performance graphics. At WWDC 2014, Apple also announced a new, super-fast graphics layer called Metal, which in some cases can offer a tenfold increase in graphical rendering performance.

Enter Swift

In 2010, Lattner and his team began working on a new programming language closely aligned to LLVM technology. The team took ideas from a multitude of other languages, including Objective-C, Rust, Haskell, Ruby, Python and C#.

The project remained a deep secret for a number of years. Nevertheless, the work became increasingly important and Lattner eventually took control of Apple's entire development tools department.

Apple announced Swift at its WWDC 2014 event. It claimed this new programming language, "would make software developers lives easier." The presentation went on to say, "Swift is friendly to new programmers. It's the first industrial-quality systems programming language that is as expressive and enjoyable as a scripting language."

The announcement was heavily focused on Swift's modern features and script-like syntax. Yet the assembled developers were

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← Chris Lattner

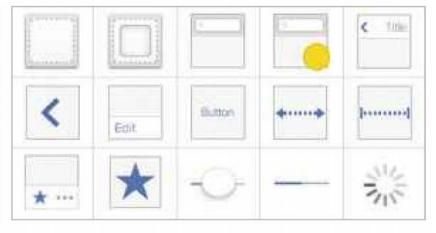
∀ WWDC 2014 Swift announcement Swift features Sprite Kit components LLVM dragon logo

Apple's Cocoa And Cocoa Touch

Cocoa Touch is an iOS-specific software framework, largely implemented in Objective-C.

The UIKit enables developers to build apps with the full range of touch GUI buttons and controls, multi-touchgestures, 2D/3D graphics, full-screen views and high-quality audio. It also interfaces with other hardware elements such as cameras, GPS systems and motion sensors.





also told that migration from Objective-C to Swift would take minimal effort.

The Right Language?

An Objective-C replacement is long overdue. Swift has a modern look and feel with its clean syntax, dynamic typing and automatic memory management. It performs a far more rigorous examination of the code, both in real-time while editing and during compilation, and Swift code listings are much smaller than for similar apps written in Objective-C.

But Swift isn't revolutionary. All the so-called new features already exist in many other popular languages, and scripting-style coding brevity is widespread in modern development.

Most importantly, it's a movement in the wrong direction. Apple hasn't recognised that times have changed. These days, the software development community make up their own minds about languages and tools, and they favour standard-based technologies that are platform-independent.

Swift is another proprietary language attempting to lock developers into a platform, so it's unlikely to attract the open-source coding community. In fact, it's more likely to alienate some of the existing Objective-C tribe.

Another problem is that in comparison to modern-day libraries and frameworks, the Cocoa and Cocoa Touch libraries (see boxouts) are strange and outdated. In reality, it's only the potential of high revenues from iOS apps that swelled Apple developer numbers in the first place.

Languages Aren't Like Compilers

Lattner and his team are held in high regard. There's no doubt the LLVM is a hugely impressive piece of work. It's easy to use, flexible, well documented, has an active community and is a critical piece of technology for Microsoft, Google and many others.

However, languages are different. They inspire strong personal feelings, so working in isolation from the larger development community and not even consulting Apple coders isn't the best way to ensure the final result will be well loved and used. And it has put Swift's acceptance at risk.

This insular, some would say arrogant, style is typified by the fact that there's already a software language called Swift (swift-lang-org).

Today's new languages typically improve on an existing, well-used language. For example, Microsoft's TypeScript (goo.gl/AT7qyM) is 100% compatible with JavaScript, and the functional Scala language can utilise any existing Java library or framework.

Interactive Playground

WWDC 2014 did, however, offer something else that's new. As part of the Swift keynote announcement, Apple introduced Interactive Playground.

• Apple long since lost the lead in activated smartphone devices

Based on the presentation details and a short demonstration of its features, it seems likely that Interactive Playground will prove much more interesting to developers.

Integrated into Apple's still-in-beta Xcode 6, it looks to be a visually enticing tool. Graphical representations of code in action along with on-the-fly, real-time interaction with running apps seemed to woo the audience.

The ability to test specific parts of an app via a novel timeline assistant (implemented as a scrollbar) is a cool way to evaluate and debug code. Such a feature means debugging with Interactive Playground should be a productive, even pleasurable experience.

Animated images, known as sprites, featured heavily in the on-stage demonstration. This revolved around a 2D game animation and utilised numerous elements of Apple's Sprite Kit (see boxouts).

The key message is that Playground lets developers learn the Swift language, experiment with Cocoa and Cocoa Touch API functionality and construct unit tests in an interactive manner.

▲ Apple iOS 8 SDK

The Battle For Mobile Developers

For many companies, attracting highly skilled, experienced and talented software professionals is a constant problem. The best people largely make their own decisions as to where in the world they work and who they work for.

More often than not, salaries aren't the deciding factor. These people are far more likely to be drawn in by exciting projects and great working environments, which use productive languages and top-quality tools.

The mobile and cloud development arenas in particular are continually searching for high-quality software developers with the vision, ideas and skills to create the next wave of mobile apps and cloud services.

So while Swift's feature may impress the typical Objective-C developer, they won't do much to inspire the modern coder. They can point to dozens of other languages that offer similar power and flexibility but don't rely on using the aging, proprietary and difficult-to-learn Cocoa and Cocoa Touch libraries.

Interactive Playground, while looking impressive, doesn't break completely new ground. In a way, it's rather similar to the greatly admired IPython Notebook initiative (**ipython.org/notebook.html**).

Nevertheless, great tools do turn developer's heads – often much more easily than a new language. Microsoft's success with its .NET framework was boosted by the highly polished, multilanguage Visual Studio development environment.

So I'd expect Playground features to appear in Microsoft, Google and many open-source community offerings soon.

App Revenue

Apple is, of course, a strong player in the mobile marketplace, but it's not the only player in town.

Apple long since lost the lead in activated smartphone devices. In fact, according to figures released for Q1 2014, Samsung alone has 30% of the global smartphone marketplace. Apple's iOS-based iPhone only managed half this at 15%. And there's dozens of other manufacturers selling Android-based smartphones.

So for the app developer, the Android Play store is already a big attraction. In theory, a \$1 Android app has much more revenue generating potential than a \$1 iOS app, and they can use the familiar and well-supported Java language, along with its huge library collection.

Apple's Sprite Kit

Sprite Kit is a graphics rendering and animation software framework for textured images or sprites. It supports sound playback and physics simulation (including mass, velocity, friction and gravity).

Your code determines the scene contents and how they change in each frame via a straightforward rendering loop. Then the Sprite Kit software uses this information to render frames of 2D animation. It takes full advantage of the graphics hardware to deliver high frame-rate animation on both iOS and Mac OS X platforms.

Sprite Kit is ideal for game development, especially when paired with the complementary Scene Kit.

It's not just a battle between iOS, Android and Windows Mobile either. Consumers can already buy a low-cost Firefox OS smartphone in Spain, Poland, Greece, Hungary, Germany and seven Latin American countries. And a \$30 Spice version will soon be on sale in India. Meanwhile, Ubuntu is pushing its own smartphone technology. They will both attract open-source developers, who can use standard web-based languages and tools.

Samsung is also adding to the platform mix. Its Tizen smartphone operating system, designed to replace Google's Android, needs to attract its own app developer community. Proposing a rival to Android is a big ask. But with 30% of the smartphone market, there's plenty of income potential for app entrepreneurs.

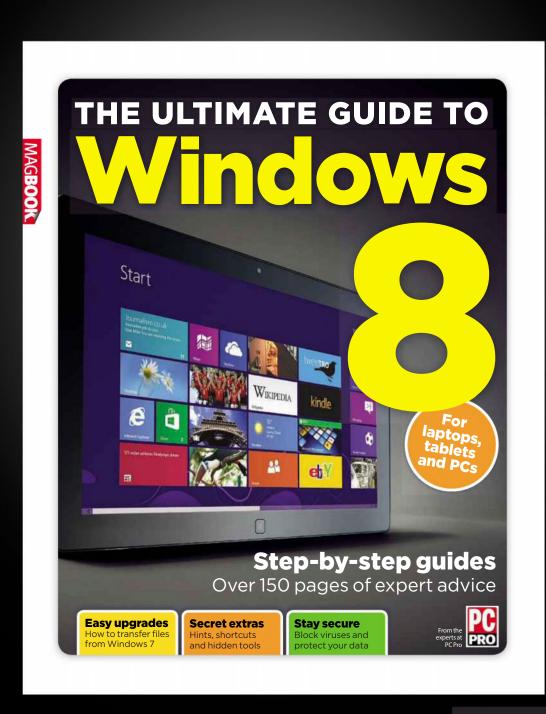
Yet it's not just about money. Ask developers to create Tizen apps using the skills, languages and open-source tools they already know, and they might say yes. However, ask them to create iOS apps with proprietary languages and libraries using unfamiliar tools and they may decline.

Future Of Development

The next wave of software development is focused on the mobile and cloud worlds. Consequently, any software developer has a keen interest in technology aligned to these areas.

Today, no matter how good it might be, a new language by itself simply isn't enough. Only when it's matched with a powerful set of cross-platform libraries and tools will it gain traction and community support.

So while Swift's feature set may help the dedicated iOS developer, it's not going to inspire the wider app building community. mm



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Walk The Linux

Just a short note regarding James Hunt's Download Directory from issue 1318. James was writing about 'Tablacus Explorer' and commented that OS X already has the ability to tab the file manager. I'd like to point out that Linux has had this facility for a while and it is something I find very useful while searching my PC and attached drives to transfer data between them.

While I'm at it, thanks to Bruce R for the tip on the San Disc Cruzer Blade as a good USB drive for a persistent Linux install. I had used this facility in the past, but found it slow, but obviously flash memory speeds have improved considerably over the last couple of years. I've just bought a 32GB drive for £8, (how times move on; back in 2001 a 256MB flash drive cost me £150). This has now got Mint 17 XFCE installed, with a 20GB Fat 32 partition for data use on all systems.

It seems to be just like running a Linux install from an internal Hard disk, so I'm now planning to get some 16GB drives for use at my local CoderDojo so that we can install all the software we need such as Scratch and python. Then if any of the students turn up with a laptop without the required software we can just boot up the Linux install on the disk and we're ready to go.

Tony Hughes

Watching You Watching

Interesting reading Phil Williamson's Big Brother letter. A while ago I noticed my Samsung TV saying "now logged on as <my email address>" when I switched it on the see the news. Why would it connect to the internet for broadcast TV? I wouldn't mind if I was using one of the Smart TV apps as I expect it to connect then. Is there any network software I can use to capture what my TV is sending out?

Although I probably will upgrade to 4K the next time I buy a new TV one of it's limits at the moment is bandwidth. For instance although Sky advertises over 50 HD channels not all programs are

HD. A quick test it to look at peoples hair. If you can see individual hairs then it is HD. A lot of the time the hair is fuzzy which means it is being transmitted on a reduced bandwidth, so they can cram in more channels in the available bandwidth presumably.

If 4K TV uses four times the bandwidth you can see the impact that will have on (say) terrestrial Freeview channels. You can have 4 HD channels or one 4K channel. The 4K will be worth it for Bluray movies though.

Derry Hincks

Show Me The Money

When I initially read the review on Internet Security software in *Micro Mart* Issue 1315 I was aware the the price of the three-user Norton Internet Security appeared to be about £16 more than I paid for it on Amazon in May 2014.

I always buy in advance and try and get the three-user version for a reasonable price. So today I decided to reread it to check some of the detail. The picture of Norton Internet Security, at bottom left on page 42 of this issue, shows that it is the three-user version that is being assessed and the price given on that page is £34.99. However on page 45 there are prices for one user and three users: the one user being priced at £34.99 and the (five-user pack) being £55.99. So presumably the price for the three-user pack for Norton could not be found. So why is Norton the only one compared on a five-user pack basis? It appears to put it at a disadvantage! And does anyone actually pay these prices? I got the three-user version for £18.64 on Amazon UK in May 2014, so why are these astromonically high prices quoted? Norton may not be perfect, but it can usually be obtained for a lot less than the £56 or so mentioned here. As usual its all about the money! Cheers!

Harry Deakin

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Component Watch

Never run out of space, with one of these 4TB hard drive deals

echanical hard drives just keep getting cheaper, and that means it's easy to buy an external drive capable of housing more data than you could possibly need. In recognition of this fact, we've looked at the cheapest 4TB external drives on the market. Could one of these be the last hard drive you ever have to buy?

Deal 1: Seagate Expansion 4TB RRP: £129.99 / Deal

Price: £109.99

You won't find a 4TB external drive much cheaper than the Seagate Expansion (at least, not for a few months), but that doesn't mean it's any worse than the rest. Seagate is a reliable brand, and while it's an unashamedly basic unit,



you do still get USB 3.0 connectivity. Great for people who want to save money and don't care about a no-frills approach.

Where to get it: Currys - bit.ly/1fZSTm7

Deal 2: Western Digital My Book 4TB RRP: £140.14 / Deal Price: £115.49

For just a few pounds more, the equally respected Western Digital offers a 4TB drive with a whole host of extras, including WD SmartWare Pro software (for local and cloud backup) and Acronis True Image software for system level backup. There's software-based encryption and even a Windows 8 app that helps you manage the drive and its contents. At full price, it doesn't quite trounce the Seagate, but for this little difference, it's hard to argue against that.



Where to get it: Ebuyer – bit. ly/1m8Rn2k

Deal 3: HGST Touro DX3 4TB RRP: £144.42 / Deal Price: £115.68

Similar to the Western Digital My Book, the Hitachi Touro Desk DX3 has one unique feature worth mentioning: the units are stackable, so if you buy multiple drives you can pile them on top of each other in a particularly pleasing manner. Aside from that, it's business as usual, and while Hitachi isn't a poor brand, it does lack the reputation of drive-specific

manufacturers like Western Digital and Seagate. Still, at this discount, it's worth a look.

Where to get it: Scan – bit. ly/1tfTINT



Deal 4: Buffalo DriveStation Quad (4 x 1TB)

RRP: £349.99 / Deal Price: £321.10

If you're wondering about the price leap, you need look no further than the configuration for this unit: it houses four

1TB drives instead of one 4TB drive. But that makes it perfect for running in a RAID configuration, and ideal for providing storage to a large number of users (though of course, you only get 1TB of storage that way). As well as RAID support, it incorporates SecureLockMobile encryption, which keeps data out of unauthorised hands. It's a bit much for a home system, but



small and medium businesses should seriously look at it.

Where to get it: Ebuyer – bit.ly/1oe6rs6

Deal 5: ioSafe Solo Pro 4TB RRP: £449.99 / Deal Price: £438.89

The one bad thing about external hard drives is how vulnerable they are to damage. Well, not this one. The ioSafe

Solo Pro is fire-proof, water-proof and precisely engineered to keep your data safe even in the worst conditions. It's compatible with Windows and Mac, and should it fail to protect your data, there's a forensic recovery and replacement service that comes with the drive purchase, free for the first year. It's only USB 2.0, but if you're more worried about speed than protection, let's face it: you'd be better off



with something else. This drive is for those who simply can't lose their data, and in that sense, you're buying the peace of mind you need.

Where to get it: Ebuyer - bit.ly/1n0uOIA









Lenovo X200 Intel Core2Duo 2.4Ghz, 2GB, 160GB, Windows 7 Pro

£149.99 inc. VAT

- Intel Core 2 Duo 2.4Ghz
 2GB DDR2 Memory / 160GB Hard Drive Included with this PC:
 1x Mains adaptor & power lead



HP 8100 Elite SFF Intel I5 3.2Ghz, 4GB, 250GB Win 7 Pro

£263.99 inc. VAT

- Intel i5 3.2ghz Processor
 4GB DDR3 Memory / 250GB Hard Drive Included with this PC:
- 1x Mains adaptor & power lead



Dell 780 C2D 3ghz, 4GB, 250GB

- £186 inc. VAT
 Intel E8400 Core 2 Duo 3.0GHz Processor
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- 1x Mains adaptor & power lead



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Transcend's Two New 1TB SSD Options

Google Snaps Up Songza

Google Play handed timely boost

eeling a little blue? May we suggest some contemplative classical a la Claude Debussy. Feeling happy? The Spice Girls will sort you out. This is much the kind of thing music start-up service Songza does for its users, creating playlists based on a person's mood. The reason you should care about this is that Google has decided to bring it under its collective wing of products and services. Buying the company for a reported \$39m, this is likely a move to bring something fresh to its Google Play streaming service as it tries to keep up with the big boys.

A statement from Songza read: "We can't think of a better company to join in our quest to provide the perfect soundtrack for everything you do." Well, quite. We can't think of a better reason for the firm to sign up to this than for it to, quoting a popular film, 'Show Me The Money'.

UK Airports Act On Electronic Devices

New advice over terrorist fears

oth Heathrow and Manchester airports are now asking passengers flying to the United States to charge all electronic devices prior to travel in order to confirm they are fully operational.

The call has come from the US and seems to pertain to a terrorist threat regarding the building of bombs in battery compartments to try to evade the usual security checks. Essentially, the new rule states that if a device doesn't switch on, it can't be brought onto the flight – and British Airways has gone as far as stating that customers could be made to rebook should they be found in possession of an uncharged device when boarding.

Passengers could buy a charger from an airport retailer if they run into trouble in order to charge their mobile devices if necessary or, according to the BBC, put powered-down devices in stowed luggage.

As always with these things, check with your airline and the airport about what you should do before travelling.

Quick, clever, cool... Basically our editor in tech form

ranscend has been in touch to let us know about two new SSD drives that the company now has available for UK customers right now.

Its SSD370 and ESD400 models can both offer up to 1TB of storage in a format to suit, with the former being a SATA-3 insidethe-box option, and the latter coming in a USB3 connectable enclosure for portability.

Both options seek to be light and compact – neither comes close to weighing 60g – while offering all the speed and flexibility we've come to expect from NAND flash storage. The ESD is especially enticing, coming in a pocketable 92 x 62 x 10.5mm enclosure (not much bigger than a playing card), with a handy onetouch backup facility when paired with the company's Elite software. You can read more about both at uk.transcend-info.com.



Hotel **Booking Site** Leaks Data

Lots and lots of data

otelHippo.com sounds like such a fun place to hang out, right? The hotel booking website allows users to plan a well-earned break and it's been used by many UK residents looking to do just that.

A shame, then, that the site is being investigated by the UK data privacy watchdog over claims that it has revealed booking information described by a security expert as being a "gift for burglars". By all accounts, the data in question could allow someone to match the hotel booking with the person's home address and the BBC apparently contacted the

site about this, leading to it then going offline.

The owners, HotelStayUK (which also offers leisure treats

Since this issue was raised, the message 'Website Permanently Closed' appears at the URL, which would therefore appear to

Another example of the high cost of falling foul of data privacy

such as theatre tickets and tourist experiences) has admitted to taking action over a "technical situation" with the siteby

suggest that it the problem was incurable. Another example of the high cost of falling foul of data privacy.



Amazon is a company that knows how to survive and thrive, even in the most difficult circumstances. Having beaten the bursting of the dot-com bubble, it's weathered just about every financial disaster that's come along and shrugged off all the negative press it's attracted. It really is, it would seem, bullet proof.

Of course, that's probably what people thought about Nokia not that many years ago. And IBM. And, indeed, Microsoft. As Mark Pickavance details this week, though, hubris can bring down even the mightiest of giants.

As Amazon continues to use its influence to push its luck, could we be seeing the beginning of the end? Could its stockholders put pressure on it by demanding more in return for their investment?

Perhaps, but it doesn't look very likely. Amazon has a knack for surviving and, like cockroaches, it'll probably be here even after the bomb drops.

Until next time,



Editor

Meanwhile... On The Internet...

e're going to flex our geek muscles a little bit this week – and take a bit of a break from all the doom and gloom of virus and snooping news that seems to have become a staple of these pages, unfortunately (tinyurl.com/ Motl1320a). However, it's still a leak of information that provides our first story.

Specifically it's the news that scripts from the new series of *Doctor Who* were allowed out in the wild, after somebody left them lying around on a publicly accessible server over the pond (tinyurl.com/Motl1320b). It's the latest in a long line of leaks surrounding the series that has seen the show's creator, Stephen Moffat, become increasingly frustrated with its fandom's penchant for breaking cats out of bags.

And while we're on the subject of Stephen Moffat, there's the little matter of the fact that the internet's most/least loved genius/troll (www.denofgeek.us/tv/sherlock/231481/moffat-and-gatiss-on-sherlock-series-3-fandom-secrets) was being linked with that other great fan favourite, *Star Wars*, sending Twitter into a minor meltdown, until his missus doused those particular flames (tinyurl.com/Motl1320c)... Which brings us to...

evin Smith – definitely every geek's favourite maverick film director and disarmingly honest fan-about-town (tinyurl.com/Motl1320d) – may not have actually written a decoy script for Batman v. Superman: Dawn Of Justice (tinyurl.com/Motl1320e) as the internet initially suspected, but he has been to the set of Star Wars Episode VII. Kevin Smith – the 'disarmingly honest' one – is not great at keeping secrets, and despite being confronted with a 'Loose Lips Sink Starships' poster and non-disclosure agreement' upon arrival at Pinewood Studios (tinyurl.com/Motl1320f), has still let a few things out about what he saw (headlines: Stormtroopers, fully rebuilt Millenium Falcon).

However, if geeks needed any reassurance that *Star Wars* under JJ Abrams is heading in the right direction, Smith's Instagram document on the visit is probably it (**tinyurl.com/Motl1320g**). Depicting his hirsute face, wide-eyed, tearful and a little bit snotty, it's the digital equivalent of

ata crunching and these pages go together like coffee and bourbon creams... We love it, and we hope you do too. What's even better is the use of complex statistical and programming techniques for irreverant and even trivial purposes, the pursuit of which has led us in the direction of two particular sites this week.

The first is one of a few quite lovely maps made by Gary Gale at his site Geotastic (tinyurl.com/Motl1320j), which highlighta some of the vaguely rude place names you'll find around the world (tinyurl.com/Motl1320k). Yes, yes, we know that we should be well beyond this kind of humour at our age, but you're going to have to live with it. We also love his map of countries that don't cry... Genius.

The other, designed by Constantine Valhouli, uses information gleaned from Wikipedia to pinpoint some of the musical references to real places in his native New York (tinyurl.com/Motl1320l). Most importantly, it highlights the fact that Rockaway Beach — made famous by everyone's favourite heavily haired riffing rockers The Ramones (tinyurl.com/Motl1320m— is an actual, real-life place, for which we thank him. Others include Tom's Diner (Suzanne Vega), Fourth St., Montague St. (Bob Dylan, Postively Fourth St./Tangled Up In Blue), Union City (Blondie) and — of course — 110th Street, made famous by the late, great Bobby Womack (tinyurl.com/Motl1320n) on his classic tune (tinyurl.com/Motl1320o).

the thumbs-up he's also giving. If you want to hear Smith talk a little about his experience, you can by checking out his Masterclass from the Neuchàtel International Fantastic Film Festival (tinyurl.com/Motl1320h). He gets to it at about the 35-minute mark.

Oh, and while we're on the subject of Lucasfilm, treat yourself to a read of this excellent oral history of LucasArts – the influential gaming side of George's creative behemoth – put together by former *ZZAP!* 64 man Jaz Rignall for US Gamer (tinyurl.com/Motl1320i). You'll be glad you did.

Aaaaaaaand Finally...

As always, you can download PDFs of this page with working links by visiting tinyurl. com/MeanwhileDownload or make contact with us @Micro_mart...

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

We've already covered a Star Wars set visit on the page this week, but we think it's worthwhile making room for mention of the footage posted by YouTube user Frank Wonderlich. His phone shot video (tinyurl.com/Motl1320p) shows Imperial forces descending on Frankfurt airport for location shooting on Episode VII... In his dreams.

For a fan-made film, the quality is Blendergood (www.blender.org) but not 'Lucasfilmgood' and adds up to a fine bit of trolling aimed at fans scouring the web for any little tidbit of news on the movie. Some of the comments are priceless too.









Welcome to this week's caption competition, Issue 1317 used this overheating chap as it's subject, and here's what you came up with...

- Thomas Turnbull: "I was showing off my new laptop when my friends said not to make a meal of it, but I did!"
- Thomas Turnbull: "It's more fun crunching this than numbers."
- **Ondrive:** "Tired of reading about cookies, Dave moved on to something more savoury..."
- Thomas Turnbull: "Virtual sandwich app now on sale."
- Martin Prince: "Searching for saucy material on the internet can increase your, er... appetites."
- Greg Browne: "This Debrette's App stinks. I know it is perfectly acceptable to eat a hot dog holding the fork in your right hand."
- Jim Ryan: "I said let's meet online, not meat."
- Leigh Spriggs: "My good friend Frank N Furter."
- Rick Wellar: "Now, that's what I call a megabyte."
- Jim Ryan: "Make use of excess heat from your PC."

Thanks for all your entries, and congratulations to our winner, Half-a-daily, who suggested, "Yes, I have plenty of experience with C++, XML, PHP and BBQ".

To enter this week, head to the 'Other Stuff' section of our forum (forum.micromart.co.uk), where you can see the picture or email us at caption@micromart.co.uk.



Mini S5 Lands In Russia

Global markets expected to follow

he compact version of Samsung's flagship mobile, the Galaxy S5, has been launched in Russia and, in keeping with the company's past form in this area, it's called the Galaxy S5 Mini.

With a launch in global markets, including the UK, expected soon, the S5 Mini promises to deliver powerful performance plus the heart rate monitor, fingerprint scanner and connectivity with Samsung's wearable devices that comes with its big brother.

Kitted out with a 4.5" HD Super AMOLED display, it promises a wide and vivid viewing experience in its premium, soft-touch grip, a powerful Quad Core 1.4GHz processor and 1.5GB RAM for multi-tasking and faster web page loading. A high-res 8MP camera is on board too.

You can expect this to come out here soon enough, given the early July release in Russia.

Ouya Teams With Mad Catz

Gaming platform finds its M.O.J.O.

he Ouya gaming platform hasn't exactly set the world alight, despite all it has to offer. However, in a move that could find a few more interested consumers, Mad Catz has decided to make the Ouya storefront and hundreds of games available on its M.O.J.O. Micro-Console for Android device.

So, M.O.J.O. users can now access Ouya's decent library of titles, including *Final Fantasy III* and *Sonic The Hedgehog*.
M.O.J.O. was actually announced back in March, but this addition of titles should see a few more interested consumers snap one up, surely? For more information on this and where to order your own M.O.J.O., head for

www.madcatz.com/mojo.



Snippets!

eGamers Reddit Ban

Reddit has banned e-sports website on Gamers from posting any content for a year in retaliation to a senior editor privately messaging reddditors and asking them to submit post to subreddits.

This isn't allowed under Reddit's rules and onGamers has been banned before because of a high number of selfsubmissions. It won't be doing any such evils for a while following this ruling.

LiLo Sues Over GTA V

Hollywood starlet Lindsey Lohan is no longer just threatening legal action against the makers of Grand Theft Auto V as she has now filed a lawsuit against Rockstar Games and Take-Two Interactive.

The suit refers to her complaints that some aspects of the game mirror her own life a bit too closely and that this is an invasion of her privacy rights. According to Reuters, the complaint argues that a minor character in the game, Lacey Jones, is a look-alike. The downsides of fame, eh?

AdWords Axes Pr0n

Google's ubiquitous AdWords platform will no longer hold any adverts with any "sexually explicit content" according to reports by CNBC. It states that Google messaged advertisers in June to notify them of the change, noting that it won't accept any adverts "that promote graphic depictions of sexual acts."

Issue 1320

WD Makes Media **Playing Easy**

New WD TV does the business

estern Digital's WD has unveiled its new WD TV - Personal Edition, an easy-to-use wi-fi enabled media player playing pretty much any media file stored on USB and network storage devices, or any computer on the home network for that matter.

Opening up access to a user's library of photos, videos and music on their home entertainment systems because of its support for various file formats, including MKV, MP4, AVI, WMV and MOV, content can be streamed from any connected USB drive, or via the cloud, NAS device or networked computer.

Aside from all that, the new WD TV media player has been given a facelift with a new UI allowing for customisation of the home page with favourite apps (including YouTube, Hulu Plus and Facebook), setting shortcuts and setting auto-run for preferred apps at start-up. There is also Miracast support for projection to a Full HD TV and an associated Remote app for Apple and Android devices can be downloaded if you wish.

The device itself casn be purchased for £70 from www.wdstore.co.uk and the Remote app can also be downloaded for free fro the App Store and Google Play.



Netflix Wants You!

Get paid for watching TV

reviously a very American phenomenon, Netflix is now looking for 'taggers' here in the UK and Ireland. A Tagger is someone who is paid (we don't know how much as the job advert is unclear on that) to sit and watch TV programmes and films to give their opinion in analysing them so that Netflix can, in its own words "connect those titles to the people that want to see them the most."

The idea behind tagging is that its 48 million subscribers can have suggestions of what they might like to watch, pinpointed to their desires. The company's own blurb on the matter is a wee bit annoying, stating that the process "is so super accurate that sometimes it feels like we are reading minds or tea-leaves" and this is the first time Netflix has appointed any Tagger outside of the Americas, with just 40 or so employed worldwide.

Perks of the job include being among the first to view Netflix originals such as House of Cards and successful applicants will need a background and/or degree in film and TV, plus strong knowledge of your subject and in possession of an analytical mind.

It all falls down for us on that last point but for your chance to nab this opportunity, head over to jobs.netflix.com.





Community Corner

Announcements and other stuff

his 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

Bank Sues Google Over Email

Accidental message leads to legal request

Goldman Sachs contractor has put himself and the investment bank at the centre of a legal wrangle with Google.

When said contractor attempted to email a Goldman employee, she accidentally sent it to the wrong person by entering @gmail instead of @gs.com – an easy mistake to make. As the email contained confidential information, Goldman Sachs wants it deleted

but has unsuccessfully tried to get in touch with the account holder. It's now gone to Google, via a US judge, to order it to delete the email from the inbox, saying "Emergency relief is necessary to avoid the risk of inflicting a needless and massive privacy violation upon Goldman Sachs' clients."

Google has assured the bank that the email hasn't been opened since it was received, but we await the court decision on this.

Dungeon Keeper Ordered To Change Ads

"Free" status questioned by ASA

he Advertising Standards Authority has gone after Electronic Arts over its promotion of mobile game Dungeon Keeper. The title has described itself as a free game, but as been openly and widely criticised by gamers over its use of in-app purchases, and now the ASA has decided to uphold complaints about it using that description.

The ASA has told EA that it can no longer label *Dungeon Keeper* as a free game in its advertising as it's free-to-play model means that it's effectively anything but. EA isn't happy about this, claiming that gameplay without purchases

isn't "severely limited" and that features in its advertising were available during free play. It also states that gamers can earn gaming currency through in-game activity over time, but gamers argue that the actual time taken to earn anything significant isn't at all practical.

The ASA has spoken, though. Wonder if this will have a greater impact on how free-to-play titles are promoted?



UK Rail To Gain Faster Wi-fi

Good use of money?

e're not sure whether this is necessarily good news or not. A £90m scheme has been put forward by the UK government to allow passengers on trains to London, Brighton, Bedford, Kent, Portsmouth, Sheffield, Manchester and Leeds access to high-speed wi-fi without any charge.

The web speeds will be ten times faster than those at present and the impact could be seen within three or four years. Wonderfully, the funds for the

scheme are partly derived from a fine on Network Rail for failing to reach its punctuality targets.

It's obviously a good thing that free and super-quick wi-fi on a train journey might be reality in a few years, but there is the obvious downside – that this money could be better spent on eradicating service delays and improving the networks in general. While we are obviously keen proponents of any technological advancements in the UK, we are also a bit fed up of train delays and overcrowded carriages.

REVIEWS



WD My Cloud EX2 4TB

Western Digital hones its NAS box designs for small business

DETAILS

- Price: £299 (4TB),
- £199 No drives
- Western Digital
- Website:
- www.wdc.com
- Required spec:
- Network infrastructure

hysically, the new My Cloud EX2 from Western Digital bears an uncanny resemblance to its own My Cloud Mirror personal NAS box. Inside this box is an ARM-based Marvell ARMADA 370 (MV6710) single cored processor running at 1.2GHz, and 512MB of DDR3. That's the same processor that's in the ReadyNAS 102 and the Synology DS414slim, so it's a popular choice for these devices.

In the 4TB review model the on-board drive slots were occupied by WD Reds (2x 2TB). The default installation is Raid 1 (mirror) mode, but you can reconfigure this to be Raid 0 (striped) or JBOD, if you're more interested in plenty space, rather than redundancy.

Configuration is through a web interface that is very big, but easy to follow – something I liked from the original My Cloud devices. It's a doddle to add users, define groups, allocate shares and control their access.



Out of the box the EX2 can share files and folders in the PC and Mac network space, distribute media for DLNA access and even operate as an iTunes server. But, it's also extensible through app installation, and they preloading a P2P Torrent client and FTP server module.

If Western Digital's My Cloud strategy has a weakness, it's that – at the time of writing – the selection of apps is modest, especially when compared with the likes of Synology. There are some useful tools offered that include Joomla, IceCast and WordPress, but there needs to be a greater selection.

Probably the best feature is the personal cloud functionality, that allows users and their devices to be connected to the shares even when beyond the bounds of the network it's installed on. Used effectively, this allows users to contribute files away from the office and sync them with those there.

Performance is largely fine, though the EX2 won't win any speed trophies. In mirror mode with WD Reds it was reading at about 100MB/s and writing at 65MB/s when accessed by Windows 7 over Gigabit Ethernet. There are faster NAS boxes out there, but for a dual drive system these numbers are respectable.

Depending how you approach buying this product can later drastically alter the total cost of ownership. For example, you can buy the My Cloud EX2 without any drives, though a couple of 2TB WD Red mechanisms costs you £200. Making that about £100 more expensive than getting them pre-installed. The larger drive models are even better value, resulting in the inescapable conclusion that Western Digital is subsidising the EX2 by £100 or more.

Therefore, unless you've got a bunch of unused hard drives sitting about then the best deal must be to buy preconfigured than to populate the box yourself.

It's also worth pointing out that at this time the almost identical My Cloud Mirror 4TB is available for £250, a

Key Features

- 4TB (2x 2TB)
- RAID 0, 1; JBOD (Just a Bunch Of Disks)
- Stream media to your connected devices
- Data protection at its best
- Easy to manage





full £50 less than the review EX2 RRP, which will probably leaves you wondering what that extra money buys you (other than the black colour scheme). There are a number of important differences, each of which might well be worth the extra to those interested in deploying this equipment.

The EX2 supports iSCSI and volume virtualisation, IPv6



(not just IPv4) and also Active Directory if your network is built around that. These all allow for a tighter integration between this and a Microsoft network infrastructure. The other enhancement on the EX2 is the software licensing for WD SmartWare Pro, which supports 10 Dropbox user accounts on the EX2, but only three on the My Cloud Mirror. The EX is also available as a bare mechanism, where the Mirror only comes with drives pre-installed.

In terms of supporting multiple users, this device should support at least 10 people reasonably effectively, if they're all not hammering it simultaneously every hour of the working day. One thing I discovered you should never do with this box is to activate the 'encryption' mode on the installed drives. It kills file transfer performance to about 10% of what you'd normally expect. As it lacks its own hardware encryption/ decryption technology, the CPU in this box just can't deliver sufficient performance to operate this feature in software mode. In our opinion WD should remove it from the firmware altogether.

Where this box really shines is when it's used in conjunction with a commercial Cloud storage facility like Elephant Drive or Amazon's S3, both of which it supports. The EX2 can act as local connection node to cloud storage over which you have direct control.



As NAS boxes go, this isn't the fastest or most sophisticated out there, but it's very competitively priced and includes exactly the features a small business might appreciate. I just hope that Western Digital keep developing this product line, because each new product and firmware release is a decent step forward.

mm Mark Pickavance



A cost effective NAS and Cloud Storage box for small business users



Acer G276HLA 27" Monitor

A fairly bog-standard monitor, with a little extra



cer have often provided us with some exceptional monitors within a very reasonable price range; there are times where they've slipped up, though, and the quality of the product has dropped. However, on the whole, it does a pretty good job and delivers the goods.

We were therefore quite looking forward to getting our hands on a brace of its G27HLA 27" monitors for a dual display setup we had in mind. Thankfully we weren't disappointed, because the Acer G276HLA is a very good monitor; larger than average, with a 27" TN panel that provides a decent enough 2ms response time, HDMI, DVI and VGA inputs and a dynamic contrast ratio of 100,000,000:1. Viewing angles are 170° on the horizontal, and 160° on the vertical, which aren't up to IPS sort of standards, but are good enough for the average.

Although it's not advertised on the Acer site, the G27HLA does include a pair of (admittedly rather weak) 2W speakers, located in the bottom corners around the back of the monitor, together with the 3.5mm input next to the video input. The build quality is good too; there's a half-inch glossy bezel around the screen, with the OSD controls located in the bottom right-hand corner together with the power. Connectivity around the back of



↑ The Acer G276HLA is very reasonable, both on price and picture quality



▲ Connectivity is adequate enough as well

the monitor is easily accessible, and there's the relevant holes for VESA mounting should you wish – although if you're doing that you'd probably prefer the video inputs to be facing down rather than straight on as they are in this example. Overall, it's certainly sturdy enough to sit on a desk and take a few knocks for the remainder of its lifespan.

The included stand is a fourpoint cross that slots up into the bracket around the back of the monitor, then is screwed in place. This makes it quite a solid foundation, but doesn't impede the monitor's adjustable angle in any way. It's also surprisingly light, weighing in at around 4.5Kg with the stand in place, which isn't too bad considering it's not the thinnest panel we've ever come across.

We found the G276HLA to be a bright, clear monitor with great colour reproduction. The 2ms response time is a benefit for watching video or playing games, but it also means there's very little eye strain when spending long hours in front of a Word document or CAD package.

Generally speaking the Acer G276HLA is, on paper, a fairly average monitor, what lifts it slightly though is the larger 27" display, the 2ms response time and the £169 price range. Also though, the picture quality is really very good and, as is in our case, when a pair of these monitors are placed together the overall effect is quite stunning, and a fair improvement over the more standard 24-inch desktop monitors. Because of these combined points then, the Acer G276HLA scores somewhat better than expected.

However, the addition of a USB hub and a better set of speakers wouldn't go amiss. Plus, we found the OSD buttons to be a little fiddly, and difficult to locate properly, especially when you've only got a few seconds to press the correct button before the OSD powers off.

To conclude: a very good quality monitor with a large screen, enough connectivity for the average user, and at a reasonable price to boot. It won't win any awards, but this a monitor that will suffice and offer you countless hours of everyday use.

mm David Hayward

A reasonably good 27" monitor for all uses





Brother HL-1110

Getting back to basics, Michael checks out a Brother monochrome laser printer



he Brother HL-1110 is a basic monochrome laser printer that presents itself in a very basic way: a dull grey box measuring 340 x 238 x 189mm when in its closed state. The depth and height increase to 360mm and 235mm respectively when the frontmounted, 150-capacity paper input tray is lowered and an output support flap is extended from the top of the box.

Its maker has decided, in its wisdom, that users will be happy to make do with USB connectivity when adding this printer to their computer system. We think that this view might be a mistake; there is nothing wrong with USB connectivity, but it does add another lead to the paraphernalia occupying your work area. A wireless connection is a far cleaner option with less clutter.

The controls for this device are also basic, limited to a single button to turn it on and off, cancel printing, instigate error recovery and form feed. In close proximity to this solitary button are two LED lights that indicate error and ready conditions depending upon the colour displayed and the flashing sequence.

The printer's toner cartridge slots into the body of the unit once you have raised the top cover. A wizard on the





supplied CD leads you through the basic steps of setting up this printer as drivers are installed and the unit is connected to a host computer. The CD also contains some basic tools and a PDF version of the user guide.

Based around a three tab interface, the print driver offers various setting options. You can opt for Draft, Normal or Fine print quality with a choice of paper sizes and document types plus the ability to print up to 25 pages on a single side of paper. Other options include

adding watermarks, headers and footers plus the use of various types of pre-defined print jobs including ones that you have created yourself.

As standard with the laser printers we have checked out, there is little different in the print speeds for the supported print qualities. The Brother HL-1110 is no exception in this respect. Using a 589-word document, we were able to achieve a print speed of 20.5ppm in Draft mode while Normal and Fine modes both recorded a speed of

20ppm. A darkening of the text produced was noticeable over the three print runs but even Draft mode produced documents what would be suitable for many tasks.

Printing a full A4 size black and white image reduced the print speed slightly to 19pmm. There was also a slight drop in print quality. Opting for printing a two-page document side-by-side on a single sheet of paper again hit the 20ppm mark as the text size was reduced to fit the available space.

We did encounter one annoying problem with this printer. According to the User Guide, the HL-1110 is meant to go into sleep mode after a period of inactivity from which it would be woken by the notification of an incoming print job. However this did not happen and I had to manually wake-up the printer to receive the print job.

While Brother has suggested a price of £66 for this product with replacement cartridges costing £42, I have seen this printed listed at £56 on Amazon with replacement cartridges priced at £29.

mm Michael Fereday

A basic mono laser printer capable of good performance



Brother HL-L8250CDN

Michael Fereday checks out a colour laser printer from Brother



■ he Brother HL-L8250CDN is a standalone colour laser printer offering USB and network connectivity. Decked out in a combination of computer grey and matte black, the boxy HL-L8250CDN measures 410 x 486 x 313mm. With its weight of 21.9kg, it is recommended that any movement of this printer is a two-person job as my complaining back will testify to.

The printer arrives with its four toner cartridges (black, cyan, yellow and magenta) already installed. When you need to replace these cartridges (with either standard or high yield units) access is through the front cover of the printer.

Part of the front cover acts as a secondary multi-purpose, paper tray with a capacity of 50 pages. The main paper input tray, holding up to 250 sheets, forms the base of the printer. Both of these paper input options have a curved paper path with documents being ejected from the top of the unit where a flip-up support helps ensure the printed copy is not scattered over the floor. There is a third paper input option requiring the printer's back cover to be opened. This will give a straight-through paper path for thicker media.

A small control panel is situated on the top left of the



printer. Along with various navigation and selection buttons, this control panel features a two-line, 16-character LCD screen providing feedback information. The positioning of

Print mode for handling the available content. You can also Brother's iPrint&Scan app. The print and mobile device both need to be connected to the same network.

print from mobile devices using

word document, we were able to match the Brother-quoted 28ppm speed for this printer in bother Normal and Fine modes (in fact, we could detect no different in the print quality between these settings). Switching to an 1158-word document, we turned on the automatic Duplex option; while we expected a drop in print speed, we were rather surprised when it dropped to 5.5ppm! Using the same document with the side-by-side option instead of Duplex, the print speed returned to the 28ppm level. Replacing text with full-coloured images resulted in a slight drop in print speed to 27ppm with a reasonable level of quality.

In our own tests, using a 589-

As mentioned earlier, there is a choice of standard or high yield toner cartridges. Replacement units are priced as follows:- Standard black (2500 pages) costs £60 while the colour cartridges (1500 pages) cost £78 each. High yield black (4000 pages) is priced at £71 while the colour cartridges (3500 pages) will each set you back £146.

mm Michael Fereday

A USB port can be used

to access documents for

direct printing



this LCD screen is such that the only way to read its information is to stand over the printer and look down. A couple of LED lights provide status and error feedback.

Located on the front of the printer is a USB port, a feature that can be pressed into employment as a means of accessing a flash stick containing documents for direct printing. The insertion of a such media automatically switches the printer into Direct

Various options, categorised buy Brother as Basic, Advanced and Print Profiles, are available with the included print driver. Among these options are those for paper type and size, printing a single or multiple pages per sheet, Duplex printing, and the inclusion of a watermark and/or header and footer plus using toner saver mode. When selecting print quality you have a choice of Normal (600 x 600 dpi) or Fine (2400 dpi) qualities.

A competent colour laser printer suited to general office use





Microsoft Wireless Mobile Mouse 1850

A Microsoft mouse for those who carry their computers to work



e get to see plenty of exotic mice in this job, some of which are even practical to use. However, many of our systems utilise old Microsoft USB mice, which can be bought for around £7.50. Wireless mice represent less desk clutter, though – which is traded off with the annoyance of replacing batteries. The new Microsoft Wireless Mobile Mouse 1850 addresses that issue, to a point, by having a power switch. Though that's only useful if you remember to

It's relatively small size makes it easy to use for youngsters and adult alike, and it's also in an ambidextrous layout. The button layout breaks no moulds, either; this is your ubiquitous three two-button-and-clickable-scroll design. That won't excite gamers, but it's what most people use in the real world.

The 1850 is provided with a tiny USB dongle that is small enough to be left on a laptop





66 Modestly priced and

featured, and coloured so as

not to cause photo epilepsy

without inviting damage to it or the port. That's good, and Microsoft even provide a clever pocket inside the battery compartment to store it should you not wish to leave it attached to your machine.

It operates on a single AA battery, the life of which will be much longer if you remember to turn the mouse off when you've done with it via a small switch underneath.

As the feature set is less than riveting let's instead talk about probably the most important aspect of any pointing device: colour. We're black mouse kinda people, but accept that other people like pastel options. In respect of this wrongness, Microsoft makes the mouse in three other colour schemes, entitled 'Light Orchid', 'Flame

Red' and 'Purple' (it appears purple is exotic enough a colour that it doesn't require an appealing prefix). These shades seem to have some palate synergy with the ones that Microsoft use for its Surface covers – though blue appears to be missing in action. Of these shades the dark purple does seem attractive, and less likely to show wear than the Light Orchid model.

In summary, the 1850 is modestly priced, unpretentiously featured, coloured as not to cause photo epilepsy, and generally a very practical accessory for anyone with a laptop that hates the track pad. So where does it go wrong?

Only one place, really. It's the same issue that confronts every Microsoft wireless accessory that uses these tiny 2.4GHz dongles. Should you be foolish enough to misplace the dongle the mouse is essentially little more than a paperweight, because you can't get a replacement – nor can you pair the mouse with an identical dongle from a wireless keyboard or other mouse.

If you can ignore that blatant environmental vandalism, this is a fine product that many will find invaluable while computing on the move. What's more, you can find it at least a fiver cheaper than the price I've quoted if you're prepared to hunt a little.

mm Mark Pickavance



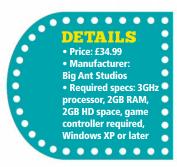


·m	icro nart
Quality	77
Value	Overall

Colours	Black, Light Orchid, Flame Red and Purple
Weight:	154 g
Product Dimensions	12.5 x 14 x 6.5 cm
Batteries:	1 AA batteries required. (included)
Item model number	U7Z-00004
Series	Wireless MBL Mouse 1850 W7/8

Don Bradman Cricket 14

Fancy an absorbing game of cricket?



hose seeking solace from the misfiring fortunes of the England football team haven't been having too much fun with the cricket either of late. Yet, even a disappointing football team brings with it no shortage of associated memorabilia and cash-ins. Cricket? It's hard to even get a decent computer game any more.

Refreshingly, though, *Don Bradman Cricket 14* gives it a really good go. In spite of the presence of the Bradman licence, this is an independent project too, developed and published by Big Ant Studios. Consequently, Big Ant Studios – a developer with a fair selection of ups and downs to its name – has spent a lot of time actively engaging with cricket game fans ahead of Don Bradman Cricket 14's release. It has been time well spent.

For this is an exhaustive, and crucially, really rather good representation of the sport. You only have to look at the assorted game modes for evidence of how much choice there is. You can opt for a casual game, or you can launch your player's career and build your way up, or you can take on one of many past, present and future test tours. Whether you're after a quick knockabout or something to absorb over months, you're catered for.







It's all well presented too, and easy to get around, but it's when you get to the cricket field proper you really realise that you're in safe hands. Bowling, for instance, has taken a leaf out of the control systems deployed by golfing titles over the years. Thus, you select the length of your delivery, add spin, seam or swing as required, then pull your control

stick down in time to plant your foot. Then, you move the stick up, as straight as you can ideally, to control the line of your delivery. It takes a lot of practice to get to grips with the many nuances here (although you can skip through and let the computer take charge for as long as you like). It's worth it, though, and bowling is a challenging discipline.

Batting is a little easier, with it's central requirement (inevitably) being timing and shot selection. You can choose whether to attack, defend or prod runs as and when. You choose what kind of shot you want to play, controlling its placement with the gamepad stick. Pleasingly, as with most good games, after a while these complicated decisions and reactions become second nature - and, as is quite common with cricket games, it gradually becomes easier to wrack up the runs.

Fielding is no doddle, we should note. Catching is down to timing too, and you have control over where to return to ball once you've retrieved it. It does mean there's a slight overload of controls you're faced with at first, but you do get used to it.

It's a really good cricket game, this. It managed to keeps thing accessible without holding your hand too much, and whilst it does require some patience, and an acceptance that updates for the game keep coming, it does also feel like a labour of love that's been rewarded. Who needs EA Sports?

mm Simon Brew

The best cricket game in ages.





Sniper Elite 3

Graphical Biology lessons in the desert



aking us deep into the sand-blown reaches of North Africa, *Sniper Elite 3* follows our gravel voiced hero as he carves his high definition kill-cam-documented way through the finest the Third Reich has to offer.

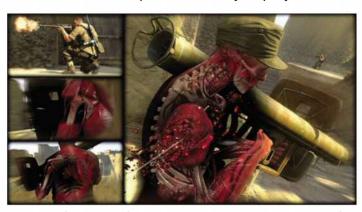
The signature move of the Sniper Elite games displays even more visceral damage this time around. As time slows down, we watch as the bullet passes clean through the right optic of a pair of binoculars, through the eye socket and continues its macabre path out of the other side of the unsuspecting soldier. Slowed down, crunches, gurgles, and a host of other wet and unpleasant sound effects accompany the recorded kill. Then, it's off to the next morally questionable objective.

The Sniper Elite series has always revelled in the overuse of X-Ray kill-cams, and there's certainly no shortage of them here. By the end of the first mission, though, we were thoroughly sick to death of them; they can be turned off or skipped, but then you're taking away the main selling point of the game itself.

Where Sniper Elite 2 was a very linear, almost an on-rails shooter, but this instalment introduces a little more freedom. The mission maps are



↑ The environment is much improved, but the enemy AI is pretty dire



▲ Kill-cam, after kill-cam, after kill-cam. Needless to say, it gets a little dull after a while

significantly larger, and allow a greater range of sniping possibilities and zones where you can take down the guards to eventually work your way to your quarry. However, it's not an open world by any standards, and you'll soon reach the limits of the map and are thus forced to take the path specified by the game.

The developers have clearly taken all that gamers liked about *Sniper Elite 2* and included it by the bucket load in *Sniper Elite 3*. There's more of a stealth aspect, with soldiers facing in the opposite direction and refusing to turn around no matter how much creeping you perform behind them. In situations like these, a quick press of the 'E' key

has you sticking a knife in the enemy or a double-tap of the silenced firearm. Either way, your experience points go up and you're one step closer to earning an award.

Timing your kills when there's significant ambient noise also makes a return, and this time you get to have more control over the environmental effects. Diesel generators can be kicked and sabotaged to start coughing loudly, low flying planes mask the sound of your gun going off and confuse the soldiers as to your exact location. Mistime the event though, and you'll raise their suspicions, which in turn forces them from their set patrol paths to come and look for you.

For the most part, *Sniper Elite 3* works reasonably well. Yes, the kill-cam gets on your nerves after a short while, it's not the greatest stealth game and, worse still, it's a rather weak action game. The actual sniping part is fun, though, and that's the main reason someone will buy it.

There are some glaring negatives mind you. The ridiculously poor AI of the enemy for instance, where a cleverly sniped soldier can be picked off and his colleague, who is standing mere feet away, stands and watches without any concern for his own personal safety. Or when alerted to your position, the soldiers search a two-foot square area before giving up and returning to their posts. Also, the story just isn't engaging enough. In fact, we didn't care a single jot about it, preferring to press the space bar to skip the cut scene just we can get to make another marathon head shot.

Sniper Elite 3's combined elements make for an okay game. The sniping is great, the rest is passable. In short, it's fun for a while.

mm David Hayward

Overall, not a bad game. It's not one you'll play for too long, though



Small-form-factor PCs

Who the heck wants a PC built into a large beige tower when they can buy a small-formfactor system that sits on a table or, better yet, hidden away on the back of a display on a VESA mount? Leo Waldock is a firm believer that smaller is better

Small-form-factor PCs

ASRock H81TM-ITX And Akasa Euler Passive Case

- Price: £70 for motherboard, £70 for Akasa Euler case
- Manufacturer: ASRock
- Website: www.asrock.com
- Required spec: Intel LGA1150 CPU, DDR3 **SODIMM RAM**

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SRock has developed the H81TM-ITX as a compact version of mini-ITX that Intel calls Thin Mini-ITX or Thin ITX. This means the I/O panel has been reduced in height from 40mm to 20mm, and ASRock supplies both a regular 40mm I/O shield as well as a special 20mm I/O shield in the package.

'Hang on' you're probably thinking, 'Why on earth do I want a motherboard with a 20mm I/O shield when every PC case on the market uses the standard 40mm item?' The answer is that both the Akasa Euler and SilverStone PT13 cases are compatible with the Thin mini-ITX standard, so you need to think of the H81TM-ITX as part of a system or an assembly and not merely a simple motherboard.

Take a closer look at the ASRock H81TM-ITX and you'll spot a couple of interesting features. For one thing, it uses DDR3 SO-DIMM system memory, which is a neat way to create space for internal connectors, but this isn't a unique feature. In this group, the Intel NUC and Zotac Zbox also use SO-DIMM memory.

The other thing that catches the eye is the power connector on the I/O panel next to the USB 3.0 ports. This board doesn't use a regular PC power supply but instead uses an external power brick of the type you use on a laptop. Akasa supplies the

and I assume that SilverStone does the same with PT13.

It's a funny thing, but removing the ATX power connectors and changing the system memory slots hasn't freed up a massive amount of space. There are two SATA connectors and a SATA power connector as well as a half-length mini PCI Express slot. There's also a PCI Express x4 expansion slot but this is probably irrelevant, since your new case is unlikely to have any expansion slots.

The low-profile 20mm I/O panel leaves little space for ports and connectors. This is a limitation of the H81TM-ITX (and any other Thin Mini-ITX motherboard) so you only get DVI-I and HDMI outputs, two USB 3.0, two USB 2.0, Ethernet and a pair of headset jacks. Once you plug in a mouse and keyboard, that doesn't leave you much to work with.

Installing the ASRock H81TM-ITX in an Akasa Euler case is a novel experience, because you don't install the motherboard and then fit a heatsink/fan on top of the CPU. Instead you lay the motherboard in the Euler so the heat spreader of the CPU makes direct contact with the inner surface of the case, and you screw the board down. This means that the Euler acts as a large passive heatsink, which keeps the system very compact and also means it's silent, because there are no cooling fans. At any rate, the system is

silent if you use an SSD, rather than a hard drive.

Akasa recommends that you use a CPU with a maximum TDP of 35W, but ASRock supplied me with a 2.9GHz Core i5-4570S (cost £149), which has a 65W TDP.

Assembling the system is easy enough, but you might have to pause for thought when you install Windows. Connecting a USB DVD drive is the obvious thing to do, but if you want to hook up a regular SATA drive, you'll need to use the doubleheaded ASRock power cable until the OS is loaded before you can disconnect the drive. There's no space inside the Akasa Euler for an optical drive.

The finished PC is relatively compact and works well in a VESA installation on the back of a TFT display. When you buy an Intel NUC or Zotac Zbox, the specification is set in stone, but Thin Mini-ITX allows you to choose from a selection of desktop Core i3 and i5 chips. That helps you control costs while achieving a decent level of performance, but you're limited to using basic Intel graphics and you only get one 2.5" drive bay.

If you prefer to build your own PCs, then Thin mini-ITX is well worth a close look.





EVGA Z87 Stinger And Hadron Air case

DETAILS

- Price: £150 for Z87 Stinger, £105 for Hadron Air case
- Manufacturer: EVGA
- Website:
- www.evga.com
- Required spec: Intel LGA1150 CPU, DDR3 RAM

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he Hadron Air chassis stands 307mm tall and measures 295mm deep by 168mm wide, which means it has a capacity of 15 litres. That's one third the size of a regular ATX tower case, yet this mini-ITX case has two expansion slots and can easily accommodate a 9" graphics card.

In the floor of the chassis, EVGA has included a slender 500W power supply, so you have all the hardware you need to build yourself a tiny gaming PC. The Air part of the Hadron name refers to the two 120mm fans in the roof of the chassis. If you fancy liquid cooling, you can buy the Hadron Hydro for £154 and that comes with an installed cooling system.

The Z87 Stinger motherboard is a well-appointed Z87 chipset motherboard that supports DDR3 memory running up to



2666MHz. You might think that Z87 sounds a bit old and crusty but EVGA will have a Z97 Stinger very shortly. I doubt the new chipset will greatly enhance this mini-ITX motherboard.

What we have here is a tiny tower case, a fully featured Z87 motherboard and in this instance a £120 EVGA GTX 750Ti FTW graphics card. You can choose any Core i5 or i7 CPU that is within your budget, and the range of graphics cards that fit inside the Hadron Air will be perfectly acceptable to most gamers.

In fact, the only fundamental issue with this implementation of the mini-ITX form factor is that

you cannot upgrade beyond the integrated features of the Z87 Stinger. This shouldn't be much of a problem as the motherboard packs a good selection of USB 3.0 and USB 2.0, along with surround sound audio, Ethernet and Bluetooth. If you want to add wi-fi, you'll need to use the mini PCI Express slot.

It's also worth noting the Hadron Air is limited to two 2.5" drives, and if you want to install an optical drive, you'll have to use a specific slimline slot-loading model.

There's no denying the quality of the hardware. The Hadron Air case is gorgeous, and the Z87 Stinger looks superb. EVGA supplies a neat heat shield that protects the rear of the I/O panel from the CPU cooler and graphics card, and visually this is a very neat touch.

Once you've built the Z87 Stinger into a Hadron Air chassis, you'll very likely have a full-powered gaming PC that is considerably smaller than most comparable systems. You can also be sure you'll have spent a considerable amount of money, as the components will be expensive. In addition to a decent CPU, you also need a mid-range graphics card, fast DDR3 RAM and an SSD, so you won't be spending much less than £1,000.

The other thing is that while the Hadron Air is small by the standards of tower PCs, it's larger than most mini-ITX systems. It's small and powerful, and that makes it is very tempting indeed.







Small-form-factor PCs

Gigabyte AM1M-S2H Motherboard And AM1 Athlon 5350

DETAILS • Price: £24 for AM1MS2H, £42 for Athlon 5350 • Manufacturer: Gigabyte • Website: uk.gigabyte. com • Required spec: DDR3 RAM

he new AM1 APU from AMD takes an interesting approach to low-cost PC building but unfortunately that mouthful of alphabet spaghetti is as clear as mud.

Obviously you know that AMD is a CPU and graphics manufacturer, and no doubt you're aware that an APU is an Accelerated Processing Unit. That's another way of saying that an APU is a CPU with decent graphics.

You might not know that AM1 is AMD's new platform to transfer Kabini laptop technology to the desktop PC, and you would have to be very keen indeed to know that Kabini uses Socket FS1b.

There are four Kabini APUs (one dual-core and three quad-core), and they all have a 25W TDP, but the clock speed and GPU frequency varies from model to model. There are other differences, such as the amount of L2 cache and the supported DDR3 system memory.

The headline news is that the prices of Kabini APUs are very low, with the cheapest dualcore priced at £24 and the most expensive 2.05GHz quad-core coming in at £42.

Naturally, you also require a suitable motherboard, and this micro-ATX Gigabyte AM1M-S2H is on sale at £24. I was sent the Gigabyte by AMD and would have preferred the mini-ITX MSI AM1I that sells for £25, simply



because I wanted to try this system in a tiddly VESA chassis.

While that wasn't possible with the micro-ATX Gigabyte, it is nonetheless stunning to see a motherboard and quad-core APU combo priced at £66. The cheapest Intel H81 motherboard I can find costs £50 and a Pentium G3220 would set you back £42.

AMD has built Kabini as a system-on-chip, so the motherboard doesn't do much more than provide a socket for the APU and the bare minimum of power regulation hardware. Look closely and you'll see the PCB is almost entirely devoid of silicon chips. The other reason that I hoped to see a mini-ITX version of AM1 is that the expansion slots on the AM1M-S2H are pretty much useless. Kabini only provides four lanes of PCI Express 2.0, so the long PCI Express slot isn't much use for graphics expansion.

You get a flavour for the retro nature of Kabini when you look at the Gigabyte I/O panel. The audio is rather basic, there are two USB 3.0, two USB 2.0 and Realtek gigabit Ethernet. Graphics outputs consist of HDMI and VGA, which is the

strangest pairing I have seen in a long while. HDMI and DVI would make sense, but VGA just looks like an irrelevance. The two PS/2 ports also look out of place.

Building your new AM1 PC is a simple job. You need a regular micro-ATX case and power supply, and the Gigabyte simply drops into place. I received my Gigabyte board with the Athlon 5350 in place, and the tiny AMD heatsink clipped in position.

During my testing, the AM1 system drew 15W at the mains plug when it was idling, and that figure only rose to 25W under load, so we're talking about the tiniest amount of power. Even so, I was impressed that the 50mm fan on the cooler was near-silent.

Inside the Athlon 5350, there's a CPU core that is labelled K16 and a graphics core called Radeon HD 8400 graphics, although in desktop terms it's a Radeon R3. Think in terms of a £40 GeForce GT 620 and you're in the correct territory.

Kabini only supports singlechannel DDR3 memory, and I saw no improvement when I added a second 4GB DIMM to the test system. AMD claims that Kabini is the cheapest quad-core socketed system that money can buy, and in that respect it's correct. It will be all the more true if the next chip, Beema, uses the same FS1b socket and is a drop-in upgrade.

The dual problems are that Kabini has weak graphics that support 1,280x1,024 gaming at best, and the CPU is nothing special. While this is an amazingly cheap quad core CPU, it doesn't do anything noteworthy in single threaded workloads, and you would do as well to have a dual-core Intel Atom.

My other concern is that anyone buying Kabini is likely to use a hard drive rather than SSD, and that will further add to the delay while your PC is booting or opening files.

The Gigabyte AM1M-S2H and Kabini combo is amazingly cheap and uses a tiny amount of power, but despite that, it fails to impress.



Intel D54250WYB NUC

• Price: £295 • Manufacturer: Intel • Website: www.intel.com • Required spec: DDR3L SODIMM RAM, mini PCle SSD and wi-fi

hen Intel launched its miniature NUC (Next Unit of Computing), I was baffled by this Wintel version of a Mac Mini. The Celeron CPU was feeble, the Intel HD Graphics 2000 were limp, and the price was too high. Subsequent versions improved the processor and graphics, but there were odd steps along the way, where some models came without Ethernet or featured dual HDMI ports on the tiny I/O panel.

By my reckoning, NUC skipped a generation, so the D54250WYB uses a fourth-generation Haswell CPU but is actually the third generation of NUC.

The tiny motherboard measures 4" x 4" (101mm x 101mm) and has the Core i5-4250U CPU mounted on the backside of the board, with a slender laptop-style cooler blowing hot air out of the case.

On the top of the board there are two DDR3L-1600 SO-DIMM memory slots and two mini PCI Express slots. One is half length and the other full length, and you'll need to use the shorter slot to install an mSATA SSD. This is a tiny form factor for storage that is little larger than a postage stamp, although it costs slightly more than a regular 2.5" SSD. A 240GB Crucial M500 costs £90, or you can pay £180 for 480GB. There's no option





any hard core games with the
Intel HD 5000 graphics

to install a laptop hard drive inside a NUC.

The longer slot is then free to accommodate a wi-fi/Bluetooth card, such as the Intel Dual Band AC 7260 and Bluetooth mSATA that costs £17.50 on Amazon.

Other ports and connectors consist of four USB 3.0 ports and Intel gigabit Ethernet with mini HDMI and mini DisplayPort outputs for the graphics.

Once you've paid £295 for a barebones, NUC you still

need to add memory, storage and wi-fi, which will take the typical cost for the system to £495 before you add in the cost of Windows. You will need to install your operating system either using a USB DVD drive or flash drive.

The performance of NUC is perfectly acceptable for watching YouTube and playing games such as *Minecraft*, but you cannot expect to play any hard core games with the Intel HD 5000 graphics.

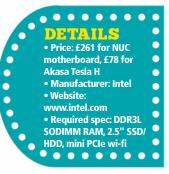
The biggest problem for me is the tiny laptop cooler, which makes an audible whirring noise when it's under load. The problem is that the system draws 35W under load, mostly used by the Haswell CPU, which means that the tiny cooler has to work rather hard.

I found myself unable to ignore the noise of the cooler. It isn't loud, just ever so slightly annoying.



Small-form-factor PCs

Intel D54250WYB NUC Motherboard With Akasa Tesla H Passive Case



hile I like the latest Intel NUC with Haswell CPU, there are a number of areas where it can be improved. The biggest problem for me is the heatsink/fan unit, as I find the noise level of the system under load is rather annoying. That is my personal chief complaint, but other people will take issue with the storage side of things.

Intel's reference design for NUC means you have to buy an mSATA device that fits in a mini PCI Express slot.

This isn't a problem if you're using NUC as a thin client, where you browse files stored on your network in a NAS box or perhaps online. Those sorts of users will be happy using a £60 Crucial M4 mSATA with 120GB of storage and might even get away with a 64GB Adata XPG that costs £55, in which case NUC looks like reasonably good value.

The problem comes if you want more local storage and especially if you want more performance, as your options are fairly limited with mSATA. The best storage on offer is a 500GB Samsung 840 EVO at £220, or you can have 1TB for £410 and that looks like poor value when you consider that a 1TB laptop hard drive costs £50. Put it this way: a 1TB mSATA SSD costs the same as the NUC barebones with 8GB of RAM.







The answer to these problems lies in the Akasa Tesla H case, which is specifically designed for the latest NUC. It's a passively cooled model that adds two 2.5."

VESA installation.

cooled model that adds two 2.5" drive bays to the NUC, so it's somewhat larger than the Intel reference design, with a footprint of 240mm x 150mm, but it's still small enough to be used in a

Akasa makes a range of passively cooled cases for specific boards, and it's worth mentioning another. The Newton H is a straight swap for the latest NUC case but does not include any drive bays and measures 170mm x 150mm, compared to the actively cooled Intel case,

which is 110mm x 110mm.

The Tesla H requires some assembly that can get a bit fiddly at times. The easy part is removing the stock NUC heatsink and replacing it with the supplied aluminium block that acts as a heat path between the CPU and chassis.

Installing the motherboard in the Tesla H is simple, as the case is specific to this model of NUC. There's no I/O shield, as the motherboard lines up precisely with the ports.

It's an easy matter to install a single 2.5" drive in the Tesla H as NUC has a pair of SATA power and data connectors, but if you wish to install two 2.5" drives, you need to use an adapter such as the Akasa AK-PCCMSA-01,

which is an mSATA to SATA adapter that costs £15.

Once you've connected the adapter and have the necessary cables in place, you can assemble the drive bay, which consists of two side plates that you attach to the drive(s) and screw into the chassis. It sounds simple but requires patience. I elected to boot off a 180GB Intel 520 SSD that costs £100 and used a 500GB Toshiba MQ01ACF050 hard drive that costs about £45 for storage.

The other hassle is routing the USB and SATA cables, as there's very little space inside the case.

Obviously the performance of an Intel NUC inside a Tesla H case is exactly the same as a regular NUC, but the extra options for storage and the silent operation of the passive cooling make this approach an excellent option for the PC enthusiast.





Zotac Zbox E1730 Plus

Manufacturer: Zotac Website: www.zotac.com **Required spec: None**

otac takes the simple and direct approach to its mini PC barebones that it calls Zbox. When Intel created NUC, the footprint was kept to an absolute minimum thanks to the use of a new form factor that located the CPU on one side of the motherboard and the rest of the hardware on the other side. The other trick that Intel employed was using mini PCI Express for the mSATA storage, rather than a 2.5" laptop form factor.

Zotac ignores that approach and instead uses a 170mm x 170mm mini-ITX motherboard, which means the case is larger than NUC and has enough room inside for a 2.5" drive bay and a reasonably sized CPU cooler.

There are two basic models of Zbox E-series. The E1730 uses a 2.7GHz Core i5-4570R, while the E1750 has a Core i7-4770R that runs at 3.2GHz. The barebones versions cost £410 and £520 respectively, but require RAM and either a hard drive or SSD. Alternatively, you can buy a Plus model that comes with 8GB of RAM and a 1TB hard drive (£567 and £657 respectively), leaving you to merely install an operating system.

Zotac supplied me with a Zbox E1730 Plus, which made my life easy, as it was ready for action, but on the downside it meant I had to use a hard drive for the first time in ages. When I build a barebones, I invariably use SSD, as the increase in performance and decrease





66 The laptop-style cooler on

the CPU can get a bit noisy when

the PC is working hard



Whichever version you buy, you'll find the motherboard uses a Haswell laptop CPU that is soldered in place rather than a socketed desktop part. That might sound like a limitation for the customer, but it has a direct benefit, because Intel

in noise simply have to be

experienced to be believed.

desktop CPUs have relatively limp graphics such as HD 4600, while Zbox E is powered by Intel HD 5200 graphics.

During my testing, the Core i5 CPU in the E1730 provided more than enough grunt for any task I performed, and I simply could not see the point of spending another £100 on a faster Core i7 when that cash could usefully pay for an SSD.

The provision of an external 120W power brick shows that Zotac is serious about the options for using the CPU under full load.

Zotac has provided an array of ports and connectors that are located on the side of the E1730. You can lay the Zbox down flat, stand it upright on the provided foot or fit it to the back of your monitor on the provided VESA mount, so it's tricky to talk in terms of the top or bottom of this PC. One long edge that looks like the front of the E1730 has the headset iacks, a card reader and one USB 3.0 port. On the edge that would be the top if you use the desktop stand, there is another USB 3.0 port, and then on the 'back' there's the antenna for the 802.11/ac wi-fi, two more USB 3.0, dual gigabit Ethernet, optical S/PDIF, DVI-I and dual DisplayPort. I am baffled by the provision of dual DisplayPort and feel that dual Ethernet is over the top. Thankfully, Zotac includes a DVI-to-HDMI adapter in the package, so you can easily connect the E1730 to your TV.

My biggest single complaint is that the laptop-style cooler on the CPU can get a bit noisy when the PC is working hard, but other than that, the E1730 is a well-balanced PC that will suit mainstream users very nicely.







How We Tested

The range of options in this group is amazing. The new AM1 platform from AMD is restricted in its power, but the cost is astonishingly low. At the other end of the scale, an EVGA Hadron Air system is a fully featured gaming PC that just happens to be housed in a tiny case. In the middle, we have a variety of chassis from Akasa, the Intel NUC and Zotac Zbox that provide you with plenty of options for a small and quiet PC.

Make And Model	ASRock H81TM-ITX and Akasa Euler	EVGA Z87 Stinger and Hadron Air	Gigabyte AM1M- S2H	Intel D54250WYB NUC	Intel D54250WYB and Akasa Tesla H	Zotac Zbox E1730 Plus	
Processor	Intel LGA1150 Core i5	Intel LGA1150 Core i5/i7	AMD AM1 APU	Intel Core i5-4250U 1.3GHz	Intel Core i5-4250U 1.3GHz	Intel Core i5-4570R 2.7GHz	
Graphics	Intel HD 4600	GeForce GTX 750 Ti 2GB	AMD Radeon HD 8400	Intel HD 5000	Intel HD 5000	Intel HD 5200 with 128MB eDRAM	
Graphics Outputs	DVI-I, HDMI	DVI-I, DisplayPort, HDMI	HDMI, VGA	Mini DisplayPort, Mini HDMI	Mini DisplayPort, Mini HDMI	Dual DisplayPort, DVI-I	
Memory Support	Max 16GB DDR3-1600 SO-DIMM, 2 modules	Max 32GB DDR3- 2666 DIMM, 2 modules	Max 32GB DDR3- 1600 DIMM, 2 modules	Max 16GB DDR3L- 1600 SO-DIMM, 2 modules	Max 16GB DDR3L- 1600 SO-DIMM, 2 modules	Max 16GB DDR3- 1600 SO-DIMM, 2 modules	
Networking	Intel gigabit Ethernet	Intel gigabit Ethernet	Realtek gigabit Ethernet	Intel gigabit Ethernet, mini PCIe wi-fi	Intel gigabit Ethernet, mini PCIe wi-fi	Dual Realtek gigabit Ethernet, 802.11ac, Bluetooth	
PC Mark 8 v2 Work Tests, Accelerated Mode	3,422	4,878	2,463	3,222	3,091	3,634	
3DMark (2013) V1.2.250 Cloud Gate Overall	5,128	19,312	2,741	5,122	4,591	8,487	
3DMark (2013) V1.2.250 Fire Strike Overall	620	4,346	370	799	768	1,095	
3DMark (2013) V1.2.250 Fire Strike Graphics	674	4,685	401	855	812	1,136	
Idle Power Draw (Watts)	25	40	15	15	15	20	
Loaded Power Draw (Watts)	50	120	25	35	35	30	

Tech Origins GNU Project

David Briddock explores the birth of the open source movement

espite being ensconced inside his beloved MIT computing lab, Richard Stallman wasn't a happy man. The increasing commercialisation of computer software was a constant source of consternation.

Proprietary Unix operating systems were a prime example, with sky-high licence fees and frequent copyright clashes, invariably resulting in lengthy and vitriolic courtroom battles.

Inception

By the early 1980s, many of Stallman's colleagues had left, attracted by the lucrative salaries and contracts on offer - paid for by the licensing agreements he so despised.

Evidentially, Stallman's persuasive arguments against software copyright wasn't enough. The situation was only going to be resolved by action, and the GNU Project idea was born.

GNU stood for 'GNU is Not Unix', using a recursive acronym naming convention popular within the hacker community.

Freedom Manifesto

The GNU project, he decided, wasn't just about the technology. Stallman wanted

it to become a social, ethical and political initiative. So in addition to producing software, the project delivered a series of publications, the majority authored by Stallman himself.

Code, Stallman argued, must always be free. That is free as in freedom, rather than price (goo.gl/Xn9Jxx). In particular he considered these four freedoms to be essential for software development:

- freedom to run a program for any purpose
- freedom to study the mechanics of the
- freedom to redistribute program copies
- freedom to improve and modify for public use

The only way to accomplish such freedom was to ensure everyone had full access to the source code at all times.

Freedom Licence

Stallman realised he could best enforce these freedoms through a new type of software licence, the GNU General Public License (GPL – goo.gl/vejujf).



▲ GNU GCC logo



GPL granted complete freedom for personal use, but for commercial purposes, regardless of end-user cost, GPL stipulated the complete code base must be placed in the public domain. In other words, while commercialisation of software was encouraged (unlike with shareware, for instance), code secrecy was banned.

Importantly, the licence allowed non-GPL applications to run alongside GPL programs or on GPL-based operating systems, as happens today with Linux and Android.

Influence

The GNU project and its manifesto enticed hordes of like-minded individuals. It acted as a catalyst for the formation of free and open source communities around the globe. Software developers were particularly attracted to the free C compiler, extensive set of development-centric tools and utilities.

With community support, work on the GNU C Compiler (GCC) simply bounded along, while the associated GNU toolkit grew rapidly in features and functionality. Today, it's estimated that around 50% of free software is released under GPL.

One key aim of the GNU project was to deliver a Unix-like operating system. However, the appearance of Linux in 1991 (which itself relied on GPL, GCC and GNU tools) dampened enthusiasm for the still work-in-progress GNU alternative.

A Different World

Where would we be today without the open-source movement? It's impossible to say for certain, but the computing landscape would certainly be very different.

A landscape almost certainly devoid of free web browsers, Linux or the vast collection of software languages and tools today's programmers use to develop free and low-cost applications.

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How-to Basics Bash Scripting Part

David Hayward concludes his look at Bash

ast week we played around with some choices and various loops.
While they're fun to toy with, getting them into a real-world situation isn't always as easy as it sounds.

One of the most well-used examples of Bash scripting is the creation of a simple backup script. Here you'll have something along the lines of:

#!/bin/bash

tar -cZf /backups/my-backup.tgz /home/ me/

What this will do is create a compressed backup of the /home/me folder, your user area, and dump it into another folder /backups, with the name my-backup.tgz.

This will work perfectly fine, but if you want to make the script a little more interactive and clever, then you could add a selection of variables, an IF FI statement and maybe even a choice or two. Also, we could check to see if there's a previous backup and check to see if the backup folder actually exists; finally, we could also include a time and date stamp so you can better manage the backups over a period of months.

Beginning The Backup Script

Let's start with creating the backup directory and checking that we can actually write to it.

You can use the /var/backups directory to send your backups to, since this folder exists on any Debian-based system, but there's some speculation as to whether this is proper form or not. You could also create a backups folder in the root of the system and use root level access to back up yours and the other users' Home folders. This, though, is getting a little more complex than it needs to, especially for our How-to Basics series anyway. What we'll do, then, in this case, is simply create a backups folder within the Home folder of the current user:

mkdir backups

This will create the folder and obviously give you the correct permissions to access it.

Now we can create some variables for our backup script. Use the following:

#!/bin/bash

clear

Time stamp day=\$(date +%A+%_d) month=\$(date +%B) year=\$(date +%Y)

Folders dest="/home/david/backups" sauce="/home/david"

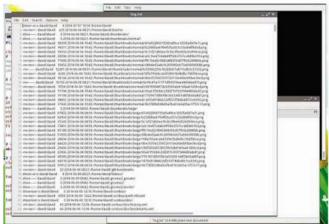
As you may already notice, we spelled source as sauce, which is because it's a shell built-in command that executes the contents of a file – hence we tried to be clever and used a different spelling. And you'll obviously change the home name from David to your own, unless your name is David, of course.

Next, we can run a check to see if the backup folder exists, just in case we forgot to create one or for some reason it's not there. Add the following to make sure everything is in place:

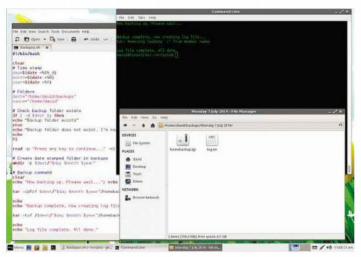
if [-d \$dest]; then
echo "Backup folder exists"
else
echo "Backup folder does not exist! I'm
now creating."; (mkdir -p \$dest)
echo
fi



▲ The backup destination is checked and created if it's not present



A Creating a log may seem a little excessive but handy if you need to see what's going on



▲ The final script, with backup file and log up and running

read -p "Press any key to continue..."
-n1 -s

The Read command will wait until the user has pressed a key then continue. Naturally, if this was an automated script, done in the wee hours, then you'd remove this line, but for the sake of showing what's going on, we'll include it.

With the backup folder now created, we can then move on to creating a folder within backups based on the current date:

mkdir -p \$dest/"\$day \$month \$year"

This will create a folder with the current day, month and year, into which the compressed backup file will be placed.

Backing Up

There are several ways to execute a compressed backup file. Gunzip, zip, tar and so on are all valid methods, with each having their own point for and against. For our example, here we'll just use the tar command, but it's certainly worth experimenting and exploring what other commands can be used. In the end, it's purely down to personal taste and what you're used to using.

To create the compressed file backup of the Home folder, add the following to your script:

clear

echo "Now backing up. Please wait..." tar –cpPzf \$dest/"\$day \$month \$year"/ homebackup.tgz \$sauce --exclude=\$dest

This will output to the screen the message 'Now backing up. Please wait...' followed by creating the compressed homebackup.tgz file in the previously created destination backups and the date stamped folders.

Expanding And Enhancing

The script we used here is really quite simple, but it can be used as a base for something a lot more entertaining – as entertaining as running a backup can be at any rate.

You can, for example, include some options to ask the user what folders to exclude, perhaps based on an outputted Is –I command and store them as variables to add to the Tar command later in the script.

Perhaps you could even include some kind of countdown; one where the script first counts how many files there are to back up, then uses a loop to Echo the number counting down as each file is added to the compressed backup file?

There's a lot more that can be done here, that's for certain. If you have any extras and fancy bits you can add to the script, then we'd love to hear from you via the usual address.

To add a little extra to this, we can include the following:

echo

echo "Backup complete, now creating log file..."

tar -tvf /\$dest/"\$day \$month \$year"/ homebackup.tgz > /\$dest/"\$day \$month \$year"/log.txt

As you can see from the echo command, this will create a log file, log. txt, of the backup process listing the files that were backed up and now stored in the homebackup.tgz file.

And finally, we can add:

echo

echo "Log file complete. All done."

This will add a final working and complete message, provided everything else beforehand worked.

The Whole Script

If we now combine that little lot, the end script should read as follows:

#!/bin/bash

clear

Time stamp day=\$(date +%A%_d) month=\$(date +%B) year=\$(date +%Y)

Folders dest="/home/david/backups" sauce="/home/david"

Check backup folder exists if [-d \$dest]; then echo "Backup folder exists" else echo "Backup folder does not exist. I'm now creating one.";(mkdir -p \$dest) echo fi

read -p "Press any key to continue..."
-n1 -s

Create date stamped folder in backups

mkdir -p \$dest/"\$day \$month \$year"

Backup command clear

echo "Now backing up. Please wait..."; echo

tar -cpPzf \$dest/"\$day \$month \$year"/ homebackup.tgz \$sauce --exclude=\$dest

echo

echo "Backup complete, now creating log file..."

tar -tvf /\$dest/"\$day \$month \$year"/ homebackup.tgz > /\$dest/"\$day \$month \$year"/log.txt

echo

echo "Log file complete. All done."

The good news is the script ran perfectly well. The bad news was we forgot to exclude the Steam folder and thus ended up with our Linux games being backed up and eventually running low on space on the drive.

We quickly remedied this by adding another --exclude=/home/david/Steam to the Tar command, but it's worth checking what you have stored in your home directory before running the script. While we're on this subject, another place to possibly exclude is the Downloads folder, especially if you've got a lot of Linux .iso files or other large downloads inhabiting it. mm

Why Aren't Batteries Better? Mobile devices are fast improving, so why is the technology that

s mobile devices become more and more popular and increasingly important to our lives, it's hard not to wonder why we seem to be locked in a constant battle with the batteries that power them. Making sure they're plugged in every night, feeding them before heading out, praying that they'll retain that last few percent until we step back through our front doors. At least you could just pop into a shop for some fresh AA batteries if your Discman or Game Boy died!

powers them lagging behind?

Clearly, companies have noticed our frustrations. Assuring customers that their device's battery will last for hours is an essential part of marketing any mobile system – and yet despite this, they rarely seem to extend past eight to ten hours of use even in the best devices. Ten years ago we were using VGA resolution screens with pixels so big you could count them by

hand. Now we can't even see them. If batteries were moving at the same pace, they'd last days, even weeks.

So what is it that stops battery capacity from improving, even though every other aspect of technology is getting better and better? How come mobile phones used to go for days between charges but now you have to plug your smartphone in at least once a day if you use it for any sane amount of time? Why is it that batteries, simply put, aren't getting better?

Li-on Batteries

The majority of modern mobile devices – that is, any with significant power requirements – use the same kind of battery: a lithium-ion type. These batteries provide power by transferring electrons between two electrodes within the battery cell.

WHY AREN'T BATTERIES BETTER?



Charging the battery reverses the process, only for you to begin it again later as you start to use the battery. This is what makes them rechargeable.

One of the problems is that the basic capacity of li-on technology hasn't really been improved for years. They were first developed in the 1970s and reached the consumer market in the 1990s, and they've only improved slightly since then.

It's not for lack of trying. The problem is that li-on simply can't

The basic capacity of li-on technology hasn't really been improved for years

be improved any further than it already has been. Modern batteries use graphite to store the lithium ions, and there's a hard physical limit to how many ions graphite can store. Modern batteries are so close to the saturation point that the only way to effect a significant improvement in a battery's capacity is to increase its size or find an entirely new technology to base it on, because the existing one simply can't be significantly refined any more.

One potential avenue of improvement is to replace the graphite electrodes with silicon-based ones. Working along similar principals, silicon-based electrodes would offer up to ten times the capacity of a current battery. But silicon also swells when it's charging, which breaks the electrical contacts and causes the battery's overall capacity to permanently deteriorate relatively quickly. When mobile devices are required to last for years at a time and accept hundreds of charges, that's a problem.



Some solutions to the problem involve the use of graphene to stabilise the silicon, an atom-thick layer of graphite, which has unique and useful properties. This would allow battery makers to harness the stability of graphite while adding extra capacity, as with silicon. In the laboratory, graphene-silicon hybrids have stored ten times the power of a standard li-on battery and fully charge ten times more quickly.

But they're not a wonder solution yet. It's hard to produce graphene in the quantities necessary to try it out, so testing and manufacturing is moving slowly. Nonetheless, it's predicted that graphene-based batteries could come on the market within two years, offering capacity improvements somewhere between 30% and 100%.



Even more refinements involve the use of completely different processes, such as PolyPlus's lithium-sulphur and lithium-air batteries. But even these technologies are some years away from being used in a rechargeable context and even further from the consumer market. They're targeted at electric cars and industrial use, so you'll see them there long before they'll ever be found in a laptop.

An extended battery life isn't just about being able to play Candy Crush Saga for longer either. At the moment, batteries don't just have an effect on the length of time you can use a device for – they also limit how compact a device can be and what technology you can put inside it. Features like 4G data signals, wireless mirroring and 4K video require a large amount of battery power backing them up, and current batteries struggle to provide enough for such features to be satisfying or in some cases viable at all. If we're going to see next-gen technology in our mobile devices, we need next-gen battery capacities too.

So as you might expect, improving batteries is an area of considerable interest to great swathes of the tech industry. Whether a company makes laptops, tablets, smartphones or wireless peripherals, a longer battery life can only be a good thing. But if lithium-based batteries are looking like a dead end, at least in the short term, what else could be used instead?

Fuel Cells

So far, the combined price, simplicity and familiarity of li-on batteries has kept other power sources far, far away from ever powering a laptop. But what about fuel cells, the great energy hope of last decade?

Rather than storing power, fuel cells actively generate it using electrochemical processes. Some break down methanol, others combine hydrogen with oxygen. In either case, recharging a battery is as simple as topping it back up, a process that usually involves nothing more complicated than swapping around a refillable cartridge.

As far back as 2006, news agencies were reporting that fuel cell technology would one day power all laptops. Prototype devices, which ran on fuel cell-type batteries were being developed by all the major companies, including Toshiba, Hitachi, Fujitsu, Samsung and Sanyo, and proof of concept versions had existed in some form since as far back as 2002.

The only real problem seemed to be one of miniaturisation: as soon as the pumps had been refined to the point of portability, fuel cell technology would become commercially viable, we were told. Tomoaki Arimura of Toshiba's Methanol Fuel Cell

For fuel cells to take off, people would have to be willing to pay more money for a less portable laptop

Group said it was aiming for commercialisation of its fuel cell technology in 2007. At that point, a unit the size of a printer cartridge could provide enough energy to keep a laptop running for ten hours – as much as a standard charge. Safety measures allayed fears by aggressively prevented leaks and overheating. It was shown, quite definitively, to work.

And yet here we are in 2014, and laptops still don't have anything more interesting or more reliable than a li-on battery available to them. So what went wrong?

The problem wasn't that fuel cell technology turned out not to work, because it does. There are cars, buses and even portable power packs that use hydrogen-based fuel cells to provide the electrical power they need. Fuel cell-powered goods are still niche items, but they do exist, and it's actually at the portable level that they're most competitive.

WHY AREN'T BATTERIES BETTER?



It's also not because fuel cells aren't environmentally friendly. Although they require the use of removable and refillable cartridges, which must be manufactured new for the purpose, that's scarcely worse than the creation of new li-on batteries. A bigger problem is that they run on hydrogen, which is currently refined using processes that rely on fossil fuels. That'll have to change if fuel cells are to present a genuinely greener alternative.

On the plus side, hydrogen cells produce nothing but water vapour when they're used, so there's no dead battery to dispose of. It may not be 100% clean, but it certainly has the potential to be better than the alternatives – as long they can get their hydrogen from sources that don't require fossil fuel-power to create it.

Most likely, what's kept fuel cells down is the price. Fuel cells aren't cheap, and they're still bulky compared to increasingly thin li-on batteries. Essentially, for fuel cells to take off, people would have to be willing to pay more money for a less portable laptop – something they've been unwilling to do in the past.

Worse still, chargers such as the Lilliputian Nectar use butane-based cells, which aren't refillable. Each cell can fully charge a smartphone up to ten times, but each one costs \$10. Paying a dollar to charge your phone isn't the worst value in the world, but it's more expensive and less convenient than a reusable li-on battery.

It's a safe bet, then, that while fuel cells have their advantages, it's unlikely people want to pay that much to get them. At this point, no major company around is going to throw money away testing that hypothesis. For the moment, fuel cells remain a hopeful goal, rather than the next stage of battery evolution.

Device Requirements

If there's no way to improve the battery technology in mobile devices, there's a simple alternative: try to make computers require less power in the first place. Although there isn't a lot of room to improve battery capacities under their current technology, it is abundantly possible to make components more efficient.

CPUs in particular become less power hungry as their capacitors and circuitry are refined. With each die shrink, a processor uses less power to reach the same performance levels. Smaller components have lower resistance and are more efficient, meaning cheaper and more conservative running. This is most often trumpeted with the release of new desktop platforms, but it's actually in the mobile space where it has the greatest effect.

There are other components that can be refined as well. A Scottish company called Sofant has developed a 'smart antenna' that uses less power by concentrating its signal in the specific direction it finds a wireless signal coming from, rather than wasting electricity broadcasting a blind, omnidirectional signal. It has the disadvantage of being mechanical, so reliability could be a huge concern, but the principle is sound and indicates how one might go about reducing the power requirements of wireless connectivity in the future.

In fact, wireless signals are still fairly unrefined and have a huge effect on battery life, so it's an area ripe for improvement. A smarter antenna – not necessarily this one – could literally double the battery life of a device with a consistently active wireless connection, so it's clearly something worth working towards for the industry as a whole – especially as wireless connections are starting to use multiple signals to achieve greater speeds.

Along similar lines, more efficient power amplifiers would allow phones to get better performance during intensive, highbandwidth uses, while the creation of low-power subprocessors

For fuel cells to take off, people would have to be willing to pay more money for a less portable laptop

could mean less power gets used while a device is idling or performing the simplest tasks. A technology called Energy Minimising Idle Listening allowed smartphones to improve their battery performance by up to 44% without any noticeable drop in usability. Screens are a major area of innovation as companies find ways to create better-looking images with lower power requirements, with consistently good results.

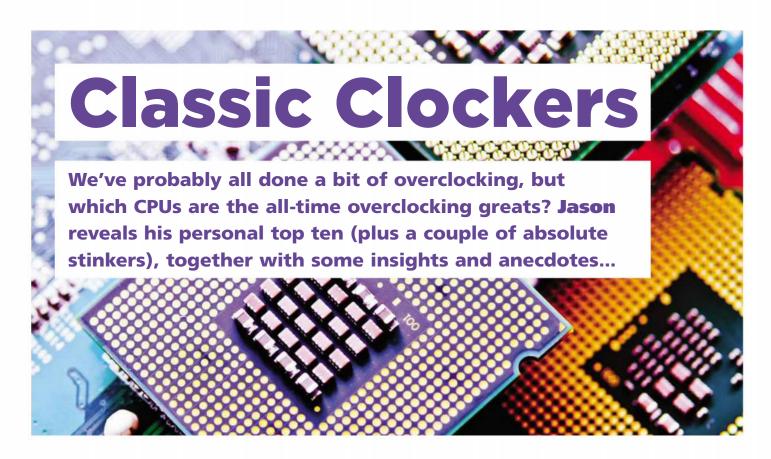
Non-standard charging methods are also being investigated. By weaving piezoelectric films into clothes, vibrations from ambient sound can be converted into energy to recharge a phone in small amounts over a long period of use. Personal solar panels and kinetic-recover clothing could achieve similar results.

Clearly, there is enthusiasm on all sides for making devices more efficient and less power-hungry without sacrificing performance, and the only way devices can continue to improve at their current rate is if li-on eventually goes away.

That said, though, things aren't automatically going to get better. There's always a way for devices to use more power if it's available, so no matter how efficient components get, better batteries will always be on the cards.

So you might think a better battery will mean 24 hours between charges, but mobile companies are just as likely to see improved technology as an excuse for increased background activity, thinner, smaller devices or more intensive processing. After all, the current average of eight to ten hours seems to represent what consumers will put up with. Why over-deliver when you can maximise profits by holding back?

Either way, one thing is guaranteed: li-on has had its day. The current generation of batteries can't get any better, but their successors will eventually arrive. Try to take comfort in that the next time you hit 3% battery just moments before an important meeting! mm



6MHz 80286 (Intel)

- Clock: 12MHz; 0.5x multiplier/divisor
- L2: none
- Die: P2; 1500nm
- sSpec: too many!
- Interface: 68-pin CPGA/CLCC/PLCC
- Date: February 1982Then: \$360 (bulk)Now: £15 (eBay)

It's often assumed that overclocking is a modern phenomenon, but folks were at it with Intel's 286 (and earlier). This was the cornerstone of IBM's PC AT, launched in August 1984, where it ran at 6MHz. Its speed was determined by a 12MHz crystal on the motherboard – a 0.5x multiplier or divisor was applied.

This crystal wasn't soldered down (as it was on the PC and PC XT, the AT's predecessors), so some enthusiasts swapped it for a 16MHz part, overclocking their CPUs to 8MHz (a speed later offered as standard). That might seem like small potatoes, but it was a 33% boost – a healthy overclock by any measure. Real hard-nuts would even chance a 20MHz crystal.

IBM got wind of this dark practice, of course, and from June 1985 all new ATs featured a BIOS that checked for the correct crystal before boot. Naturally, someone took about five minutes to discover a workaround...

350MHz K6-2 (AMD)

- FSB: 100MHz; 3.5x multiplier
- L2: none, 512KB or 1MB (motherboard-mounted)
- Die: Chomper Extended (CXT); 250nm
- OPN: AMD-K6-2/350AFR
- Interface: Socket 7/Super7
- Date: August 1998
- Then: \$317 (bulk)
- Now: £3 (eBay)

Overclocking truly became mainstream with the advent of glorious Socket 7. Intel reckoned this wasn't suitable for speeds beyond 266MHz (or just 233MHz on the desktop) – when the Pentium and Pentium MMX were succeeded by the Pentium II, Slot 1 was introduced – but AMD had other ideas.*

The K6-2 was an enthusiast's dream. All K6-2s were sweet (sweeter than the K6-Ills), but the daddy was the 350MHz chip. As faster models were released – 550MHz was the peak – it sold for peanuts, and a voltage nudge would often see it scaling to 500MHz or beyond. I used countless examples in builds of the late 90s, quite a few of them overclocked (with customers' knowledge, you understand!).

Even better than the K6-2 was the K6-2+ – built at 180nm and featuring 128KB of on-die L2 cache. Sadly, nothing was launched until 2000, and buyers pretty much ignored it (as they did the

killer K6-III+). Athlon-mania was sweeping the globe.

* Also popular in the twilight years of Socket 7 was the Cyrix 6x86MX (later renamed the MII). Some models were rebadged by IBM. Another runner was IDT with its various WinChip families, but only about 15 people placed bets there. And does anyone remember the Rise mP6? No, I thought not.

300MHz ('300A') Celeron (Intel)

- FSB: 66MHz; 4.5x multiplier
- L2: 128KB
- Die: Mendocino; 250nm
- sSpec: SL2WM and SL32A (Slot 1);
 SL35Q and SL36A (Socket 370)
- Interface: Slot 1; Socket 370
- Date: August 1998
- Then: \$149 (bulk)
- Now: £7.50 (eBay)

In April 1998, to combat rivals' cheap Socket 7 chips, Intel launched the Celeron. This used the Covington core, derived from the Pentium II's Deschutes core. With Slot 1 and Socket 370, L2 cache wasn't on the motherboard, as it was with Socket 7, but on the CPU. Deschutes had 512KB, but Covington had 0KB. Not a single byte. Even at 300MHz, the early Celerons were stone-cold stinkers – slower than the 233MHz Pentium MMX they replaced.





▲ 350MHz K6-2

Just months later, Intel was shamed into releasing the Cappuccino core – sorry, the Mendocino core. The updated Celeron became the first consumer CPU to have L2 cache on-die, running at full speed. The prevailing Pentium II's L2 cache was off-die, running at half speed. The 300MHz Mendocino performed nearly twice as quick as the 300MHz Covington, and by upping the FSB to 100MHz it would routinely hit 450MHz. At that speed it was merely a whisker slower than the fastest-ever Pentium II (also 450MHz) – at a quarter of the cost!

Athlon Xp-M 2500+ (AMD)

Speed: 1867MHz

FSB: 133MHz (266MT/s); 14x multiplier

L2: 512KB

• Die: Barton; 130nm

OPN: AXMH2500FQQ4C

Interface: Socket A

Date: February 2003

Then: \$239 (bulk)

Now: £6 (eBay)

Socket A was the nuts, wasn't it? It was home to the mammoth Athlon XP, and the flagship was the 3200+, running at 2200MHz on a 400MT/s FSB. However, enthusiasts often opted for the 2500+, the same chip but running at 1833MHz on a 333MT/s FSB. It cost about half the money.

By this time, most AMD chips had locked multipliers, but the 2500+ had the same 11x

multiplier as the 3200+. With a half-decent motherboard – typically featuring an Nvidia nForce2 400 or Ultra 400 chipset – users would simply crank up the FSB. Et voilà – a cheap 3200+! Success was hit and miss, though, even with extra voltage.

But the XP-M 2500+, the mobile variant, was a different kettle of silicon. With BIOS support, XP-Ms could be dropped into desktops. And get this: the multipliers were unlocked. So, naturally, the 2500+ could have its FSB increased and its multiplier lowered and be turned into a 3200+. But there was more – much more. Mainstream Barton-core XP-Ms required only 1.45V, not the 1.65V of their desktop counterparts. That gave them oodles of overvolting headroom. Never mind 2200MHz – at 1.65V, 2500MHz was on the cards.

Pre-tested XP and XP-M chips became staple items on eBay during 2003 and 2004. So did pre-overclocked systems (I used to sell them!). Sadly, however, re-marking was rife: unscrupulous distributors would rub off the product codes and print on faster ones.

Pentium M 730 (Intel)

Speed: 1600MHz

FSB: 133MHz (533MT/s); 12x multiplier

L2: 2MB

Die: Dothan; 90nm

sSpec: SL86M; SL86G; SL8FT

Interface: Socket 479Date: January 2005

• Then: \$270 (bulk)

Now: £3.50 (eBay)

The Pentium M was crucial for Intel. Its laptop Pentium 4 CPUs were responsible for doubling users' utility bills – or would've been had they not also made great central-heating systems – so a skunk-works team in Israel took the P6 architecture of the Pentium Pro, II, and III and developed what became the backbone of the original Centrino initiative.

Sadly, the Pentium M used Socket 479, not the desktop's prevailing Socket 478. However, Asus produced the CT-479, a drop-in adaptor for some of its Socket 478 motherboards. AOpen and DFI, among others, launched a selection of motherboards that supported Socket 479 natively.

All Pentium Ms were stellar clockers, but the 730 had healthy headroom and, being an entry-level model, wasn't colossally expensive. Even without extra voltage, it could almost always be pushed to 2.4GHz – ramping up the FSB to 800MT/s would do the trick. That made it faster than the flagship 780 and the equal of a desktop Pentium 4 running 1GHz quicker, all while consuming less than a third of the energy!

Opteron 146 (AMD)

Speed: 2000MHz

 HT: 200MHz x 5 (2000MT/s); 10x multiplier

L2: 1MB

• Die: Venus/San Diego; 90nm

OPN: OSA146DAA5BN

• Interface: Socket 939

Date: August 2005

Then: \$180 (retail)

Now: £10 (eBay)

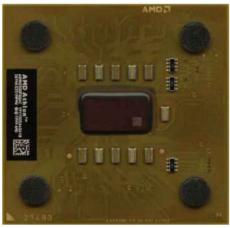
Opterons, of course, are server CPUs. However, AMD has a tradition of releasing budget models that'll work in standard desktop motherboards. The plan originally was to steal market share from Intel by



▲ The Rise mP6 chips were certainly pretty, but of course beauty is only skin-deep



▲ 300MHz ('300A') Celeron (Slot 1)



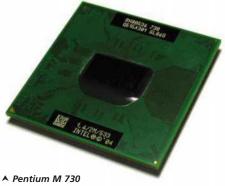
Athlon XP-M 2500+

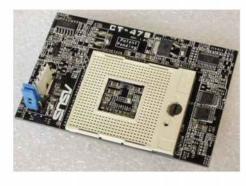
making entry-level servers more affordable, but Intel with its Xeons now does the same thing.

The first desktop Opterons dropped into Socket 939 and were essentially rebadged Athlon 64s.* Server CPUs have to be able to run rock-stable even under extreme conditions, so these Opterons were the 'purest' Athlon 64s cut from each silicon wafer - the cream of the crop. The low-end 144 and 146 could reach far higher speeds than suggested by the numbers on the box.

Demand always outstripped supply. At one point I found a little-known retailer with

a stash of the 146 that somehow hadn't been discovered, so I bought about a dozen units and cleaned up on eBay. Typically, the 146 would clock at least to 2.8GHz (3GHz





▲ The CT-479 was manna from Asus for users who saw 'Pentium 4 Inside' as a warning label



▲ Opteron 146 (Socket 939)

was common), meaning it was really an Athlon 64 FX-57 in disguise. At the time, the FX-57 cost \$1,031!

* The dual-core models were popular, too. These were essentially rebadged Athlon 64 X2s (using the Denmark/Toledo core).

Pentium D 805 (Intel)

- Speed: 2 x 2667MHz
- FSB: 133MHz (533MT/s); 20x multiplier
- L2: 2 x 1MB
- Die: Smithfield; 90nm
- sSpec: SL8ZH
- Interface: LGA775
- Date: March 2006
- Then: \$143 (bulk)
- Now: £3 (eBay)

And so we move into the multi-core era. AMD was king in the early days, as Intel's Pentium D, being two Pentium 4s grafted together, was a melon. Except, perhaps, for the 805. This was the slowest, and the last of the 800 series, but it was also fabulously cheap. At the time, AMD's entry-level Athlon 64 X2 3800+ was more than twice the price.

The 805 was the only Pentium D to use a 533MT/s FSB (all others used 800MT/s or 1066MT/s). Because of its massive multiplier, upping the FSB to just 600MT/s (even motherboards costing peanuts could handle that) resulted in a very handy 3GHz - the speed of the doubly expensive 830. Even using the regular cooler, 3.6GHz was commonplace, making the 805 rival the fastest Pentium Ds ever put into production.

Many users bought the 805 as a stopgap: some were waiting for the upcoming Core 2 CPUs; others were waiting till they'd saved up enough to buy one. For Intel, the 805 was the right product at the right time - and at the right money. It forced AMD to lower its prices.

Core 2 Quad Q6600 (Intel)

- Speed: 4 x 2400MHz
- FSB: 266MHz (1066MT/s); 9x multiplier
- L2: 2 x 4MB
- Die: Kentsfield; 65nm
- sSpec: SL9UM (B3); SLACR (G0)
- Interface: LGA775
- Date: January 2007
- Then: \$851 (bulk)
- Now: £30 (eBay)

And talking of Core 2 CPUs, they really were phenomenal, weren't they? Many are still doing sterling service. The architecture was an evolution of the Pentium M's, and the performance knocked us back in our seats. The spectre of the Pentium 4 and Pentium D evaporated overnight.

Classic Duffers #1

The fastest Pentium III on Slot 1 ran at 1133MHz. Or was supposed to. Launched in July 2000, it's the only CPU ever released not able to operate even at its advertised speed. Thomas Pabst (the Tom of Tom's Hardware) proved it simply wasn't stable (see bit.do/nyZz). After initial denial, Intel eventually conceded he was right, and the chip was withdrawn. But not before Dell and others had shipped around 15,000 PCs using it.



I could have chosen almost any Core 2 as a classic clocker. The cheap Pentium E5200 was a contender, being nothing less than a marginally hobbled Core 2 Duo E7xxx, but ultimately I've gone with the Core 2 Quad Q6600. Costing \$851 at launch, a year later Intel slashed the price to \$280. True, the newer Q9xxx chips were out, but more importantly Intel wanted a bargain powerhouse that would lure buyers away from AMD's new Phenom X4s.

The Q6600 remains popular even today, making a terrific upgrade for LGA775 users still running single- or dual-core chips. Maybe you're one such user yourself? It's pretty darned potent at the default 2.4GHz, but an overclock to 3GHz is practically guaranteed, especially on the model with the cool-running G0 stepping. Just bump up the FSB to 1333MT/s (most later-generation motherboards can do that). Snap on an aftermarket cooler and you might hit the moon.

Athlon X2 5000 (AMD)

- Speed: 2 x 2200MHz
- HT: 200MHz x 10 (4,000MT/s); 11x multiplier
- L2: 2 x 512KB
- Die: Deneb; 45nm
- OPN: AD50000DJ22GI
- Interface: Socket AM2+
- Date: October 2009
- Then: \$39 (retail)
- Now: £12.50 (eBay)



▲ Pentium D 805



▲ Core 2 Quad Q6600



▲ Athlon X2 5000



▲ Core i5-2500K

All of AMD's Socket AM3 CPUs – comprising at least twelve product families, chief among them the Phenom II and Athlon II – are derived from just four dies.

Regor: 2 cores, 2 x 1MB L2

• Propus: 4 cores, 4 x 512KB L2

Deneb: 4 cores, 4 x 512KB L2, 6MB L3

• Thuban: 6 cores, 6 x 512KB L2, 6MB L3

Single-core Semprons, for example, use the dual-core Regor die: one core is simply disabled. Likewise, the Athlon II X3s, all triple-core, use the quad-core Propus die. Such a scheme slashes production costs, and CPUs that don't quite work as intended can be rebadged and still sold. Intel plays a similar game.

Now, a few would-be Socket AM3 chips are available for Socket AM2+. One little-known beauty is the Athlon X2 5000. This uses the Regor die, but half of the L2 cache is disabled. It's therefore a hobbled Athlon II X2. Or is it? You see, the variant with the AC die code – etched onto the heatspreader – actually uses the Deneb die. Yep – under the hood, it's got four cores *and* 6MB of L3 cache. It's a full-fat Phenom II X4!

On motherboards with appropriate BIOS support, disabled features in AMD CPUs can often be unlocked (sometimes they're simply faulty).* Unlocked, the Athlon X2 5000 becomes the Phenom FX-5000 (success is about 50/50). Overclock it to 2.8GHz and it's a Phenom II X4 920, which in 2009 was six times the price! If you're still running an AM2+ system, dear reader, get down to eBay and see what you can find.

* You'll find a handy guide at CPU-World: **bit.do/mkis**.

Core 15-2500K (Intel)

• Speed: 4 x 2300MHz

• Clock: 100MHz; 33x multiplier

L2: 4 x 256KB

L3: 6MB

Die: Sandy Bridge; 32nm

sSpec: SR008

Interface: LGA1155

Date: January 2011

Then: \$216 (bulk)

Now: £100 (eBay)

Let's get current – or as current as it's worth getting – with the Core i5-2500K. The Core i5s have always been good value. Typically, they cost only £50 more than similar-frequency Core i3s, yet you get Turbo Boost, double the L3 cache, and four proper cores, not two cores with Hyper-Threading. Similar-frequency Core i7s cost around £100

Classic Duffers #2

AMD's flagship FX chips perform so poorly that even AMD has abandoned them (hopes are now pinned on its value-orientated A-series models). The FX-9590, the last, was released in July 2013, and despite being aimed at enthusiasts, it requires so much voltage and power that the overclocking headroom is zero.* It's effectively overclocked already. Even with eight cores and a frequency of 4.7GHz (5GHz with Turbo Core), performance is miles behind a cheaper, 'slower', quad-core Core i5. What a sad and desperate way for AMD to exit the high-end desktop market.

* FX-9590: up to 1.912V and 220W. All other eight-core FX chips: up to 1.45V and 125W. Nuff said.

¥ FX-9590



more again – a big wedge for little but Hyper-Threading and bragging rights.

Sadly, the bottom's fallen out of overclocking since the introduction of the i-series chips. From the second generation onwards, every system bus is tied to a 100MHz motherboard base clock. USB, SATA, PCIe – everything. Each bus's multiplier is usually fixed, and increasing the base clock more than a few megahertz always sends something screwy.

An i-series CPU's frequency is also derived from the base clock – it's the replacement for the FSB – but as this can't really be altered, the only means of overclock is the CPU's multiplier. Naturally, that's locked. But not on K models, not if your motherboard's got a Por Z-class chipset. With the i5-2500K, 4.2GHz is routine. Add some voltage and a £15 cooler and 4.7GHz should be possible.

The i5-2500K remains the last CPU to really set the overclocking world alight. The fifth-generation i-series will soon be at hand, but CPU performance long ago outstripped most software requirements, with even £35 chips now being adequate for 90% of users. Has overclocking moved out of the mainstream and back into geekdom, where it began? Probably. For now... mm



Adding Technology To Your Car

Get high-quality gadgetry out of your dreams and into your automobile

rom smart TVs to the internet fridge, connectivity has reached pretty much every room in the home. But what about beyond it? Mobile technology makes it easy to do things like check shop opening times when you're out in town or watch a movie on the train or work on a coach, but there's one place most of us still have to rely on an old-fashioned combination of FM radio and increasingly mangled road atlases: our cars.

It's not just because your car's probably older than your phone. In-car computers can be costly extras, and while it's nice to have something that lets you run your GPS, manage your music and entertain the kids, it's not necessarily worth the extra money you have to spend to get it. So are there any alternatives to smashing open the piggy bank? Or are you fated to spend your life driving offline? We've taken a look into the available solutions.

Tablets

Perhaps the easiest way to turn your normal car into a connected vehicle is to 'install' a tablet. It's relatively cheap to do, costing only a few hundred pounds, and you get the benefit of being able to remove the tablet and take it with you when you're done.

This approach doesn't require a lot of work. All you have to do is install a mount somewhere convenient, as you might a mobile phone holder. Audio connectivity can be managed by a Bluetooth connection or an aux cable, and 3G connection on the tablet can handle online functionality. A media player is essentially built in, free map software from Google contains GPS features, and compatibility with apps means you can use virtually any software with it. There's even the possibility of voice control!

Of course, tablets aren't cheap, and since it won't be integrated into the dashboard, you won't have the luxury of leaving it in your car if you pop out for a few minutes. An opportunist thief would be particularly pleased to see an unattended tablet behind a single pane of glass, after all! Due to the size and weight of 10" tablets, it'd be advisable to get a 7" tablet where possible, and even then you may struggle to find a mounting point where it isn't blocking something.

Still, the size restriction narrows the field considerably. Assuming you want both 3G/4G and GPS functionality in a 7" tablet, your current options are a Samsung Galaxy Tab or Galaxy Note, which come in sizes from 5.7" to 8.0",





6 One of the problems for iOS in particular, at present, is that Apple's maps data is not as good as Google's **● ●**

a Google Nexus 7 or an iPad Mini 2. Any of those would be suitable, but do make sure to avoid the Kindle Fire HD. Despite its popularity as a home device and an appropriate form factor, it isn't available with a data connection, nor does it contain a GPS receiver. Unless your car already has wi-fi (and most don't), it's going to struggle to be much use as anything other than a media device.

For reference, the Galaxy Note 3 is the most recently released of the suitable tablets, having gone on sale in September 2013. It runs Android 4.3 and, at 5.7",

it's essentially a really large smartphone rather than a tablet, not least because you can also make calls on it. But it's also reasonably powerful and just about big enough to work as a display in your car, as long as you've got good eyesight! It'll set you back around £400 in total, plus the monthly PAYG fee.

If you want a cheaper option, then, by comparison, a 7" Nexus 7 with 4G costs just £300, and there's no monthly fee. Unless you want a device that can also act as your phone, the Nexus is the safest and most reliable bet. Just be wary of an





impending hardware refresh due in the next month or two – you don't want to be driving around with an out-of-date model!

Raspberry Pi

If you're not averse to a little tinkering (or, indeed, a lot of it), then the customisable, ultra-configurable pocket system known as the Raspberry Pi might provide the solution to your problems. The Raspberry Pi allows you to build a low-power mobile system out of interchangeable and expandable basics, and there's a whole ecosystem of software and hardware around for enthusiasts to dip into — including stuff developed for cars.

Clearly, this isn't a project for the risk-averse. You'll need to be handy with a screwdriver and willing to prise the front off your car's dash (at least!) to get things properly installed. A more-than-basic knowledge of electrical wiring would also be a massive help. It's a tough project to take on, but get it right and you'll

have potentially added hundreds, if not thousands of pounds to the value of your vehicle – or saved as much.

Raspberry Pis have several significant advantages over tablets. They're mostly cheaper. The basic kit costs just £20, and a fully featured car installation can be done for around £200, with the added benefit that it doesn't take up as much space and isn't going to result in a shattered window if you leave it out while you run into the supermarket. Raspberry Pis are also far more customisable than a tablet, with swappable components and storage allowing you to build a system that suits your exact needs. The right setup could even allow different drivers to use different systems simply by changing an SD card.

As well as finding the necessary hardware, you'll need to search for the right software and programs to use. For the most part, Raspberry Pis are best used for adding media centres to a car, rather than for things like I

internet and GPS, although you can add that level of functionality if you wish. With that in mind, RaspBMC – a Raspberry Pi version of XBMC – is worth keeping in mind as a primary interface. GPS navigation can be provided by adding a SkyTraq receiver to your system and augmenting it with Navit, a program that uses OpenStreetMap for its data. Some setups even add things like rear-viewing cameras and parking sensors. If you're willing to go all the way, you can create something truly impressive from the mixand-match components available.

Of course, most beginners would be happy just to get the screen turning on correctly. Luckily for anyone who doesn't have a lot of experience, adding computers to cars by way of the Raspberry Pi has become its own mini-industry, and there are entire sites dedicated to the process and practicalities. You can buy component kits, read how-to guides and ask for advice on forums, all in service of turning your car into what is essentially an iPod you can drive around in.

Weblink

Related to the Raspberry Pi, a company called Abalta Technologies is actively working on a project it calls 'Weblink', which allows you to use your smartphone as an interface to your car's computer. The system itself is a 7" touch-screen powered by Linux, running on Raspberry Pi hardware, which draws power from the cigarette lighter, which links up with software on your smartphone – there are iOS and Android applications in development.

The phone apps essentially act as servers, channeling data to the client screen, which you mount on your dash, GPS-style (should Weblink become licensed, there's a chance the screens can be seamlessly installed into your dash). The Weblink device uses your phone's wireless connectivity (wi-fi or Bluetooth) or a USB direct link to tether itself to the phone, sharing its internet connection. Once that's up and running, the HTML5 apps on the Weblink device can do their stuff.

And what is that stuff? Well, you get web-based media streams, mapping apps, even games. Anything that already runs in pure HTML5 should work on the Weblink device (or will, when it's fully released). There are even apps available that allow you to use the smartphone as a screen to control the input on the Weblink device, though we recommend you don't try this while driving.

This approach has its benefits – it's low cost, easy to set up and compatible with your smartphone by default – but there are also problems. For a start, playing a lot of music over a mobile connection could get expensive, depending on your data plan. Secondly, it relies entirely on the phone for its advanced capabilities. If your battery runs out, there could be a problem. And finally, the lack of HTML5 web applications could present a problem to more sophisticated functionality. All in all, you'd probably do as well with a device that simply mirrored your smartphone screen.

Still, the Weblink is very much a prototype device and is likely to change and improve as it gets brought to market. It's aiming high, with plans to virtually replace all existing in-car solutions with its simple approach, so keep an eye out for that name in future.

Google Projected Mode

You can't yet buy it, but recent leaks have given Google's long-rumoured in-car system a name – Connected Mode – and confirmed some of its many features.

Connected Mode isn't something you can add to your own car; it'll have to come built-in. Nonetheless, its function is to 'seamlessly integrate' an android smartphone into the dashboard of compatible vehicles, in this case by mirroring the screen within a larger display on the car's main control panel.

The system went public when Daimler, the parent company of Mercedes, posted a job listing for a software engineer who would be tasked with helping to integrate the technology within its cars and will be added to all new models by default. Interestingly, a similar advert requested an iOS developer for similar purposes, so it's possible – indeed, probable – that Mercedes will offer support for both of the major operating systems.

Google already has form with in-car technology, of course. As well as its much-hyped 'driverless car' project, Google has also provided in-car mapping for certain versions of the Tesla electric car and secured support for Google Glass in the forthcoming Hyundai Genesis. Projected Mode isn't yet available on the market, but it's safe to assume it's coming in the next six to 18 months.

Apple CarPlay

A sister technology to Apple AirPlay, CarPlay is the iOS equivalent of Google Projected Mode that would see iOS integration built into car dashboards and on-board computers. CarPlay is slightly further along than Projected Mode, with more features confirmed.

As with Projected Mode, the primary function would actually be screen mirroring, with the phone itself taking most of the processing and connectivity functions. The advantage to manufacturers is that their on-board systems could rely on the latest available hardware and interfaces. Current systems must be developed in tandem with the cars themselves, which means they can be significantly behind the state of the art when they actually reach showrooms. Side-stepping this process and relying on a smartphone for the bulk of the software and hardware would avoid lengthy and largely pointless extra development. Consumers, meanwhile, have one fewer device to manage and can rely on the same apps and media being available in their car as on their phone.

Upgrades are also easier, because each time you upgrade your handset and/or its operating system, your car effectively gets a better computer too. The only real downside is that you'll use more power on your phone, but a built-in dock will, at least, allow the car's electrics to keep it charged up.

One of the problems for iOS in particular, at present, is that Apple's maps data is not as good as Google's. There is a Google app for iOS, so it's not a complete loss, but it's still an inconvenience, since apps using the default API will only be

able to access Apple maps. Users would have to manually switch to the Google Maps app to check its more reliably mapped routes and street names.

Despite this, CarPlay is still forging ahead, with CarPlay-supporting vehicles due this year from Ferrari, Honda, Hyundai, Mercedes-Benz and Volvo. Features include Siri voice control, with a steering-wheel activation button, turn-byturn mapping with real-time traffic details and hands-free phonecalls. It'll even be able to read new messages and emails to you, so you don't have to take your eyes off the road for a second. Any music on your phone will be available too, even from within apps like Spotify and BBC iPlayer (as long as the relevant downloads or internet connections are available).

Of course, at present CarPlay is only available on Apple's phones, and only the iPhone 5, 5C and 5S, so you'll need one of those to take advantage of it – but it does have the advantage of coming to market first. That might be enough to give it the edge it needs, despite Apple maps' failings.

So while in-car computers might be taking their time getting off the ground, it's clear that it's no longer the preserve of the overly rich. You have the choice of waiting for one of the bigger technologies to become available or cobbling together your own solution. And either way, it's clear that the way we drive is going to change drastically in the coming years. It's fair to say it's already overdue. **mm**







Dictionary Apps For iOS



Keir Thomas finds the best apps to look-up spellings and cheat at crosswords











t wasn't until 1928 that the definitive Oxford English Dictionary was finished, casting aside all others. It might surprise you that all iOS devices include the Oxford dictionary, although not as an app. Instead, it exists as a background service. To view the dictionary, tap and hold a word in Safari or certain other apps, and select Define. You can tap the Manage button to download other dictionaries too.

To get the usability of an actual dictionary app you'll need to look to the App Store, where there are several free-of-charge examples and a handful of less-than-free examples. Below we take a look at a selection and attempt to evaluate their ability to look-up words as well as provide help for those who play word games.

Dictionary apps come in two forms: offline, and online. The latter includes the entire dictionary on the device, while the former requires a net connection to perform look-ups. Bearing in mind a reliable net connection can be hard to find when out and about, offline dictionaries have a clear advantage.

Chambers

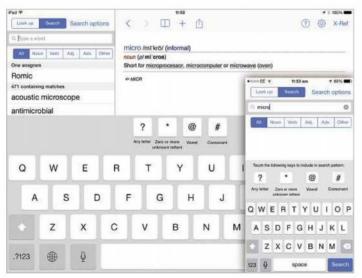
At £5, the Chambers app is expensive in app terms but you get the new 2014 edition of what many consider to be the authoritative British English dictionary, especially for fans of word

puzzles. The dictionary is stored offline, so will work even when there's no net connection. The app works equally well on both tablet and iPhone and there are two methods of looking-up words: plain-old Look Up mode, and the more advanced Search mode.

Simply typing a word in Look Up mode shows results beneath as you type and a nice touch is a list of suggestions that appears in case you're spelling the word wrong. In Search mode the on-screen keyboard gains four new keys running at the top: ?, *, @ and #. These can be typed instead of characters and represent respectively Any Letter, Zero or More Unknown Letters, Vowel, or Consonant. Additionally, a filter bar appears above the search results letting you show only nouns, verbs, adjectives, adverts, or "Other". Tapping the Search Options button lets you further refine searches by avoiding hyphenated/multi-word answers, specifying case sensitivity (that is, searching for proper nouns), and specifying only common words or derived forms appear in the results. A slider also lets you limit the maximum word length. This degree of search refinement contrasts well against other apps.

Although it's not the goal of this group test to review the dictionary itself, the word definitions are good – although brief compared to the actual Chambers dictionary. Etymologies are listed for most words, too.

DICTIONARY APPS FOR IOS



A The Chambers dictionary app looks great and has some neat functions but doesn't quite justify the £5 asking price

Also, a X-Ref button lets you switch out to search other apps that are installed, or online sources such as Wiktionary.

One feature strangely absent is the ability share a word definition. iOS' built-in share sheet function isn't present and you'll have to copy to the clipboard and manually paste in elsewhere to share things. The Chambers app is competent but most of its asking price is buying access to the dictionary, rather than innovative features.

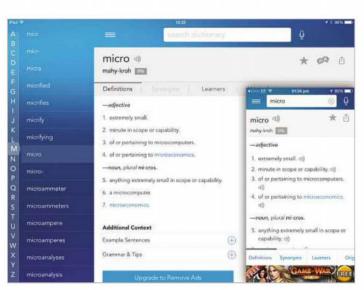
Dictionary.com

The partner app to the immensely popular website of the same name, Dictionary.com at first appears to be an online-only app. However, the app can be set to work in offline mode. To download the main dictionary file, you need to open Settings and then tap the Offline Dictionary switch. This needs only be done on the iPhone version of the app, however, because the iPad version automatically includes offline functionality.

Using the app without a net connection will deliver a substandard experience because you'll miss out on the 'Daily' features'

Using the app without a net connection will deliver a substandard experience because you'll miss out on the various 'Daily' features such as Word Of The Day, a list of trending words (that is, those that have seen a recent spike in popularity), and themed slideshows that provide fun ways to explore language and build your vocabulary. You'll also lose out on one of Dictionary.com's coolest features: speech recognition. This is powered by the same recognition engine that powers Siri and, in fact, you can simply tap the microphone button on the built-in iOS keyboard for much the same effect. However, the app's speech recognition tool is significantly easier to use and anticipates you saying only one word, rather than a sentence.

Word definitions are satisfyingly thorough and several buttons along the bottom (iPhone) or top (iPad) of the screen let you look up synonyms for the word, browse a learner's dictionary definition



▲ The Dictionary.com app provides a good basic level of word look-up, although more advanced features will cost you

(what the word is and does, rather than just what it means), and look up its origins. All in all, that's just about everything you might want to do with a word, apart from translate it to a foreign language, and here you come upon Dictionary.com's rather aggressive paid-upgrade structure. Translation to and from 30 languages will cost you 69p, although translation from English to another language is included free of charge as a separate function accessed from the main menu in the app (that is, you can't do it while viewing a word definition). There are various other tools for sale too. These range from invaluable to niche, such as an example sentences dictionary (£2), that shows the word in example contexts, to a medical dictionary (£2).

This is a competent app backed-up by a more-than competent dictionary service. The only feature missing, or as far as we could tell, was help with word puzzles. Attempts to search using the standard wildcard characters (?, *, #) within words simply confused the app's search tool.

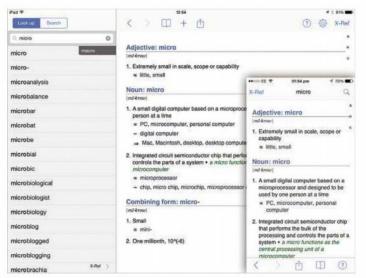
WordWeb

A certain sense of déjà vu overtook us when using this app because it looks and operates a lot like the Chambers app, reviewed above. However, WordWeb is an entirely different project that attempts to create an electronic-only dictionary, and the actual wordbase has its origins within Princeton University.

If you're wondering which app came first, then the answer is WordWeb – according to clues provided by the help files (both apps are copyrighted to WordWeb), but the family relationship of the two apps means you can cross-reference easily between them when looking up word definitions. Like Chambers, WordWeb works offline because the dictionary file is stored on the device itself.

Perhaps more importantly, WordWeb beats Chambers handsdown when it comes to price because it's free, and for word gamers this is pretty cool because they gain access to the same sophisticated Search tools (see the Chambers review above for details). In other key ways, WordWeb is a better app than Chambers. It too can pick a random word for you to learn, but also includes the option of looking up random common words -- which we guess avoids the chance of getting one of the several hundred thousand words not commonly used in everyday discourse.

Additionally, the Settings panel offers options to show American, Australasian and Candian definitions too, and a feature we particularly liked was the ability show derived words (so



▲ WordWeb is basically the same app as Chambers although with more bells and whistles, and with an entirely different dictionary

looking up Orwell will show Orwellian, for example). Sadly, there's again no sharing tool, so you can't share definitions on Facebook or Twitter without copying them to the clipboard and pasting them in manually.

Because this is a dictionary linked implicitly to an app, it's fair to evaluate the quality of the dictionary at the same time. Sadly, when it came to this, we found things a little basic compared to other dictionaries. There's no etymologies provided, for example, and although example phrases and sentences are provided, they're not always present alongside definitions. Word definitions tend to be ultra-concise too. Pronunciation guides are provided in the International Phonetic Alphabet (IPA), and a nice touch shared with the Chambers app is that tapping the IPA guide defines lesser-known symbols to help you learn the pronunciation.

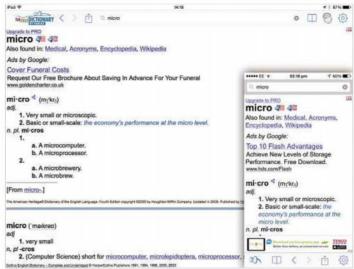
There's a lot to like here, not least the price. This is a sound app if we set aside our concerns about the dictionary quality.

Dictionary

This simply-named app is a companion for The Free Dictionary (**www.thefreedictionary.com**) website. As such, it's actually a combination of several different dictionary sources, including Webster's, Collins, and The American Heritage Dictionary (that's the three we noticed coming up repeatedly, at least; there may be others too). Each time you look up a word, definitions from at least one of the dictionaries will be provided. This approach lets you compare and contrast definitions. Look-ups from one or more thesauruses are usually provided too.

Like the Dictionary.com app, Dictionary assumes you're going to be online all the time so doesn't download the dictionary files by default (this applies to both the tablet and phone versions of the app), although toggling a switch within the Settings panel will prompt it to make the files available offline. This offline dictionary is a shade of the online version, though, and includes only single concise definitions of words.

The app's equally at home on iPad and iPhone, although we suspect in each case the word definitions you see are actually web pages, reformatted and presented within the app. They certainly look similar to website look-ups, and contain the same kind of advertisements – including text-based Google ads – that can be distracting, and make it difficult for your eyes to locate the actual definition. That being said, these ads can be turned off for a £1.49 payment, should they really get on your nerves.



▲ The Dictionary app is able to look-up from several different dictionaries, providing the best possible definition of a word

The biggest strength of the app is that it isn't just limited to English. Type a word into the search phrase a flag symbols appear alongside each result. Tapping the German flag, for example, will show a German definition, assuming the word exists in the German language. However, these aren't translation dictionaries and the definitions are in the native language. Search for bleu, for example, and once you tap the French flag icon you'll find the word defined in French. Tapping the

The app's at home on iPad and iPhone, though we suspect the word definitions you see are actually web pages

speaker icon alongside any word in a look-up provides an audio pronunciation guide and a nice touch is that there is a British English as well as American English voice (and pronunciations).

The Search feature provides an Advanced section that lets you search for words that start or end with what you type, or that include the word you type within the definition. This might be useful for word puzzles but there appeared to be no way to use wildcards to help with crossword clues. However, a solution of kinds is offered by the 'Did you mean?' feature that attempts to correct misspelled or mistyped words – type fat?ous into the search field, for example, and the search will find nothing, but will suggest fatuous as being the word you meant to type.

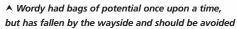
Dictionary is a nice app but the ads make using the app almost impossible, especially on a smaller iPhone screen, so this is really an app with a £1.49 asking price.

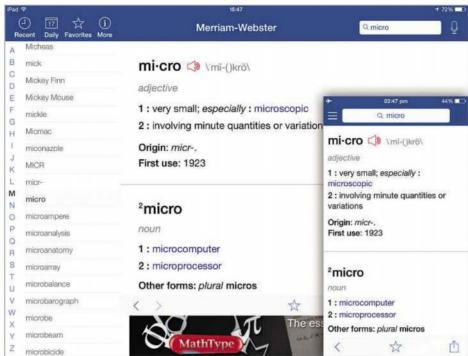
Wordy

This app is unique for two obvious reasons. The first is that its subtitle is 'The Logophile's Primer' (a logophile being a 'lover of words' – though we did need to look that up). The second is that this is an iPhone-only app, usable on an iPad only via zoomed-mode. Wordy is also an app that hasn't been updated for iOS

DICTIONARY APPS FOR IOS







▲ The Merriam-Webster app brings the full American English experience to iOS, although the app isn't exactly feature-packed

7 or the larger dimensions of the iPhone 5 screen, which is odd considering the app was launched to significant fanfare a few years ago and heralded as the bright new thing in the world of dictionary apps.

In all honest, though, there isn't much here beyond and above the pretentiousness. There's a word of the day feature that appears to simply pluck a word from the dictionary and provide a definition once you tap it. Wordy will also notify you of this word daily on the notification screen. On the day we reviewed the app the word was 'croustade' (a type of crisp bread or pastry that's been hollowed for a filling).

The second main feature of the app is that it looks up words from several different sources, just like the Dictionary app reviewed above. The description in the App Store says these sources include Merriam-Webster, Century Dictionary and American Heritage Dictionary, although in our tests every single definition came from the last in that list. Not only that, but each definition is treated as its own section within the list, separated by a keyline, so that reading the definition of a word like 'run' -- arguably the word with largest number of definitions in most dictionaries – can mean scrolling through pages upon pages of information. Usually dictionaries present this information in the form of a number ascribed to each definition, which is much more logical and easier to view.

Unfortunately, Wordy can only work if there's an Internet connection. There's no way to download the dictionary file for offline use. Along the bottom of the screen when viewing a definition are buttons to search for synonyms (i.e. a thesaurus) and antonyms (opposite meanings). Not many examples of either were shown in our tests. The Reference button appears to cross reference the word against other entries in the dictionary, so looking up run displays a link to score, for example, because a run is defined as a score when playing cricket.

Wordy harks back to an age when apps were significant quantities of mouth and only small quantities of trouser. The trick nowadays is to be both, but Wordy hasn't kept up and is best avoided.

Merriam-Webster

The dictionary of choice for many Americans, Merriam-Webster has made it into app form and works equally well on both iPad and iPhone. It automatically downloads the dictionary file, meaning it can work offline, although lacking an Internet connection means certain features such as the pronunciation guide won't work (and unlike several other apps here, the pronunciation guide appears to be samples of actual humans pronouncing the word, rather than speech synthesis, although the voices are American).

Words are looked-up by typing them into the search field, although you can also tap the microphone icon to speak the word (again this needs a web connection). Results appear beneath as you start typing and tapping one will select it to open the word definition. Uniquely, most definitions contain a quick summary at the top, with a blue background, providing at a glance definitions. The standard dictionary entry then appears below. Definitions include brief etymologies but no example sentences, which are available for a £2 upgrade that will also remove the adverts and add-in a full thesaurus.

Unfortunately, the search field appears to have no way to use wildcards, making the Merriam-Webster app less than idea for crossword fans. It does include a Word Of The Day function to help build your vocabulary, though. Additionally, word definitions can be quickly and easily shared by tapping the share button, although only via email, Twitter and Facebook.

Aside from the fact words can be added to a favourites list, and a recents list shows words already searched for, that's about all we can say about this app. It looks terrific, making full use of the iOS 7 look and feel, but in terms of features it's curiously muted and those adverts can become annoying – especially when they appear full screen, blocking your progress until you tap the X icon in the corner, as with some games.

You should also bear in mind that this is an American English dictionary, which arguably makes little difference most of the time but there can be serious differences between US and British English word definitions. **mm**

PC Tip Of The Week

Better Gaming, Part 3: New PC Games



Even super-fast modern PCs can struggle with games, so try these tips out if you're having problems

ver the last couple of weeks we looked at some of the problems that generally crop up when we try to play an older PC game on our ultra-modern PCs, with their ultra-modern operating systems. Hopefully, you got some valued tips from that and you're now enjoying a selection of dusty but still great titles.

This week, we'll concentrate on modern games, and we'll look at some of the problems that usually arise when we try to play the likes of Watch_Dogs.

Why Isn't It Running?

Let's assume that you have good, up-to-date system that cost you an arm and a leg and that should, on paper at least, run the latest game without even so much as a hiccup. Why, then, does it struggle with the

There could be a number of reasons as to why this happens. It may turn out to be a single reason, or it could be a combination of problems that have built up to become a bottleneck for gaming on your system.

Drivers

Hardware drivers are funny things. You would think that since it's installed and working, then it (being the item of hardware) is running to the best of its abilities and should be able to perform as the specification states. Unfortunately, this isn't always the case.

Take graphics cards, for instance, which are often the source of various gaming hassles present in a modern system. One of the main reasons that a game runs badly on a modern system is usually down to the graphics drivers being out of date for the product.

Support for the AMD Radeon R9 295X CrossFire fixes enhancements: ■ Crysis 3 – frame pacing improv ■ Anno 2070 - Improved CrossFire scaling up to 34% Titanfall – Resolved in game flickering with CrossFire enabled Metro Last Light – Improved Crossfire scaling up to 10%
 Eyefinity 3x1 (with three 4K panels) no longer cuts off portions of the application Stuttering has been improved in certain applications when selecting mid-Eyefinity resolutions with V-sync Enabled Full support for OpenGL 4.4 OpenGL 4.4 supports the following extensions

ARB_buffer_storage

Highlights of AMD Catalyst™ 14.4 Windows Driver

- ARB enhanced layouts
- ARB_query_buffer_object
- ARB_texture_mirror_clamp_to_edge
- ARB_texture_stencil8
- ARB_vertex_type_10f_11f_11f_rev
- · ARB multi bind
- · ARB spare texture

▲ The new ATI drivers offer some improvements to gaming...

The latest Nvidia drivers offer a significant performance boost for a selection of games and support for resolutions of the 4K kind.

There are usually more advancements and support for operating systems and many other games in a new driver set, with overall performance being boosted with each new driver update. It's a bone of contention among many gamers and PC users in general, with calls to the driver manufactures to get their products working at 100% from the word go without having to wait for an updated driver. Needless to say, and without going into too much detail, if you're struggling to get a game running or it's running slowly, then check to see if your graphics drivers need updating.

On the subject of drivers, it has also been known that in some instances a previous driver version works better than the latest. It's not often, but it has happened in the past. Again, check the game forums for any hints or tips with regard to driver versions.

Patching

Games developers are under considerable stress these days to get games out in the ridiculous time limits imposed on them by their totalitarian software publishers. While the finished product may work for 90% of the systems out there, there's a good chance that the problem you may be having is because you're one of the lost 10%.

While this may seem a little unfair, there's usually a good fix around the corner. In the case of games patches, you'll need to check out the software publisher that released the game to see if its support page offers a fix for the particular problem. They usually do in most cases, and with the advent of Steam, the game patches and updates are applied automatically.

Next Week

Next week, we'll check out what performance options and services we can play around with to improve gaming speeds.

> ... as do the Nvidia drivers. Either way, it's worth checking you're up to date



Drivers

On the subject of drivers, if you're running an ATI, card you'll need to visit support.amd.com/en-us/download. And if you're using an Nvidia card, then you'll need to check out www.nvidia. co.uk/Download/index.aspx?lang=en-uk.

If it's a patch you're after, then Google the game developers, publishers and any forums relating to the game itself. You'll find a ton of useful info as well some playing tips if you're stuck.

The Things That Frustrate Us About... Spotify

Sarah tries to sort out the irritants in this music streaming service

oaning about Spotify seems a bit whiny, doesn't it? The service lets you access pretty much all the music you can think of, in unlimited quantities, on almost any device you care to mention, for a negligible monthly fee. There's even a free version, though it's more limited (and forces you to hear some of the most irritating adverts known to man). For those of us who grew up saving their pocket money to buy maybe one tape or CD a month, usually without even having heard most of it, it's a bit like sorcery.

But even so, there are some things that occasionally irritate us about Spotify, when our diamond shoes are feeling a bit pinchy. Here are three of the most annoying...

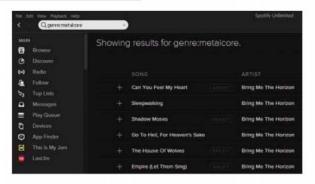
Argh! Exposed Bad Taste

Spotify has added loads of social features since it first launched. You can link up with friends on the service, see what they're listening to and share their playlists or you can integrate Spotify with your Facebook account and share your music taste with all your Facebook friends. Automatically. Even when you're listening to, say, One Direction. Or Neil Sedaka. Or whatever passes for embarrassing music taste in your social circle.

Fix it: This one's fairly easy to fix. You just have to dig into your settings and untick the box that says you agree to share what you're listening to. Scroll down and you can link or unlink your Facebook account in the Settings menu too. Or if you generally want to share your music taste, but fancy listening to something secretly, you can launch a Private Session from the File menu. Easy.

Privacy: Share my activity and what I listen to with my followers on Spotify

File Edit View Playback Help New Playlist... Ctrl+N New Playlist Folder... Ctrl+Shift+N Import Playlists Private Session Offline Mode Connect to Facebook... Log Out Ctrl+Shift+W Exit



Huh? Baffling Searches

Sometimes, Spotify is a victim of its own massive catalogues. Search for something that seems obvious and easy to find and you might get a huge and bewildering array of search results, none of which is quite what you want. And if you don't quite get an artist's name or a track title correct, you're probably doomed.

Fix it: There are advanced search tricks you can use in the Spotify search box to get better results. Use 'artist:' to find all songs by a specific artist or 'track:' to find all tracks with that title. You can also search by year, use 'AND' or 'NOT' to narrow down results or even search by 'genre:' or 'label:' if you're browsing a little more generally.

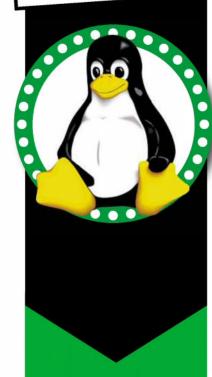
Bah! Broken Links

If you have music files saved on your computer, you should be able to play them in Spotify and add them to playlists with other stuff you're streaming from Spotify's servers. But sometimes, for no apparent reason, you can't. The track's name is greyed out or it just refuses to play, even though the file is still on your computer in the same place it always was. All you can do is remove it from your playlist – or listen to it in iTunes.

Fix it: Sometimes it'll turn out that you've moved the files, and you can reimport your music or reinstall Spotify, and everything will be fine. But honestly, sometimes this is just an unfixable bug. It's caused by how Spotify recognises music and all sorts of things – a censored title, a featured artist or a slightly different track length – can cause a file to stop playing. Grr. mm



Specialists



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

CAELinux 2013 - a review

A distro for the engineers among you

AELinux 2013 is the brand new, stable release of the popular computer aided engineering operating system. Although significantly delayed and still carrying the '2013' stamp, this is the most recent and long awaited version of the distro.

It's built on a 64-bit Xubuntu 12.04 LTS base and includes many upgrades of an engineering nature. These include CAD geometry tools, 3D fluid dynamics analysis tools, 3D post processing tools, modelling, meshing, animation, MATLAB functionality, mathematical modelling and a whole host of other features for clever engineers to sink their teeth into

Beyond the niche and often unpronounceable engineering tools, there come the likes of Blender, GIMP, FileZilla, Firefox, VLC and LibreOffice – the usual suspects you'd find in a decent Ubuntu-based distro.

However, the emphasis is on enhanced scientific and engineering capabilities and the wealth of tools and software available for Linux. And although we aren't that well informed when it comes to engineering and specific 3D modelling, there are a number of titles that do

stand out and can offer a more amateur enthusiast approach to enjoying the benefits CAELinux has to offer.

In the electronic section there are tools to communicate with the popular Arduino board, and there are enhanced versions of various utilities that can be used in the 3D printing industry, with G-Code editing and creation such as PyCAM, Dxf2Gcode and GcodeTools

LibreCAD, SagCAD, FreeCAD and OpenSCAD apread the CAD/CAM load accordingly, and with the aid of the other packages available – Meshlab, GCAM, Inkscape and Cura – there's enough diversity for the student scientist or engineer to get to grips with.

The customised Xfce desktop environment offers a stable and reasonably quick interface to the large array of tools and programs, a pleasant upgrade from the previous 2011 Gnome edition. It feels sprightly and, although packed to the gunwales with packages, CAELinux performs very well indeed – even when installed inside a virtual machine environment. Speaking of which, the development team also offer a virtual machine image that's capable of running on the

Amazon Cloud Computing EC2 platform, so you can utilise the full potential of the science and engineering factors within the power of a heavy duty cluster.

It's Not Small, Though

This is a 64-bit only OS, and you'll need at least 25GB free to install it from the Live version.

Installation follows the standard Ubuntu method, so there are no nasty surprises or a need to fiddle with partitions with GParted, although you obviously can should you so wish. The .iso comes down at an eye-watering 3.8GB, which is hardly surprising considering the amount of programs that come pre-installed, and although we live in a generally highly portable world, not everyone has access to the kind of bandwidth necessary for such a large file. Perhaps if the OS size was reduced, with options to install the packages individually, CAELinux would be more accessible to those in lowbandwidth areas?

There's a handy Getting Started HTML guide on the desktop, which lists the packages installed and even goes on to suggest video tutorials involving linear static stress analysis of a piston, simple 3D fluid dynamics of a Y-shaped pipe and additional aspects of an engineering and scientific nature.

There's clearly a lot of thought, design and consideration gone into CAELinux 2013, and the wait for this release has been worth it.

The level of detail in the getting started guide, the inclusion of a more efficient desktop environment and up-to-date packages and, of course, the phenomenal amount of software included with the OS is simply mind boggling.

Tarder (American)

Finally (American)

Finally

◆ There's plenty to help you create
in CAELinux

Store Bores

Apple's software stores continue to swell, but they still make no effort to sell to you personally

remember when I first set foot in the gargantuan superstore that seemingly suddenly materialised a couple of towns over. It was supposed to be some kind of shopping nirvana — a store that enabled you to buy absolutely anything, with more convenience and choice than you could shake a stick at. In reality, things were very different. The store in fact had a tendency to sell lots of variations of precisely the same thing. If you wanted cornflakes, you had a good few dozen options to mull over; if you wanted something a bit more interesting, tough, you weirdo with your penchant for strange foods, you.

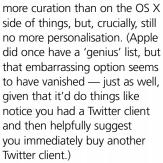
This of course relied on you being able to find whatever you wanted anyway, given that the store was so vast. You could imagine at any point turning a corner and seeing people aimlessly stumbling along the huge aisles, having spent years desperately searching for the last few items on their shopping lists, determined not to let this warehouse of doom get the better of them. These days, this is precisely what I feel like when I set virtual foot in Apple's various app stores.

We should by now be at a point where stores have a modicum of intelligence — or at least the appearance of

intelligence, based on your purchase history and also what other people have bought. This is how Amazon works, and although it sometimes goes a bit crazy when you look at, say, a USB cable and then decides you must want ALL OF THE USB CABLES, the suggestions are often useful.

For whatever reason, Apple has no truck with such thinking. On the Mac, you instead get a

At WWDC, we saw that the iOS store will be getting some



It seems Apple's doubling

down on never giving away

information ••

few offers or new apps at the top of the screen, followed by a 'best new apps' section, quite often populated by products that strictly speaking should neither be described as 'best' nor 'new', although, to Apple's credit, they are at least 'apps'. One out of three isn't bad. Hit a category, and you're faced with a wall of apps and some charts, with literally no personalisation whatsoever.

On iOS, things aren't any better. At the time of writing, there are 449 apps on my iPhone, most of which are games. A quick trip to the App Store shows

changes to aid discoverability: drilling down into subcategories; infinite scrolling for results; currently trending searches. This will no doubt aid developers, but it's still surprising Apple isn't using your own purchase history to aid you.

Perhaps this is down to privacy. With Google and Facebook terribly eager at any moment to use your browsing history to fire adverts into your eyeballs, it seems Apple's doubling down on never giving away information. But if users had the choice, I think they'd be okay enabling Apple to use their purchase histories (and/or information regarding installed apps) in combination with those of other people to discover better and more suitable apps. Anything's got to be better than the digital equivalent of a supermarket from hell, where the shelves are packed with junk you don't want, and anything that might be perfect for you is buried within, but who knows where?

◆ The Mac App Store: still rubbish for finding new apps



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**





lan is a professional IT analyst, a semiprofessional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Modelle Modelle

L Of A Wait...

Android L is in beta, and Ian McGurren finds out how to get it in your phone

o Google have finally revealed the shape of Android things to come. The upgrade formerly known as Lime Pie, Lollypop or even Liquorice is, for now, simply known as Android L. But while the name may be smaller, the update is one of the world's most popular smartphone operating system's largest since Ice Cream Sandwich.

Layers. Presumably the word 'layers' has popped up quite a lot in the word-a-day toilet roll that must be popular with the technology glitterati because what iOS 7 has started, Android L is picking the baton up and running with. There are those who will suggest that it might have been Apple taking a leaf out of the Android book, with cards having been introduced way back with 2012's Jelly Bean, and therefore what Google is doing with Android L is the logical conclusion the layers and cards idea has been building to. Either way, the designs for both OSs have been simplified and look beautiful and ultra-modern.

Android L also adds another 2014 buzzword – convergence. Finally our tablets, laptops and phones are not strangers anymore, and we will at least be able to respond to phone texts

on our tablets, pick up browsing where we left off on any device and even use our Android devices to unlock other Android devices. Why continually unlock your tablet if it knows you are about by the NFC signal your phone emits? Or even your watch? There's also been a revision of the whole notification system too; it's now card based and much easier to navigate, rolodex-like.

So, Android L is pretty great huh? Bet you want it now, but know it won't come out until the next Nexus device is launched too? Well yes, the full launch of the complete, 'gold' version of Android L won't be until possibly October / November, but if you're feeling brave, it's available now for a few Nexus devices – yes, Nexus devices, so not even your Google Play versions of devices or the humble Moto G will run these. Yet.

For the Nexus 5 and the Nexus 7 (2013 wi-fi version only), there are actual, official versions from Google itself over at **developer**. **android.com/preview/index**. **html**. The process is also quite straightforward or at least more straightforward than hacking a preview ROM onto a device can be, as it's officially sanctioned.

You'll ideally need a spare or unused device, because not only

can it have possible catastrophic failures that wipe data, many commercial apps simply won't yet work correctly (or at all) under Android L – it's for them to fix this that this developer release is made available. The installation requires the main ROM, the Android SDK (developer.android.com/sdk/ **index.html**) to be installed onto a PC along with the Google USB driver (developer.android. com/sdk/win-usb.html). After this, the installation is quite straightforward; just be aware that the first boot can take upwards of 20 minutes.

There's also an unofficial hacked build for the Nexus 4 to be found on XDA Developers (bit.ly/nexus4l), though this is even more likely to have a fair few quirks and problems along the way. You can expect more devices to start getting AOSP-style builds soon too now the source code is out there..

But if you want some Android L goodness now, without the pain, there's always the app route. The new Android L keyboard has already been separated from the rest of the OS for everyone's pleasure (bit.ly/ androidlkeys), the ever-excellent Nova launcher has gained some of the L look, including some of the sliding animations (bit. ly/novalauncherl), and lastly there's the Moonshine icon pack that brings many of the new, flat icons to any capable launcher to use (bit.ly/moonshineicons).

Android L should see the light of day in October or November 2014, initially on any new Nexus-type devices, and then on the Nexus 5 and 7, and possibly the 10, the Moto G and Google Play devices.



Dark Forces At Work

Shaun has had another busy week doing the important job of playing 8-bit games. Again

If Yngve and Richard Bayliss have teamed up to produce another vertically scrolling shoot-'em-up for the Commodore 64, which has been created with Martin Piper's Shoot-em Up Construction Kit (SEUCK) Redux that I reported on a couple of weeks ago.

The game is called *Dark* Forces Redux and tells the story of an entire solar system in imminent peril from hordes of attacking alien scum. Naturally, the best defence is in the form of a single-armed space vessel taking on the groups of malevolent meanies.

Unlike the more standard SEUCK titles that many C64 gamers will be familiar with, this one has some really good enhancements. Firstly, the sprite multiplexors (which allows more than eight hardware sprites per screen) really are fixed; there are no major slowdowns or flickering. Secondly, the attacking aliens have some intelligence to them; rather than firing randomly, the missiles are shot to your initial position. And also, there's some elements of parallax scrolling in the background.

More typical enhancements are included, such as a high score table, a splash (loading) screen, and title and in game music, as can be found in Alf Yngve is something of a legend with SEUCK games, with some of his titles available commercially from **psytronik.net**, but this one is a free download which is available from **csdb.dk/release/?id=131739**.

Get To The End

Icedout Games has released a preview on his simple reaction

game called Get to the End, which is a horizontally scrolling affair for the Commodore 64, in which you must guide a speedy 'smiley' through a two-tracked obstacle course while collecting the love hearts along the way.

Each side of the track is presented as squares, which may contain any number of hazards to avoid.

The game has quite a nice, distinctive colour scheme, with the graphics being simple but effective to match the unique aesthetics. There's no music to speak of, just rather simple sound effects to accompany play.

It tests your reactions in what looks like a high-resolution VIC-20 game. In an interesting twist, the game may change direction in the way it scrolls





▲ The recently released Atari XE/XL version of Lunar Jetman

from the last time you played. This definitely keeps you on your toes.

The playable preview is available to download from the Commodore Scene Database at csdb.dk/release/?id=131541.

Lunar Jetman

The Sinclair ZX Spectrum classic from Ultimate Play The Game *Lunar Jetman* has been converted to the Atari XE/XL actually from the BBC Micro version, as the Atari and Beeb share the same CPU.

Lunar Jetman is the sequel to Jetpac and was to be followed by Solar Jetman, which was sadly lost. Unfortunately, Jetman's poorly assembled budget rocket ship has started to disintegrate, as it simply couldn't handle warp speeds that well. By chance, he has crash-landed on an undiscovered planet whose inhabitants are plotting to destroy Earth, as some of their lost minerals are somewhere on this world, and rather than ask for them back, they think it's better to obliterate everything from North to South Pole.

This port has been handled by Atari enthusiasts Fandal and Irgendwer from Poland, a place where the XE/XL was quite popular even through the 1990s. To download this excellent version, head over to **tinyurl.com/Lunar-Jetman-Atari**.



Shaun has a passionate interest in 8-bit computing and gaming and has been finding novel ways to use retro technology since 1994



Specialists



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*





This week, **Ryan** looks ahead to the zombie spin-off Escape Dead Island, and checks out the one-of-a-kind MMO, Cloud Chamber...

Plug & Play

We can't help wondering where video games would be without George A. Romero. Would we have the Resident Evil franchise, Left 4 Dead, House Of The Dead, Day Z, or any number of other zombie-related games had Romero never made his seminal horror film, Night Of The Living Dead, back in 1968? Our guess: probably not.

Dead Island is another series that owes a considerable debt to Romero, dealing as it does with a disparate group of survivors trying to fend off a zombie horde - very much like the director's classic sequel, Dawn Of The Dead, except on a tropical island instead of in a shopping mall. Thanks in part to an attention grabbing teaser trailer, Dead Island was a sizeable hit in 2011, and while it was a tad rough around the edges (to say the least), it was an atmospheric and often tense action RPG experience.

A semi-sequel, Dead Island Riptide, provided more of the same in 2013, while a full follow-up is due out next year. Until then, Swedish developer Fatshark has a spin-off title in store, called Escape Dead Island. Although set in the same tropical locale as the earlier games, its style is markedly different: if anything, Escape Dead Island looks more like a Japanese

third-person action game like No More Heroes than an RPG. The graphics are cel-shaded, the hero's a generic, muscle-bound chap named Cliff Calo, and he wields a weapon that's half axe, half crowbar.

Calo's goal is to discover the source of the zombie outbreak, and also work out why he keeps having strange, black-and-white nightmares. The first trailer (youtu.be/_b-Xz84c5xM) hints at a decidedly surreal game, with gaudy splashes of colour and sudden, disconcerting shifts in reality. What we're not entirely clear about is what Escape Dead Island is: Fatshark describe it as a survival mystery game, with an emphasis on stealth rather than combat, yet the trailer shows Calo wading into an army of zombies with his axe-crowbar thing.

It's an odd game from a visual standpoint, too. Is it supposed to look like a game from the PlayStation 2 era? Even by the standards of the earlier Dead Island games, Escape looks decidedly, shall we say, retro. What really matters, of course, is how Escape Dead Island plays. The earlier entries provided plenty of bone-curdling entertainment, so if Fatshark can channel those games' B-movie spirit, then Escape Dead Island might just follow suit.

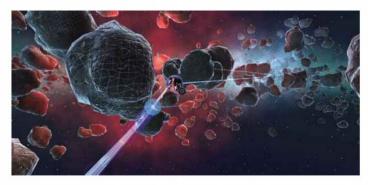
Online

If the *Dead Island* games are inspired by movies, then what about a game that actually looks more like a movie than a video game? That was our first thought when we encountered Cloud Chamber, a unique indie MMO which fuses live-action footage, social media, and the exploration of artificial landscapes.

Created by the Danish developer Investigate North, Cloud Chamber asks players to solve a mystery that involves a murdered scientist, an unidentified signal from outer space, and a global cover-up of the whole messy business. For much of the game, players explore a persistent online landscape of mountains and oceans - a visual representation of a vast, disparate cloud of data. In order to discover Cloud Chamber's secrets, players follow the paths that connect these bits of data together - dotted around this surreal network are maps, bits of code and, most importantly, 150 video clips, each furthering the game's story.

Cloud Chamber isn't so much a conventional game, then, as a kind of interactive TV series where everyone's actively encouraged to talk to each









▲ Described as a "story MMO" by its creators, Cloud Chamber is an unusual fusion of TV show, exploration game and social media experiment.

other about its mysteries. The footage itself looks well-shot, in a low-fi sci-fi sort of way, and has a reasonably starry cast, too: among the cast you'll find Gethin Anthony of *Game Of Thrones* fame, and Jesper Christensen, who appeared in the Bond movies *Casino Royale* and *Quantum Of Solace*.

The game's very much an experiment for Investigate North, as it attempts to create an entirely original gaming experience around the sharing of theories and speculation. Early feedback from those who've played it so far has been positive, though, according to *Cloud Chamber*'s creative director Christian Fonnesbach.

"Cloud Chamber is a new kind of game which brings story exploration to a multiplayer environment," Fonnesbach said. "In the beta launch, we saw core players discuss everything from the characters' inner lives to the birth of the universe while trying to figure out what happened. It's going to be fascinating to see how people from all over the world meet and respond to the challenge."

Given that shows like *Lost* and *Breaking Bad* have thrived thanks to social media, where the latest plot developments are dissected at length on Twitter and Facebook, it could well be that *Cloud Chamber* provides

a logical step forward: a new entity that isn't exactly a TV show or a game, but a new experience where players can guide and resolve an unfolding narrative in real time rather than discuss it after the fact.

Cloud Chamber might look and sound like a strange construct right now (youtu. be/e9XmLNWyr_I), but if its concept catches on, we could see its creative baton picked up by other designers and perhaps even TV networks in the future.

Cloud Chamber launches later this year. You can find out more about it at cloudchambermystery.com.

Incoming

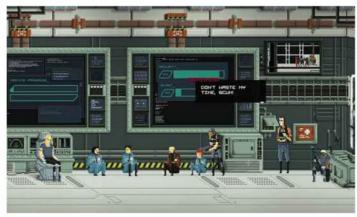
Indie publishers Devolver
Digital are no strangers to
video game violence, as anyone
who's played Hotline Miami or
the Serious Sam titles will tell
you. Gods Will Be Watching
is similarly bloody, and it's the
kind of game that, had it been
produced with high production
values by a mainstream

developer, probably would have had certain British newspapers up in arms.

A point-and-click adventure with 16-bit era pixel graphics, Gods Will Be Watching sees its central character Sqt Burden go to all kinds of extremes to protect the crew of his space ship. Potentially shocking though the game's scenes of torture and death are, there's a serious undercurrent to them, according to developer Ludum Dare. "There's no good or evil, just decisions... Do you intimidate or comfort your hostages to maintain your tenuous control of the situation? Should you kill the weakest member of your party to save on food for the strong? What is one life worth in the face of annihilation?"

Gods Will Be Watching is out on the 24th July, and if you want a taste of its bleak and disturbing 2D world, you can download the original prototype mini-game from its website at godswillbewatching.com.





A Don't let the retro pixel graphics fool you: Gods Will Be Watching is a stark and cold-blooded point-and-click adventure about cruelty and judgements

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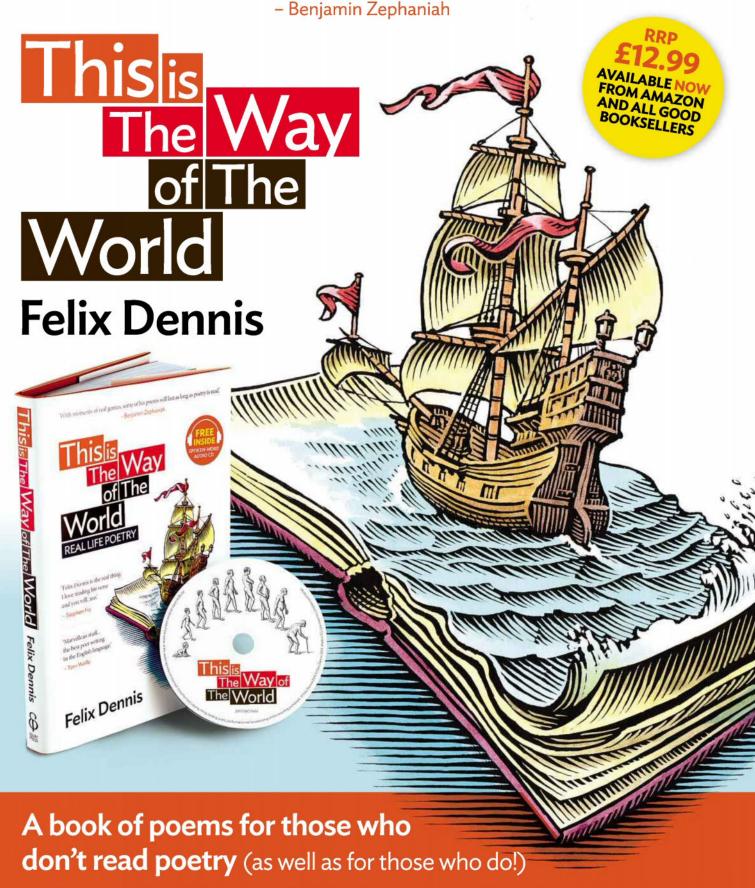


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Tel: (02387) 333212 Email: zen96403@zen.co.uk

MAC BOOK PRO A1151. Spares and repairs 17" screen 2.16GHz intel CPU looks in good condition screen appears to work. Please email or call me for a price and more information.

Tel: David (01616) 888119 Email: pcmadnessItd@ yahoo.co.uk

CISCO CONSOLE CABLES. I have a lot of Cisco console cables all new let me know how many you would like please email or call me for a price and more information.

Tel: David (01616) 888119 Email: pcmadnessItd@ yahoo.co.uk

750GB SATA drive for sale. Perfect working order. Formatted ready to use. Only £25 plus £3 p&p. Genuine Windows XP with Certificate of Authenticity can be pre installed for an extra £10. Tel: Dave Thomas (01942) 706572 Email: davethomas 96@aol.com

Six p3/p4 PC with XP. £100 the lot. Buyer collects. Get in touch for more information. Tel: (02380) 733312 Email: zen96403@zen.co.uk

Socket 775 System. Coolermaster Case, audio + USB. Asus P5KPL-AM EPU E6600 CPU. 250 GB Hdd. DVDRW, ATI 5450. Boxes, drivers. Samsung 19" Monitor HDMI USB. Keyboard mouse. Windows 7 Professional SP1. £100 collect from Louth, Lincolnshire.

Tel: (01507) 602914 Email: flipinek@hotmail.co.uk

2 x 2GB Samsung DDR3 pc3-8500 1066 SODIMM. 204 pin as new laptop memory. £15 inc postage to inland UK.

Email: jvital@mail2web.com

HP 5101 5102 5103 Netbooks and Notebooks.
Lots of parts available down to the tiniest screw.
Contact with requirements.

Tel: (01892) 833413 Email: fwfkent@gmail.com

Dell OptiPlex 755 (80 GB, Intel Core 2 Duo, 2.33 GHz E6550, 1GB memory, DVD/CDRW) Ultra small form factor. Fantastic small and very fast computer. You will need to load the drivers. XP Pro or Vista Business can be loaded for an extra £10. The hard drive and memory can be upgraded for an extra cost. £70 plus £10 for delivery.

Tel: Dave Thomas (01942) 706572 Email: davethomas96@aol.com Internal Card Reader. Compatible with most camera memory cards. Also has a USB port. Colour: black or silver. Please email or call me for a price. Tel: David (01616) 888119 Email: pcmadnessltd@yahoo.co.uk

AGP, PCI and PCI-e graphics cards. Please email or call me for a price.

Tel: David (01616) 888119 Email: pcmadnessltd@ yahoo.co.uk

Motherboard Bundle. 3Ghz AMD 64bit CPU 512MB Ram 5xpci 2xSATA 2IDE 1Gb LAN 6 channel sound firewire. Comes with driver CD and manual. Good for gaming, office work, surfing the net, watching movies, generally a good all round system. Spec can slightly be changed if required. Please email or call me for a price.

Tel: David (01616) 888119 Email: pcmadnessltd@yahoo.co.uk

PC gaming hardware. I have got 1 x force feedback steering wheel, 1 x force feedback joystick, 1 x normal joystick, lots of game pads. Please email or call me for a price.

Tel: David (01616) 888119 Email: pcmadnessltd@ yahoo.co.uk

Vintage Apple Macintosh Classic II PC for sale. Complete with keyboard, mouse and microphone. Offers.

Tel: 07733 628986 Email 576924@tiscali.co.uk

Brand new USB brackets. Add 2 extra USB2 ports to your computer at little cost. Very simple to fit cable connects onto the motherboard and uses a spare slot on the back of your computer. No drivers required. Please email or call me for a price.

Tel: David (01616) 888119 Email: pcmadnessltd@ yahaq.ca.uk

Internal 3 1/4 floppy drives. Choice of white/black/ silver/no face plate. Please email or call me for a price.

Tel: David (01616) 888119 Email: pcmadnessItd@ yahoo.co.uk

Brand new Laptop bag. Still sealed in the plastic bag and never used (it came as part of a bundle). Please email or call me for a price.

Tel: David (01616) 888119 Email: pcmadnessltd@ yahoo.co.uk

Brand new flatbed scanner. Still boxed and never used (it came as part of a bundle) Please email or call me for a price.

Tel: David (01616) 888119 Email: pcmadnessltd@ yahoo.co.uk

Desktop cases. AT and ATX types and tower and flatbed form factor different sizes and colours can be posted or picked up from Manchester please email or call me with your requirements.

Tel: David (01616) 888119 Email: pcmadnessltd@ yahoo.co.uk

Laptop RAM. 2x1GB PC3-8500 DDR3 1067MHz pulled form a working mac book pro but can be used in other laptops this is the quickest way to boost your laptop's speed. Please email or call me for a price.

Tel: David (01616) 888119 Email: pcmadnessItd@ vahoo.co.uk 160GB 3 1/2 inch desktop Hard drive IDE. Clean pull (little to no use) no bad sectors tested all you need to do is plug in and go. £20 +p&p Tel: David (01616) 888119 Email: pcmadnessltd@vahoo.co.uk

Asus Transformer Prime TF201 Tablet PC. NVIDIA Tegra3, 32GB Flash, 1GB RAM, 10.1" LED, Wifi, Bluetooth, 2 x Webcam, Champagne Gold, Android 4.2, with keyboard dock. £150.00.

Tel: Rob Pratt (01189) 781753 Email: robpratt@bizitsolutions.co.uk

Computer Monitor. HP s2231a. 1080p, 22 inch display, 1920x1080 resolution. 60 Hz, contrast 15,000:1. Price £40 0NO Tel: Matthew Taylor (01842 813630) Email: chack-pobly12@hushmail.com

Two Apple G4 iBook Laptops. 12" screen, 800 MGHZ CPU 640MB RAM. OSX (Tiger) 30GB HDD batteries ok M/Chargers, nice machines. £105 each or £200 for the two.

Tel: Matthew Taylor (01842 813630) Email: chackpobly12@hushmail.com

Gaming PC HAF-X case. ASUS P6X58D-E, i7 930
4GHZ 6GB Corsair i7 mem, gigabyte gtx470, Asetek
CPU LCLC 240mm radiator + watercooling. Two
12cm fans, PSU needs replacing. DVDRW, networking, original software, extra cabling. (Price: £400
ONO)

Tel: Matthew Taylor (01842 813630) Email: chackpobly12@hushmail.com

SATA Drive Tray For Laptops. Allows you to remove your CD/DVD Optical Drive and Insert a second

Very useful for backups, file recovery and RAID setup on a laptop. Brand new, still sealed and boxed. £10 including P&P.

Tel: Gary Gemmell (01415) 712822 or (07551) 293083 Email: omendata@gmail.com

Gold Northbridge Heatsink. £3 including P&P. Tel: Gary Gemmell (01415) 712822 or (07551) 293083 Email: omendata@gmail.com

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: fwfKent@ gmail.com

Midi tower PC. Windows XP, Office XP, 230GB HDD, FDD, 2x DVD drives, HP Photosmart printer & Canon scanner. All relevant discs. £50.00. Tel: Alan Phillips (01745) 354614. Email: alan. phillips747'talktalk.net

Two Apple G4 iBook Laptops. 12"screen, 800 MGHZ CPU 640MB RAM. OSX (Tiger) 30GB HDD batteries ok M/Chargers, nice machines. £105 each or £200 for the two.

Email: micksharp@live.co.uk

XFX Radeon HD 6870. 1GB GDDRS. Original packaging, never overclocked..£75 plus £6.95 pp.
Tel: Simon Hardwicke (01536) 724334 Email: simon. hardwicke 1@nthworld.com

Asus Sabertooth 990FX Mobo. £100 plus £6.95pp (with Phenom II 980 add £50).

Tel: Simon Hardwicke (01536) 724334 Email: simon. hardwicke1@ntlworld.com

Lian Li PC-X2000 Computer Case. Supports mATX, ATX, eATX; hot swap SATA drive compartment.

six 3.5" & two 2.5" hot swap disc holders. Three 140mm intake plus two 80mm and one 140mm exhaust fans.

Tel: lan (01932) 856971 Email: a2345@btinternet. com

Matricom G Box Midnight MX2 Android HTPC. New boxed. £85 ono. Postage £3. Tel: Mick Young (02072) 321695 Email: mick. young@02.co.uk

Funai D50M-100Y VCR recorder, 6 head A2 stereo. New boxed. £90 ono. 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: ken@ stonehaven2.plus.com

Gaming PC. HAF-X case ASUS P6X58D-E, i7 930 4GHZ, 6GB Corsair i7 mem, gigabyte gtx470, Asetek CPU LCLC 240mm radiator + watercooling. two 12cm fans, PSU needs replacing. DVDRW, networking, original software, extra cabling. £390 0N0

Tel: Alex Thomas (01842)813630 Email: chackpobly12@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 ono. Tel: (01964) 622867 Email ian.macklin@mypostoffice.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 Saward (01354) 656578 Email: steven_ saward@sky.com

16GB Corsair Vengance DDR3 RAM (2 X 8GB). £120 ONO. Brand new and unopened Tel: Chris Paul (07827) 447779 EMail: cmpaul25@ 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@amail.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: jhturner77@outlook. com

ASUS PSN-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 medicineman@ntlworld.

Toshiba Satellite L350-159 17 inch screen laptop. 320GB HDD, Vista license, 4GB memory. Restore disks, charger, WED lightly. Wireless excellent, long battery life, excellent condition. £165 with free postage.

Tel: (01619) 501218 Email medicineman@ntlworld.

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 medicineman@ntlworld.

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-tastic £75. Tel: Martin Welch (07971) 528739 Email: welch_martin@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 PO2015dn extra lower 250 page feed tray. £20. Tel: Gary Gemmell (01415) 712822 or (07551) 293083 Email: omendata@gmail.com

New, boxed Belkin 24-Port CAT 5e Patch Panel. Part # F4P338-24-AB5. The RJ45 CAT 5 patch panel is 19 inch rack mountable and supports both 568A and 568B installations. Compatible with both 110 and Krone punch down tools. £15.00. Tel: Robin Hewlett (02083) 930301

TP-LinkTD-W8968 wireless N USB ADLS+ Modem Router. Unused, boxed, with all cables and set up CD and installation guide.£20.00 plus postage. Tel: (01748) 886885 Email: hsturner@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.

SATA/64MB Cache, Model No: WD20EARS. £40.00 inc p&p.

Tel: Michael (01452) 303732

HD 5850 XFX Black Edition for sale. It has been flashed with the Asus Bios and can be made to run as fast as a HD 5870. 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_martin@yahoo.co.uk

Nvidia Geforce GTX 670 2GB. Made by MSI O/C model. Not overclocked. VGC. £110 plus postage. Tel: Tim Stirland (01623) 624509 Email: tim. stirland@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 F9T110ukCW. £15 inc p&p. Tel: Alan (01258) 446500 Email: alan@asandco. ca.uk

1 TB 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: davethomas 96@aal.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: medicineman@nt/world.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 1255GSX. £35 with free postage. Email: medicineman@ntlworld.com

Gateway MT622oG Laptop. 15.4 inch screen.
200GB HDD 2GB memory. Duel core CPU. Excellent
condition, wireless supurb, £129.95. Tracked post,
£7.50. Please ask any questions.
Email: medicineman@ntlworld.com

MSI KT4AV-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@rodtheobald.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 Bonnett (01932) 856971 Email: a2345@ btinternet.com

Dell Ultra small form factor GX620. 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 CLI-8 cartridges. Yellow (3), magenta (2), cyan (2), black (2),PGI-5 black (2).

Won't fit new printer. £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 upgrade. Will be provided in anti-static packaging. £50.
Tel: Mark Sullivan (01142) 745864 Email: mark. sullivan 34@aol.co.uk

PC for sale. Athlon Dual Core 3Mhz CPU, cooler, Asus M3A board, 2GB DDR2, Nvidia GT8600 500MB, 750W PSU, XPSP3, Sony 17" Monitor, £150.

Tel: Ray Dawson (01202) 893997 Email: ray. dawson02@btinternet.com

Gateway MT6220G 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@ntlworld.

ASUS P5QLD Pro motherboard. 3GB. Dual core CPU, 6GB man memory, set up disk and 1/0 plate. Heatsink and fan, comes in brown box £70 plus £5 postage.

Tel: (01619) 501218 Email: medicineman@ntlworld. 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@ntlworld.

PC with AMD Athlon 6000+ dual core 3Mhz CPU, quality cooler with external speed control. Asus M3A motherboard, 2 GB DDR 2 RAM, Nvidia GT8600 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

Enermax 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: wryrat@hotmail.

Antec 900 ATX Gaming Case. Not new but unused, VGC. Boxed, with all accessories. £57.00. Tel: Tim (01892) 689054 Email: wryrat@hotmail.

Free CPU and RAM. Athlon 64 3200 socket 939 CPU and 4 x 512MB ddr 333 strips.SAE and I will post

Tel: Jo Barden (01255) 870690 Email: cornsnake@ cornsnake.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: t2o@ areenbee.net

MSI Motherboard G41M-P28 LGA775 socket. Also two 2GB matched Kingston DDR3 1333 RAM. Both unused in original packing. £35, inc postage. Tel: JG Moorhead (01606) 852461 Email: moorhead373@btinternet.com

3 x 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: mail2luzl3ygym@yahoo.co.uk

Linksys WMP54G Wireless PCI card. £8 collection in Oldham or £11 posted to UK.

Tel: Ken Vickers (01616) 78 6139 Email: mail2luzl3ygym@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.

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@ntlworld.

PNY Europe GEFORCE GT520 DDR3 1GB PCIE 2.0. £22

Tel: (02393) 117877

TP-LINK 32-BIT PCI 10/100M fast Ethernet adapter TF-3239DL, £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: omendata@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: davethomas96@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 PCI Professional Audio card. Works perfectly with Windows XP, 7 and 8 32 and 64bit OS's. 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

Akai Apc40 MIDI Controller. As new, in full working order with software, paperwork, etc in original carton. £240 ovno Delivery £6 Tel: Peter Van Win (01702) 559210 Email: vanpwin1@googlemail.com

Hitachi Deskstar T7K250 HDT722525DLA380. 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: geoffandcynth@ themailspot.com

Dell GX240 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 GX3020 SFF Desktop, P4/3.2 Hyper-threaded 2 GIGS RAM, 80 GIG hard drive, CDRW-DVD combo, network, sound, XP Pro, C.O.A, 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: davethomas96@aol.com

iMac G4 15inch. Iconic Mac PC, unique design, 700mhz CPU, 512MB RAM, 80GB Hard Drive, DVD/ CDR, Apple USB Keyboard & Mouse, OS X 10.4 Tiger with other software installed. Boxed with disks. £80.00 Buyer collects.

Tel: Wayne Deeley 07748170828 wdizz55@gmail.

Toshiba laptop. SP 6100I, complete except no HDD, unable to boot, charger. 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@

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 T722525DLA380 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: geoffandcynth@ themailspot.com

NAS Two Bay Server. Zyxel 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 £100 or nearest offer.

Tel: Paul Brogden (07545) 496002 Email: paulbrogden2007@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 Brogden (07545) 496002 Email: paulbrogden2007@hotmail.co.uk

Apple iMac Intel 2006 for sale. 20 inch screen, 1 TB 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 Brogden (07545) 496002 Email: paulbrogden2007@hotmail.co.uk

AsRock mobo N68-S. Original box and contents. £20 P+P extra at cost.

Tel: (01842) 879932 Email: mmadds@btinternet.

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 ovno. 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 freeview card with remote KBD, 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: davethomas96@aol.com

Lenovo ThinkPad X100e Laptop. Model 2876-2FG 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 13, 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. 2 x 3GHz Xeon processors, 12 GB RAM, 3 x 160GB hard drives, 6CH SATA RAID controller. £200.

Tel: Kevin Gracie (07506) 685879 Email: kgracie12@

Main bits of a quick rig for sale. Asus PK5SE 775 mobo, Core 2 Quad 6600 GO, 8GB Patriot DDR2 memory. £125 plus postage for the lot. Will not split the CPU/mobo.

Tel: Pat Casey (07532) 387078 Email: patngerry@ googlemail.com

Foxconn Nvidia GeForce 7200 GS video card. £15 plus postage.

Tel: Pat Casey (07532) 387078 Email: patngerry@ googlemail.com

Palit Nvidia GeForce 9600 GT Sonic video card. Factory overclock to 700MHz. £40 plus postage. Tel: Pat Casey (07532) 387078 Email: patngerry@ googlemail.com

Palit Nvidia GeForce 450 GT video card. £50 plus postage.

Tel: Pat Casey (07532) 387078 Email: patngerry@ googlemail.com

Fujitsu PSU model DPS-210 fb +3.3v 7.5A +5A, +12v 15.3A, -12v 0.3A, AUX +5v 2A A5 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: r.edwards14@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: pattersong@ hushmail.com

HARDWARE WANTED

Trying to breathe life back into an old machine? Why not submit a wanted ad to MicroMartClassifiedAdverts@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: Fully working mainboard for AMD socket AM3/AM2+, DDR2, micro-ATX size. Email: Brian bmorgant@yahoo.co.uk

Wanted: Factory system restore disc for a Dell Inspiron 1750.

Tel: Darren Day (07707) 556193 Email: ddshaggy@ btinternet.com

Wanted: 4GB (2 x 2GB) of Corsair DDR2 RAM. 800Mhz XMS2-6400. Must be in good working condition.

Tel: (01928) 733808 Email: wilsal9@aol.com

Wanted: One Series Printer HP DESKJET 610c in good working order. One servicing manual (Not Users Instruction Manual) for the HP DESKJET 610c Printer. Old Zip Discs. Tel: (01214) 777691

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: j.cleary@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

Tel: Ken Driver (01890) 820295 Email: ken@ branxton.plus.com

WANTED: Foxconn H61MXL-K I/O backplate.

Please state price & postage cost. Tel: Steve Wilson (01617) 939906 Email: sb.wilson1@ntlworld.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 Ernail: jauung2@btinternet.

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 turnbull 50@sky.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: medicineman@ntlworld.

Wanted: SDRAM laptop modules. Either PC100 or PC133 for elderly Dell Latitude CPt C Series Laptop. Wanted x2 SDRAM modules up to 254 MB for Dimms A + B (Non Parity).

Email: cievans@fsmail.net

Wanted: AMD Opteron or FX Processor wanted. This does need to be socket 754.

Tel: 07817861011 Email: richardhaviland@gmail.

Wanted: Motherboard for Toshiba laptop. Model SA60-302.

Tel: Edward Usher (07708) 235768 Email: e.usher@vahoo.co.uk

Wanted: Advent 6553 working motherboard. Tel: Sean Lavelle (01614) 280430 Email: sean-is@ ntiworld.com

SOFTWARE FOR SALE

Windows Vista 32bit for sale. Genuine item with genuine product key. £35 including P&P. Tel: Ian (01132) 629028 Email: ianmatthewuk@yahoo.co.uk

Windows 7 Professional. I have both 32 and 64 bit versions. NEW software and license (certificate of authenticity) 100% genuine and unopened software. ONLY £35 including P & P.
Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas 96@aol.com

Windows 8 Professional 64 bit. NEW software HP branded. 100% genuine and unopened software. ONLY £15 including P & P.
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Windows 2000 Professional. NEW software and license (certificate of authenticity) 100% genuine and unopened software .ONLY £15 including P & P Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

Windows Vista Business. New and sealed. Book, software and license (certificate of authenticity) 100% genuine and unopened. (Dell branded but will install on any machine) ONLY £15 including P.R. P.

Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

Windows 7 Home Premium NOT BRANDED 32 and 64 bit versions. NEW software and license (certificate of authenticity) 100% genuine and unopened software. ONLY £35 including P & P.

Tel: Dave Thomas (07828) 982930 or (01942)
706571 Email: davethomas96@aol.com

Office 2007 Pro Plus for sale. Includes Word, Excel, PowerPoint, Excel, Publisher and Outlook. Disk only with serial number. £40 including postage. Email: ianmatthewuk@yahoo.co.uk

Windows XP Professional. New, 100% genuine. Disc, manual, certificate of authenticity. Dell branded but will load onto any computer. £15 including delivery.

Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

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.

Tel: 0203 519 7628 Email sales@bitsmith.it

Windows Vista Business edition disc and certificate of authenticity. New and 100% genuine. Only £15 including postage and packing.

Tel: Dave Thomas (07828) 982930 or (01942)

Microsoft Office Professional 2007. In original wallet with original licence Code. £100. Price Includes P&P.

706571 Email: davethomas96@aol.com

Tel: Carole Walker (07551) 293083 Email: omendata@gmail.com

SOFTWARE WANTED

Wanted: Nero 9 reloaded for Windows 7. £80 given. *Tel:* (01629) 732623

Wanted: SmartDisk HD250 Installation CD.

Novice Linux CDs with instruction manuals reasonable prices will be paid.

Tel: Alun (01525) 288972 Email: jauung2@ btinternet.com

IMPORTANT BUYING ADVICE

We work very hard to police our classified ads, and make them as secure as possible.

However, please do your bit too and use the following guidelines:

- Never NEVER pay by bank transfer or post out cash, unless you know the trader already, or are sure it is okay to do so. Pay by cheque, Paypal, Nochex etc wherever possible.
- Be wary of anyone who insists on you paying by the above methods if in doubt, get us to check them out by mailing editorial@ micromart.co.uk
- 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.

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software and system
building issues. He's
got advice aplenty,
and you're very
much welcome to it!

Send your questions to: Aaron Bich 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.



iLocked

I've recently purchased an iPhone from a friend who upgraded to a new phone. He bought it himself, separate from a contract, so it's not vendor locked or anything. It's in great condition, and he's a good friend, so I know nothing is dodgy, or at least, it shouldn't be.

I saw the phone working before he sold it to me, and checked it before I bought it. However, upon getting it home and slapping in my SIM card, I've found that I can't use the phone, as it asked for his user name and password. I can't wipe or reset it, so can't use it at all. I've asked him about it, and he said that I should be able to simply wipe it and use it as normal. He's even tried himself, but cannot get it working. He's just as confused as me.

He's offered to give me back my money, but I really wanted to move to the iPhone, and I just can't afford to buy one new, and don't trust buying from an unknown person or seller on sites like eBay, especially as this one from a trusted source hasn't even worked.

Do you know how I can get around this and use the phone. Will Apple help me?

Lee

Sadly, without proof of purchase, it's unlikely Apple will help you. Your friend could get in touch, of course, but I don't think that's necessary. There's nothing untoward going on here, the iPhone you have is likely behaving exactly as it should. I'm assuming that the iPhone is running iOS 7, and if so, this is where your problem lies.

With the arrival of iOS 7, Apple introduced a new security measure into the OS in the form of the Find My iPhone activation lock. This ties an iPhone or other Apple device to an Apple ID, so it can't be used or restored without the login details of the user who originally purchased the device and registered it. With this active, there's little you can do. There are companies that offer an unlock services, but

. Once this is done, you'll be able to reset the phone and use it as normal. In fact, I'd recommend

66 With the arrival of

iOS 7, Apple introduced a

new security measure

these can be very pricey, and if you take precautions, simply aren't needed.

When buying a second-hand iPhone, it's important to always check the phone before you buy, which you did, but while checking it, make sure you go into Settings and then into the iCloud section. Scroll down here and you'll find the 'Find My iPhone' setting. If this is on, ask the owner to disable this with their credentials before you buy it

you get the previous owner to actually wipe the phone too, before you buy it. This way you know you're covered.

As you've bought the iPhone from a friend who you can easily get in touch with, you should be able to sort this out with no problems.

→ If you're buying a second-hand iPhone, always check that the Find My iPhone lock is deactivated before you part with your cash





Clean Thumbs

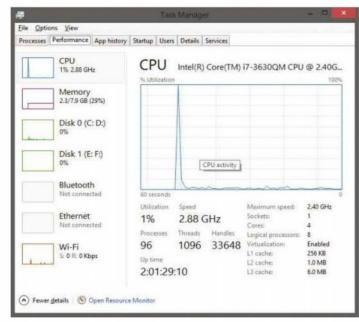
Thank you for the full explanation as to why I was having problems with Windows Explorer. You are correct in that I was trying to consolidate my pictures onto my NAS drive and was moving large RAW files and JPEGS around. Once I had cleaned out the thumbnail cache, I stopped having problems.

Many thanks for your help.

Frank

Thanks for the update, Frank. I'm glad you sorted out your thumbnail issues and conflict with dllhosts. I've had quite a few similar questions about this, and the same fix seems to have helped sort out these problems, so if anyone else is having thumbnail issues and dllhosts problems, it's a good trick to try.

In case you missed it (I've had questions after the issue hit shelves), this simply pertains to a problem with Windows' thumbnail cache and dllhosts.exe taking a large amount of system resources. To remedy it, simply go to Start > Run, or press Windows+R and type 'cleanmgr' and press Return. Select the drive to be cleaned and press OK. When prompted, pick the items to be cleaned, including thumbnails and the cache will be cleared. Done.



▲ If dllhosts is sapping your CPU resources, try this simple image thumbnail fix

Slow go

I have a HTC One X mobile phone that's running really slowly. It's an Android phone and it initially ran very fast, and the interface was very responsive. In fact, it was possibly the fastest phone I've had, even faster than my old iPhone, which was very fast.

Lately, though, I've noticed that it's getting slower and slower, taking longer to open apps, enter text (the keyboard takes ages to appear), and even scrolling from screen to screen takes longer. Can you help? I usually end up getting a new phone when my contract lets me, but I'm quite a way off that yet.

Vic

Like all operating systems, be they mobile or computer, Android starts out very fast, but as you install apps and clog up the drive and cache, the phone will slow down. After a while, it can become a shadow of its former self.

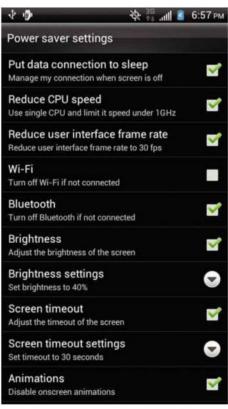
Wiping a phone is obviously an effective way to remedy this but it's also a pain, and other ways are far more desirable. The most straightforward and often effective way to speed up a phone is to simply remove apps and items you no longer need. The

more apps, music and other data you have clogging up the phone, the slower it'll go. By clearing out some space and uninstalling apps, you'll probably speed your phone up a great deal. Also clear any cache stores, such as internet history.

It's a very good idea to regularly clear out your photos. It's amazing how quickly you can fill up your phone with photos, and these take up a surprising amount of space, which can also add to the sluggishness of your phone. If you use photo editing apps, having tons of photos can also slow them down as they have to scan through your collection, especially if they have a thumbnail preview.

A method used by some it to use a system cleaning app from Google Play. These can automatically clean your system, but just like PC cleaners, they can be hit and miss, and some fear they can cause more problems than they fix. So it's up to you if you want to use these.

Another idea is to download the Hidden Settings app from Google Play. This can be used to unlock, yes, you guessed it, hidden setting for your phone. These can let you play around with various options, including the ability to disable flashy menu animations and other CPU-sapping features. This can help keep your phone speedy.



A Hidden Settings can be used to access extra options for your phone, some of which can speed things up



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

While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

Who Dares Wins?

The 750GB hard drive in my Lenovo B590 laptop is filling up fast. I want to get something bigger and quicker, and I've just read a review of HGST's new 1.8TB C10K1800. For a spinner, the performance is mind-blowing. I had no idea 2.5" drives were capable of 10,000rpm – a bit better than my current effort's 5400rpm! Could I fit one, though? It looks like I could, but I see it's sold as an 'enterprise' drive, whatever that means.

Jerry Haslam, Suffolk

All three main drive vendors sell 10,000rpm 2.5" enterprise models, but the king of Western Digital's new C10K1800 range sure is monumental – or perhaps just mental.* It bumps the capacity record from 1.2TB to 1.8TB, and the spindle speed is actually 10,520rpm, another record in this class. Sequential transfer is as high as 247MB/s, and random access is around 3.5ms. Performance far outstrips anything on offer in the mainstream. Of course, 15,000rpm 2.5" enterprise drives are even faster...

So, Jerry, can you fit an Ultrastar C10K1800 in your laptop? Sadly not, my friend. Sadly not. These are SAS drives - Serial Attached SCSI. Just as SATA is a serial implementation of IDE/ ATA/PATA, SAS is a serial implementation of SCSI. SATA drives can often be connected to a SAS socket, but SAS drives can't be connected to a SATA socket. Enterprise-class motherboards sometimes have SAS functionality, but I've never seen it on a laptop. SAS drives are for folks with racks of server hardware.

Also, along with most other 10,000rpm 2.5" drives, the C10K1800 models are 15mm thick. Standard laptop drives are 9.5mm thick, and Ultrabook-type devices usually require drives only 7mm thick. 15mm drives,

and even 12.5mm drives, are off-limits. Even Western Digital's VelociRaptor models – 10,000rpm, SATA and aimed at enthusiasts – are 15mm. They're intended not for laptops but for desktops, DVD unit, fit an adaptor, and put your 750GB spinner into that. Use the spinner for stuff where speed isn't especially important – music, videos, archived documents and so on. You'll have 1.25TB in total,

Where speed isn't especially

important

fitting into a 3.5" bracket, just like an SSD.

And talking of SSDs, a kickass 500GB/512GB model can be had these days for under £150 (check out the Crucial MX100). Even if you could fit one, a 1.8TB C10K1800 would cost over £400 (an estimate, as none are in the channel yet). And compared to a modern SSD it would be positively sluggish.

Of course, 500GB/512GB won't give you enough space, Jerry, so just fit the SSD as your boot drive – for your OS, programs and working data. Take out the Lenovo's

and if you ever need to read or burn a DVD, simply beg, borrow or buy a USB unit.

* The three main drive vendors, after years of mergers and acquisitions, are Seagate, Toshiba and Western Digital. HGST is a Western Digital subsidiary, bought from Hitachi in 2012. Hitachi built the company from assets bought in 2003 from a little-known outfit called IBM.

→ HGST's latest 2.5" enterprise spinners are blisteringly fast (for spinners), but are they suitable for laptops?





Feeling Blue

Here's another Lenovo query...

When I bought my Lenovo IdeaPad Z580 laptop I knew it had Bluetooth. But it's taken me ages to discover how to use it! There's no label advertising Bluetooth. There's no mention of Bluetooth in the manual.

After searching online, I've found I can bring up the Bluetooth settings by typing 'bluetooth' into Windows 8's search bar. And I can bring up the dialogue to send or receive files by digging into C:\Windows\System32 and double-clicking 'fsquirt.exe'.

Why is Lenovo not advertising the fact that the Z580 has Bluetooth? Why are the settings hidden? Even getting the thing enabled is a chore! All I wanted to do was stream music to my Bluetooth speakers.

Clifford Evans, BT

I'm baffled, Cliff. I've just downloaded the Z580 user guide – available from **bit.do/ DyNd** – and the Bluetooth functionality is

explained on page 18. As is often the case on a laptop, enabling it involves striking a key combination: here, it's Fn + F5. This is the switch for flight mode (I can't bring myself to call it 'airplane mode', and 'aeroplane mode' just sounds wrong). Use it to activate and deactivate the Wi-Fi and Bluetooth radios.

You may well find there's a Bluetooth icon in the notification area of Windows 8's desktop too. This may appear only after Bluetooth's enabled, though. If it's there, you should be able to change any settings via that, by either clicking or right-clicking. You'll also be able to do the same thing via the Settings section of Windows 8's Charms menu. There's no need to mess about with the search bar, and if you ever want to use Bluetooth to send a file to someone, just right-click the file in Windows Explorer and use the 'Send to' menu.

Or am I missing something? I feel there could be more to your problem than I'm realising, Cliff. The Z580 shipped with both Windows 7 and Windows 8 – is yours the

Windows 7 model and you've installed Windows 8 yourself? If so, maybe there's a driver issue. All the official drivers can be downloaded from **bit.do/Dy98**.

→ This is the fella who 'invented' Bluetooth: Blåtand (King Harald Bluetooth of Denmark and Norway)



Sim City

My smartphone, a Nokia Lumia 510, was bought from Tesco, and it proudly proclaims 'I'm locked to the Tesco Mobile network' (printed on the box). I dropped the phone in the bath (don't ask!), so I'm after another – perhaps a Samsung Galaxy of some sort. I'm happy with Tesco as my network (I pay as I go), so am I right in thinking I need a phone from Tesco in order to stay on it?

Gary, Gmail

Thankfully, Gary, you're mistaken. Fundamentally, there are only four MNOs – mobile network operators – in the UK.

- 3
- EE (including Orange and T-Mobile)
- 02
- Vodafone

All other companies offering mobile services in the UK are actually MVNOs – mobile virtual network operators. They have their own branding, billing and support, but they don't have any infrastructure. They buy their network access wholesale from one of the four MNOs. Below is a list of the UK's main MVNOs (there are numerous other, smaller players) and the networks they use.

- Asda Mobile = EE
- Giffgaff = O2
- Lycamobile = O2
- Mobile by Sainsbury's = Vodafone
- Post Office = EE
- Shebang = 3
- Talkmobile = Vodafone
- TalkTalk Mobile = Vodafone
- Tesco Mobile = O2
- Virgin Mobile = EE

If you have a SIM from an MVNO, it'll work in any phone locked to the parent MNO. So your Tesco SIM will work in any O2 handset, and a Post Office SIM (the Post Office launched its MVNO just this month) will work in any EE handset. There are a few exceptions, mostly with older phones, especially Apple handsets prior to the iPhone 4. More than once I've assumed a 3G or 3GS on O2 will take

a Giffgaff SIM and ended up looking like a buffoon.

The reverse isn't always true, however: it's not a given that a SIM from an MNO will work in a phone from an MVNO. For example, an O2 SIM will *not* work in a handset explicitly labelled as being locked to Tesco (such as your well-washed Lumia). A similar scenario may apply to handsets from Asda, Sainsbury's and so on, but I'm doubtful. Could you share your own experiences with us, dear readers?

Caution should be exercised with EE phones too. Models sold prior to the merger of T-Mobile and Orange may have trouble with interoperability. For example, I've encountered early Galaxy S2 handsets on T-Mobile that request unlock codes when presented with an Orange SIM. Modern phones locked to any of EE's three brands should work with SIMs from any of those three brands.*

The upshot (I was bound to get there eventually, Gary) is that you're safe to use any (modern) phone advertised as being on O2 or of course any phone that's unlocked. Unlocked phones work with all SIMs, whether from an MNO or an MVNO. Most phones these days can be unlocked online from £0 to £10 – something to consider if the perfect handset pops up for sale but it's on, say, Vodafone. The exceptions, as ever, are iPhones. The going rate for unlocking those is three times that upper figure.

* The Orange and T-Mobile brands are in phase-out. The EE brand used to be reserved for the group's 4G services, but gradually it's being used for everything.

∀ Will a Tesco SIM work in a non-Tesco phone?



Crowdfunding Corner

Looking for something a little different? Look no further...

Cable Keeper

If there's one experience common to most computer users, it's having more cables than you know what to do with. Battery chargers, audio connectors, headphones, USB cables, network cable – the list goes on. Inevitably, when you have this many cables around, you eventually waste time looking for the right one, then untangling the right one when you find it. Isn't there a better way?!

Well, soon there will be. The Cable Keeper is a cable manager designed to solve this set of problems for you, helping to manage cables, cords and other accessories. It's simple and versatile, and while it can be used for a variety of purposes, it's bound to prove invaluable to any tech fan.

The cable keeper comes with five different sections: X-Small, for pens, cable adapters and audio jack adapters; Small, for phone cables, audio cables and small card readers; Medium, for battery packs and longer cables; Large, for video cables such as DVI, HDMI and VGA cables, as well as power kettle leads, and a Onestrap Velcro section for charging blocks, hard drives and paper notebooks. It also comes in three different sizes: a small and medium for portable cable management and a larger one designed as an all-in one storage solution.

Constructed from high-quality materials with a roll/fold-up design, the Cable Keeper starts at \$35 for the smallest version, costs \$45 for the medium version and \$55 for the large version. All tiers require \$15 of shipping outside the US. The good news is that it's already hit its \$12,000 target, so if you back now, you're as certain to get one as Kickstarter can be!

URL: tinyurl.com/CFmm1320a Funding Ends: Tuesday, 22nd July 2014

KOR-FX Gaming Vest: 4DFX Haptic Feedback System

We've mentioned before how the Oculus Rift has made Kickstarter a haven for immersive and virtual reality gaming peripherals. Well, here's the latest: the KOR-FX gaming vest, which uses your game or movie's 3D audio output to create targeted, high-definition haptic feedback.

By channelling the audio into vibrations across several packs in the vest, the KOR-FX allows you to feel enemy vehicles approaching or detect the direction a sniper is firing from. It's not just for fun – it could actually help you play better by triggering in you the kind of instinctual reactions you'd have in real life

The KOR-FX team is keen to point out that it's not just a rumble pack, describing how its 'acousto-haptic technology' uses audio and special transducers to create precise, directed haptic output, which echoes into your chest cavity and effectively turns your body into an instrument.

The vest is fully compatible with PCs, Macs, game consoles, tablets and any other device with a 3.5mm audio jack. Its built-in processors mean there's no extra burden on your system, nor any extra software required – simply plug it in and start playing.

Back the project now and you can get a 'First Edition' unit for just \$150 (plus \$30 shipping outside the US). Pledge \$250 and you'll get a 'Founder Edition' in silver, limited to 100 units (with just 24 left at time of writing!). The project has already almost doubled its \$75,000 goal, so it'll probably do even better in the coming weeks. Get in now before they announce stretch goals!

URL: tinyurl.com/CFmm1320b

Funding Ends: Thursday, 24th July 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!



Transferring files has never been so easy

ile transfers between various platforms, machines/devices and other forms of digital storage can be something of a pain at times, especially when you have umpteen files to copy across or several large files. Usually they seem to know that you're in a hurry to catch the last train home and therefore decide to take an age to copy, probably going the scenic route through the internals of the devices involved and sightseeing throughout the ether as they traverse the cloud.

Until Infinit came along...

To Infinit And Beyond...

A very fast, unlimited and clever file transfer program, infinit is currently available for Mac and Windows (from **infinit.io**) with a version for Linux rumoured (this was apparently meant to appear at the end of 2013 but is, as yet, not available). It's predominately aimed at the digital artists and creatives among us who naturally have a need to transfer the excessively large files they produce when going about their jobs. "As a team, we're able to identify with these types of professions because we feel their pain and frustration when it comes to file transfer tools", commented co-founder Baptiste Fradin.

"We're already working with hundreds of people in music, film and advertising. These types of people bring content to life. Infinit makes getting there a lot easier."

It has been designed to combat many issues and problems that are generally encountered when transferring large files and, as a result, Infinit can offer some pretty amazing features. For example, as already stated, it's unlimited, so that's any file type of any size allowed. It's extremely fast, quicker at transferring anything from 100MB to 2GB than a variety of already established methods (look at the graphs). It's secure – running a 256-bit encryption on the files being transferred – and it's simple, in that there are no emails, websites or anything else to clutter the process; just an easy to use drag and drop interface.

Not only can you transfer files to and from each of your various contacts, but you're also able to stream content of varying types at the same kind of speeds that the transfers take place at – obviously your connection to the internet is the deciding factor, but generally speaking the program takes out much of the bottleneck of software that often causes the slowdowns.

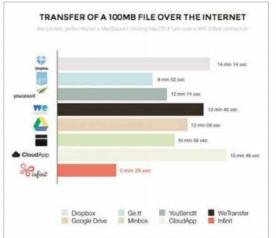
The Numbers

Infinit claim that a 100MB file takes something like five and a half minutes to transfer between two users – compared to (again, according to Infinit's figures) something in the region12 minutes to transfer the same data via through Google Drive.

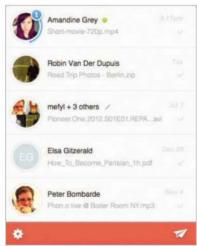
Almost as importantly, Infinit feels very fluid and gives off the air that there's very little that can go wrong, except for an all-out internet outage. It's also worth mentioning that any transfers can be paused and resumed once the connection is back up again, which is a handy feature should you need your connection at maximum capacity for a while; it can even be resumed after a shutdown and reboot.

Conclusion

It's nice to see a company paying attention to a specific need; here, simplicity and speed rule the day and the product offers the ease of use and a kind of fire and forget operation that is admirable. Infinit is well worth having a look at and when it's released for Linux (and should it appear on iOS and Android) there could be some interesting times ahead.



▲ 100MB zips along at a rate of knots



A Pick your contact and send them the file

Features At A Glance

- Any file. Any size. Any type
- Infinit's P2P technology means transfer speeds are up to 23 times faster than competing products
- Closing and opening your computer doesn't cancel the transfer. As soon as the Internet connection returns, the transfer continues unlike competing tools
- Files are encrypted such that only the sender & recipient can access them



▲ Then they or you, can accept or decline

Logging Office O

'm not entirely sure why, but given that I produce this part of *Micro Mart* each week and still find something to write about, I developed a sudden urge to work out how many Logging Offs I've generated over the years.

I'm pretty good at keeping all my work stored in an easily accessible and form, so searching for the first example wasn't that difficult. Unless I'm mistaken, the subject matter was the obsession the tech industry has with speed, and it appeared in *Micro Mart* issue 912 circa July of 2006.

Since then I've missed a few because of ill-health, but that still means that I've probably passed 400 contributions to this part of the mag. That's about 200,000 words, or about three novels worth. In amongst those hundreds is at least one where the words make sense, in English. Oh, hang on... no that one I was thinking about was written by Simon Brew while I was unavailable. Anyway, all the wonky ones, they are certainly by me.

With so many published I'm slightly incredulous that I can keep finding something new to ramble on about each week, but it's usually disturbingly easy. As long as the world is populated by tech companies with no morals, governments with no ethics, and phones that cost more than a car, I'll have plenty of potential targets to take pot-shots at.

This week I had intended to rant about how Google was being so remarkably petulant about implementing the new EU directives on the right to be forgotten, but I discovered that many of my arguments about why they're both wrong and right simultaneously had already been creatively mined by the always witty David Mitchell in *The Guardian* (you can read it at tinyurl.com/pwuamut).

I don't often appear on well publicised TV comedy shows, or captain a light entertainment quiz team. So why would he stomp on my toes so carelessly, I pondered? Whatever the reason, and it's probably something along the lines or 'because he can'. Anyway, my masterpiece on the utter irrationality of reality bending legislation got spiked before it was published.

Ignoring the very fine irony in that turn of events, I was forced to consider a more introspective subject, i.e. the longevity of my tenure here. Whenever anyone does something for any substantial period of time the question of them stopping suddenly comes up, like that's a stronger possibility than just after they just begun. When in this specific case the complete reverse was true, because I'd assumed

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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



back then that I'd only be writing this section for a few weeks.

For those wondering where this is all going, like many of the 400, nowhere in particular.



I've no great intention to fall back to the feature pages on-mass, as this is creative territory I've demolished a few keyboards to hold this long.

It's tempting on occasion to take a break, and perhaps challenge someone else to be wistful and acerbic in equal measures each week. But since I've come this far, and I've got the t-shirt, and the mug, I'll carry on thanks.

Like a journalist version of the five peaks challenge, I can see the distant top of 500 issues through the misty morning haze, and have enough Kendal Mint Cake to get me up there.

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: 7 Outsourcing, 8 Aments, 9 Newbie, 10 Coulomb, 12 Agree, 14 Op-Amp, 16 Dismiss, 19 Osiris, 20 Thrift, 22 Thunderbird.

Down: 1 Worm, **2** Atonal, **3** Consume, **4** Print, **5** Bigwig, **6** Igniters, **11** Opposite, **13** History, **15** Markup, **17** Margin, **18** Aside, **21** Fade.

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 nublishers cannot accept any responsibility for any resulting unsatisfactory transactions. Reading Mark musing on just how many Logging Off columns he's put together has given some of us pause to think about just how long we've been involved in hiding little bits of text like this around these pages (along with surreptitious web links, references and pictures of ocelots) ourselves. Not that we'd ever want to do anything else... Long may it continue, we say. Yes,

like Mark, we've seen a lot of technology come and go - though we tend to err on the side of wideeyed wonder, leaving him to do the world-weary sage thing that he does so well. Or maybe we just get through a hell of a lot more coffee and Haribo than he does? We'll have to get him to log his caffeine and rubbery-confection intake with one of those new-fangled apps so that we can compare. Actually, come to think of it, we don't really want to be the ones to ask him to do that, as we imagine the response would be short and not so sweet. Anyway, here's a toast (we're going with Kenco Milicano and Tangfastics) to Mark's many Loggings Off. We hope you've chuckled at his incredulity as many times as we have And while we're at it, we're going to have an extra one or two for ourselves. Cheers!

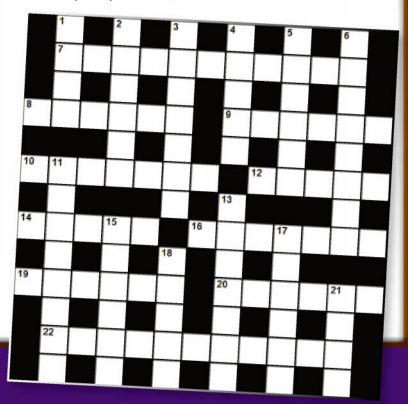
THIS WEEK'S CROSSWORD

Across

- **7** A method in polynomial computation which both reduces the number of necessary multiplications and results in less numerical instability due to potential subtraction of one large number from another. (7,4)
- 8 Unequivocally detestable. (6)
- **9** A journey by a large group to escape from a hostile environment. (6)
- **10** The amount that something in scarce supply is valued above its nominal value. (7)
- **12** Unwanted and sometimes destructive transient over voltage. (5)
- **14** A brand within IBM's software group comprising multiple enterprise marketing management products. (5)
- **16** Independent variables in statistics. (7)
- **19** Capable of being done with means at hand and circumstances as they are. (6)
- 20 Built into a given computer system, denoting the language associated with a given processor, computer, or compiler, and programs written in it. (6)
- 22 Trials of software in the final stages of development, carried out by third parties unconnected with the development process. (4-7)

Down

- 1 .td TLD. (4)
- **2** A Marvel Comics supervillain, arch enemy of the Fantastic Four, and leader of the fictional nation of Latveria. (2,4)
- **3** Son of Danae and Zeus he was helped by the gods to obtain the deadly head of snaky-tressed Medusa. (7)
- 4 Tilted to one side. (5)
- **5** Logic-based number placement puzzle. (6)
- **6** A computer programme that assists in the detection and correction of errors in other computer programmes. (8)
- **11** The system of currency of the People's Republic of China, introduced in 1948. (8)
- **13** Collection of wires or cables bundled and routed according to their function. (7)
- **15** Ancient units of length based on the length of the forearm. (6)
- 17 The first entertainment software title to be exported from the USSR to the U.S. Published by Spectrum Holobyte for IBM PC and Commodore 64. (6)
- **18** Scottish peer, administrator and politician, first general manager and first director general of the BBC. (5)
- **21** The brightest star in the constellation Lyra. (4)



In Next Wek's Issue*

- » Why government technology schemes fail
- » What do SATA speeds really mean?
- » Should you buy two of everything?
- » Plus app tests, hardware reviews and more

* May be subject to change

TECHNOPOP IS COMING...



A POP-UP FESTIVAL OF SCIENCE, TECHNOLOGY, DESIGN & INNOVATION Look out for new Autumn dates! Stratford, London

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