CAN THE **STEAM MACHINE** REVOLUTIONISE PC GAMING?

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WATER COOLING

THE LATEST LIQUID COOLERS TRIED AND TESTED

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46 Group Test: Watercooling Kits

Short of putting nitrogen in your PC, watercooling setups are the best way to keep your components chilly. It's not even particularly difficult to do, with many kits being self contained. So which of the many kits that exist should you buy?

56 Encrypted Backups

We all know we're supposed to back up our data on a regular basis, but it tends to be something that most of us either forget or put off. However, if you're more diligent, then you might be interested to learn about encrypted backups, so you get extra peace of mind, knowing your files are less likely to be viewed by unwanted eyes. Chris Salter is your guide

60 Building A Console Killer

There's nothing new about saying that PCs lead the way in terms of gaming technology compared to consoles. The latter might be more popular, but they're updated around every ten years, while new PC components are being released all the time. But can you really build a PC that outperforms and Xbox One or a PS4 for the same price as one of those machines? Mark Pickavance has been finding out

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STEAM
Can It Reinvent PC Hardware?

As Valve gears up for the launch of multiple Steam Machines in time for Christmas, David Crookes looks at the likely impact on the PC market

Last year, Valve unveiled SteamOS, a brand new operating system specially created so that any PC on which it is installed is instantly turned into a dedicated gaming machine. It allows access to the Steam games distribution channel and so lets gamers buy, download and install hundreds of games without being distracted by all of the other things the PC tempts you with – you know, word processing and spreadsheets, dull stuff like that. Any games that are downloaded are instantly accessible and, what's more, they can be played on large screen televisions from the comfort of your living room thanks to a feature called Big Picture Mode.

> **"Valve has been able to remove the distinct advantage that consoles have long had"**

With such innovations, Valve was positioning SteamOS firmly in console territory, and now it is allowing third-party manufacturers to produce what are in effect PC-console hybrids running the operating system, while letting existing PC owners replace Windows with the Linux-based SteamOS. Valve will not be manufacturing any of the so-called 'Steam Machines' itself, but companies such as Alienware and Cyberpower have seized the opportunity, producing official gaming PCs that look cool enough to sit in the living room by shedding the bulk and ugliness of a typical tower.

U p until now, modern day gamers have had a simple choice to make when deciding how they want to play: do they go for an inexpensive console or do they invest in a potentially wallet-sapping gaming PC? The arguments over what path to take have raged for many years, spanning the relative merits of the hardware and the quality and quantity of the games. The truth is, that a consensus has never really been reached.

On the one hand, console gamers have extoll the virtues of compatibility while, on the other, PC fans stress the diversity and choice offered to those who prefer to play on computers. Console owners say they needn't worry about whether their chosen system has the right internal card or enough memory, while PC gamers point to the wider range of genres – which include Real Time Strategy and the deep, involving, point-and-click adventures that consoles have traditionally struggled to grasp well enough.

For many years there was a pretty clear line in the sand, with many gamers staunchly positioning themselves on one side of the fence or the other. In more recent times, however, the boundaries between PCs and consoles have become increasingly blurred. Although consoles continue to make playing games a simple, straightforward process (give or take the frustrating regular updates), the likes of GOG.com and Steam have also simplified things immensely on the PC. These days gamers who get a decent enough PC will have just as stress-free a time as those who choose a console. Indeed, when coupled with the rising number of console developers who are factoring in PC development, it has become harder to choose between the two systems and say definitely that one is better than the other. Soon, that choice is likely to become more difficult.

In one fell swoop, Valve has been able to remove the distinct advantage that consoles have long had over the PC: their ability to sit under the living room television and allow gamers to kickback with a gamepad. Traditionally PC gamers have played with a mouse-keyboard combo while sitting at a desk, and that has been off-putting for many players.

Even those who have used PCs in the living room have found the arrangement clumsy at times – since a tray with a mouse and keyboard balanced on the knee is no match for a small, all-in-one controller. With the Steam Machines and SteamOS, though, that issue looks set to be circumvented somewhat.

Letting Off Steam

So what is actually on offer? Quite a lot actually. As of the beginning of June, in the US at least, it has been possible to pre-order official Steam Machines running SteamOS (the previous Steam Machines had to make do with Windows) with a delivery date of October 16th. Prices range from $449 for the Alienware Steam Machine, which utilises an Nvidia GeForce GTX GPU 2GB GDDR5 graphics and an Intel Core processor. At the top end, though, $1,419 with get you a Core i7 edition.

There is also a small machine from Cyberpower, called Syber, costing from $499. That can support up to an Nvidia GTX 980 but, unlike the Alienware offering, a controller has to be bought separately. It is also possible to buy a piece of hardware called Steam Link, though, which lets existing Steam gamers stream games from a Steam PC or Steam Machine to a TV at 1080p if the player doesn't want the computer in the living room.

The cheaper the machine, the lower spec'd it will be, and so gamers will perhaps make a decision based upon the kind of titles they like to play: cheaper machines for indie games, more expensive for blockbusters. Yet even though there eventually will be a potentially confusing array of Steam Machines with SteamOS installed around, they will all be marketed under one umbrella, so for those tempted to move from console to PC

Who's On Board?

It is becoming a question of who isn't. A host of developers are clamouring for a slice of the action at long last with Epic Games and Crytek's respective Unreal Engine and CryEngine featuring Linux support and Aspyr Media bringing titles such as *Civilization V* and *Borderlands* to Steam. There is a big swing towards Linux gaming, which will mean plenty of games available for the Linux-based SteamOS. Valve itself is obviously supporting too: *Dying Light* was made available in January and many more will be coming.

gaming, it will be clear that the computer is capable of running and streaming games.

This will hope to get around the issue of gamers being put off by the oft-baffling and/or daunting sets of requirements for a PC gaming set-up. There are some gamers who would love to play games on a PC, but are unsure if the machine sitting in front of them in PC World is good enough to do what they want. This has often been a barrier for entry for potential PC gamers and so, in this sense, Steam has the opportunity to reinvent PC hardware.

> 66 **There is already evidence that Steam has the potential to reinvent PC hardware** 99

It could, should it be successful, create a subset of machines that consumers and gamers see as perfect for play. For those looking for a gaming rig, it may soon be a case of looking for a Steam Machine, safe in the knowledge that there will be minimal fiddling before they have a system verified as being suitable for the games they want – and lots of cool, advanced

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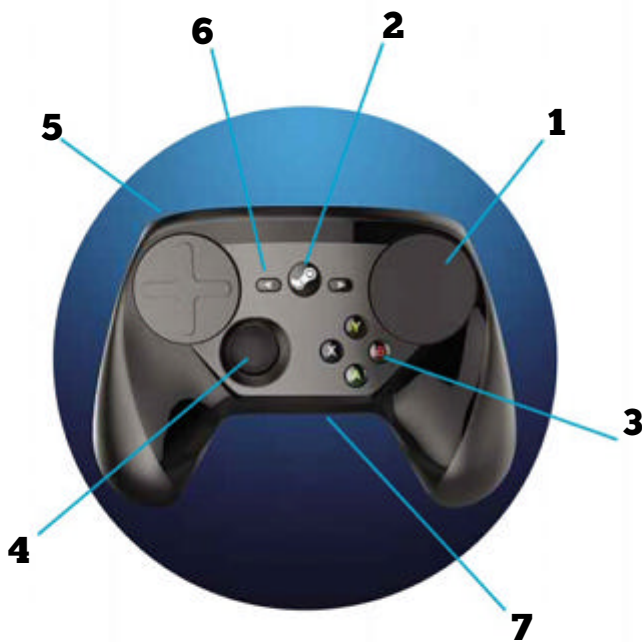
titles available via download within seconds of the thing booting. With a bit of research as the months and years roll on, those who own the Steam Machines may then feel more confident about swapping out certain components such as the GPU and the memory to move with the times (like a PC, the Steam Machines are always going to be more freely upgradable) but the point is that it should encourage even greater take-up of PCs as a gaming machine.

A Reinvention?

There is already evidence that Steam has the potential to reinvent PC hardware, on the outside at least – the Steam Machines do not look like PCs and resemble consoles instead. Inside, the specs and the features are largely down to the discretion of the manufacturer, but they are geared towards being home

> **❝ Getting Steam out of the PC den and into the front room is a good idea ❞**

entertainment systems. Valve has requested that the companies have HDMI input so that the consoles are able to control and manage television feeds, as well as have the ability to record TV programmes. And for those who want to install and customise SteamOS, they must have a Intel or AMD 64-bit capable processor, at least 4GB of RAM, 500GB or more storage space, an Nvidia or AMD graphics card and UEFI boot support.

While this is all a variation on the theme of PC, and something people are relatively familiar with, there is one major addition that is new and unique to Steam – its accompanying controller. That's a piece of kit that seems to want to do away with the keyboard and mouse combo that is so prevalent with PC games today. As such, it comes with two haptic feedback trackpads that can mimic all manner of 'rival' control methods, dual-stage triggers and fully

customisable control schemes. It is potentially revolutionary, and could become the reason why gamers will want to switch.

The idea is that – even if a game should require a keyboard and a mouse – the player will be able to grab the gamepad, ensure it is set up properly (the gamepad is customisable to suit different games), sit back on a sofa and relax. It's very clever and has gone through many iterations to get to this point.

The controller is being sold in the UK on the Steam website for £40 as well as in GAME where it is already available for pre-order, allowing gamers to get their hands on it on October 16th, a good three weeks ahead of the November 10th general release date. GAME is only selling the controller with a £20 Steam credit, making the overall cost £60. You can also purchase the controller with the Steam Link online for £80 (or for £100 at GAME including the Steam credit).

"For years, Steam has been at the forefront of PC gaming and so we're excited to be able to bring our gaming communities

and Steam fans products that allow them to enjoy the full experience in the comfort of their living room, or indeed any room with a television," says Charlotte Knight, UK Retail Managing Director at GAME.

PR aside, it is likely that, if the controller becomes successful, games developers will start to produce games that take into account the gamepad first and foremost at the expense of the traditional method. It won't see the end of the keyboard nor the mouse for all users (some will stick with their tried and tested methods), and neither will it ever replace these peripherals for those who use the computer for non-gaming, recreational purposes (although it can, we're told, be used to surf the web). It does have the potential to disrupt the way people play PC games, though. It takes PC gaming down a console-style path, while also allowing some of the flexibility that current console controllers cannot provide.

The Steam Machines are also tapping into a trend. Sales of desktop PCs have been declining sharply in the face of competition from laptops, tablets and even phones. Research firm Gartner has said that global PC shipments in the first quarter of 2015 have dropped 5.2% from the previous year with business desktops suffering the most. Intel has been so affected by this that its CEO Brian Krzanich is sceptical that even Windows 10 will be able to turn things around. He told the recent annual shareholders meeting, "We're seeing some quarter-to-quarter pushing, but we continue to take a view of our long-term forecast... the PC market should be flat to slightly down mid single-digits over the long term."

Gaming PCs are bucking that trend, however. The likes of Intel and AMD will be paying close attention to this and since chips from both makers are being used in Steam Machines, a rise in demand for these gaming PCs will continue to fuel the demand for ever greater CPUs. We should also see, as games continue to become bigger, a call for even larger hard drive sizes. None of this is especially new – videogames have long driven technological advances along with war and space exploration – but a potentially larger take-up of games-only PCs constantly updated year-on-year could have a profound impact. Consoles are only significantly updated every five to eight years.

Microsoft's Comeback

Not that Microsoft is taking any of this lying down. SteamOS was born out of the frustration felt by Valve founder Gabe Newell over Windows 8, which he constantly berated (labelling it a "catastrophe" and claiming it make people "rage quit computing"). Even though take-up of Windows 8 among Steam users was initially healthy – it was reported that 7% adopted it within the first three month, which put it ahead of OS X and Linux – Newell feared that Microsoft

Setting Standards

Mark Healey, co-founder and creative director of videogame studio Media Molecule which makes *LittleBigPlanet*, discusses the potential impact of the Steam machines.

"The last time I developed something on a PC 'down to the metal' – so to speak – was *Rag Doll Kung Fu*, which was a lifetime ago.

"But it just so happened to be the first third party game on Steam, I believe. Since then the Steam service has pretty much owned PC gaming.

"Making that game was a nightmare for me because of the many possible configurations you had to cater for. So if the Steam Box can standardise things a bit, then I guess that's a win – although things like Unity take away most of that pain anyway.

"Making PC games more of a living room/console experience sounds like it should have interesting repercussions on the types of games people make for PC, but I haven't wanted a PC in my house for a long time.

"I feel you need to have an expert IT guy on hand to help you install anything, and fighting viruses and so on always felt like a losing battle. If Steam can take away that pain, then it will be a good thing."

was creating a controlled walled garden. SteamOS was a way of ensuring a long-lasting open system.

However, since Valve started to push ahead with the Steam Machines, much has changed. Microsoft has rolled out Windows 10 for free and it has promised to throw its weight behind gaming. The operating system ships with a souped up DirectX 12 graphics API that reduces CPU bottlenecks and allows for

greater performance on all hardware. Microsoft has also allowed Windows 10 users to stream games to the Xbox One. They will need to be controlled using Xbox One gamepads, though, which gives Steam and its controller an advantage. Nevertheless, Microsoft has more than risen to the challenge and it will be up to Valve to persuade gamers that a dedicated gaming machine with its own UI and innards geared up for the best possible performance for each price point is worth shelling out for.

Which brings us to exactly who the Steam Machines are being aimed at. It is unlikely that Valve is targeting Steam Machines at hardcore PC gamers. The high spending PC enthusiast market will always want to keep their machines up-to-date with the latest upgrades, regardless of the success or failure of Steam Machines and so, while they will have their heads turned by the Steam Controller and potentially SteamOS, the fact that a great many games are Windows-only may persuade them to stick things out a little longer. The Steam Machines, then, are perhaps more geared towards console gamers who want to take advantage of the great titles that are being released solely on the PC.

Whatever the audience, though, the lower spenders will help to drive technology ever higher, demanding that their new living room machines are able to play the latest titles. In that sense, PC gaming and PC hardware will emerge the winner. But what of the long-term future of Steam? "Perhaps we will also see an even greater diversity of content on Steam – more family or casual orientated games," says Nick Burcombe, the CEO of Playrise Digital. "Who knows. Perhaps the longer term goals of 'Steam - the Digital Entertainment Platform' is the bigger goal here. Maybe they will have music and film services lined up in the future too?

"Getting Steam out of the PC den and into the front room is a good idea for the company, but whether it is adopted by hundred of millions of people only time will tell. From a development point of view there's some potentially huge cost savings on offer if this did become the dominant platform, but you can rest assured that neither Sony, Microsoft or Nintendo will stand by whilst that happens. Steam in your PC den, your lounge, your tablets and even on our Phones too. Now that would be a cool entertainment platform." **mm**

Confusing Times

Nick Burcombe, the CEO of Playrise Digital and the creator of the *WipEout* series of games, is unsure of Steam's aim.

"I'm sometimes a little confused by the Steam Machine's strategic goals and its certainly going to be an intriguing time for the industry once they start arriving in volume.

"Overall, with my Playrise hat on, it's a positive development and with us working in Unity 5 we'll be keen to hit all commercially realistic platforms. But it's not without some hesitation.

"Games running on the bottom rung of devices at $499 are possibly going to be running worse than on the PS4 and Xbox One, yet the hardware is looking likely to be more expensive.

"Then at the top end – around the $1000+ mark – a PC gaming rig of the same price is likely to perform better but isn't as social for the household.

"I do find myself asking 'What's the overall goal here?' Is it to drag hardcore PC gamers into the lounge? I find that highly unlikely after seeing some of the time and money ploughed into some of those amazing home-built battlestations.

"Or is it to try and drag console gamers away from PlayStation and Xbox which, again, brings the price versus performance back into question. We'll have to wait and see how thing pan out and whether it's a significant dent to consoleland.

"I suspect they might well be bought as a second gaming rig for the front room by mid-core PC gamers as it's simply more acceptable for the family room."

The Useful Family Hub

Keir Thomas explains how to turn a Raspberry Pi or old PC into a useful storage and sharing device for the entire family's computers and handhelds

Most households feature a corner of the living room in which electronics are stashed. Alongside the TV you might see a Sky or Virgin box, and a games console or two, an internet router, and perhaps more complex add-ons such as a Chromecast.

In this feature we discuss adding another device that acts as a go-to helper for all the computers in your household. For example, it can act as an ad blocker for every computer, a DNS cache to speed up net access, and a network-attached server to store and share files. You can add in a personal cloud or AirPlay capabilities so you can beam your music live from your iPad, iPod Touch or iPad.

We use a Raspberry Pi throughout and just about any model will do. The chief advantage of a Pi is that it's small and consumes very little power – ideal for being left switched on all the time – but you could feasibly use an old PC or laptop. All the instructions assume you're using a Linux distro based on Debian (or Debian itself), but don't worry, we take you through everything step by step and do not get bogged down in technical discussion. Note that there's no need to leave a monitor, keyboard or mouse attached to the Pi. It's designed to run 'headless', meaning all that it needs are power and Ethernet cables. However, note that an old PC might refuse to (re)boot unless a keyboard is plugged in.

Setup

A Raspberry Pi model B running the standard Raspbian release is used below and we refer to it throughout as 'the hub'. We won't go into how Raspbian is installed – instructions are available at the download site (**www.raspberrypi.org/downloads**). Nor do we cover how to SSH into it for configuration purposes, although as usual we recommend PuTTY if using Windows, and you'll find instructions here: **goo.gl/YmabYb**.

Overclocking or adjusting the memory split via raspi-config isn't strictly necessary but might be useful if you intend to run more than a couple of the services described below on the Pi.

If using an old PC or laptop, then the latest release of Debian (**www.debian.org**) will work just as well. Again, setup is pretty elementary, and there are guides online, such as the one provided by Debian itself (**goo.gl/x92H0o**).

Whatever system you opt for, you should update it before doing any of the steps below: sudo apt-get update;sudo apt-get dist-upgrade.

The hub will require a static IP address on your local network so other computers will always know where to find it. Before setting this up you'll need to know the DHCP network range used by your router.

Below we assume 192.168.1.2-255, which is perhaps the most common. You also need to know the router's own IP address (referred to as the gateway in network terminology). You can usually discover these details using the router's admin configuration screen. We also assume the hub is connected via an Ethernet cable to the router.

SSH into the hub and type the following:

```
sudo nano /etc/network/interfaces
```

You'll see a line that reads iface eth0 inet dhcp. Replace dhcp with static, so the whole line now reads iface eth0 inet static.

Add the following new lines directly below this line (NOT at the bottom of the file; note that you can copy and paste this from **goo.gl/NMdFzt** if typing it from the page proves difficult):

```
address 192.168.1.123
netmask 255.255.255.0
network 192.168.1.0
broadcast 192.168.1.255
gateway 192.168.1.1
```

Again, we assume above a standard 192.168.1.* network range, with the router located at 192.168.1.1 – as it typically is with most models. (If you have a BT HomeHub, it's very likely the last line should read gateway 192.168.1.254).

Above we assign the hub the address 192.168.1.123, which is nice and memorable, and unlikely to cause a clash with addresses automatically assigned to other computers.

Tap Ctrl+X, tap y, and then hit Enter to save the file, and at the command line type sudo reboot.

Note that when you reconnect you will be warned the security key of the hub has changed. This is fine. Just click to continue. If connecting from a Linux or Mac computer, you might need to remove the older entry for the hub from your ~/.ssh/known_hosts file. Just open the file for editing, then delete the relevant line that begins with the IP address you formerly used to connect to the hub.

Ad Blocker

The Pi-Hole project (**goo.gl/nqtYlK**) explains how to turn a Raspberry Pi or any Debian-based distro into an effective ad blocker and domain name server (DNS) cache for the entire network. The benefits are that all computers your family use – including handhelds on which you might not be able to install ad-blocking software – will receive zero advertising. This increases the speed of web page loading and reduces bandwidth consumption. Additionally, there's no need to install an ad blocker on any computer on the network, which can help avoid browsers getting loaded down with too many plug-ins.

The second benefit is that, in order to block ads, the Pi uses a DNS cache. This is like having a DNS server on your own network, avoiding the need to use your ISP's. Rather than waiting 40-80ms for a DNS look-up, your browser will have to wait just 5ms or so. Again,

this can lead to quicker page loading on websites. (Note that there are some technical reasons why this isn't always the case, but we'll leave it to Micro Mart correspondents to explain why on the Letters page.)

The instructions below are adapted from the Pi-Hole project. Start by installing the necessary software on the hub – the following is a single line:

```
sudo apt-get -y install dnsutils dnsmasq
```

Following this we need to temporarily stop the new DNS service, then replace its configuration file – the following three commands do the trick:

```
sudo service dnsmasq stop
sudo rm -f /etc/dnsmasq.conf
sudo nano /etc/dnsmasq.conf
```

Type the following into the new file (or copy and paste from the text file found at **goo.gl/AwvU0D**):

```
domain-needed
interface=eth0
min-port=4096
cache-size=10000
log-queries
bogus-priv
no-resolv
server=127.0.0.1
server=8.8.8.8
server=8.8.4.4
```

Tap Ctrl+X, tap Y, and then hit Enter to save the new file. Note that the listing above uses the Google Public DNS servers (8.8.8.8 and 8.8.4.4; see the last two lines), which are free of charge for worldwide use. You can substitute these with any DNS address, including that of your ISP or OpenDNS.

Next, you need to add a script to download the ad blocking definitions. Type the following:

```
sudo nano /usr/local/bin/gravity.sh
```

In the new file, type the following five lines (or copy and paste the data from **goo.gl/Nu3Fm9**). Note that you should change the piholeIP line's address to that of the static IP address you set earlier if you didn't opt for 192.168.1.123:

```
#!/bin/bash
piholeIP='192.168.1.123'
eventHorizion='/etc/dnsmasq.d/adList.conf'
curl -s -d mimetype=plaintext -d
hostformat=unixhosts http://pgl.yoyo.org/adservers/
serverlist.php? | sort | sed '/^\$/d' | awk -v 'IP=$piholeIP'
'{sub(/\r$/,''); print 'address=/'$0'/'IP}' > $eventHorizion
service dnsmasq restart
```

Tap Ctrl+X, tap Y, and then hit Enter to save the new file. Then type the following two commands:

```
sudo chmod 755 /usr/local/bin/gravity.sh
sudo /usr/local/bin/gravity.sh
```

▲ *All adverts for every computer or handheld on the network can be blocked without the need to install browser extensions on each*

We now need to set the ad-blocking list to periodically update. Type the following command:

sudo crontab –e

And in the file that appears type the following line at the very bottom:

@weekly /usr/local/bin/gravity.sh

Tap Ctrl+X, tap Y, and then hit Enter to save the file.

Setup is finished and now it's just a matter of setting all computers on the network to the hub as a DNS server. Needless to say, explaining how to manually specify a DNS server is outside the remit of this feature, but there are many, many guides online for all major operating systems and handhelds.

The changes will take effect immediately, and there's no need to restart the hub. You can test the ad-blocking capabilities of your computer(s) at **ads-blocker.com/testing**. However, note that most operating systems browsers cache DNS addresses so the blocking might not start immediately. Even quitting and reopening the browser might not clear the DNS cache, so a reboot/restart of the PC might be necessary.

File Server Or Backup

By attaching a USB hard disk or memory stick to the hub, you can add in an elementary but nonetheless useful network attached storage (NAS) service that all computers on the network can access. Considering USB disk adapters can be found on eBay for little money, you might choose to attach an old hard disk that you have lying around.

In the steps below, we assume the disk or stick you attach is formatted as FAT32/64. This is the case for most USB disks bought off the shelf, because this provides the maximum all round compatibility. See the note later if you can't avoid using an NTFS-formatted disk.

To start we need to identify the USB disk/memory stick once it's attached. SSH into the hub and type the following:

sudo fdisk –l

We're interested in what appears at the bottom of the list. If you're using a Pi, you'll probably see a line that begins /dev/sda1 and which will end with W95 FAT32. Make a note of the part that begins /dev.

Type the following commands, which will open a file for editing:

sudo nano /etc/fstab

Then type the following as a new line at the end (or paste it in from **goo.gl/KH7IE2**), substituting /dev/sda1 if you discovered different details using the fdisk –l command earlier:

/dev/sda1 /media auto user,rw,umask=111,dmask=000,noatime 0 0

Tap Ctrl+X, tap Y and hit Enter to save the file. Then reboot the hub using the following command:

sudo reboot

Once the hub has rebooted and you've reconnected via SSH, it's necessary to add in the network sharing component. Type the following two commands to install the software and open its configuration file for editing:

sudo apt-get -y install samba samba-common-bin
sudo nano /etc/samba/smb.conf

Tap Ctrl+W to open the search field, and type security = and then hit Enter. This will take you to a section of the file that discusses authentication. Look for the single line beneath it that reads as follows:

security = user

Remove the hash and spaces from the front of the line, so it now reads:

security = user

▲ *The hub can share files not only via Windows file sharing but also DLNA, allowing smart TVs to tune into the files*

Tap Ctrl+W and then Ctrl+V. This will take you to the bottom of the file where you should type the following new lines (or copy and paste from **goo.gl/CR18v8**):

```
[FamilyHub]
comment = Family Hub
path = /media
valid users = @users
force group = users
create mask = 0660
directory mask = 0771
read only = no
```

Tap Ctrl+X, tap Y and then Enter to save the file.

Then type the following two commands, entering your login password when prompted twice to enter a new password (that is, type raspberry in the case of a default Raspbian setup). Note that if you're not using a Pi for the hub, then you'll need to change pi in the second command to the username you chose during installation:

```
sudo /etc/init.d/samba restart
sudo smbpasswd –a pi
```

Your new hub-based NAS should now be accessible from computers on the network in the usual way, just like a shared folder on any Windows computer. The FamilyHub folder is where you should store your data and/or create new folders for your users.

If you have trouble connecting from Windows, click Start and then type two backslashes followed by the IP address of the hub you set earlier and then \FamilyHub. For example, if you chose 192.168.1.123 you would type the following:

```
\\192.168.1.123\FamilyHub
```
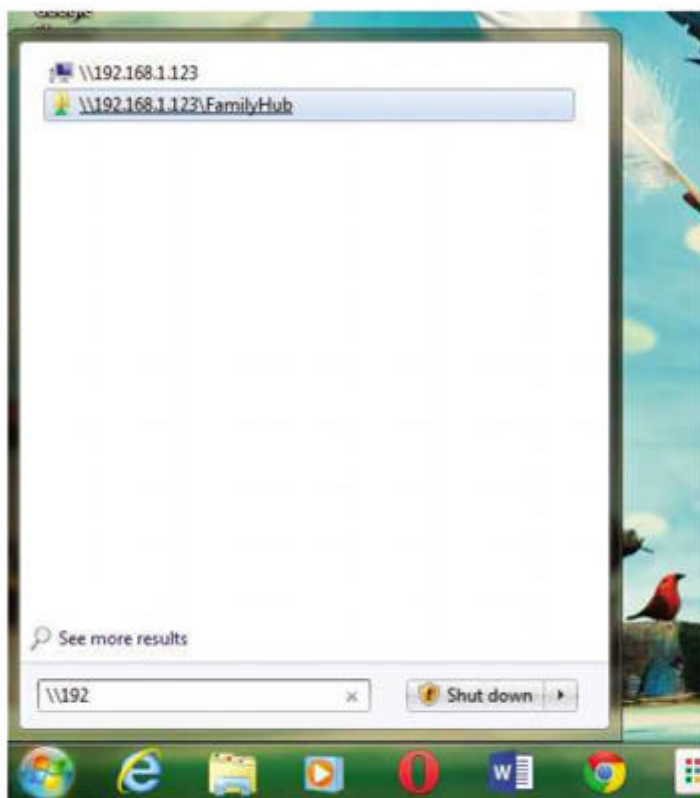

▲ *A cheap, low-power and effective NAS is easily created using a Pi/PC and an old hard disk*
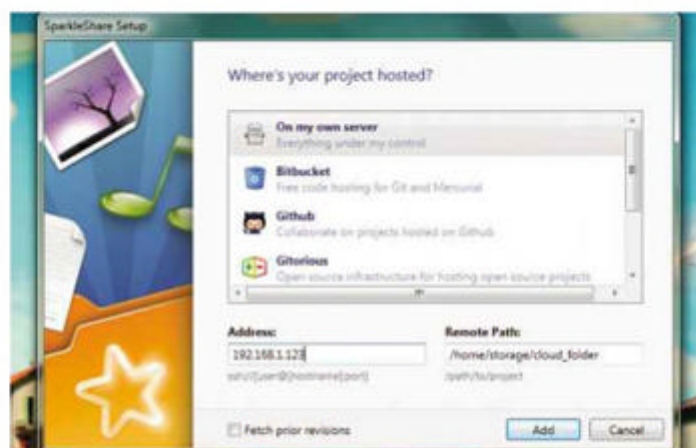
▲ *You can create a personal cloud folder on your hub using the free of charge SparkleShare software*

DLNA sharing

An optional extra step after configuring a NAS is to enable DLNA support on the hub so that smart TVs and/or games consoles can connect to the hub in addition to computers. Type the following commands to install the software and create the necessary new folders:

```
sudo apt-get –y install minidlna
mkdir /media/music /media/photos /media/videos
```

Once it's completed, open the config file for editing:

```
sudo nano /etc/minidlna.conf
```

Tap Ctrl+W and then Ctrl+V to jump to the bottom of the file, and type the following (or copy and paste from **goo.gl/OCHQtJ**):

```
media_dir=A,/media/music
media_dir=P,/media/photos
media_dir=V,/media/videos
```

Tap Ctrl+X, tap Y and then hit Enter to save the file. Then type the following to restart the DLNA service, after which it will be accessible from TVs and consoles:

```
sudo service minidlna restart
```

Users on other PCs should place their files in the respective music, photos or videos folders if they want to utilise the hub via DLNA.

If the disk you attach to the hub is formatted with NTFS, before any of the steps above you'll need to install NTFS support with the following command:

```
sudo apt-get -y install ntfs-3g
```

Following this, the remaining steps are identical.

For the ultimate low-power device, you might also choose to implement hard disk power saving for the external drive. Again, this is outside the scope of this feature, but googling the hdparm command should reveal instructions.

Personal Cloud Storage

Dropbox is a standard feature on many computers nowadays, but privacy concerns haven't been addressed satisfactorily. As an alternative you can implement your own personal cloud on the hub that can then be accessed from all your computers.

For access outside the home (that is, the local area network) – when you're in a coffee shop, for example or work environment – you should look into configuring a dynamic DNS address for your broadband router in addition the steps below, and also forwarding the Secure Shell (SSH) port to the hub via the router's configuration screen. You'll find many guides online via Google if your router is compatible, although in the instalment of this feature next week we'll look at setting up a dynamic DNS updating service using the hub alone.

We're going to use SparkleShare (**sparkleshare.org**) to implement a personal cloud, which is both free of charge and open source. Start by typing the following to install Git, which is the backend software it requires (note that you might find this is already installed, in which case just move to the steps afterwards):

```
sudo apt-get –y install git
```

Then type the following four commands, which will install the SparkleShare software (if you want to copy and paste you'll find the three commands at **goo.gl/EegBPS**):

```
sudo curl https://raw.githubusercontent.com/hbons/Dazzle/master/dazzle.sh --output /usr/bin/dazzle && chmod +x /usr/bin/dazzle
sudo chmod +x /usr/bin/dazzle
sudo dazzle setup
sudo dazzle create cloud_folder
```

Now all you have to do is install the SparkleShare client app on each computer you want to access the cloud folder. You'll find it at sparkleshare.org.

During setup on the computers on your network, you'll be provided with a Client ID. For each computer you'll need to copy this to the clipboard, SSH into the hub, and then type sudo dazzle link, then hit Enter, before pasting in the Client ID when prompted.

Click Finish on the PC client software, then right-click the new SparkleShare icon that you'll find in the System Tray and select SparkleShare > Add Hosted Project.

In the dialogue box that appears, type the hub's address into the address field, and /home/storage/cloud_folder into the Remote Path field. Then click Add. (If you set up a dynamic DNS earlier, then you should enter the dynamic DNS address into the Address field instead,

rather than the hub's IP address, even if you're on the local network when doing so.)

Setup is now complete, and your personal cloud folder (/Users/USERNAME/SparkeShare/cloud folder) will sync automatically with all the other computers.

AirPlay

If you have an iPhone, iPod Touch or iPad, you can add AirPlay audio capabilities to the hub so you can play music through a hi-fi attached to the audio port of the Pi/PC, via a 3.5mm to RCA audio cable (or to headphones plugged into the Pi/PC). Doing so is simple courtesy of the Shairplay software, which again is free and open source. Type the following after SSHing into the hub:

```
sudo apt-get –y install shairplay
```

You'll need to start Shairplay each time the hub boots or reboots, which means adding a runtime script. Start by typing the following to create the file:

```
sudo nano /etc/init.d/shairplay
```

Visit **goo.gl/9kfTlo** in your web browser, and copy and paste all of what you see into the file you're editing on the hub. Tap Ctrl+X, tap Y and hit Enter to save the file.

Type the following three commands to make the runtime script executable, and also reboot the hub:

```
sudo chmod +x /etc/init.d/shairplay
sudo update-rc.d shairplay defaults
sudo reboot
```

Subsequently playing music from an iOS device is a matter of bringing up the Control Center (drag up from the bottom of the screen), tapping the AirPlay icon, and then selecting the FamilyHub icon. Note that you'll need to be on the same network as the hub for AirPlay to work.

To control the output volume of the hub if it proves too quiet, SSH into it and type alsamixer. Then use the up/down cursor keys to adjust the PCM volume. **mm**

⌃ *Plug a stereo into your Pi/PC and you can beam music to it via the hub from any iOS device*
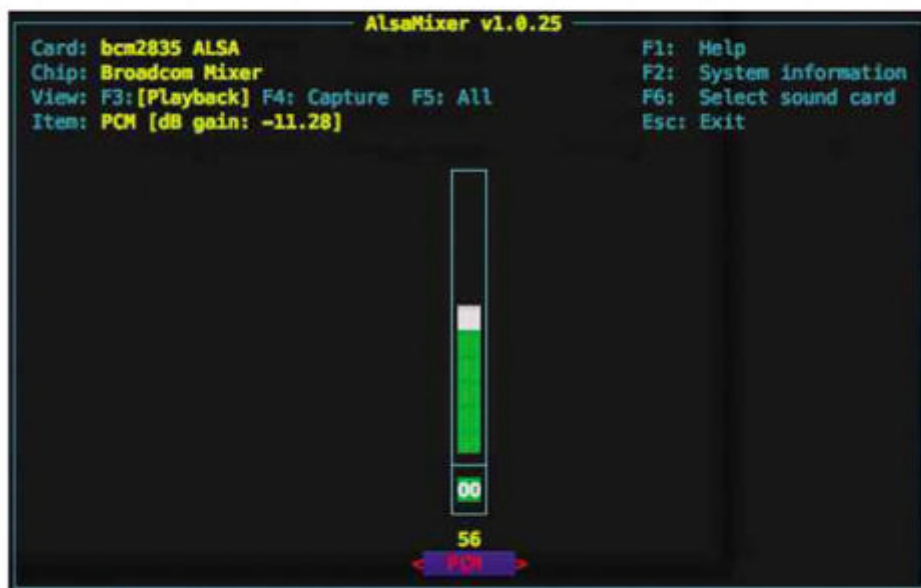
⌃ *The alsamixer command lets you adjust the volume output of music playing via AirPlay through your hub*

The Apple-IBM Partnership

David Briddock investigates why Apple is partnering with a company it depicted as the enemy in 1984

R ight from the early days of personal computing, Apple CEO Steve Jobs saw IBM as the enemy. A company out to dominate the entire computer industry. The company that would crush technological freedom and innovation.

Jobs decided he needed a campaign to convince people to reject the bland, grey world of IBM and instead purchase Apple hardware and software.

Nothing exemplified this campaign more than Apple's vitriolic 1984 advert. Shown during the Super Bowl XVIII match, the imagery it portrayed was an allusion to George Orwell's classic novel *Nineteen Eighty-Four* (**goo.gl/xfcqpP**).

The novel described a Big Brother controlled dystopian future, and the advert suggested Big Brother was none other than IBM. In fact the parallels, with the 1984 novel were so obvious that the estate of George Orwell considered it to be a copyright infringement and promptly sent a cease-and-desist letter to Apple.

Nevertheless, it has been frequently described as a masterpiece of advertising and is now considered to be one of the world's greatest ever commercials.

Siding With The Enemy

But today these two giants are not just talking to each other but striking up a business partnership. The obvious questions are why is this happening now, what's the end goal, and what are the partnership details?

Change at the top of Apple is one reason. Over 30 years after that infamous commercial, Steve Jobs's long-time confidant and successor Tim Cook has buried the hatchet. Without the historical baggage, Cook is open to new ideas and new partnerships, including with IBM.

Apple is always vigilant about maintaining its market share. Look closely and you'll find a few disconcerting details in Apple's overall rosy accounting figures. In particular, recent trends point to a dramatic decline in tablet sales.

These days, many consumers see no reason to upgrade their tablet, or opt instead for an equally capable and cheaper Android-powered alternative. Others are abandoning the format altogether and instead investing in a more powerful and flexible touch-screen laptop or 2-in-1 device.

Most importantly, Apple has so far failed to conquer the business marketplace to any significant degree. A deal with IBM is all about securing business backing for its mobile devices, before it's too late.

What Apple Wants

Apple is looked upon as the consumer champion. Its range of high-quality products are always in demand, despite large profit margins. Every new product launch generates massive worldwide media interest, and even updates to existing products can make the news headlines.

Other consumer-focused successes include the iTunes Music Store and Apple's popular cloud storage facilities, known as the iCloud. In short, Apple seems to be doing just fine without this new business endeavour.

However, to grow as a company, Apple needs to win over more business customers. In particular, it desperately wants to penetrate Fortune 500 level organisations with its technology.

And this is where partnering with IBM starts to make sense. Apple realised it can't achieve this goal on its own, yet a strategic partnership offers the opportunity for a quick win.

▲ *Apple 1984 advert*

Why IBM?

What does a company like International Business Machines (IBM), with roots that go back to the 1880s, have to offer Apple? IBM has always had a business-centric heart. It developed punched card systems for analysis of the 1900 US Census plus general time recording and accounting. This means it has decades of enterprise expertise and equally long-term business partnerships.

> 66 **What does a company like International Business Machines (IBM), with roots that go back to the 1880s, have to offer Apple?** 99

And IBM also has a huge pool of highly trained, highly experienced employees (around 400,000 against Apple's 100,000), many with strong commercial sales and marketing capabilities.

IBM's decision to sell off its hardware divisions was a great success. Profits soared on the back of its new business-focused, services-led model, but more recently it's been a different story. IBM is in a financial hole and has started trimming costs, including tens of thousands of jobs around the globe. Today, it desperately needs something to drive profits, raise its technology profile and bolster its share price.

Mobility Target

As for targets, both companies want a bigger slice of the mobility pie. Consequently, this coalition aims to target a number of vertical marketplaces, such as healthcare (think Apple Watch here), financial services, telcos, transportation and many others.

IBM has thousands of consultants who know the mobility business inside and out. Yet so far it's been an embryonic and low-key affair. A partnership would significantly raise its mobile-centric profile. Apple will continue to concentrate on design and hardware. Meanwhile, IBM intends to head up the customer-facing enterprise sales and handle the vitally important after-sales care.

As IBM hasn't built a PC or mobile device for around a decade, there are no concerns for Apple that it will suddenly become a competitor in the hardware marketplace. Instead it's all about Apple's iPhones and iPads – strategy that's helped by the modern 'bring your own device to work' trend that many organisations are adopting.

Into The Details

An announcement of the deal came in the second half of 2014. Of course, talks must have been taking place for some considerable time before this. Yet hard facts and substantiated details of how this partnership will work are still thin on the ground. Here's what we know so far.

The key driver is to tap into the enterprise arena by integrating Apple products, pre-loaded with IBM software, into the business technology workflow. This means IBM can supply, activate and deliver mobile device management (MDM) services for iPhones and iPads and the new Apple Watch. Plus there are rumours of a larger iPad tablet with a digital stylus.

IBM will sell pre-configured Apple devices with organisation-specific apps, security features and policies. It's a much better solution than working with a bunch of vendors who each provide only a single service, such as a phone/tablet, a specific app or only MDM provision.

Of course, IBM will benefit from the Apple branding phenomenon. Meanwhile, it's an opportunity to bring its analytics and data platforms, technologies and services to Apple users, who are employed in healthcare, telecommunications, finance and many other vertical business sectors.

How many new customers could an IBM-Apple partnership attract? Well, some analysts suggest figures as high as 42 million. That's an awful lot of iPhone and iPads sales, and let's not forget the app marketplace.
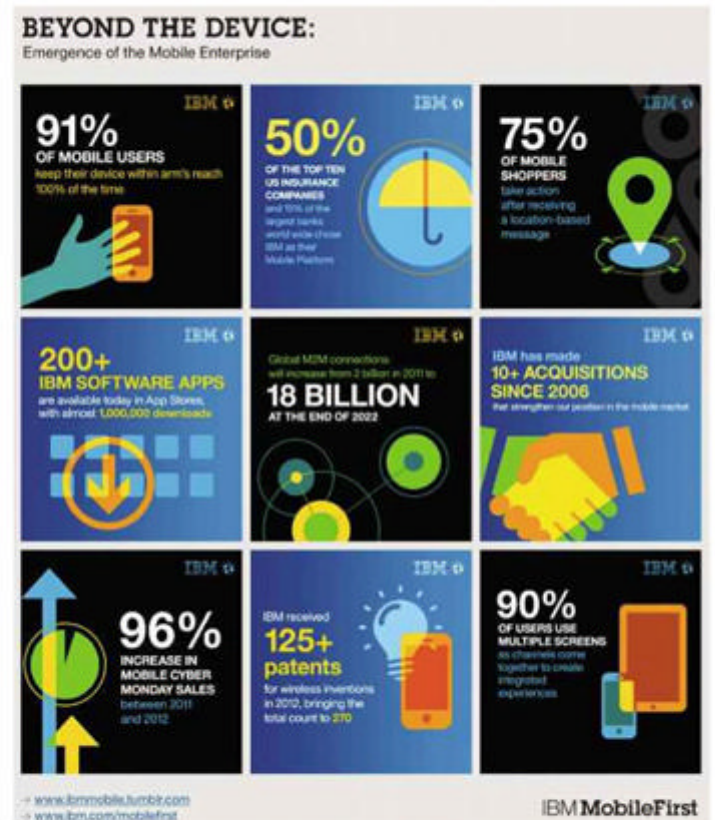
▲ *IBM MobileFirst*
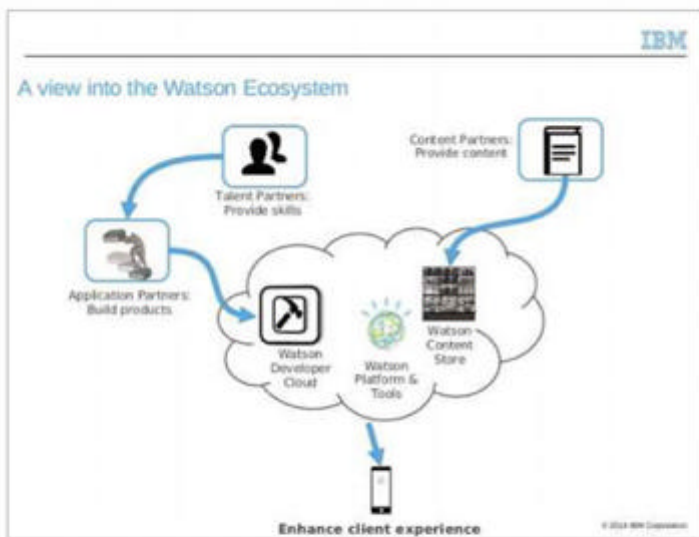
▲ IBM Watson Cloud

Business App Scenarios

While Apple hardware is a critical part of the partnership picture, apps are another way these companies can help each other. Apple and IBM already have plans to launch more than 100 exclusive industry-focused apps. The first apps should appear later this year, although it's expected many will only see the light of day in 2016. It seems the bulk of these apps are designed and built for Apple iPads, but there are some iPhone apps too.

IBM is certainly involved in app development. However, it will limit its scope to business-specific, custom-built scenarios and not generic App Store ones. In this way IBM would become a kind of Apple Store for enterprises.

> **❝ Apple wants to penetrate Fortune 500 level organisations with its technology ❞**

The IBM MobileFirst strategy delivers faster and simpler transactions between companies and their customers. This can be achieved with custom-built iPhones and iPads apps that use existing Apple technologies, like the M8 coprocessor chip and iBeacons (see boxout).

A typical example would be at airports. A quick scan of the boarding pass would reveal which terminal the traveller needed to go to, by what time and the directions on how to get there.

IBM will supplement this app strategy with its own technology in the form of big data, visual analytics and software services, and this is where IBM's infamous Watson technology (see boxout) may come in.

As you'd expect, Apple will undertake the support of its devices and its system software. However, it's IBM's responsibility to handle issues surrounding any custom-built apps. IBM will certainly have enough people to sort out these app issues, but the quality of service it will ultimately provide is as yet untested.

Government contracts could be rather more problematic, as Apple is unlikely to offer too many concessions. Even so, iOS already has some government certification. Being FIPS 140-2 compliant means it's already suitable for low-level security classifications, and it has also received the STIG certification necessary for the US Department of Defense.

Watson Health

IBM already has its Watson Health initiative, which makes sense of the mass of data created by the growing numbers of medical and fitness tracker devices and associated apps. The goal is to provide diagnostic assistance and health alerts for doctors, carers or insurers.

In official statements IBM said it would be, "a secure, cloud-based data sharing hub", which can provide "individualised insights and a more complete picture of the many factors that can affect people's health", and it went on to insist that no data would be captured without the user's permission.

IBM is keen to partner with Apple in offering Watson Health services to employees across the US. Enticed by the latest Apple devices and possibly lifestyle incentives too, this marketplace could be a golden opportunity for both companies.

Speed is all important, and IBM is looking to buy companies like Explorys (**explorys.com**), which has one of the largest healthcare databases in the world, and digital medical record systems expert Phytel (**phytel.com**).

▲ Apple ResearchKit

How iBeacon technology works.

iBeacon

We've placed wireless Bluetooth beacons throughout the Apple Store. You'll receive notifications from us based on which beacon you're near. Bluetooth must be enabled on your iPhone. Read more details

⌃ *Apple iBeacon*

Privacy Concerns

Increasingly, employers are seeking to learn more about their employees' health, activities and lifestyle. They say it will help them deliver a better working environment for everyone.

Apple's ResearchKit, which gathers health data from iPhones, has already been used to develop apps that study asthma, breast cancer, cardiovascular disease, diabetes and Parkinson's disease. In a recent announcement, it said that Apple's ResearchKit software is now available to anyone.

As of April this year, Apple Watch data can be added to the mix, but it's not just Apple. Companies like Jawbone (**jawbone. com**), which sells a range of fitness trackers, are already talking to firms about how personal fitness trackers could be used to monitor a workforce.

Maybe you're thinking this sounds uncannily like the Big Brother scenario Apple was so keen to fight against in 1984, and you'd be right. There are big concerns over the sharing of health data, especially as this data may find its way to insurers and health professionals, and the US Federal Trade Commission even found some iOS apps that claim to diagnose cancer.

It's clear we employees need strong controls and possibly new legislation, before it's too late.

Fight For Rights

The rights of the employee should always be upheld. Data capture consent must be freely given. There should be no penalty imposed by the employer if the answer is 'no', and anyone should have the right to withdraw previously given consent at any time.

Unfortunately, this type of consent is likely to be asked at the recruitment stage, so there's a concern that saying 'no' to data collection might count against the candidate when it comes to decision time.

Of course, there could be some sweetening of the proposition – for example, free devices or a set of incentivising rewards for programme participation, but only for those who wear the official data-tracked personal health and fitness devices.

Under Surveillance

In a way, intrusive levels of personal surveillance are nothing new. It's something we often voluntarily sign up for to get the

The Watson Question

One of the few bright spots for IBM in recent years is its Watson technology (**goo.gl/HKwPba**). Watson's winning appearance in 2011 on the US *Jeopardy* gameshow boosted IBM's profile as a leading player in the machine learning technology arena.

But Watson is capable of far more than playing games. Its machine intelligence algorithms can analyse vast amounts of data from just about any field you care to mention and, of course, that includes medical and health data.

Today, Watson is used by hundreds of clients and partners across 25 countries, helping businesses interact and engage with their customers, accelerating scientific discovery and revolutionising how medicine is taught, researched, practised and funded.

In early 2014, IBM announced a $1 billion investment to establish a new Watson Group. This included $100 million of venture investment funding to support start-ups, which can now build a new generation of cognitive intelligence apps with the Watson Developer Cloud and an associated API.

So Watson technology could be yet another factor in an Apple-IBM partnership.

Apple's iBeacon

An extension to the existing iOS 7 or 8 Location Services feature, iBeacon is a low-power low-cost transmitter that sends out notifications to iOS 7 and 8 devices in the proximity.

In operation, certain iPhone/iPad apps receive alerts as you approach or leave an iBeacon location. These apps can then inform the mobile device owner of nearby sale items and even special of-the-moment offers.

iBeacon wireless technology is based on the Bluetooth Low Energy (BLE) signal, which is also known as Bluetooth Smart. The iBeacons units themselves come in a variety of form factors, including USB sticks and self-contained Bluetooth 4.0 USB dongles.

latest services, apps or devices. Google has been doing it for years, at least from the online perspective. Every search you make and every subsequent site you visit is captured and stored away, and it scans every image and document you store on Google Drive.

Amazon too monitors your product browsing history in addition to your actual purchases, and if you own a Kindle it knows which books you own, which pages you've read, the passages you've re-read, sections you've highlighted and where you placed your bookmarks.

Microsoft is also after personalisation data. When Windows 10 rolls out later this year it can capture just about every action you take and voice command you utter.

But all these are far less invasive than the data that emanates from a band that's worn 24 hours a day. A band that's able to monitor your activity, inactivity and sleep patterns. Data that can be analysed to access your day-to-day health, but also indicate fitness levels, calorific intake, mood swings, stress levels, stroke/heart attack risks and so on.

There's no doubt medical science, healthcare and individuals will benefit from all this intelligence. Nevertheless, it sounds uncomfortably close to the Big Brother regime in George Orwell's novel. **mm**

Remembering...
Commodore Amiga

We pay homage to a computer that was years ahead of its time

We looked at the glorious Atari ST last week, and lamented it's fate as an underappreciated computer of the era. The other side to the 16-bit coin was of course, the Commodore Amiga, and consequently the winner of the 16-bit battle, and probably one of the most popular home computers to have ever been sold.

I'll admit here, I only owned an Amiga 500 for the last few months of my time in the 16-bit years, before I got rid of all the 'old' stuff to be replace it with a 386 PC. So I never really got to know the machine in the way I loved the ST or Spectrum. Saying that, in the little time I did own one I never saw it as less than a staggering machine. It interested me back then, and still does to this day – I regularly read Sven's Amiga section in *Micro Mart*, to see what's going on with the scene.

The Amiga really was years ahead of its time. When the 500 version was launched in 1987, it featured multitasking capabilities, amazing arcade quality graphics and sound, an incredible GUI (in the form of the Amiga OS) and windowing system Workbench. It's stuff we take for granted today, but that it wasn't realised by the mainstream PC until some years later.

Beyond the hardware, the other thing about the Amiga that always amazed me was the immense public domain and community offerings. If you connected with the right people, and bought the right magazines, you'd find markets with exclusive Amiga stalls, individuals creating their own content on disk, and just about every mail order

example you could possibly imagine. Most of the content was sold for mere pence, some of it was even free, all you needed was to pay the postage. It was the community that was the backbone of Amiga development, and the life and soul of the 16-bit era.

History

The story of the Amiga goes back to 1980 where integrated circuit designer Jay Miner as developing 8-bit chips for Atari. Apparently, when his idea for a computer based on the Motorola 68000 processor was rejected by the company (in its ultimate wisdom) he decided it was time to move on.

He teamed up with another former Atari employee, Larry Kaplan and an ex-VP of marketing from Tonka Toys, Dave Morse, to create the company Hi-Toro. It was divided into two sections, one for developing peripherals and games, and the other computer development. The idea that Miner had was to build a high powered home computer, with keyboard

and floppy disk, that software developers could have freedom to work with. The end result was the Lorraine Project (named after Morse's wife).

In 1982, Hi-Toro – primed and ready to begin work on the the Lorraine Project, and already having a motherboard complete with Blitter-like chip – renamed itself as Amiga Incorporated. The history after that gets a little rough. There are a few versions, depending on who you talk to or what you decide to read; the gist of them all is that the crash of 1983 brought massive cashflow problems to computing, and Amiga was in dire straits. According to the more popular story, Atari lent Amiga $500,000 to keep going, on the proviso that if they didn't pay it back in one month, the Amiga was theirs.

Eventually, and after much suing and lots of Jack Tramiel, Commodore Amiga launched the Amiga 1000. About eighteen months later, the bestselling Amiga 500 was launched and with it the winner of the 16-bit battle.

➤ *The Amiga was, and still is, an incredible computer*

⌃ *Workbench, the forefather of all our modern operating systems?*

Component Watch

Looking to grab yourself one of AMD's new Carizzo APUs? You'll need FM2+, then...

AMD's latest line of APUs – the Excavator-based Carizzo chips – are due out any week now. They the follow up on the surprisingly successful Kaveri line, which finally gave AMD a fighting chance against certain Intel chips. If you want to get your PC ready for Carizzo, though, you are going to need a motherboard with FM2+ support – so maybe now's the time to choose one. We can, of course, help you do that as cheaply as possible!

Deal 1: MSI A88X-G45
RRP: £100 / Deal Price: £83

This high-end MSI A88X ATX-sized motherboard is aimed at gamers, and comes with a chipset that supports the latest CPUs and PCI-E 3.0 (unlike some earlier chipsets). It's also got a full complement of expansion ports with eight SATA-III ports, VGA, DisplayPort, DVI-D and HDMI-out, 12 USB 3.0 ports and a built-in Gigabit LAN controller. It's debatable whether AMD chips are a good choice for high-end gamers but, assuming that's what you are and you've got your reasons for rejecting an Intel solution, this motherboard is undoubtedly the one to go for.
Where to get it: Dabs (**bit.ly/1cLSkeU**)

Deal 2: Gigabyte GA-F2A88XN-WIFI
RRP: £85 / Deal Price: £79

This mini-ITX board also has an A88X chipset, but its reduced size aims it squarely at the compact and HTPC market. What's more, because its got built-in wi-fi that supports full Wireless AC, it's perfect for high-speed connections such as the one you might want for streaming HD video. With Bluetooth 4.0 and Gigabit Ethernet support also built in, there's no faulting the connectivity of this board. Its size means it only has four SATA-III connectors, five USB ports and one PCI slot, but at this form factor that's fair enough.
Where to get it: Scan (**bit.ly/1kCG8zL**)

Deal 3: Asus A88XM-A
RRP: £58 / Deal Price: £53

Aimed at smaller systems, this board has a microATX form factor that gives it a slightly reduced set of capabilities, but with a smaller price to match. You still get four memory banks, but only three PCI slots, six SATA-III ports and 10 USB ports. More than enough for any modern system, which makes it a great way to save money on a new-ish motherboard with the latest CPU support. The only corners cut are ones you won't use!
Where to get it: Ebuyer (**bit.ly/1HrCV0d**)

Deal 4: Biostar Hi-Fi A88S3
RRP: £55 / Deal Price: £49

This Biostar board is a sub-£50 model that still incorporates the A88X chipsetand has a full ATX form factor. So you can expect four PCI slots, six USB ports, HDMI, DVI and VGA-out, eight SATA-III connectors and four RAM banks, along with the standard gigabit Ethernet port. A perfectly decent set of features for mid-range all-purpose systems, and at the right price for it as well. Ideal, in fact, for the kind of non-gaming systems that Kaveri and Carizzo chips are going to be found in!
Where to get it: Ebuyer (**bit.ly/1lvwibP**)

Deal 5: MSI A78M-E35
RRP: £45 / Deal Price: £37

If you want to go even cheaper, the MSI A78M-E35 clocks in at under £40 because it uses a slightly less-capable A78m chipset – though it will nonetheless still support Kaveri and Carizzo chips. Its microATX form means you only get two memory banks, three PCI slots, six USB ports and VGA/DVI-D/HDMI-out ports, but you still get Gigabit LAN and six SATA-III ports, so it's not like you're being short-changed on the important stuff! It's hard to complain about anything being missing at this price, though!
Where to get it: Scan (**bit.ly/1rATddP**)

NEWS AND VIEWS

Hackers Turn Air Blue On Billboard

Also From Apple...

iOS9, Apple Pay and El Capitan all announced at WWDC

We'll keep this brief, since not everyone worships at Apple's altar, but suffice to say that its latest Worldwide Developers Conference saw the announcement of another set of products and upgrades for consumers to mull over.

For Mac users, El Capitan will take over from Yosemite this autumn (El Capitan is a rock formation within Yosemite national park, so there's the link on that one) with a Split Screen view, better searching via Finder and easier finding of that pesky cursor icon among the features shown off.

Mobile users got a glimpse of iOS9, with multitasking on the iPad and a generally reworked look and feel among a release that promises a host of performance and stability improvements. And iPhone owners will also be able to make contactless payments, as Apple Pay gets its UK launch in July.

They're some of the key points in what was yet another exhaustive (and some would say exhausting) WWDC.

Malware Hits Record High

First quarter figures suggest all's not well

Panda Security will be in business for some time if its latest figures are anything to go by.

The security outfit's anti-malware lab, PandaLabs, detected over 225,000 new malware strains a day in the first quarter of the year. Its quarterly report looked at security events and incidents from January to March and at its peak, malware hit 500,000 new strains a day.

These figures represent a year-on-year 40% increase, and it's also considerably higher than the yearly average at 205,000 new malware samples a day.

The biggest threat of them all is still CryptoLocker, dominating ransomware attacks in the quarter, and notable scams included an entirely fake Facebook-based $500 Zara gift card giveaway.

QUICK BITS... Project CARS has sold over a million units worldwide. Clearly, it knows how to 'drive' sales up...

Hackers played a big old jape in Atlanta, USA, as they placed an obscene image on a billboard in the area.

According to media reports, the police were called, naturally, and the owner of the billboard, Yesco, promptly switched it off. The company behind the board had been warned beforehand, by all accounts, and this was such a serious breach that the FBI and Homeland Security have reportedly both got involved. Wowsers.

A security expert was quoted by the BBC as saying that vulnerable signs were easy to track on the web and that he had indeed told Yesco as much just prior to the hack. Yesco told him that it wasn't interested in what he had to say.

Oops.

Apple Music Is Born

Spotify will be looking over its shoulder on 30th June

So Apple has actually gone ahead and launched its Apple Music streaming service that will directly take on Spotify and the rest.

Bringing together radio, music streaming and artist interaction from the same place, Apple Music will likely be a major player in the streaming marketplace, if for no other reason than it has the might of the Apple brand behind it. Costing £9.99 a month and £14.99 a month for a 'family plan' covering up to six individuals, the reality is that this is similarly priced to everything else that's already out there. Apple Music gives access to more than 30 million songs, but again that's nothing especially new.

So what does it actually bring to the table that's unique? The reshaped Radio now has the backing of famous DJs such as Zane Lowe and Apple's very own station, Beats1, will broadcast round the clock. The Connect feature also gives artists a platform to share lyrics, photos and even release songs directly to fans via their iPhones. Plus, all this will obviously integrate with Apple's other services such as Siri.

Bottom line? Apple is very good at building an ecosystem around products and services that other companies similarly provide. It's more than likely that this will fare very well if you happen to think Apple is great at what it does, and there are plenty of consumers out there who do.

Whether you're a gamer or not, as a PC enthusiast, the videogames industry should matter to you. Consoles like the Xbox and PlayStation might lead the way in terms of sales, but the PC games market is still alive and well, which is important, because it drives a lot of innovation in the hardware market.

PC gamers want ever increasing amounts of speed and power, and the high-end technology that manufacturers create to cater for that desire undoubtedly filters down to rest of us eventually.

Of course, it's not the only source of innovation in the computing industry (no doubt the enterprise sector contributes a lot too), but it still matters. And if PC games are selling well and getting more advanced, that means more sales of hardware.

So even if you're not a gamer, the announcement of a release date for the Valve's Steam Machines is surely something we can all celebrate.

Until next time,

Anthony

Editor

Meanwhile... On The Internet...

Last week we very briefly touched on the US hack that appeared to compromise the employment records of four million federal employees in the US (**tinyurl.com/ MMnet67a**). But over the last week more information on the matter has leaked out, adding a little detail to the eye-watering headline statistic.

Verifiable data on what was stolen and by whom is understandably being closely guarded. However, a recent letter (tinyurl.com/MMnet67b) was sent by the American Federation of Government Employees (a union representing those potentially effected: www.afge.org) to Katherine Archuleta, the director of the Office of Personnel Management (essentially the federal HR department and the target of the hack).

Bemoaning the response to the hack and highlighting the lack of information forthcoming, it outlines the federation's belief that "based on the sketchy information OPM has provided... the hackers are now in possession of all personnel data for every federal employee, every federal retiree, and up to one million former federal employees." That would be a cache of information including "Social Security number(s), military records... address, birth date, job and pay history, health insurance, life insurance, pension information" and more.

That's quite a haul for anyone looking to leverage the information into spear phishing attacks or, worryingly, outright blackmail – which makes the rumour doing the rounds that the hack was "state sponsored" by "the Chinese" (**tinyurl.com/ MMnet67c**) even more worrying. The fact that the breach was apparently known about for a couple of months before even Homeland Security was aware in the US could really come back to haunt the Obama administration, one suspects (**tinyurl.com/ MMnet67d**).

Those arch publicity hunters behind Pornhub – usually adept at grabbing column inches by publishing revealing statistics about user habits – have come up with a new attention-grabbing tactic. The company has launched an Indiegogo drive to crowdfund the first porn film to be shot in space, specifically aiming to send two performers up on a commercial spaceflight to boldly do what no one's done before (though we can't confirm that). Anyway, if you feel the need to donate (it's going to take a gigantic, err... thrust in support to hit the $3.4m target), you can at **tinyurl.com/MMnet67e**. Just $150,000 dollars will get you one of the spacesuits worn by the performers, as well as their undergarments. Washed... we hope.

It's taken long enough, but the recent Apple WWDC finally bought word that Tim Cook and co. are planning to take on Spotify in the music streaming business. Much has been written about how Apple has fallen behind the curve since the iPod and iTunes service first threw an almighty spanner in the music industry's business model, robbed us the vast majority of our record stores and established digital formats (though not its own, preferred AAC format) as the major method of music distribution going forward (**tinyurl.com/ MMnet67j**). But the keynote announcement of its Worldwide Developer Congress (**tinyurl.com/MMnet67k**) spilled the details on how it will hope to regain ground.

It has, to be fair, a lot of work to do. Spotify currently has something in the region of 20 million paying subscribers and, like the iPod and iTunes did, it has become a brand name synonymous with the service it provides. In its favour, though, Apple has a large number of customers for its App Store and products that it will no doubt be trying hard to attract to its three-month trial offer, and then on to one of its subscription plans, which it's generally expected will match its rivals in the UK. Unlike Spotify, however, Apple won't be offering a free option – although rumours persist that the music industry in general is losing faith in the viability of freemium services in the streaming sector and that Spotify may have to remove this option eventually.

Ding ding... Round one, then...

The fallout of the 'Celebgate' iCloud hackings appears to be settling with news that police have raided two addresses in Chicago based on the fact their IP addresses link them to accessing many hundreds of Apple accounts (**tinyurl.com/ MMnet67f**). The main name linked to the ongoing investigation is Emilio Herrera, a 30-year-old Chicago man whose IP is suspected of hooking into 572 accounts. Another IP address linked to a home in the city (where the suspect remains unnamed as yet) was used to access another 330 between August 2013 and May 2014. Of this prolific number of hacks, the documentation cited in reports states that "a number" of them were celebrity accounts later involved in the leak, and also reveals some testimony outlining the events from the point of view of those having their private pictures shared (**tinyurl.com/MMnet67g**). While it's heartening to see that the investigation into this is ongoing, in matters such as this, an IP address could be a long way from actually proving anyone's involvement in the crime; indeed, getting caught in such a way would add up to an amateurish mistake. It could be that this is just a breadcrumb along the trail behind the perpetrators, who appear to have used phishing tactics and password resets to get access to their target's accounts. It could also be that the most interesting upshot of the documents was that it was probably a social engineering hack rather than a direct result of vulnerabilities in Apple's systems that it failed to promptly respond to (**tinyurl.com/ MMnet67h**).

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

Quite why Micah Graves was sitting at a US minor league baseball game with a GoPro camera strapped to his head is unknown (and will probably remain so). But the fact that he used said equipment to perfectly capture the moment he caught a rocketing 'foul ball', single handed, without a glove, will now forever be filed in the drawer marked 'Winning At Life' (**youtu.be/TQFBrSccYN8**).

Aaaaaaaaannnd Finally...
While we've become increasingly frustrated with online TV services, if they give Terry Gilliam another shot at *Don Quixote*, they're alright by us (**tinyurl.com/MMnet67**)

QUICK BITS... The Federal Aviation Administration is looking into another case of dangerous drone navigation as a low-

Caption Competition

"It's all about the floating point calculations"

What's going in this odd picture? We don't know, so let's see what our army of captioners (you) came up with:

- EdP: "Unboxing the new ultra-light netbook!"
- Boris: "So this is the new ZeroG Surface Pro 10?"
- JayCeeDee: "Hold on tight - it's off to the cloud!"
- idunno: "The 21st century flying ducks."
- columbo77: "Windows 10 gives you wings."
- TeckkieGuy: "The kids are delighted at Microsoft's new Peter Pan Flying Simulator."
- BullStuff: "Somewhere, over the Lenovo, way up high…"
- Thomas Turnbull: "This Peter Pan app works brilliantly, thought Wendy."
- Thomas Turnbull: "This is not my idea of a multi-user flight sim."
- Peter Hopkins: "The bottom drops out of cloud computing."
- Trent Carpenter: "I'm not sure this Sky broadband connection is legit…"
- Robert Wheelhouse: "Booking a flight online gets an update."
- Kevin Thoms: "On second thoughts, maybe we shouldn't have increased the fan speed!"

Good stuff, people, but as ever, there can be only one winner of the Micro Mart caption competition. And this week, that winner is Lee Pelham, with "It's all about the floating point calculations."

To enter this week, head to the 'Other Stuff' section of our forum (**forum.micromart.co.uk**) and say something funny (but not too rude) about the picture below or email us via **caption@ micromart.co.uk**.

NSPCC Attacks Facebook Over Video

Calls for government action

Proving once more that social media can be a pretty disturbing place at times, the NSPCC has called on social networks to take responsibility for a video showing a baby being dunked in a bucket of water.

According to the NSPCC website, Facebook has responded to its concerns by stating that the video doesn't breach its policies. The NSPCC's chief executive has now called on MPs to sort out a meeting to get some "decisive action" on videos like this one.

Baidu Thrown Out For Cheating Test

Chinese search engine found out in AI test

When Chinese search engine Baidu beat Google and Microsoft in an image recognition test, those involved with the search engine would have naturally been delighted.

Scoring a mere 4.58% error rate on the ImageNet Large Scale Visual Recognition Challenge, which tests how well computers recognise a set of imagery, this was a bit of a coup for Baidu. However, it's since had its crown removed, as it turns out that its submitted way more tests than allowed for under the rules. As a result, its results were skewed, and while Baidu has said sorry, it will still be banned from submitting for the challenge for a year.

You see, cheats never beat.

Skype Translator On Windows This Summer

A post on the Skype blog has announced that its Translator Preview technology will be coming to the Skype for Windows desktop app by the end of the summer.

Including four spoken languages (English, Spanish, Italian and Mandarin) and 50 written instant messaging languages, Skype Translator is pretty easy to set up and you can read more over at **www.skype. com/translator**.

Google Has Another Self-Driving Accident

Google's self-driving project has encountered another bump in the road as the firm has experienced its 12th accident.

The news has come to light thanks to the firm's decision to publish monthly reports on the project, with the first in May including summaries of all accidents on the project since it started back in 2009.

The good news is that in every incident noted by Google, no injuries occurred at the scene.

Spike Lee Directs NBA 2K16's Career Mode

In what is surely seen as a bit of a coup for the company, developer 2K Sports has confirmed that Spike Lee (yes, THAT Spike Lee) will be directing the single-player career campaign for upcoming basketball title *NBA 2K16*.

The character in the campaign will go by the memorable name Frequency Vibrations, and Lee's involvement in the game is certainly interesting. Can we expect Christopher Nolan to get involved in the next installment of *FIFA*? No. No, we don't think we can.

4K Display From ViewSonic

24" release promises home entertainment delights

We're always pleased to hear from ViewSonic, and the company has again been in touch with news of another display release.

The VX2475SMHL-4K is a 4K monitor featuring a 3840 x 2160 native resolution with a 60Hz refresh rate, promising a future-proof purchase for anyone keen to keep one eye on what tech comes next. The 24" Ultra HD monitor is designed with a professional-grade panel and advanced features for home entertainment, gaming and photo editing.

With 4K monitors in Europe forecasted to achieve 60% growth this year, ViewSonic is betting that this will attract a fair few of you, and a 120M:1 dynamic contrast ratio plus a 2ms response time ensures smooth and blur-free movement for games and video content.

HDMI 2.0 and DisplayPort 1.2a are included to support Ultra HD content, and sound is outputted by dual 2W speakers. Setting you back £329, you can look at this at **www.viewsonic-europe.com**.

Pong & WoW Make Hall Of Fame

US voters make the call

Regular readers may well remember that we wrote some weeks back on US museum The Strong's search for video games that deserved to be inducted in the first ever Video Game Hall of Fame.

A whole host of titles were nominated to make the cut but while *Minecraft* and *Angry Birds* were among those that missed out, *Pong* and *World of Warcraft* were among six of the first videogames to start up what we hope will be a highly popular Hall of Fame.

Here's the full list of the six that made it to what the museum is hoping will be a permanent exhibition: *Pong*, *Doom*, *World of Warcraft*, *Tetris*, *Super Mario Bros* and *Pac-Man*. The Strong museum asked for people to nominate games to start this whole process off, and we can imagine that in years to come, these greats could well be joined by the likes of *Frogger*, *Football Manager* and *Jet Set Willy* (we can but hope).

QUICK BITS… The US Army was forced into temporarily shutting down its website after it was, yes

Windows 10 In A Plug?

Yes, please

Windows 10 hasn't even been released yet but hardware companies are already naturally keen to get their products out into the open.

This one is particularly interesting, though.

Taiwan-based Quanta has released the Compute Plug, a mini-PC and power adapter system that can be plugged directly into a power socket and which houses an HDMI port and a couple of USB sockets to be connected to a PC. The Compute Plug has even been promoted on Microsoft's blog as a possible solution for turning a TV into a smart computer controlled by Cortana via a Bluetooth remote or headset.

Unique and potentially very interesting. We would genuinely love to get our hands on this.

Steam Machines Land

Alienware among the PC makers

Mark it down on your calendars, people. If you want a Steam Machine, you can have one in October, thanks to Alienware and Syber.

Valve's website is promoting models from the system makers, and there will be significant hopes that these will genuinely rip up the gaming market somewhat, bringing PC gaming into your living room.

Pricewise, we're talking around £300 for each, but if you also want to use Valve's Steam Machine controller, then you'll have to add another £40 and bear an additional wait until November.

Will you be on the waiting list, or would you frankly rather just buy a next-gen console? We'll leave you to mull it over.

DARPA Robotics Challenge Winner Announced

South Korean team takes a bow

A cool $2m was handed to a South Korean robotics team for their outstanding efforts at bagging the top prize at the DARPA Robotics Challenge.

The challenge, put together by the US Department of Defense's research unit, hands robots a series of tasks to be completed within an hour. Tasks such as walking through rubble and driving a car were included in the challenge, and the ultimate goal of all this is to eventually get to a stage where robots can help out in areas affected by natural disasters. The South Korean team and its robot, DRC-Hubo, completed the tasks in the fastest time in just under 45 minutes

Dota 2 Prize Money Hits $12.8m

Crowd-funding pays off

This year's Dota 2 The International tournament will run with prize money totalling, at the last count, $12.8m, comfortably beating last year's $10.9m fund.

Can you imagine sitting on that kind of money? Wow. What makes this figure all the more interesting is this money is chiefly coming from crowdfunding via sales of Compendium, a digital programme including various items, rewards and challenges relating to the game.

If you want to find out more about the Dota 2 challenge, head for **www.dota2.com/international/compendium**.

ABBYY PDF Transformer +

Michael Fereday has been messing about with PDF documents
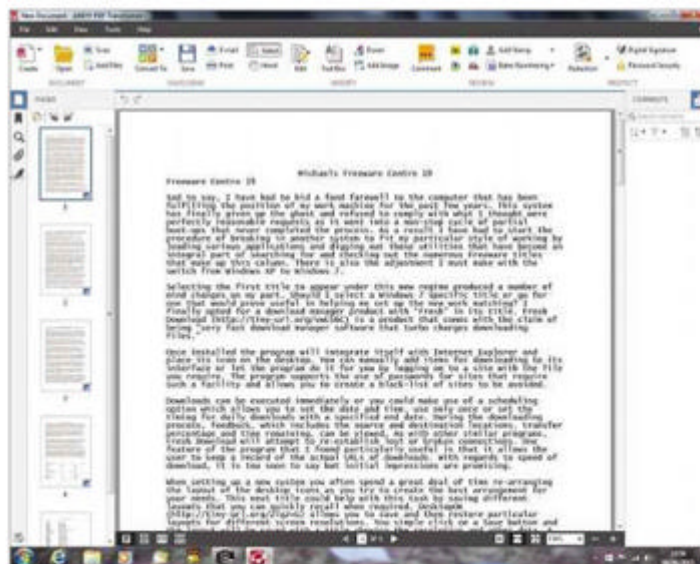
As the *lingua franca* of electronic documents, PDF forms the basis of numerous software applications capable of creating documents that can be accessed on a various systems. Of course Adobe, as the developer of the Portable Document Format, has its own tool for this purpose; namely Acrobat. In its current version (X1 Pro), Acrobat can set you back a budget-stretching £400, though. Solutions provided by other companies are more economically viable, though, with one such offering being PDF Transformer + from ABBYY priced at £60.

PDF Transformer + has a Windows 8-style interface, with tiles representing the program's main options – which are split between opening up existing PDF documents and selecting from a choice of new document options. When creating a new PDF document, you can work with a single existing file, combine together a group of files or receive content from an attached scanner (with support for either TWAIN or WIA technology). Working in the opposite direction, you can convert an existing PDF document into various formats that include Microsoft Word, Microsoft Excel Workbook, Microsoft PowerPoint Presentations, HTML or Electronic Publication.

PDF Transformer + offers support for a variety of file formats that can be used as the source for creating a PDF document. These formats include JPEG, GIF, TIFF, RTF, Text files and HTML. The more observant will have noticed one surprising format missing from this list. There is no direct support on offer for the popular Microsoft Word format when creating a PDF document. I was really surprised by this omission especially as the software supports this format when converting files from PDF.

When working with PDF documents, the ABBYY software offers a range of features. These are available from a task bar positioned at the top of the screen. Selected items in the document can be erased or embellished with an image or appropriate comments and you can add a digital signature or stamp to a document. Content can be scanned and converted into other formats when necessary.

If working in a group is important then this ABBYY product allows for collaboration with others in the creation and editing of document. Sensitive documents can be protected with 128- or 256-bit encryption and a password. Documents can be sent to other interested parties via email or directed towards an attached printer for hard copy.

As PDF documents can be created by various third-party applications, it is important that your chosen tool can handle any slight differences that can occur when dealing with documents from various sources, including the *de facto* standard of Adobe Acrobat. PDF Transformer + was able to handle a variety of documents from various sources. It was generally quick in this task even when the documents consisted of hundreds of pages.

During the loading and resaving of PDF files created by a variety of applications, it was noticeable that often the file size would be reduced.

This was more noticeable when the document being converted consisted mainly of text. For example a 990KB PDF document consisting entirely of text was reduced to 680KB. A 3000KB document, with several embedded images, was reduced slightly to 2890KB. While hardly a prime reason for purchasing this product, it could prove a useful attribute in space is at a premium.

There were, however, a couple of occasions when an image was totally or partially ignored when converted a PDF document into another format. This was a minor fault that I could live with especially with the accompanying cost saving.
mm Michael Fereday

If money is tight, then this product could be the PDF tool for you

micro mart
7 Quality
8 Value
7 Overall

Acer Chromebox CXI

With Chrome OS in the box, do you really need anything else?

With a launch date for Windows 10 now confirmed, those considering the upgrade are already wondering about that data transfer and how to solve the inevitable problems it throws up. Those who have already migrated away to Chrome OS won't encounter any such challenges, especially if they buy the inexpensive Acer Chromebox CXI. Because, once you've provided you're Google credentials, this system will soon be configured and organised exactly how you want it, mirroring whatever other Chrome platform you've previously used.

Included in the box you get a branded mouse and keyboard, leaving the monitor as the only extra hardware you'll need to get this system operational and ready for use. You can place the CXI on the desk, horizontal or vertical, or you can mount it to the monitor using a VESA mount included with it.

Two versions of the Chromebox CXI have been defined that are identical other than the size of memory installed. The review model had 4GB, but you can get almost identical hardware £20 cheaper with 2GB if you want. I'm not convinced that it would perform very differently, so the 2GB model might be the smarter choice. What they both contain is a 1.4GHz Intel Celeron 2957U, a dual-core CPU with a TDP of just 15 watts.

For running Windows that might be insufficient power, but for Chrome's largely web-based experience it's more than enough poke. The machine also has 16GB of SSD space although, as it's designed to be a primarily Cloud use, most users might never need to know about internal storage or how much it has. Google provides all Chromebook and Chromebox users an extra 100GB of cloud storage for 24 months, and that's plenty of online room for most users.

Connected to the Internet by either LAN or wi-fi, the CXI can be ready to use in a couple of seconds from pushing the power button, and it renders web pages effortlessly and streams YouTube videos smoothly.

Using it reminded me what low levels of performance can be made useable in the right environment and with the right software, and how relatively rocket propelled this is compared with computers I used in the past. Also like old computers, the CXI is largely a silent worker, and as such it's also not a significant generator of heat either.

The CXI is quick, highly transportable and a near perfect adjunct to the Chrome OS, so did Acer get anything drastically wrong here? The few faults I found were minor and easily correctable at the next product revamp. One moan is the cheap membrane keyboard that could have easily been better specified. Also, for whatever reason, Acer has decided to place the headphone jack on the rear, not the front of the enclosure. It should also spend a little time redesigning the clumsy 'L' shaped power jack, and ask itself why it made such a small PSU external anyway.

Beyond those relatively minor points, this is an fittingly ambassadorial platform for Chrome OS, and something anyone using the Google facilities in an office environment of it should seriously consider.

mm **Mark Pickavance**

A slick Chromebox that's built specifically for the job

Key Features

- CPU: 1.4GHz Intel Celeron 2957U (dual-core, 2MB cache)
- Graphics: Haswell Intel HD Graphics (200-1000MHz)
- RAM: 4GB DDR3 RAM
- Storage: 16GB SSD
- Ports: 4x USB 3.0, SD card reader, headphone/mic jack, Ethernet, DisplayPort, HDMI
- Connectivity: 802.11b/g/n with Bluetooth 4.0 + Low Energy
- Weight: 1.2lbs
- Size: 1.3" x 5.1" x 6.5" (W x D x H)

micro mart

7 Quality
8 Value
7 Overall

Enermax MAXPRO 700W

Mark discovers an affordable Power Supply for bigger gaming systems

Having once worked in the automotive industry making wire harnesses for cars, I'm acutely aware that connectors are a predicable source of electrical problems. Building any circuit with intentional breaks in it is never good in terms of reliability, and the more you use the less dependability you'll have.

Yet, confusingly, in the world of computers, power supplies with cable management are considered ideal, and those without are often sneered at. This anachronism is no more finely presented than in the new Enermax MAXPRO 700w (EMP700AGT) that just arrived to me from Germany.

The specification for this PSU is top notch, and the price is really competitive too, yet it doesn't have cable management. I'm actually convinced that's a good thing for a range of reasons, though, and not a detracting feature.

This design sits upon the top rung of the Max Pro range, starting with a 400W model, and notching up in 100 watt intervals to the review model's 700 watt output. They all use the same compact and beautifully powder-coated case, offer an 80 Plus efficiency rating, and utilise a 120mm durable Twister bearing fan as their cooling choice.

Where they diverge is in the amount of power they can distribute, and the cabling provided to do that job. They all feature a single floppy line, four 4-pin Molex, and the usual suspects in respect of ATX 2.3 standards. Where the EMP700AGT is different is that it supports eight SATA lines, and no less than four 6+2 PCI-E lines as well. That's double the amount of PCI-E you get on the 600 watt model, and makes this supply perfect for anyone wishing to build a high performance multi-GPU gaming rig.

The flipside of having all that cabling is that, should you not need or require all of it, you can't disconnect it – and thus you'll need to find somewhere in the PC to neatly stow it. That's a hardly an insurmountable problem, but it's something worth considering if you have a small or hopelessly cluttered case.

If you can handle that challenge then you'll be rewarded with an exceptionally high quality part that includes many of the same features that Enermax puts on its most expensive PSUs.

These include HeatGuard; a thermal timer that keeps the fan

Max Pro Specifications							
Model / DC Output	**+3.3V**	**+5V**	**+12V**	**-12V**	**5Vsb**	**Peak Power**	**Total Power**
EMP400AGT	16A	16A	30A	0.3A	2.5A	440W*	400W
	100W		360W	3.6W	12.5W		
EMP500AGT	18A	18A	38A	0.3A	2.5A	550W*	500W
	110W		456W	3.6W	12.5W		
EMP600AGT	20A	20A	46A	0.3A	2.5A	660W*	600W
	120W		552W	3.6W	12.5W		
EMP700AGT	22A	22A	54A	0.3A	2.5A	770W*	700W
	130W		648W	3.6W	12.5W		

Peak power may last up to 60 seconds.

going up to a minute after the system shuts down to make sure that the supply doesn't suffer from heat soak. And, it also uses Enermax's branded inlet modifications called AirGuard that reduce the noise created by the airflow into the supply.

It might seem a rather minor thing, but being nearly silent was one of the main design priorities, and in operation the supply almost achieves that objective. Another contributory factor to this is Enermax's patented fan, that uses a special bearing that generates no noise at standard loads and relatively little when at 1500 RPM running and extreme duress.

Other enhancements protect the supply from short circuits, over voltage, over current, over power in addition to surges and inrush current. Built to withstand prolonged 24/7 operation through the use of high quality Japanese parts, Enermax offers a three-year warranty as proof of its confidence in this product.

In testing this supply was as resilient as I'd anticipated, as I've not seen an Enermax PSU in many years that didn't demonstrate excellent stability under load. The only real catch I've found with this design is that it was exclusively designed for the European market, and as such is only built for 200-240VAC mains and not the lower voltages used in the Americas. Therefore you couldn't run a PC built with this PSU in the USA, should you take it there.

That's not a problem many will have, but limiting the input has allowed for the most effective conversion of power, enabling it to post a great average efficiency of 87%.

The spec of the MAXPRO is right, the build quality is exceptional, the price is just amazing, and the reliability of this design over one with managed cables is the icing on the cake. Unless you are bonkers enough to be building a system that needs more than 700 watts on hand, the EMP700AGT ticks all the boxes for anyone who is happy to manage their own cables. Or you could chance a poor connector, and spend considerably more getting a similar spec, the choice is entirely yours.

mm Mark Pickavance

An efficient, powerful and inexpensive PSU from a top brand

micro mart

8 Quality
9 Value

9 Overall

HP Colour LaserJet Enterprise M553x

Those big print job finds a worthy adversary

Inkjet printing can be super-expensive for businesses, because usage can rapidly spiral out of control when a big project comes along. The answer to this problem appears to be simple: a step up to colour laser printing. Many, however, are put off by the cost of the equipment, reliability and consumable costs of that technology.

HP Colour LaserJet Enterprise M553 range looks to address many of those issues, and challenge the accepted thinking about the cost of colour laser technology in general. HP has made it in three distinct flavours were the M553x (reviewed here) is the top tier, with the M553dn and M553n below that. They're all built around the same four-toner CYMK 1200dpi print engine, with the differences being mostly optional items – though thr entry level M553n model doesn't offer hardware duplexing, the option for Wireless Direct or HP's Hardware Integration Pocket (HIP). The high-end M553x also adds a nifty colour touch-control panel, where the M553n and M553dn have a smaller display with a separate touchpad.

Getting the printer operationally is straightforward enough once you've extracted it from the enormous box it is shipped. You simply connect it either by USB or network cable, and then answer a series of simple questions that the printer asks you via the control panel. After which you can install the provided driver and load whatever paper stock you fancy.

The basic design has a manual 100 sheet feed and 550 sheet bin, and the M553x an extra 550 sheet bin that can take A4/A5/Legal, and you can optional add another two tray 550 sheet layers if required.

That's office friendly, and so is the power management system that allows the M553x to sleep when not in use. Waking from slumber doesn't take long, generating first output takes less than nine seconds, and churn out 40 ppm mono and 38 ppm colour once up to speed. The duty cycle for this unit is 2,000-
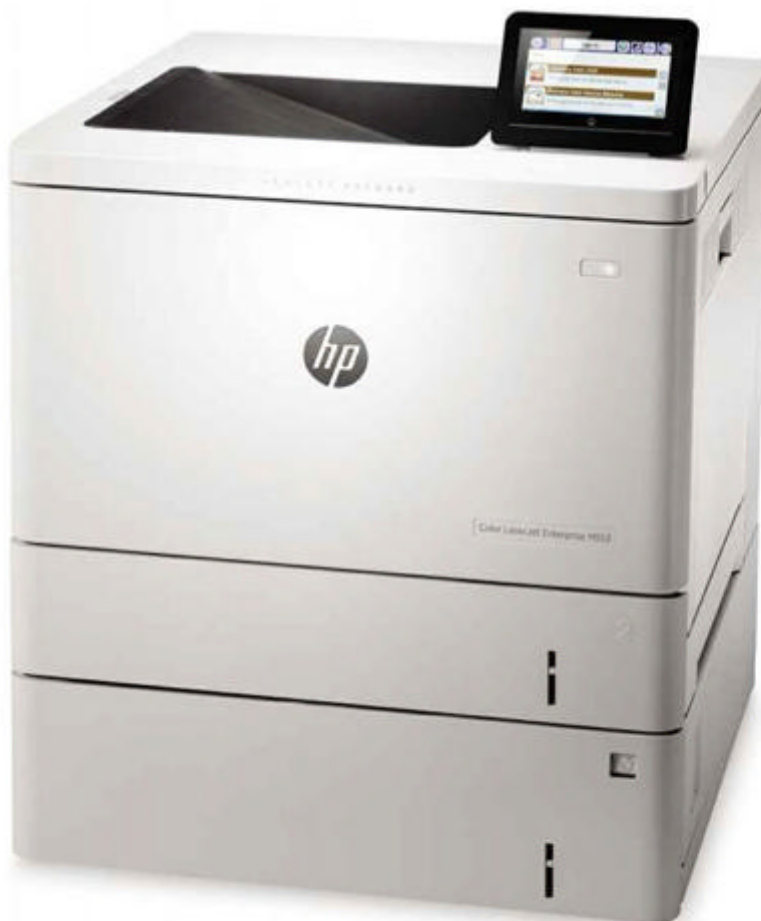
Specifications

- Print from sleep mode in as fast as nine seconds
- Print speeds of up to 38ppm.
- 10.9 cm colour touchscreen.
- The additional paper tray brings the input capacity up to 1200 sheets.
- Secure printing
- Duplex
- WiFi Direct and NFC
- 1GB RAM, expandable to 2GB
- 1.2GHz CPU
- 1.98 kWh/Week (Energy Star

6,000 pages a month, or 300 pages per day. That's not huge, but probably more tree killing than most small businesses should be aspiring to.

How much it costs is entirely dependent on how much coverage each pages has, but HP does offer High Yield toner modules where the Black cartridge can crank for 12,500 pages and each of the three colour ones for 9,500. The cost of these is £187 and £259 respectively (each colour),

though standard lower capacity ones are cheaper. Replacement fuser kits and toner collectors are also available, with a cycle of 150,000 pages.

The cartridges might seem expensive until you factor the cost over pages each could produce. That's a relatively low cost per page, with black being around a penny and colour about 6.5p, for typical 5% coverage, not including the cost of paper.

That's substantially lower than any inkjet printing, and

the output also comes out dry to the touch. The toner print process is also superior at representing images that include very fine lines, as there is no appreciable bleed. You might get more colour punch from wax transfer technology, but in terms of a practical and affordable solution this design is exceptional.

What's more, there are some very neat security devices that HP built in that paranoid users will love. For example, you can print a secure document which is only then produced when you are physically at the printer and input your secret pin number. Another is the ability to install a hard drive (all models), and store onto it forms and templates that you can demand be printed without access to a PC.

I have but one complaint about this printer, and it's a silly thing: one of the default features of the M553x and optional on the N553dn is a module called 'Wireless direct' that offers NFC printing. With a wireless card installed you'd think that it might give flexibility as where in the office you put the printer, but you'd be dead wrong. Because the wi-fi only supports direct wireless operations, you can't use it to connect it to a local access point, amazingly. That head-scratching point aside, this

is a remarkable piece of kit that makes more economic sense than a dozen office inkjets.

Its fast, the output is clean and generates colourful output, and there are tons of options for multi-stationary scenarios and even an official cabinet is available. The cost is what it is, though those who don't need the extra paper tray and a touch screen can get the M553dn for around £499, and home users might entertain the basic M553n for just £352. These are HP prices, you may find better.

If you work in an office where accounts are moaning about inkjet consumable costs, then perhaps you should point them in this direction, and let them write the justification themselves.
mm Mark Pickavance

The perfect colour printer for small offices

micro mart

9 Quality
9 Value
9 Overall

Gigaset C620A Duo

Michael Fereday has been busy creating a Blacklist of telephone callers

Described as the "Clever family phone", the Gigaset C620A Duo is a two-handset DECT phone system that offers to deal with a bane of modern-day living. Whether you refer to them as 'Cold Calls' or 'Expletive-deleted Nuisance Calls', these unwanted intrusions can be annoying and sometimes expensive. The Gigaset solution to this problem involves levels of protection and a Blacklist – but more on this aspect a little later.

The two handsets, while identical in appearance, come pre-defined as Handset 1 and Handset 2. Also included in the package are power leads, two base stations and accompanying rechargeable sets of batteries. Each handset features a 4 x 3cm colour screen with control and navigation options plus a 4 x 3 alphanumeric keypad.

Handset 1 sits on the main base station which incorporates the answer-phone module with appropriate controls and a small screen showing the number of messages being stored. This base station has connections for mains power and the telephone line. The much smaller second base station, for Handset 2, features just mains power connection.

Following an eight-hour charging session, you can set about applying language, date and time settings. The default answer-phone message can

> ❝ A two-handset DECT system that offers to deal with a bane of modern living ❞

be changed if it does not suit, and you can add entries to the phonebook facility – which can hold up to 250 items. Each entry can consist of three numbers (home, office, mobile) along with a first and last name which can be used to sort the entries. It will be up to you to ensure that phonebook entries are kept in synch between handsets as this task is not carried out automatically as I would have expected.

While incoming calls from those in the phonebook or anybody who has not blocked CLI (Calling Line Identification) will be automatically accepted, other calls will be regarded as anonymous. Three levels

of protection are available for dealing with anonymous calls. The lowest level handles calls as it does identified numbers with the screen display indicating that no information was provided. The second level of protection will block the ring tone while displaying call details on the display. With the highest level of protection, the call is blocked with the caller hearing a busy tone. I would have preferred an unobtainable tone rather than the busy signal to further discourage repeat calls.

Whether calls are blocked or not, they will appear on the incoming call list. You can access this list at any time. These calls will be identified by date, time

and other information. You can then select individual numbers for transfer to a Blacklist, which has the same levels of protection as anonymous calls.

As well as blocking calls, the C620A DUO allows you to apply restrictions to a specified time period. You can either opt for a lower ring tone volume or have silent calls displayed on the screen. A VIP list of 15 callers can be created. Those on this list will automatically by-pass the time period restrictions and will be allowed through. You can also use this phone as a baby monitor that alerts you via a call to a designated number if noise is detected above acertain level. While activated, incoming calls will be silent with just a screen display notification. If you accept an incoming call then the baby monitor feature will be turned off during the call.
mm Michael Fereday

The more you use this kit, the better it becomes

micromart
7 Quality
8 Value
8 Overall

Sharkoon Skiller Gaming Keyboard

An inexpensive keyboard with a ton of impressive features

The Sharkoon Skiller Gaming Keyboard has been around for a good couple of years now, but hasn't shown any signs of fading into the background despite the wealth of mechanical gaming keyboards that are currently available.

There's a kind of snobbishness attached to gaming keyboards, in that a non-mechanical can't ever be as good as its mechanical counterpart. We've seen it a number of times, and it's utter nonsense. Yes, a mechanical keyboard is an excellent choice, but let's not discount the huge price differences and the fact that a modern membrane (or other such non-mechanical) keyboard can offer just as many features.

The Sharkoon Skiller is a rubber-dome switch based, 107-key keyboard with a further twenty additional multimedia keys. It's USB, with a decent 150cm length cable and N-Key rollover for up to 18 keys. In addition, the package comes with a set of rubberised, light blue, W, A, S, D and arrow keys, including a tool to easily pop the existing keys out.

The keyboard has a shiny piano black design throughout, with an illuminated Sharkoon logo in the bottom centre, and the usual Caps, Scroll etc. LEDs in a small strip between the number pad and main QWERTY keys. Along the top, in two separate sections of five, you'll find ten action keys for opening My Computer, Email, Search, Calculator and so on, along with Previous, Next, Wake, Sleep and Power. There are also two strips of five media keys down either side of the keyboard, one side caters for browsing with Home, Favourites, Refresh, Page forward and Back, while the other offers the usual media player functions.

The accompanying software is extensive, and allow the user to setup virtually every key to represent something else or as a macro assigned to a particular program. Amazingly, this isn't the limit of the Skiller; each key has three layers of programming and ten different profiles, which means, essentially, each key on the Skiller has thirty possible other uses other than the letter or number stamped on the key cap.

It may sound extreme, but considering the vast number of programmable keys gamers tend to setup and use for their favourite MMO you begin to see how useful the Skiller really is.

However, as with mice, we find that a keyboard needs to 'feel' right for it be worthy of our gaming attentions. The Skiller has an overall good feel to it, although it's probably a little too light for our personal tastes. Other than that, with the light blue rubber gaming keys in place, the Skiller operated well under gaming pressure, and even in the more sedate routine of regular work.

It may lack the lifespan of a mechanical switch keyboard, and the full key illumination of other gaming keyboards, but the Sharkoon Skiller is a pretty good overall keyboard. The sheer number of programmable keys is simply mind-boggling, but thankfully the software is pretty easy to get a grasp of. What's more impressive though is the ludicrously low price of £15.47.

Considering everything the Skiller can do, and the fact that it's well designed, change from twenty pounds is an absolute steal for a keyboard of this calibre. If you lots of macro functions and programmable keys, then we think the Skiller will be a handy weapon of choice.
mm David Hayward

A good keyboard, with an unbelievable number of programmable keys

▲ *The Sharkoon Skiller is a decent enough looking keyboard*

➤ *It's the features and low price that make it stand out from the crowd though*

micro mart
8 Quality
8 Value
8 Overall

When standard air cooling simply isn't enough to keep your CPU from overheating, the other option is water or liquid cooling.

In the past, liquid cooling was a laborious affair and quite messy at times. These days, we have enclosed units and pre-filled setups.

David Hayward takes six liquid coolers and hooks them up to his PC to see which have what it takes to keep things really cool.

Water Cooling

Corsair H55

DETAILS
- Price: £63.98
- Manufacturer: Corsair
- Website: goo.gl/Cf1s7f
- Socket support: AMD: AM2, AM3, FM1, Intel LGA: 1150, 1155, 1156, 1366, 2011, 2011-3

micro mart
8 Quality
8 Value
8 Overall

▲ *The Corsair H55 is a great, all-in-one liquid cooler for intel and AMD CPUs*

Corsair has built a good reputation for itself with the 'H' range of liquid, performance coolers it has on offer. The range caters for nearly every possibility (for CPUs, graphics cards and more), with a pair of fans attached to the radiator or just a single fan. The prices aren't too bad either, with the most expensive coming in at around £120.

The H55 is the company's entry-evel liquid cooler, an ALC (all contained liquid cooler) package that's designed for simplicity, easy fitting, low maintenance and very little hassle for the user.

It's a no-nonsense setup, according to the bumph that accompanies the kit. With a tool-free mounting bracket that's compatible with both Intel and AMD CPU setups, a pre-filled unit, low noise 120mm fan, low-profile pump and black aluminium heat exchanger and low evaporation rubber tubing, there's a surprising amount on offer for the relatively low price of £63.98 (Flacon Computers currently sells the kit at £49.99, but check for most up-to-date pricing).

Inside the box you get the radiator, pump, fan, mounting kits for both Intel and AMD, instruction manual and warranty postcard, all neatly organised and labelled accordingly. The instructions are well laid out and easy to follow, although perhaps the images of the individual steps could have been clearer and produced to a higher standard.

The individual components are finished to a very high standard; the 120mm fan, for example, is a seven blade, 1700rpm, 30.32dBA model, with a three-pin connector for power, which will attach to the radiator where a standard output case fan normally resides.

The black aluminium radiator measures 120 x 152 x 27mm, with a pair of 10mm rubber tubes attached that lead to the pump. The pump itself is low profile, making the H55 an ideal solution for cases where there's very little room or where larger memory sticks take up a fair portion of the internal area. The bottom of the pump has a micro-fin copper cold plate, with a thin layer of pre-applied thermal paste in a perfect circle in the centre.

The design of the pump allows it to slot into the baseplate and retention ring perfectly, creating a secure fitting over the processor. With everything ready, the correct mounting plate and so on, the process of getting up and running shouldn't take more than five minutes. The trickiest part, in our example system, was working around the internal makeup of the chassis to fix the radiator and fan to the case output vent.

Stock performance on the i7-4790k 4GHz CPU we used was perfectly fine, measuring a mere 33°C. With a slight overclock adjustment to 4.4GHz, the temperature was measured at 58°C, which is reasonable enough. We could have clocked a little higher, but time and the fact that this was our only processor at hand meant we kept within 'normal' limits and avoided the realm of the extreme overclocker.

The Corsair H55 is a good, entry-level APU water cooling kit. Everything is built to a high quality, and it's an extremely easy fit and forget package. If you're thinking of more extreme overclocking, though, you may need to look at the higher end of the Corsair H-series scale, but otherwise, the H55 is a good start.

Cooler Master Seidon 120V Liquid Cooling Kit

▲ *The Cooler Master Seidon 120V is good all-round cooler*

▲ *Higher clock speeds may need something a little better*

Unsurprisingly, Cooler Master is the go-to name when it comes to total system cooling, regardless of whether that's air or liquid based. Its CPU liquid cooling options come in two main product lines: the Seidon, which we're reviewing in this instance, and the more exclusively designed Nepton series.

The Seidon series is Cooler Master's compact, all-in-one, easy-to-fit liquid cooling solution – one that will fit into pretty much any PC chassis going and with either Intel or AMD setups. The Seidon 120V is the start of the range and features a 120mm aluminium radiator, single 120mm fan and a square-shaped pump with 9.5mm diameter, corrugated FEP tubing attached.

As with the Corsair H55, this is an already primed and ready to go system, filled with same kind of distilled water and Propylene Glycol coolant. And as we've previously seen, the 120mm radiator and fan are low profile, which means they'll attach to the interior output vent of the PC case without too much difficulty and without getting in the way of other internal components.

The aluminium radiator or, to be more technical about it, liquid to air heat exchanger is very similar to the Corsair H55 in design, look and feel. It, like the other components from Cooler Master, is of a high quality, but we much preferred the tubing on the H55 than the corrugated FEP tubing on the 120V, despite the fact that the 120V FEP tubing is, in our opinion, somewhat more flexible than its rubberised equivalent.

The pump stands a little higher than the previous H55. Generally, that's not too much of an issue, but in some circumstances, which we mentioned in the previous review, there are systems where other components tend to invade the space where a larger cooler sits. Thankfully, the 120V is still fairly small, standing 35mm from the base, so there's only going to be some clash with other components if you have a fairly unique system.

The underside of the pump has a thin copper base that, according to the technical specifications, features engineered micro-channels to maximise the liquid contact surface. However, as far as we could tell, the finish on the copper base plate was perfectly smooth or as near as. The 120V also comes shipped without any thermal paste already pre-applied.

The kit comes with all the necessary attachments and brackets for both Intel and AMD systems. All you need to do is work out which CPU socket you have and fit the right screws to the right holes in the mounting plates. There's also a handy squirt of Cooler Master thermal paste in a syringe for you to apply.

Performance of the 120V was generally good. The stock cooling temperature of our i7-4790k 4GHz processor was 38°C, a little higher than the H55. The overclocked (to 4.4GHz) temperature was again a tad higher at 60°C, but operable.

The Cooler Master Seidon 120V is a reasonably good kit. Performance was okay and it has a good build quality throughout. Price is better than the H55, with the lowest we found at £39.99 (using Falcon Computers as a price benchmark).

While extreme overclocking may not be on the cards with the 120V, it's certainly good enough for the average user who requires a near-silent and better cooling system for their PC.

micro mart

7 Quality
8 Value
7 Overall

Water Cooling

NZXT Kraken X31 Closed Loop Liquid Cooler

DETAILS
- Price: £55
- Manufacturer: NZXT
- Website: goo.gl/lQ0nZe
- Socket support: Intel LGA 2011-3, 1366, 1156, 1155, 1150 CPUs AMD FM2, FM1, AM3+, AM3, AM2+, AM2 CPUs

We looked at the NZXT Kraken X31 some months ago. It impressed us a lot, as a stand-alone liquid cooling kit, so we thought it would be interesting to see how it fares when placed side by side with other kits of the same ilk.

The Kraken X31 may well be the entry-level liquid cooling solution from NZXT, but it has a wealth of mind boggling specifications. For starters, this is the world's first variable speed pump that utilises a spare USB header on the motherboard to communicate with the customised NZXT CAM software. With this in place you're able to control the motor pump speed from 2400rpm up to an impressive 3600rpm, while being able to view a multitude of real-time information regarding CPU and liquid temperatures, as well as helpful notifications as to what's using up your system resources.

The variable pump can also be fine-tuned for certain situations such as performance, silent, manual selection and so on. And you can even access the controls remotely by using the mobile version of CAM for iOS and Android. It's a fascinating addition to an already high-quality product and one that you could happily spend many

▲ The NZXT Kraken X31 is a fantastic CPU water cooler

▲ The added benefit of the integrated software makes for a great product

minutes in front of tweaking to the highest possible degree.

The list of desirable features doesn't stop there, however. The large 120mm fan can be controlled to a rate of up to 2000rpm while still remaining a whisper quiet 34dBA, and the 400mm of flexible tubing is certainly more than long enough for any system setup, including specialised PCs.

Fitting the Kraken is simple too, with mounts and standoffs for Intel LGA 2011-3, 1366, 1156, 1150 and AMD FM2, FM1, AM3/3+ and AM2/2+ CPUs. There's even a handy online animation that walks you through the process depending on the type of socket you're fitting the Kraken to.

Needless to say, this is an exceptionally high-quality

liquid cooler. Every detail has been meticulously engineered to near perfection; even the thermal paste on the cold plate is spot on and neatly dispersed. Also, the black aluminium radiator offers a slightly larger than usual area to help draw heat away, with the aid of 120mm fan, from the coolant.

We were singularly impressed with the NZXT Kraken X31. The long tubing made it easy to wind around the internal chassis of our test system, while still keeping maximum airflow to other components. The high efficiency of the Kraken, combined with its near silent operation, makes it a must for those who put their systems through demanding overclocking or high intensity CPU tasks. And of course, the icing on the cake here is that variable speed pump and the CAM software.

In terms of performance, the Kraken didn't disappoint. Our stock temperature on the i7-4790k at 4GHz was a chilly 28ºC. And when we upped the clock speed to the 4.4GHz mark, we recorded an equally cool 52ºC. Even with the pump and fan tuned to the highest rpm levels, the noise levels were still incredibly quiet – compared to that of an air-cooled equivalent setup, at least.

The Kracken X31 is a great liquid cooling solution. It's perfectly fine for the beginner, and we think even the hardened overclocker will appreciate what it's capable of. At around £55, it's well priced too.

Thermaltake Water 3.0 Extreme S AIO

▲ The Thermaltake Water 3.0 Extreme S AIO is a good cooler, with plenty going for it

▲ Make sure your case can take the large radiator though

Thermaltake is certainly no stranger to the PC cooling scene. The company has been around for at least 16 years now and shows no signs of resting on its laurels.

The range of liquid cooling solutions vary, from the entry-level Water 2.0 Pro kit, through to the Water 3.0 Extreme and Ultimate kits. In this instance, we have the Water 3.0 Extreme S CPU cooler on test, a beast of a cooling solution for those who demand freezing temperatures for their processors.

The striking difference between the previous three coolers and this model is the obviously far bigger radiator and dual 120mm fans. However, considering the fact that the radiator is twice as long as the previous models, it doesn't feel like it's unwieldy and awkwardly huge. Obviously, it is bigger, but not in the same sense as a Titan X graphics card would be compared to a GT740 – if you see what we mean.

Starting with the radiator, it measures 270 x 120 x 27mm and is constructed from a black aluminium mesh in the same vein as the H55 and V120. The dual, curved, seven-blade fans fit close to each other onto the radiator and provide between 1200 and 2000rpms of heat exchange from the cooling system. It's an efficient setup, and the large surface area makes for a better than average cooling solution.

The pump head or water block, if you prefer, can fit both Intel and AMD processors and has a large copper surface area with a small amount of pre-applied thermal paste. Like the H55, the pump head is quite low profile and shaped very similarly. In fact, the entire setup is nearly identical, including the backplates, connections and faceplates. Needless to say, it's easy to fit the pump to the CPU.

The rubber tubes are reasonably flexible and at 325mm are generally long enough to wind through most systems to the radiator placement. Speaking of which, this was the only issue we had with the Water 3.0 Extreme S. The radiator is fairly slim, and the length of it did bring on a bout of head scratching as we tried to figure out the most effective and efficient method of attaching it the inside of our case.

The performance of the Thermaltake Water 3.0 Extreme S was good. The stock cooling temperature for the i7-4790k at 4GHz was measured at 30/31ºC. And the overclocked 4.4GHz test temperature was a reasonable 56ºC. Both are good numbers, but not too far from the smaller radiator solutions we've already looked at.

We imagine the larger area of the radiator and the combined dual fans will begin to be more of a benefit when the clock speeds are ramped up again, to 4.6GHz and beyond and while under considerable stress. We didn't test this theory, but on paper it makes sense.

The Thermaltake Water 3.0 Extreme S AIO is a pretty good liquid cooling solution. It's a tad expensive, at around £89.99 (using the Falcon Computers prices as a guide again), but you do get some low temperatures. The only issue, of course, is being able to fit the radiator in our system.

micromart
Quality 7
Value 7
7 Overall

Water Cooling

Alphacool NexXxoS Cool Answer 120

Alphacool isn't a company we've come across before, so we were fairly intrigued as to what we might be unboxing, especially since this is a product with an exceptional number of Xs in the title.

This kit differs somewhat from the rest of the products we have on test. For one, it's a system that you'll fill up yourself, not self-contained as we've already looked at. Secondly, there's a reservoir that will fit into a spare 5.25" drive slot, and thirdly, the setup is different.

To start with, setting up the entire kit requires some room to manoeuvre in your chassis. Where with the previous kits you could get away with most of the individual components still in place, with the Cool Answer 120 we found the easiest solution was to pull everything out of the case, including the motherboard.

The pump head is a little odd, in that it doesn't require a backplate. Rather it attaches directly to the processor through the four mounting screws. Once that's in place, you'll attach the tube fittings, then the full copper radiator, followed by the reservoir in the 5.25" drive bay with the pump and tubing. After all that, you can top up the reservoir with

⌃ *There's a lot to take in on the NexXxoS Cool Answer 120*

⌃ *And there's plenty that can go wrong*

> 66 **The 120mm fan that came with the kit made an annoying click** 99

the accompanying clear liquid and power everything up.

The individual components are finished to a reasonably high degree. We did find, though, that the reservoir felt a little fragile and the tubing a little too short and quite inflexible. Furthermore, the entire process was incredibly

awkward and left a lot of scope for something to go wrong when you applied the power. The last thing you want is a leak or to find out you've not made good contact with the processor and the CPU water block. While the chances are slim, they are considerably higher in this

case compared to the previous examples we've looked at.

In terms of the performance of the Alphacool NexXxoS Cool Answer 120, we weren't all that impressed. The stock cooling temperature of the i7-4790k at 4GHz was a decidedly warm 42°C. And when we overclocked the processor to 4.4GHz, the temperature rose to an alarming 74°.

We're not sure if it was a fault in the way we built the system or whether it was just due to the kit, but the numbers still stand and they aren't too impressive. Incidentally, the 120mm fan that came with the kit made an annoying click, just slightly audible, every few thousand revolutions. As far as we could see it wasn't hitting anything, but once the case was back together the click reverberated throughout until it was the only thing we could hear. A small annoyance, but one that could put a buyer off.

In all honesty, although the build quality is good for most of the individual components, we didn't really get along with the Alphacool NexXxoS Cool Answer 120. It's expensive too, at around £146 and, to be blunt, not worth the trouble and effort of setting it all up.

micro mart
5 Quality
5 Value
5 Overall

Corsair H100i GTX

▲ *Like its smaller brother, the Corsair H100i is an excellent CPU cooler*

Now for the second Corsair product in this group and a higher performance model to finish the group off.

The Corsair H100i GTX is classed as an extreme performance liquid cooler, with a large 240mm radiator, dual 120mm fans and an easy-to-fit solution in a single, neat package.

As before, the build quality is superb throughout. The radiator measures 276 x 125 x 30mm and features the same high-quality black aluminium cooling fins encased in a sturdy black metal and plastic case.

The dual SP120L, seven-blade fans are designed to deliver high static pressure, more so than the conventional fans you'd normally find inside a PC case. This makes the entire heat exchange area very efficient and surprisingly quiet too considering there are a pair of fans spinning at a maximum of 2400rpms.

Furthermore, the pump has an ace up its metaphorical sleeves in that there's a USB connection to link to the USB header on the motherboard. Much in the same way as the Kraken X31, when you download and install the Corsair Link app, you'll be able to control the speed of the fans, monitor performance of the system, monitor the coolant levels,

▲ *The addition of LEDs is a nice touch, albeit an aesthetic one*

and you can even change the colour of the Corsair logo on the CPU pump head to either match the current LED colours of your system or alternatively as a kind of traffic light warning system based on temperature readings.

The performance of the Corsair H100i GTX was really good. The i7-4970k stock test at 4GHz recorded a temperature of just 29°C. The overclocked to 4.4GHz test increased the recorded temperature to 53°C. Both are superb numbers and will offer some comfort when you start to up the clock speeds.

Setting up the H100i GTX was simple enough, as easy

as it was with the previous all in one systems – minus the NexXxoS, of course. The only issue again was the larger radiator, but since we'd already discovered a way to fit that to our case, we didn't have any trouble in this instance.

There's not a huge amount to add in terms of the build, setup and how the H100i GTX works. The similarities between the all-in-one systems are quite evident. The only difference here really is the addition of the USB and accompanying app option. But then again, we've already seen that in the Kraken X31.

However, the Corsair H100i GTX is a great liquid cooling

solution for either Intel or AMD processors. It's quiet, does an excellent job at keeping the system cool and we liked the addition of the LED and visual aspects – something the Kraken sadly lacks. And it's not too badly priced either; £101 may sound steep, but considering what you get, it's worth every penny.

If your case is capable of handling the large radiator comfortably, then there's no hesitation in recommending the H100i GTX as your all-in-one liquid cooling solution.

micro mart
Quality 9
Value 7
8 Overall

NZXT Kraken X31 Closed Loop Liquid Cooler

The NZXT Kraken X31 is the best in the group for cost and cooling abilities. It's easy to fit, easy to use and will last you for as long as your PC.

The addition of the software to collect information and control aspects of the kit is a great idea and surely a draw to those who demand absolute detail of control for their systems.

Corsair H100i GTX

It may cost just over a hundred pounds, but the Corsair H100i GTX is a fine cooler with a lot going for it.

Provided it'll fit your case, the setup is extremely easy, and again, thanks to the integrated software, you can monitor and control the water cooling system to a higher degree than normal.

How We Tested

Each water cooling system was built and fitted to an Intel i7-4790k processor, running at 4GHz. As well as testing at that speed, we also recorded results when the system was under some stress playing *The Witcher 3*, having Firefox open with eight tabs, Word 2013 open and VLC playing a HD video.

The same programs were run when we clocked the processor up to 4.4GHz.

	Corsair H55	Cooler Master Seidon 120V	NZXT Kraken X31	Thermaltake Water 3.0 Extreme S AIO	Alphacool NexXxoS Cool Answer 120	Corsair H100i GTX
Price	£63.98	£39.99	£55	£89.99	£146	£101
No Fans	1	1	1	2	1	2
Fan Size	120mm	120mm	120mm	2x 120mm	120mm	2x 120mm
Radiator Size	120 x 152 x 27mm	154 x 120 x 27mm	155 x 120 x 25mm	270 x 120 x 27mm	154 x 120 x 30mm	276 x 125 x 30mm
Thermal Past Pre-Applied?	Yes	No	Yes	Yes	No	Yes
Stock Temp	33oC	38ºC	28ºC	31ºC	42ºC	29ºC
Overclock Temp	58ºC	60ºC	52ºC	56ºC	74ºC	53ºC

Your Letters

Windows 10

I've read your item regarding the future of Windows with interest (issue 1365). As a user of XP, Vista Ultimate and W7, I am aware that some specialised software (for equipment connected to the PC) may not function if I update my OS, which is why I have retained the original OS of my various PCs. Giving control to Microsoft and allowing them to change the OS at will could render some (expensive) connected kit unusable, or even trash some existing software.

An example is Apple's Final Cut Pro video editing program, which I was told (and please correct me if I'm wrong) went to version 10 and would no longer support the use of two screens (most editors would use at least two) or output to tape – a media in common and professional use at the time. More distressing was the issue that apparently you couldn't re-edit a production edited with a previous version. If true, this clearly demonstrated that either Apple was being very cavalier towards their customers, or that they hadn't a clue about the way the software was being used. I have since been told that due to many complaints these issues were addressed, but they shouldn't have happened at all, and generated considerable distress until an update was issued. I suspect that many users did a quick migration to Avid, Adobe, or Edius. Such unexpected problems can come as a nasty surprise when up against a deadline.

Are we to expect similar problems from Microsoft? What procedure would be put in place to uninstall a change? Would we be given advance notice? Would we have a choice (or be able to select a previous version for a particular task)? And having to depend on a live web connection is putting far too much dependency on something that can go down and affect delivery timescales for those in business, possibly risking late delivery penalties. Surely not a good idea? Maybe those in industry and commerce should get together and start taking an interest in alternative OS's, and offer some funding...

Pete Heaven

Window Vs Linux

I don't wish to argue with Dick Pearson, or to debate interpretations of the terms "most" and "virtually all", but I feel that in his reply to my previous letter (ref *MM* issue 1353), he has been negative and doesn't offer much useful information.

It's true that Linux is unlikely to be found in 'Joe Public's shops'. That's because of the commercial stranglehold that Microsoft exerts over manufacturers of PCs and associated hardware, and to the fact that the salesmen are on commission. These shops are not at all interested in selling PCs without Windows!

My main points were that folks CAN have a choice between pre-installed Windows or pre-installed Linux if they so wish, and that Linux can be a very viable desktop alternative to Windows.

Considering how poorly Microsoft has treated its users of late, and the uncertainties surrounding the upcoming Windows 10, perhaps some folks might wish to consider a more clearly defined alternative that is more user orientated than is Windows.

Dick stated that he was commenting on "the overly focused perceptions of many Linux users". I'm sure that he is aware that most Linux users also have working knowledge of Windows and could work with either OS. So why might we be more focused on Linux?

Clue: It's not because we find that Windows provides the more user friendly, stable, virus free, and non restricting OS. And it's definately not because Windows provides a choice of impressive and usable desktop managers.

Thanks to history, commercial constraints, and advertising, most Windows users remain almost oblivious to the existence and potential benefits of Linux, and to open source software in general. Unless folks like me continue to talk and write about the subject, this rather one-sided situation is likely to continue.

I make no apologies for my megre efforts in this area.

Ken Hough

Windows 10 Again

What are the overpaid idiots at Redmond trying to do? Just what is the Windows 10 release day going to be like on internet speeds around the world?

With the typical Windows bloat of four or 5GB of data to be downloaded by at least 50 million people on the first day, the internet could be down to a crawl. How will the worst download speeds cope – not to say the people miles away from the exchanges? I am about 200 metres from my exchange and my speeds drop to about 10kb/s in the afternoon when the kids come home from school and check their facebook accounts.

I can see servers crashing and maybe the internet crashing with possibly dire consequences for all who rely on it as part of their business, security, files or anything else more important than Microsoft's bottom line.

Dave Shaw

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Backing Up To The Cloud

Prevent a rainy day disaster by using Cloud services for backup

These days it seems that all the online services are offering online storage space. Recently, prices have been dropping across the board with Google Drive, Dropbox, Microsoft and others slashing prices to encourage users to move services to them.

Dropbox, one of the first online storage services, now offers 1TB of storage for $10 a month, however this has been undercut by services such as Hubic (offering 25GB for free, 100GB for €1 a month or 10TB for €5 a month). With all that storage space, it's easy to upload as much data as you want – which in turn makes it easy to backup data to the cloud offsite, if that's what you want. In doing so, though, you no longer have total control over the data and it could potentially be viewed by others that shouldn't have access to your files. Data can be encrypted during transit, and services state that they encrypt the data on their servers, but there are unseen factors – if an employee was to turn rogue, for example, or a system be hacked – that could see usernames and passwords stolen, or data accessed.

As Edward Snowden has shown us all with his leaking of NSA files on US Government spying, and with our own new government already discussing implementing a so-called 'snooper's charter' again, it's not just hackers that might access your data. Certain agencies appear to have the capability to trawl files at will – Google states that it scans files, Dropbox allow files that are the same as ones in someone else's account to be uploaded instantly (i.e. they store a single copy) and Microsoft have banned users for uploading images that they deemed broke their terms of service, which de facto means they're taking a look at them.

However, if you upload data to the services already encrypted, then the services cannot view the data that you've uploaded and it's much more secure against prying eyes. Doing so means you can use whatever service you want to use without fearing for the safety of your data (in terms of data security). If you hold the encryption keys, theoretically, no one can view the data other than you.

So how can you upload the data to these services encrypted? And how can you keep your computer backed up to the cloud using these free services? This article explains a range of options.

Services

There are a few programs that will allow you to upload to different data services after the data has been encrypted locally. These apps may not require that the services own backup/sync program is installed, and therefore you can often backup to multiple services with just one backup app. For example, Arq does not require the OneDrive program to be installed for it to backup to OneDrive. It also backs up to Dropbox and Google Drive without requiring them to be installed, and therefore you can use one program to backup to multiple services without having each services own programs installed.

Note that, in most instances, if you lose the encryption key you will also lose access to your files – so make sure you keep a (secure) backup of your passwords.

Arq ($40)
www.arqbackup.com
Arq has been around for the Mac since 2009. It was created initially to backup encrypt data and backup offsite using Amazon S3. Since then, it's been updated to send data to Amazon Glacier, Google Drive, Google Nearline, SFTP servers, OneDrive and Dropbox. It's also recently released a Windows version, but unfortunately there is no Linux support.

Arq encrypts and compresses all data locally before it uploads it to the service you choose. Data is also compressed, and you can select any folder you want to backup on you computer or NAS drive. Each service can be backed up with a different password as well, so you don't have to repeat the password for each one. For those that are familiar with Apple's Time Machine, the program works in a similar way – by default it runs every hour and uploads changes to the files. It doesn't delete any files that you've uploaded it unless you tell it to.

Arq costs $40 for a software license (for an additional $20, you can get a lifetime upgrade version), but with one license you can upload to multiple services. These services will cost extra, but it does allow you some flexibility as to what service you use – bearing in mind that Dropbox gives 50GB for a Samsung phone purchase, Google give 100GB with every Chromebook purchase and Microsoft give Unlimited storage with Office 365 subscriptions.

Setup is easy – once the program is installed, Arq lets you choose the account you want to sign into on first starting. This will then let you select a passphrase for your encrypted backups to that service and if you're using Google Drive, you can opt to hide the files you upload to the service so they're not visible when you browse the website of the service online (this is specifically a Google Drive feature, as it can hide Android uploads etc. within the hidden area that you can't edit directly). This is handy as it can prevent you from editing the files within the backup folder, which would cause issues with backups and recovery.

Once the setup is done, you choose the folders to upload; these can be any folder you want on your system, including NAS files. Selective upload can be achieved by either selecting each file and folder individually or by using the filter to filter out files by name or extension. The software then compresses and encrypts the data and sends it to the server.

▲ *Arq backup page*

▲ *Arq restore window*

▲ *Boxcryptor - with the encrypted file on the right*

▲ *Boxcryptor can be used with various cloud services*

Boxcryptor (Free/$48 a year)
www.boxcryptor.com

Boxcryptor takes a different approach to that of Arq. It requires each service you want to backup or sync with to be downloaded and be running on your computer. It then creates a virtual drive on your computer that encrypts all data you move into this folder. This means that only the encrypted data is uploaded to the service you're using. As the service creates a virtual drive on your computer, you can use it with any backup or sync service you want that can run on your system. To backup your data already on your machine, you have to move into the Boxcryptor drive.

The data is stored on your local device (as well as the offsite service) as encrypted data. It is only by accessing the data though the virtual drive that you can access the unencrypted data itself. This can potentially cause issues with other backup programs, like Time Machine, that would backup the encrypted data. You would need to point the backup program to the unencrypted drive, rather than the Dropbox/Drive folder.

Boxcryptor operates a freemium model. That is, the software works on two devices for free (say, a computer and a tablet application) and you can use a single web service (such as Dropbox), but if you want unlimited installs and to use more than one service, you would need to move for the subscription based service. This currently costs $48 a year, but allows allows you to share files with others using the links – and to encrypt the filenames of the files for extra discretion – along with unlimited installs and unlimited services.

▲ *Duplicati by default backs up important document folders*

▲ *Duplicati asks if you want to encrypt your data - it's not compulsory*

▲ *A list of some od Duplicatis backup locations*

▲ *Settings can be changed on setup with Duplicati*

▲ *Duplicati backup being run*

Boxcryptor doesn't upload or download any data itself. It relies on the service you're using to do that. The files you put into Boxcryptor remain the same size the service itself will deal with how the file is uploaded and downloaded when the file is changed.

Unlike the others mentioned in this review (other than Crashplan and Spideroak), Boxcryptor is the only one that has a mobile app, for both Android and iPhone. This means that you can download and access your encrypted files on the go if needed. This can be handy if you need to sync files between devices or even just access a backed up file on the go.

Duplicati (Free)
www.duplicati.com
Duplicati is a backup client that securely stores encrypted, incremental, compressed backups. It works similarly to Arq, in that it encrypts data locally and then sends this data to a remote server. It deduplicates data (so you're not sending the same file to the server more than once) and like Arq, only uploads the changed portions of the file to reduce upload time and wasted bandwidth.

Duplicati is an open source software program and can be downloaded for Windows, Mac and Linux which allows it to backup all major operating systems. Like Arq, all the uploads are dealt with within the software so there isn't any requirement to be running other software other than Duplicati. However, it is more limited in where it'll upload data to. The website states that it is designed for Amazon S3, SFTP and WebDAV and Google Drive. This is more limited than Arq in terms of third party services, but is handy if you already have hosting on an SFTP site somewhere (I get 5GB free with my email account).

If you want to upload to Dropbox or alternative, you'll have to use a workaround solution like DropDAV (**www.dropdav.com**). This can be a messy workaround, and isn't always guaranteed to work, though some storage providers (such as Box) provide WebDAV access.

Veracrypt (Free)
veracrypt.codeplex.com
Veracrypt is cross-platform on-the-fly encryption software. It creates a container file on your computer and then mounts it as a virtual drive. Everything within the Veracrypt folder is then encrypted using a specified passphrase. Veracrypt replaces the more well known, Truecrypt, which was discontinued last year.

By putting this Veracrypt file into a folder that is sent to an offsite service, all your files are encrypted. This approach is similar to Boxcyptor in that you'll need to have the services software running on your machine to allow the file to be uploaded.

Veracrypt however, suffers from a flaw in terms of offsite backup – in that the container file is a single file that is uploaded to the server. If you have a large backup, this may take some time to update the backup, even if a small file has changed within the container. Most services are built to upload delta backups only (only the changed data) but not all seem to be. Veracrypt's approach is similar to Boxcryptor, except Boxcryptor encrypts each file individually, whereas Veracrypt backs up the virtual drive within one file.

There was a concern in the last few years that Truecrypt was unsafe, but it seems from recent studies that this isn't the case – though the developers have stopped development, citing that operating systems have good encryption methods built in now. Veracrypt fills the gap of

▲ *Veracrypt main window*

▲ *Creating a Vercrapyt container file*

▲ *Select the format for the container file*

▲ *Mounting Veracrypt file*

Encrypted Online Services

If you want to use a backup service that encrypts data itself there are a couple of options. Spideroak states that it is a zero knowledge backup solution (in that the password is never sent to Spideroak servers). It was recommended by Edward Snowden as a privacy concerned service.

In addition, Crashplan can encrypt files. In it's default mode, Crashplan stores the account username and password on the Crashplan servers and therefore an employee could theoretically access your data. Crashplan does however offer the option to encrypt all data sent to the servers with a 448-bit encryption key that never leaves your computer. If you lose the key, you lose all access to your data, though!

Other options

If you encrypt the data locally, you could use something like Expandrive (**www.expandrive.com**) to copy the encrypted data to a number of different online backup services. Linux users have access to EncFS which perfoms in a similar function to Boxcryptor (but is free and open source). Mac users can upload encrypted disk image files, using Disk Utility and Windows can use Bitlocker with Virtual Hard Drive files (though this is limited to Windows Professional, Enterprise or Ultimate editions).

Not Encrypted

Be wary when using third party encryption tools. Recently it emerged that an encryption app for Android was easily compromised and the password was easily guessable, therefore making your encryption easily negated and therefore useless. Most will publish how they encrypt your data and you'll have to consider if this is good enough. Open source tools are considered to be the best for security as many people can review the code and see how safe the software is. However, this is not always fallible as could be seen in the case of the Heartbleed bug, which was a bug within the OpenSSL library affecting encryption between your computer and a web server.

Truecrypt and is very similar in terms of looks and function. It features a number of improvements over Truecrypt in security terms.

Veracrypt is perhaps a bit more involved than other software. You have to start the program up, select 'Create New File' and follow the process through. For encrypting data for cloud storage, you need to create a container file, select the encryption methods (the default is fine) and then select the size. The software asks you for a passphrase and then gets you to select a format for the new drive to have (remember, FAT is readable and writable on Linux and Mac by default but can't have files bigger than 4GB). Once that's done, you can mount the file and write data to the file. The container file has to be as big as the files being stored within it.

Conclusion

Hopefully the above has given you some idea on how to use free online storage solutions for backup of personal data but still maintaining your privacy by encrypting the data yourself before sending it to the service.

This article doesn't cover all the available methods of encrypting and sending data. Each operating system has a number of tools built in that can do the job and there are a large number of third party tools that will also encrypt data for you. **mm**
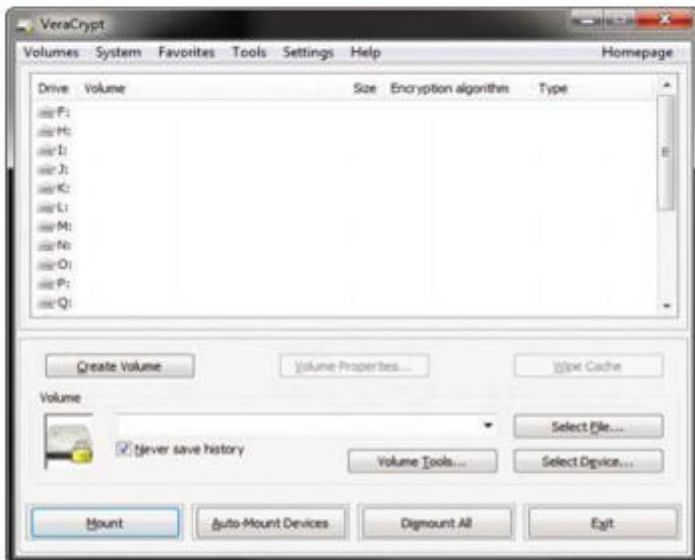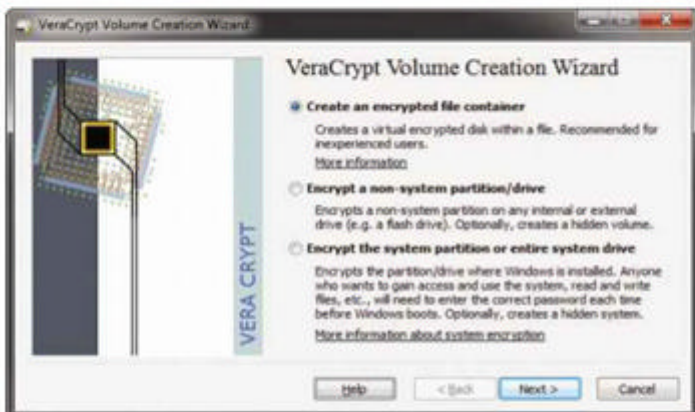
Building A Console Killer

Mark Pickavance tries to build a console-beating PC
while celebrating the Pentium's 20th anniversary

Almost exactly a year ago, I built a SteamOS PC for Micro Mart from an AMD APU processor and a H75 chipset motherboard. I recall thinking at the time that with the addition of a decent video card, the system might be comparable with the latest-generation games console, at least on paper. Indeed, if you ask most people why they bought a games console over a PC, it certainly wasn't because the games were cheaper!

There is a general view that the PC, if specified correctly, is actually a superior gaming experience to the console, but it's hampered by what a system like that might cost.

At the time of writing, the PS3 is £329 with a single controller, and the Xbox One without Kinect is exactly the same price also with a single controller.

66 It's reasonable to expect that a £500 PC should easily be able to beat a £329 console 99

Obviously, there are other deals around that bundle games and extra controllers, but £329 seems to be the magic number these days. However, when both these consoles launched, they were closer to £400, so I'm not going to beat myself up too much to get down to that level – not least because most buyers don't own any games before they own the console, whereas most PC owners are likely have titles already.

Also, to use the Xbox One, you'll need to fork out for a Live Gold code for the first year – another £39.99. The PSN isn't compulsory like Live, but it costs about the same. Factor in a second controller, which almost everyone buys, and you're back to sub-£400, unless you crave the Kinect, and that's another £130 on top.

After much consideration, I set my target at £400 for a working system that could generate the same level of detail or better at 1080p in a selection of games compared to the console versions. With most console games that equates to 60fps, below which things can get a little choppy.

With my £400 budget in mind, I set about building the very best games PC I could, in the hope that when it was built I'd have something that could at least give those consoles a run for their money. But to achieve this I needed a radical plan, one that didn't involve stealing the parts.

The Planning Stage

I'd be the first to accept that as a tech journalist I do get a rather skewed idea of what a PC build costs, on the basis that I had most of the bits for this one on the shelf.

Not having to pay for items definitely makes parts cheaper, even if it's slightly delusional. Therefore I decided early on that what I'd do was use a part that I had handy but price up an equivalent if I was forced to source a part for hard cash. This might seem like a cheat, but frankly I'd be happy to test the exact bill of material for this computer against what I actually put together, and as they both have the same CPU and video card they'd be amazingly close performers.

Because of this, I've ended up with probably a better CPU cooler and better memory than I really needed, but that was for my financial benefit more than it was to suggest you use the same.

That point made, all good projects start with a critical part, and in this computer there are two of them. I've remarked recently in the magazine that Intel seems content to keep the cost of its processors artificially high, as AMD doesn't currently represent much of a challenge to its desktop product range.

At around £150 for a good Core i5, that chip would consume 40% of my budget, so it's out of the question. What I needed was a processor that's much cheaper but which can be tweaked to get extra performance out of it. The obvious candidate for that is a curious processor that Intel launched to celebrate 20 years of the Pentium, the amazing Pentium G3258.

On paper this looks a bit of a dud. It's only dual core, doesn't have Hyper-Threading or much in the way of cache memory. Normally, that's a combination that would keep gamers heading in the opposite direction, even if it does have a 3.2GHz default clock.

Still, it has one feature that none of its Pentium brethren can match: it's completely unlocked for modification, and as one of the Haswell generation, it's also been fabricated using a 22nm process – the perfect ingredients for some fine old-fashioned tweakery.

That's one part of the recipe, but if I insisted on using the Intel HD Graphics GPU in the G3258, then this wouldn't be much of a gaming experience. Luckily, because the Pentium only cost £50, there was plenty left in the kitty for a decent video card too.

At various points in this project, it was going to be an Nvidia GTX 750Ti, and then I realised that most of the cheaper cards of that series don't have DisplayPort. As this is a technology that I'm slowing moving to, in the end I went with the even cheaper

Original Parts Build	
Parts	**Costs**
Corsair Carbide Series 100R Silent mid-tower Case	£53.00
Intel Pentium dual core G3258 3.2GHz Socket 1150 3MB L3 cache retail boxed processor	£50.86
ASRock Z97 Pro3 motherboard	£76.99
Asus DirectCU II OC Radeon R7 260X	£66.66
Crucial 4GB (2x2GB) DDR3 1866MHz Ballistix	£40.00
Corsair Hydro Series H80i GT high performance liquid CPU cooler	£84.06
Enermax MaxPro 700W	£55
Corsair Force LX 128GB 2.5" SSD	£56.99
Total	**£483.56**

Revised Parts Build	
Parts	**Costs**
Corsair Carbide Series 100r mid-tower case (black)	£44.50
Intel Pentium dual core G3258 3.2GHz socket 1150 3MB L3 cache retail boxed processor	£50.86
MSI H81M-P33 motherboard	£31.98
Asus DirectCU II OC Radeon R7 260X	£66.66
Corsair 4GB DDR3 1600MHz XMS3 memory PC3-12800	£35.13
Corsair Hydro Series H55 high performance liquid CPU cooler (refurb)	£34.98
Corsair 430W V2 CX Series PSU	£40.60
Kingston 120GB SSDNow V300 2.5" SSD	£41.99
Total	**£346.70**

Radeon R7 260X. That has the ports and power to drive a game very fluidly at 1080p.

The case, PSU, cooler, memory and storage were almost secondary considerations to the CPU and GPU showboat, and the chosen motherboard was a LGA 1150 one that I had unused.

Because of that, I've built two shopping lists (see below): one that I actually used and another that I could have, had I started with absolutely nothing. As you can easily see, there's a pretty huge difference. And, you could make the revised list even less if you used a stock air cooler for the processor. I put £40 for the

Ballistix RAM as an arbitrary amount, because the ones I used you can't buy any longer. The conclusion must be that if you exclude the cost of the OS and some peripherals, you can build a PC for console money, but will it perform like one?

Before I can answer that question, I need to build it and then configure it to get the very best performance out of the hardware.

The Building Phase

All my PC builds follow a very similar pattern these days, as I've worked out the most efficient approach to assembling the parts by now. The first job is always to strip the case down so I can
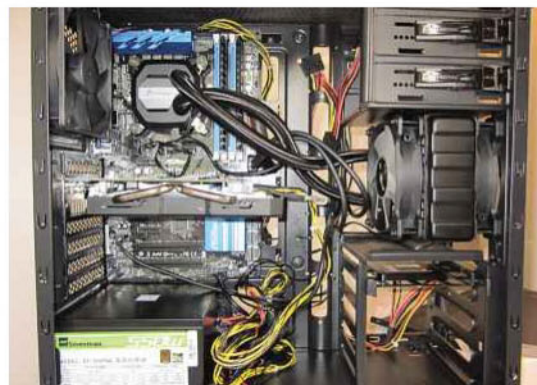
access all the things I need for mounting the motherboard and running cables.

Once that's complete, I mount the CPU on the motherboard and mount that, because it's easier to get the processor in the socket away from the case. What I don't generally do is mount the cooler at this point, because it can make working around the motherboard difficult in respect to the power supply.

In this design I've decided to go with a closed water cooling system, not for any other reason than I'm going to overclock the processor, and it helps in that endeavour.

What I'll say about that choice is that with the G3258 it isn't a necessity, because it's possible to overclock this CPU by some way purely on air cooling.

Therefore, if you want to build this system even cheaper, you could remove this item and use the stock item, saving yourself at least £50 or more.

Equally, the case I used isn't the cheapest, and neither is the main drive or the PSU, so there's room to either reduce the costs even further or redistribute the expense to get a better GPU or a CPU that doesn't need overclocking.

The case I've chosen is the excellent Corsair Carbide Series 100R. I happen to have the 'Silent' model that costs £53, although it makes another version with a clear side panel that's only £44.50.

The motherboard was an ASRock Z97 Pro3, though anyone wanting to do this more cheaply should use a H81 platform.

Normally in these features I'd detail the exactly build method, but there isn't anything special about putting this system together other than the fun I had with the H80i GT water cooler.

Unless you've got a case with a specific place designed to take the radiator, then finding the perfect place for it can be something of a challenge. Corsair suggests you place it over the rear fan vent, but there just wasn't clearance over the CPU to make this work. Ideally a ventral position would have been perfect, but there is no vent or space on this case for that. In the end, I did something counter-intuitive and placed in between the internal and external bays, so it could suck cool air from the outside. The disadvantage of this is that it now pushes warmed air in towards the video card, although I retained the rear fan to expel it from the case.

If you don't use water cooling, then this is a very simple build that would take anyone with experience probably less than an hour to complete.

When it was all working, I installed Windows 10 preview edition, purely because it wouldn't keep asking me for a valid licence code while I worked on it.

Tweak Town

Once you've built a PC, the first thing you need to do is make sure it works as is, before you do anything else with it. This part is crucial, because there's nothing more infuriating that trying
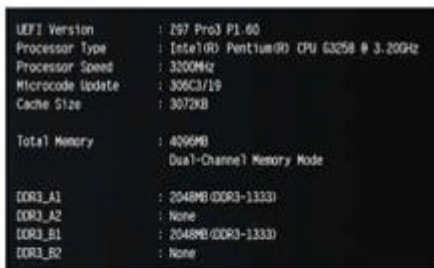
⌃ I fired up the PC and entered the UEFI BIOS by hitting 'del' before Windows could boot and made sure that everything was set to the normal defaults. Prior to starting this exercise, I'd upgraded the BIOS to the very latest version and set any minor changes I normally make, like disabling the serial port IRQ.

⌃ It's worth looking in the H/W Monitor panel, to make sure the cooler is working correctly and what voltages the CPU is currently enjoying. The CPU is currently at 38.5C, and CPU input voltage is 1.744V. Vcore is a very modest 1.088V, a low level from which to start progressing upwards as we increase the clock speeds.
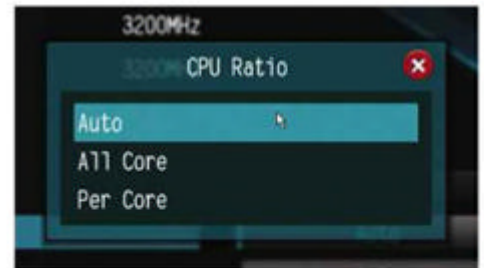
⌃ On this ASRock board all the controls I need to adjust are in the 'OC Tweaker' panel, and they do include an option to 'Load Optimised CPU OC Settings', which I'm ignoring. You can select 4GHz here, but learn nothing about how this system works. Instead my first job is to access the 'CPU Ratio' setting and set it to 'All Core'.

⌃ Directly below I set the ratio to 40 (100MHz x 40), and the cache to 35. I could have set the cache clock to the same as the ring clock, but these are early days, and I want to take things slowly, initially. Higher cache speeds can introduce instability, but I'm not expecting any at this level all the same.

⌃ With the speed set, there are a few things I want to disable. The first of these is Spread Spectrum, and the next is Speed Step. On a normal machine these features generally make the system more stable, but in this context they could create problems that I'd rather avoid. Those who feel brave can turn them back on later.
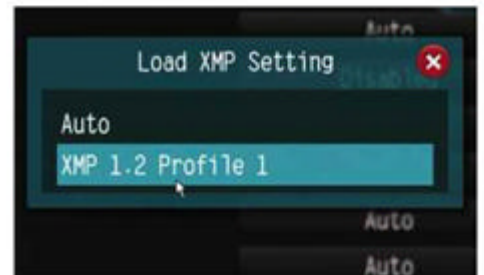
⌃ Memory isn't the critical factor that it once was in overclocking, ever since they decoupled the memory speed from the CPU bus. It's best not to try overclocking the RAM at the same time as messing with the processor, so the best option if you have it is to simply select the XMP memory profile and leave things in an optimal place.

⌃ Now we get to the meat in this sandwich: voltages. There are two critical ones that need to be messed with, and the first is Vcore. I set the CPU Vcore Voltage Mode to Override, and put 1.122V in this slot. That's only a little more than the default, but there's no point over-volting the system as it will only make it hot for no gain.

⌃ The other voltage change is the CPU Input Voltage, which was fixed at 1.900V and I actually lowered to 1.770V. These are effectively the only changes you need to make initially, which must be the simplest overclocking I've ever done. After those changes you can hit F10 and save the settings, before attempting a reboot into Windows.

⌃ The system booted first time and initially seemed fine. As the H80i GT water cooler didn't fully kick in till the system was in the OS, it actually idled cooler than it did in the BIOS at 3.2GHz. Unfortunately, after I stress tested it I noticed some minor instability, so I went back in the BIOS and upped the Vcore a bit until it stabilised.
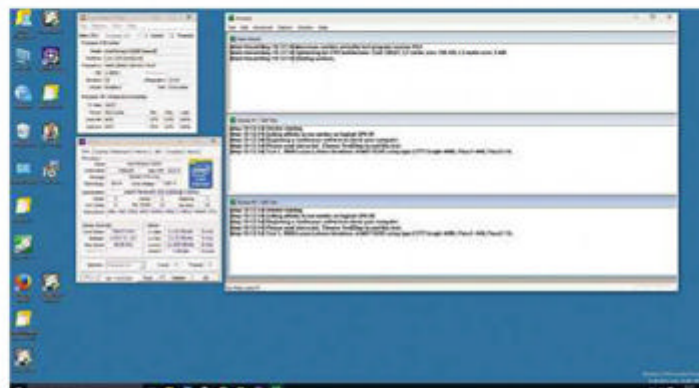
⌃ To make sure I'd got enough voltage, I ran a torture test on Prime 95 while using Core Temp to track the CPU for several hours. The maximum temperature the system hit was about 70C, and most of the time it cruised at about 67C, well inside my maximum target.

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to overclock a system that has an inherent fault from the outset.

There are numerous free tools you can use to do the soak test, but I'd recommend Prime95 (**mersenne.org**) as a straightforward torture testing device. If the PC can run this straight for 24 hours, then you can be reasonably confident that it's a stable platform on which to build.

I'm old enough to remember some of the frankly insane things that you needed to do to get chips over their specification in the past, but these days it's all rather civilised. That's because instead of trying at every opportunity to a scupper you, the chip makers have realised that the enthusiast community are good customers, especially if they think they're getting something for free. Now, both AMD and Intel make processors that are 'unlocked', allowing some creative alterations to be made that can improve performance, sometimes by disturbing amounts.

Intel processers that are unlocked are denoted by their 'K' classification, and those are the ones that are most prized by enthusiasts. Usually they cost a bit extra, but the object of my intentions here, the G3258 is about £50.

These days, I've generally matured in my attitudes, and ragging processors till their pins glow red isn't something I commonly do. But hey, it's the 20th anniversary of the

66 There is more to performance than clock speed 99

Pentium, so it's time to unleash the demonic hell-hounds of thermodynamics.

The G3258 is a 3.2GHz dual-core CPU without Hyper-Threading, which on the face of it doesn't seem a great choice. That said, what we're fighting here is heat, in that realistically the chip will work well until it reaches about 100°C. So nothing unfortunate happens, I've put an arbitrary cap of 90°C on proceedings, and we'll see how far the chip will go before it gets that toasty.

What I have on my side is numerous things, not least that with just two cores there isn't much surface area to generate heat, and plenty of chip surface to dissipate it. This is also a 22nm fabrication, and I've got the H80i GT water cooler sucking the heat away from the CPU.
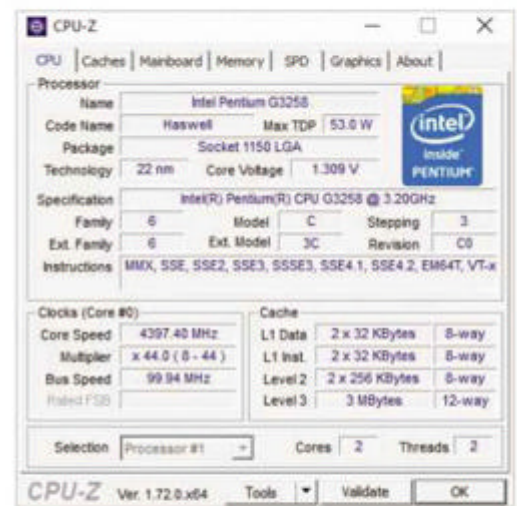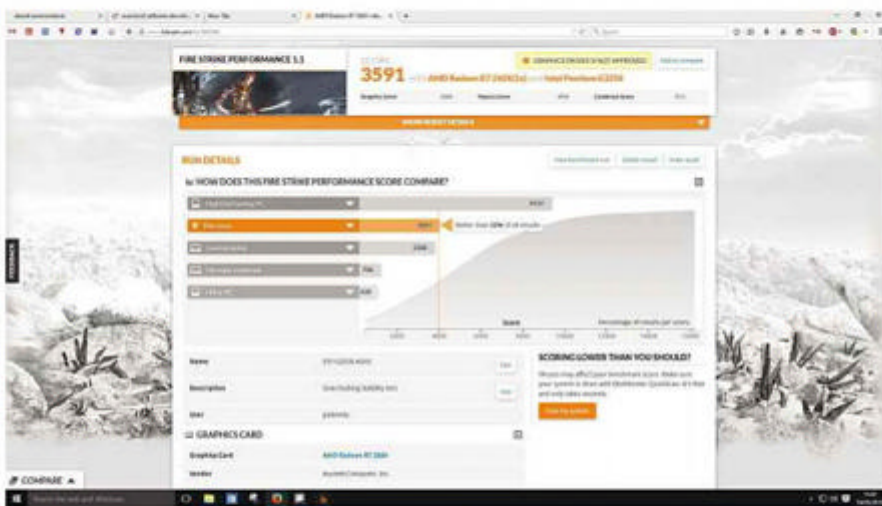
On paper, this sounds like a perfect combination of circumstances, but how fast can I get the 20th Anniversary Pentium to go, and will it actually be worth the effort?

First port of call on this mystery tour is 4GHz.

4GHz Or Bust

On some chips, throwing them from 3.2GHz to 4GHz might be considered excessively optimistic, as it's 25% faster than stock speed. But my research showed just how adaptable the G3258 is, and 4GHz is just a short paddle in the greater ocean of tweakery beyond.

Pips Squeaking

Getting the G3258 to 4GHz isn't at all difficult, because it's patently well within it's true performance envelope. Even though I didn't leave the system at this speed setting for long, I did a few benchmarks to access what the real benefits were. This is a critical part of the exercise, because it's not unheard of that speeding up a chip can actually make it slower in some tests.

I wasn't expecting this to be the case, and in general it wasn't. However, it's worth pointing out that when I ran 3DMark Fire Strike, the score only moved from 3361 to 3591 – less than 7%. Therefore, in that test, pure clock speed is only a portion of the whole story, and other factors are in play.

To reduce the impact of the video card in the equation, I ran that old classic Super PI 1.5 4M, which took 43.031 seconds versus the 58.643 seconds baseline 3.2GHz level. That's 27% more computing power, on a 37.5% higher clock. However, going higher than these speeds seemed destined to frustrate me.

The system posted fine at 4.5GHz with sufficient Vcore voltage (1.3V), but Windows was highly unstable, and most of the time would crash before it fully booted. The obvious choice was to hike the voltage to get stability back, but that proved not to be the magic bullet in this case. I was also getting close to 1.36V – about the most I really wanted to use.

Eventually, as suggested by someone else, I tried enabling Internal PLL Overvoltage, and amazingly that was the critical factor in getting my G3268 to 4.4GHz. I was actually a bit disappointed with this, because I've seen lots of reports of people getting to 4.7 and even 4.8GHz on air cooling. My chip was a little disappointing in this respect, and I can only conclude that this specific processor on this motherboard wasn't a perfect marriage for some reason. That said, a

1200MHz increase in clock speed (37.5%) isn't that bad, even if I'd have liked more.

What was slightly sobering, however, was that for the last 400MHz, a 10% clock boost, I managed to increase the Fire Strike benchmark from 3591 to just 3663. That's only a 2% increase in video performance, suggesting that the 260X was approaching its limits. Comparing a PCMark 8 Home test, which went from 4637 to 4878, a more than 5% increase, supports that view. But it also shows there's more to performance than clock speed in this instance.

> ❝ **First port of call on this mystery tour is 4GHz** ❞

Costs And Conclusions

When I actually put together the parts list and priced this computer, I was a little shocked, as it wasn't anywhere near the low cost I was looking for.

It's reasonable to expect that a £500 PC should easily be able to beat a £329 console. But my reliance on off-the-shelf items has actually made this computer a good bit more expensive than I'd intended.

Using the cheaper 100R case, an alternative motherboard, 4GB of RAM, a refurbished cooler, a slightly smaller PSU and a cheaper Kingston SSD, I knocked off a massive £150. If I'd dropped the water cooler altogether, then it would have been cheaper than either of the games consoles, and by a decent chunk. Probably enough to buy an OEM licence of Windows 7, which I didn't include. Many people could easily run SteamOS, which is free, or another flavour of Linux.

If you look at the performance levels that I was getting out of the R7 260X, this is a much more powerful system than either console and capable of higher detail levels and higher resolutions. This system could also use Eyefinity multi-display mode or one of the new variable frequency monitors supporting AMD Free Sync.

But there's another story here, and it's the G3258, an insane piece of silicon that can overclock to almost unprecedented levels, even if the one I own seemed a little shy.
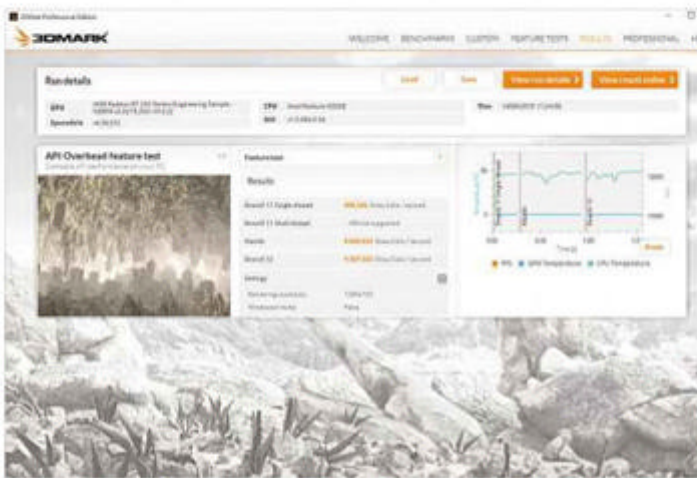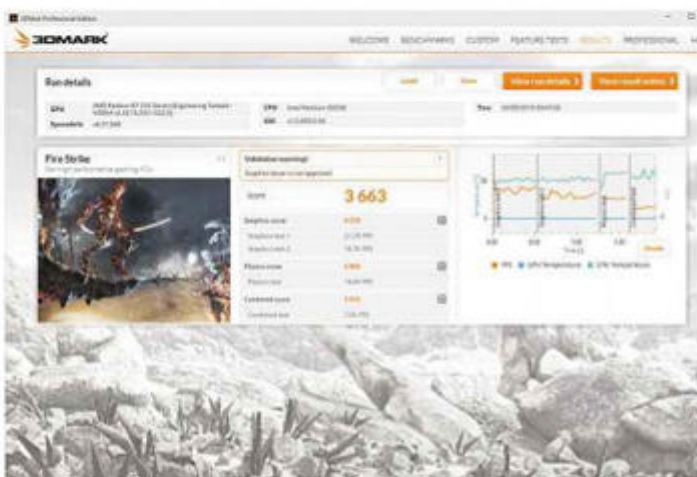
If you think 4.4GHz is impressive, then you should search the internet for the lunatic who through the use of extreme cooling technology managed to get it to 6.7GHz! Obviously, that's not a practical exercise to run on a daily basis, but it shows how paring down the system to two cores and controlling the voltages can yield spectacular results, in theory.

These things said, it's easy to get carried away and forget that what I managed to do was use tweaks and water cooling to drive a cheap chip up to the level of a medium performer. For another £50, I could have used a low-end Core i5 at stock speeds and got more real performance.

As an aside to these experiments, and another reason I used Windows 10 preview, was that I ran some tests using the new DirectX 12 and also AMD's Mantle API. For those unaware of these technologies, they aim to get the GPU working to maximum potential by reorganising how the API drives the video card.

With this functionality in place, at 3.2GHz the 260X using DX12 performed over seven million draw calls per second, compared with just 700k on DX11 multi-threaded.

And at 4GH,z it shifted a stunning 9.2 million calls compared with 890k on DX11.

The hint, if you didn't get it, is that under Windows 10, the performance of all video cards is likely to improve massively, once game designers support the new API.

However you get there and even before DX12, it is possible to build a PC that can easily outperform a console for around the same money, but if you take the G3258 route, it might involve more work than just assembling the parts. **mm**

Warnings - Please Read!

In this feature, I'm exploring taking a chip and motherboard beyond their known specifications, and that comes with some penalties that need to outlined.

When you overclock a component, there isn't any guarantee that it will work correctly, you're probably shortening its life, and it might fail completely.

Doing this, I've broken equipment in the past, because unpredictable things can happen when a chip gets very hot or more voltage than it was intended to handle. Therefore, if you can't afford to replace your processor, motherboard and PSU, then simply don't do it.

Experimenting in this fashion can also damage your OS installation, so never do it on a system that you're using to work with. And in a worse-case scenario, you could start an electrical fire, with all the negative consequences that could follow that scenario.

Because of this, never experiment without some suitable (not water!) means of extinguishing an electrical fire handy, in a well ventilated space and ideally with someone else handy if things get really out of control.

Take your time, and never leave an overclocking system unattended when you're torture testing it.

At Micro Mart we're not the Mythbusters, looking for an excuse to blow things up. We'd much rather that our and your experiments end without a YouTube disaster video. So please, be safe!

> 66 **If you think 4.4GHz is impressive, then you should search the internet for the lunatic who through the use of extreme cooling technology managed to get it to 6.7GHz!** 99

Top 5 Ways Your PC Could End You

Be nice to your computer and maybe you'll be spared..

1 Electrocution

They say it's the amps that kill you, but it's more like the amp – or at least part of one: between 0.1 and 0.2 amps is enough to send you to the next life. Bearing that in mind, you'd think that sticking your hands into your PC case while it's turned on would be a recipe for instant death, but worry not. There's not enough voltage running across your motherboard or the components to overcome the natural resistance of your skin (if it's unbroken, anyway).

Your power supply, however, is another matter entirely, for within there be dragons. And when we say dragons, we mean enough electricity to grant you an express ticket to the great system builders' convention in the sky. So please, never open a power supply. It's simply not worth it.

2 Fire

Place your hand in front of an outgoing PC fan, and if the system has been on for a while, it'll feel warm. That, as we all know, is because electronic parts radiate excess heat. It's the reason we need heatsinks and fans, and it's also the reason your computer should be given a bit of space to breath. Blocking up the ventilation areas will cause overheating, and that, combined with potential electrical failures (especially from cheap, unbranded power supplies), means your PC could easily become an impromptu fireplace. Thankfully, a few safety measures, like getting a decent PSU, sufficient cooling and working smoke alarms should keep you safe.

3 Inactivity

In 2012, an 18-year-old man in Taiwan was found dead in an internet cafe, after spending around 40 consecutive hours playing *Diablo 3*. Clearly, he hadn't heard about the other Taiwanese chap who died in similar circumstances just months before, who reached a permanent game over state after just 23 hours. These are merely two of several such cases of extreme gaming sessions killing people, but it's not just gamers who are affected, and death can creep up more subtly. If you spend all day on the web or working at a PC, all the while eating doughnuts and crisps, you're probably fully aware that you're pushing yourself ever closer to an early grave.

4 The Are Other People Out There

Human beings are resilient creatures. You can take almost anything away from a man, and he can still bounce back. But never, ever take another man's virtual sword – especially if it belongs to Zhu Caoyuan, the Chinese gamer who stabbed fellow gamer Qiu Chengwei for stealing and then selling his digital blade. The sword, won in the online game *Legend of Mir 3*, fetched 7,200 yuan (around £473 at the time), but it was Qui who ultimately paid the highest price. After failing to get the police to take action, Zhu tracked Qui down and stabbed him to death (with a real, rather than virtual knife). There were similar incidents in Nottingham in 2009 and in France in 2010. The fact is the internet makes it easy to connect with people in no time at all, and sadly not always in the most productive or healthy ways.

5 Self Awareness

Turn on your PC, and the processor instantly gets to work, making hundreds, if not thousands of decisions in mere seconds. Humans, by comparison, can spend an age trying to decide whether they want ketchup or daddy sauce on their chips (the potato kind – it's probably not good for CPUs). But in spite of these vast computational skills, artificial intelligence still lags significantly behind our own squidgy grey matter – for now, at least. When the robot revolution does happen, though, it'll probably start with small things, like search engines that guess what you want to search for before you've searched for it and voice controlled digital assistants that can make phone calls for you… Oh, hold on a sec, we already have those…
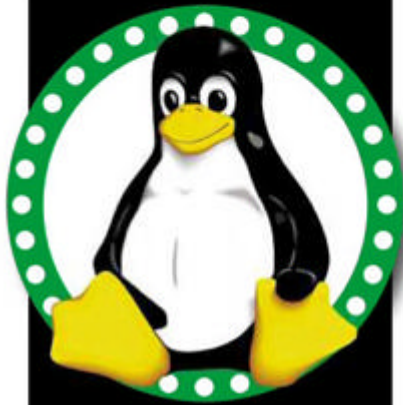
Working Linux

Linux, as a career

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

I had some good news the other day. A friend, Neil, who was made redundant a couple of years ago, has now landed himself a job, as a Linux administrator for a company in London. What's extraordinary, though, is that he never used Linux until last year.

He was an engineer, having worked from school at a shipyard for the best part of 24 years. But with the company's order book looking bare for the last six months, he and many others were unfortunately handed their cards and given a fond farewell.

As a part of his getting back to work scheme, he visited the local job centre daily but, in his own words, "It was such a depressing place, I decided to go it alone and find a job on my own." With his limited redundancy, he bought himself a cheap, refurb laptop without an operating system and powered it on. Obviously nothing much happened, and with him being a bit of a computer 'noob', he gave me a call.

Since he was living on limited funds, I suggested he download and install a copy of Linux Mint – since it seemed like the friendliest option to begin with. Neil followed my instructions over the phone and soon found himself staring at the desktop of Mint. After a quick introduction to the desktop and the installed programs, he thanked me for the help and decided that it looked 'okay' and that he would muddle through.

I didn't speak to him for a few months

after, but then I received a call from him asking me a couple of command line questions. I answered them and asked how he was getting on. "Great," he said, "Linux is really good – much better than the slow Windows the job centre had."

Moving On

Just last week, he called me up again and thanked me for helping him install Linux on his laptop. I asked him how it all went, to which replied. "Well, it was tough to begin with. I didn't really know what I was doing or what the system was asking from me. Most of the online tutorials I looked up were wrong or only went so

far then seemed to skip some vital steps or never catered for a problem if one cropped up. In the end, I just followed what I could and dipped my toes in slowly.

"As it turns out, though, I took a few Linux courses at the local college, then moved on to some home-based courses, and I've just finished my Red Hat Certification. With that little lot, I've just got myself a job in the city as a

> ## 66 It's good to hear someone getting back on their feet 99

Linux Systems Admin and start next week!"

Old Dog, New Tricks

Although it's not necessarily Linux news, I thought it was a nice Linux story to share with you all. Those of you who are thinking of changing jobs or careers and who are a dab hand at using Linux on the desktop, have you considered it as a career? Also, it's good to hear someone getting back on their feet after taking a kicking from their job.

I found it quite a positive story, and since it concerned Linux, it made it even better. If you have any Linux-related stories you'd like to share, then please get in touch.

Until next week, folks.

◄ *A good news Linux story. Long may they continue*

News Updates

More from the Amiga part of the market, with Sven Harvey

Hollywood GL

The multimedia programming language (or cross platform multimedia application layer) Hollywood has just had rather a major upgrade, and it's available for free. Taking the form of the GL Galore plug-in, it allows Hollywood programmers to use OpenGL scripting and thus hardware accelerated drawing using its wrapper, and it allows for rapid program prototyping, all compatible with AmigaOS flavours via MiniGL, TinyGL or StormMesa depending on the platform. It's also the first plug-in to receive a seal of quality for use with Hollywood 6.0.

If you want to start putting applications and even games together, it may be worth a look – and you can find out more at **www.hollywood-mal.com**.

More A-Eon Software

A-Eon Technology has been busy again, with the acquisition of TuneNet – a multi-format music player and audio streaming application originally developed over ten years ago by Paul Heams. The agreement sees the program and brand rights coming under the A-Eon umbrella with so many other big Amiga software names, with the company intending to target new releases on both classic and current AmigaOS machines, as well as Amiga-a-like OS and emulator systems.

A-Eon technology has also released the first iteration of a newly developed application. Developed by Andy Broad, Multiviewer and Multiviewer NG, for classic Amiga and AmigaOS 4.1 systems respectively, is a multi-format file viewer, which makes use of the Amiga OS's unique Datatypes library system. The program will link in with other Workbench-based applications such as Personal Paint and ImageFX and has full Ringhio support. The classic version has as many of the NG features as possible to implement and acts as a replacement for the original Commodore application Multiview, which shipped originally with AmigaOS 3.0.

You can find out more about Multiviewer and TuneNet at the A-Eon Technology website at **www.a-eon.com** or **www.tunenet.co.uk** shortly.

Commodore: The Amiga Years

The oft delayed and repeatedly cancelled and reinstated (by publishers) follow-up to the *Commodore: A Company on the Edge* book is finally looking like making it to a public release. Brian Bagnall is launching a Kickstarter, which will be live by the time you read this, if all goes to plan (due on 15th June.) Unfortunately, there is no link as of yet, but there is the Facebook page for *Commodore: A Company On The Edge*, where updates have been appearing. You can find that page at **goo.gl/vsokn2**.

▾ *Commodore: The Amiga Years book, coming to Kickstarter.*

Event Updates

The UK's 30th anniversary event at the beginning of August has added Trevor Dickinson, on of the people behind A-Eon Technology, to the guest list. A-Eon Technology is now also a sponsor, and Trevor is due to give a talk and presentation at the event.

The guest list has become something of an Amiga music lover's dream, with the guest list now including Mike Clarke, Allister Brimble, Tim Wright (CoLD SToRAGE) and Bjørn Lynne (Dr. Awesome), so if you're a fan of the music from Team 17 and Psygnosis games especially, this will be a huge treat. Rumour has it David Pleasance may bring his guitar too. After all, the Amiga is Everybody's Girlfriend!

Find out more about the UK event at **www.amiga30.co.uk**.

There are various events worldwide taking place, and you can find out about the main ones at **www.amiga30. com** and **www.amiga30.eu**. Various smaller events are taking place too and a non-exhaustive list is being maintained at **goo.gl/TVeHLL**.

A Is For Apple, M Is For Music

Ian McGurren looks at the current music streaming options

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

Apple Music. Has a familiar, Beatlesque ring(o) to it, don't you think? Well, even though it's not anything to do with a little-known pop combo from Liverpool, Apple Music could well be as big as The Beatles, certainly if Apple the technology giant gets its way. Long rumoured and all but confirmed when Tim Cook handed Dr. Dre the GDP of a small nation for his style-over-substance headphone setup with middling streaming service thrown in. Now it seems more obvious that Apple really wanted the prebuilt streaming service, and the well-known headphones came as a bonus. So by the time you read this, the collective power of said rapping general practitioner, Trent Reznor, and er, Zane Lowe will have thrust Apple Music into our online lives. But what resistance does it face? Who are the big names already running the music streaming market?

Spotify

Let's start with the big one, the original legal streaming service so old that when it was first launched, most questioned its legality. Now Spotify is so much part of our collective media conscience that the play counts it amasses count toward young guns efforts to climb the hit parade. There's a good reason it's so revered, though: it's very good at what it does. Tons of music from nearly every popular artist? Check. Easy to use? Check. Decent free version? Check. Reasonable price? Check. Arguably the lead others in this field follow, Spotify is the one for most of us, bar (ironically) The Beatles, Prince and Taylor Swift.

Deezer

Deezer, also stupidly named, is possibly Spotify's main platform-agnostic rival. On the surface it's pretty much the same service, but it's ITV to Spotify's BBC, a little rougher round the edges, not so refined. The mobile app alternates between signing you out and just not recognising you're online too often, and the playlists aren't quite as comprehensive. But for the same price as Spotify, you'd probably be better going with Spotify, though if you've got six months free with things like a new mobile contract and new Samsung Tab S tablet, then give it a go. Just don't forget to cancel if you want to switch.

Google Play Music

Part storage locker, part streaming service, Play Music is probably closest to what Apple Music will ultimately offer. The service examines your music collection and allows you to upload those on its servers for your own listening pleasure too. That way you can not only listen to the millions of tracks everyone else can listen to on the move, you also get to hear those DJ mixes or Pink Floyd bootlegs too. It's a good system, and the free version is reasonable too if you just want to listen to the music you've uploaded, even commercially available stuff. It's on iOS too, not just Android, though not officially Windows Phone.

Plex

Or you can be in the cloud instead with Plex. Better known for video media playback, Plex has long had an audio side too, though it tends to be overshadowed. But if you just want your many gigabytes of music available anywhere, and your Plex server's upload speed is good, then it's well worth checking out. Plex is especially useful if you have the kind of music that's not going to appear on streaming services, such as DJ mixes, bootleg concerts, rare vinyl rips or even spoken word, like comedy shows or audiobooks. Sub for a Plex pass and you can even sync audio and video to your device for offline enjoyment.

Apple doesn't always hit a home run, but then not all its projects are expected to be game changers. It does have a high bar already set here, however. Apple Music may not be the next Spotify or even the next Ping (there is a social element though), but instead adds another premium service to Cupertino's growing list of services that it can offer iOS and OS X users. Apple Music launches 30th June.

Eyeing Up iOS 9

Andrew Unsworth ponders revelations from Apple's latest keynote event

I know it's unfashionable to admit it, but I like Apple's keynote events and product reveals. As someone who likes Apple's products but who can't justify buying anything other than the iPhone (my iPad 3 and Air were both handed down to me by someone with more credit card balance than sense), I look forward to seeing what new products and services have been added to Apple's line-up.

Sure, many of Apple's more recent 'innovations', such as the Apple Watch, have been more desirable than ground-breaking, but Apple has a strong tradition of taking an existing idea or technology and improving it beyond expectation. After all, the iPhone wasn't the first smartphone, yet the original iPhone redefined not only what people expect from their phones but how they interact with technology as a whole.

Sadly, the latest keynote hasn't revealed any exciting hardware, but it has revealed some goodies to help you get the most out of hardware you already own. One such goodie is iOS 9, which brings with it an improved Siri, more intelligent life-management features and, perhaps most important for owners of an iPhone, new features for preserving the battery life of mobile devices.

Siri improvements are always welcome, although I must admit that I stopped trying to use it a while back. Siri's difficulty in understanding regional accents has diminished over the years, so that is less of an issue. I just haven't ever felt a need to talk to my phone in public instead of quietly entering a search string in Google. If Siri's

improvements make it a quicker option for performing searches and undertaking basic tasks, then maybe I'll start using it.

More important for many people will be the options for preserving battery life. I've been a bit disappointed with my iPhone 6's battery life, to be honest, as it seems to drain too quickly, especially when I'm using it for navigation with Google Maps. Apple's iOS 9

> **❝ It's good to see Apple consolidate and improve existing products ❞**

web page (**tinyurl.com/ nkbl397**) states that apps, as well as the operating system, have been made more efficient, and that this extra efficiency alone helps give users one hour of extra time before their phone needs recharging. Even better, the iPhone can tell when it's face down and will keep the screen switched off, further

helping to preserve battery life.

Another neat new feature is the ability to use two apps on an iPad side by side, which helps if you have information from one app that you want to compare or use in another. Apple provides the example of continuing a FaceTime call while you open another app to get info from it. This new feature will be supported by built-in iPad apps initially, but

hopefully third-party apps will follow suit, and I'm sure a few third-party apps will be compatible at launch.

As much as I love new hardware to coo over, it's good to see Apple consolidate and improve existing products, especially iOS, to make its products even more appealing. Good on it.
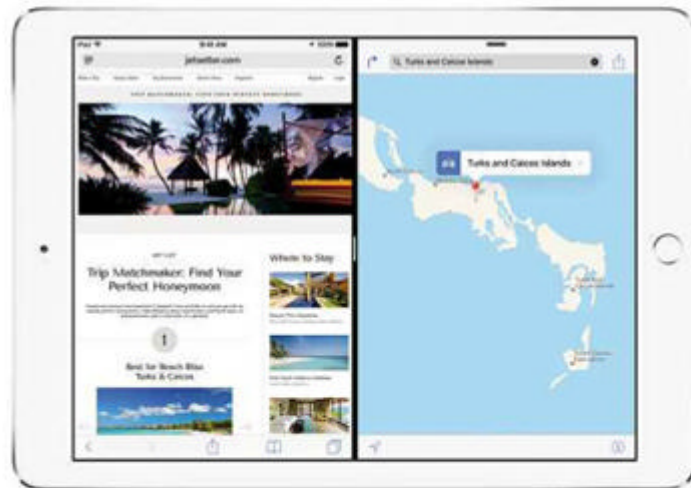
Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

Hardware

Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

Gaming

Know Your Enemy

Firaxis' reboot of the classic X-Com deservedly received lots of acclaim and purchases in 2013. And now we're getting XCOM 2 in November. This is fabulous news

This week, Ryan checks out the first details from the strategy sequel XCOM 2, and takes a look at the surprising closure of Warner and DC Comics' MOBA, Infinite Crisis...

Plug & Play

Remember when 2K Marin unveiled its *X-COM* reboot, and how disappointed fans of the series were to learn that it was to become a tactical shooter rather than a proper strategy game, like its predecessors? Suddenly, that all feels like a long time ago. While 2K Marin's *XCOM* floundered (it was ultimately released as *The Bureau* in 2013, to middling reviews) Firaxis, thankfully, swept in with *XCOM: Enemy Unknown*, the 2012 game that not only captured the feel of Microprose's classic 1990s strategy titles (particularly the original, designed by the great Julian Gollop) but also brought the series screaming into the 21st century.

Disproving the received wisdom that a turn-based strategy game can't be a mainstream success, *XCOM: Enemy Unknown* was not only a critical and financial hit, but it's also sold well enough to spark a sequel. Thus *XCOM 2* will take place 20 years after the events of the original, in an alternate future where the alien invaders of the last game have actually managed to subjugate Earth. As a result, our planet's ruled over by a government called the Advent, which keeps our cities aggressively in check. To throw a spanner in the works, along comes a group of resistance fighters – and that, as you've probably guessed, is where the player comes in.

As well as new alien units, soldier classes and stealth-based tactics, Firaxis plans to introduce procedurally generated maps (which should mean more variety and longevity for the most dedicated players) and full mod support. The most exciting bit of news from the *XCOM 2* camp, perhaps, is that Firaxis is developing the game exclusively for PC, Mac and Linux – thus leaving it free to concentrate its energies on making its user interface and controls as finely tuned as possible.

"When we looked at what we wanted to do with the sequel, we had all these very, very ambitious goals," creative director Jake Solomon told IGN. "To do that, we had to use all of our studio expertise… and our expertise here is PC. That's our home, and that's where we're really comfortable."

Concentrating on the PC version makes sense from a financial perspective, too; *XCOM* has sold an estimated 2.6m copies on Steam since its release, and is consistently one of the most oft-played games on that platform.

The quality of the previous game – and the studio's experience with its acclaimed Civilization series - means that the *XCOM* series is in safe hands at Firaxis. For strategy fans, *XCOM 2* will almost certainly gone straight to the top of their 'most anticipated' list until it appaears around November.

Online

By now, you'll probably be aware that MOBAs are a pretty big deal. *League Of Legends* is officially one of the biggest games on Earth, with the number of worldwide active users hitting 90m per month in April, according to its developer Riot Games. That success has prompted the launch of numerous competitors, including Hi-Rez Studios' *Smite*, released in 2014, and Blizzard's much-publicised *Heroes Of The Storm*, which arrived on the 2nd June.

Inevitably, some games have fared better than others in this violently competitive market. Thus, the MOBA genre, it seems, has its first truly high-profile casualty: Warner Bros. Interactive's free-to-play *Infinite Crisis*. On the 2nd June – the very day, oddly enough, that *Heroes*

▲ Warner Bros Interactive have made the surprising announcement that its free-to-play MOBA Infinite Crisis is to shut down after just two months. The game will close for good in August

Of The Storm was released – the publisher announced that it was no longer supporting the free-to-play game, which had launched only two months earlier.

What's surprising about the announcement is not only the speed at which it's taken place – even in the fast-moving world of online gaming, eight weeks isn't long at all – but also the scale of the game itself. A joint venture between Warner and DC Comics, Infinite Crisis is a game starring some of the most famous characters in comic books: Batman, Superman, Wonder Woman, Green Lantern and the evil Joker are just a few of the big names on its lengthy roster.

Developer Turbine, veterans of titles like Asheron's Call and Dungeons & Dragons Online – had been working on Infinite Crisis since at least 2012, and possibly even earlier, since Warner acquired the studio way back in 2010. This means that a game which took years to make has survived as a fully completed game for a few short months, resulting in what must be some very hefty losses for its financiers.

"This was an extremely difficult decision to make," read a statement which accompanied Warner's unexpected announcement. "On behalf of the entire Infinite Crisis team we want to thank all of you for your feedback, support and for joining together to create one of the best communities in gaming."

According to Infinite Crisis' Steam page, the game will be officially shut down on the 14th August, with players who've splashed out on starter packs or elite packs eligible for a refund through the platform. While that's fair enough, the death of Infinite Crisis has raised some valid questions about the future of the MOBA sector. According to figures recently published by GamesIndustry.biz, the market may have exploded in recent years, but the numbers are skewed by the runaway success of League Of Legends; rival games like Valve's DOTA 2 or Hi-Rez's Smite only enjoy a tiny, tiny percentage of that market.

Of course, Blizzard has the kind of marketing clout and respect that should ensure a healthy turnout for Heroes Of

The Storm, but if the combined strength of Warner and DC Comics couldn't eat into League Of Legends' market dominance, can Blizzard's shiny new MOBA? All eyes will surely be on Heroes Of The Storm's user numbers over the coming months.

Incoming

Mighty No. 9 is one of those plucky little videogame underdogs we've covered a few times in Gaming Weekly. Successfully funded on Kickstarter back in 2013, the 2.5D platformer marks the return of one of the veterans of Japanese game design – Mega Man creator Keiji Inafune. Mighty No. 9 is a platformer very much in the vein of those 80s and 90s console classics; its title hero is a boyish robot who can attack enemies with a laser blast and a shoulder barge, and can also steal their weapons and abilities. We played a beta version of Mighty No.9 earlier this year, and its action was slick and as tough as you'd expect if you've played any of the brutally difficult Mega Man games.

After a bit of a delay, Mighty No. 9 has finally had its release date confirmed – the platformer gets its worldwide release on the 18th September.
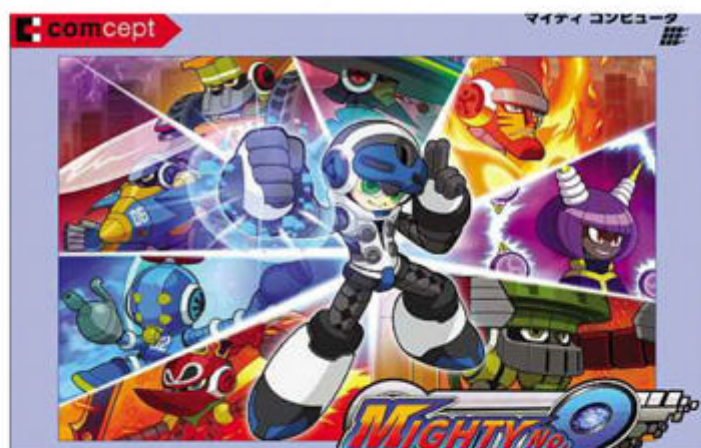
▲ After a six month delay, Mega Man creator Keiji Inafune's much-anticipated 2.5D platformer Mighty No. 9 launches on the 18th September

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31	32	33	34	35	£1.70	£8.50	£17.00	£9.70	£19.40
36	37	38	39	40	£3.40	£10.20	£20.40	£11.40	£22.80
41	42	43	44	45	£5.10	£11.90	£23.80	£13.10	£26.20
46	47	48	49	50	£6.80	£13.60	£27.20	£14.80	£29.60
51	52	53	54	55	£8.50	£15.30	£30.60	£16.50	£33.00
56	57	58	59	60	£10.20	£17.00	£34.00	£18.20	£36.40

Step 2
Choose a category you would like your advert to appear in and tick the box.

☐ Hardware for sale   ☐ Software for sale   ☐ General for sale   ☐ Accessories
☐ Hardware wanted   ☐ Software wanted   ☐ General wanted

Step 3
Complete all fields of your personal details and payment method.

Name _____

Address _____

_____   Post Code _____

Landline Telephone No. _____   Email _____

If I have more than 30 words, I have enclosed due payment. I am not advertising pirated, pornographic or any other kind of illegal software and my advert is both honest and legitimate. MM reserves the right to refuse or alter adverts at the discretion of the management. MM cannot be held responsible for the condition or quality of goods advertised. Your advert will be processed on receipt and will appear a.s.a.p. subject to space and availability.

Please tick appropriately   ☐ Private   ☐ Trade

I enclose payment by   ☐ Cheque   ☐ Postal order

or please Debit my Mastercard/Visa/Amex account No

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐   Expiry Date:

Authorise payment for £_____

3 **FAX** this completed form to: **0207 907 6066**

Please Note: The standard Micro Mart conditions of advertising acceptance apply to all classified advertisements. Cancellations and amendments are not accepted to free ads. The publishers may refuse any advertisements and cannot guarantee insertion into any specific issue. Dennis Publishing will use your information for administration and analysis. We may share your information with carefully selected 3rd parties. We, or they, may send you details of other goods or services which may be of interest to you. The information may be provided by letter, telephone or other reasonable means of communication. If you do not want your details to be shared with carefully selected 3rd parties, please tick here. ☐

IT Essentials

Amber
Transforming young lives

Amber *transforms lives* by offering a fresh start to unemployed, homeless young people seeking direction in life.

Amber *builds* confidence, motivation and self-belief.

Amber *works*

To donate text AMBR03 to 70070 and the amount

or go to **www.amberweb.org**

Registered charity number 1051388

To place an ad in our classifieds, simply fill in the form at www.micromart.co.uk or send your ad by post to Maaya Mistry, Micro Mart, Dennis Publishing, 30 Cleveland Street, W1T 4JD

HARDWARE FOR SALE

Have you got any old kit lying around you'd like to get rid of? Fancy making a few pounds while you're at it? Why not advertise in the Micro Mart classifieds? It's easy and it's free, just email what you've got, how much you'd like for it, and your contact details to micromartclassifieds@gmail.com, and we'll do the rest. There are thousands of readers out there looking for components every week, and you may have something unwanted they've been searching for – so get in touch and save your kit from going to the tip!

27" iMac. 2.9 GHz Intel i5, 1TB HDD, 8GB RAM – late 2012 Model (thin edge) iMac in good condition, running OSX Yosemite. No keyboard or mouse. Supplied in original box. £700.
Tel: Chris Salter (01707) 880251
Email: ChrisSalter@hoarelea.com

ANTEC 2800 MIDI-TOWER. Black Antec case, Sempron 2800+, Gigabyte m/board, 2GB RAM, 80GB Hard-Drive, DVD-RW, 10/100 Network. Clean install of Windows XP, Office 2007, fully updated & activated, all usual utilities, XP COA on case. £39 (P&P £15).
Tel: Pat (07710) 348638
Email: pat4cars@aol.com

OPTERON 185 WORKSTATION. 2.6GHz Dual-Core, Freezer 64, 4GB RAM, 160 + 300GB, CD-RW, DVD-RW, Floppy, network Card, Soundblaster , NVidea , Vista Business, fully updated & activated, with copy of install media & working activation number. £79 (P&P £15).
Tel: Pat (07710) 348638
Email: pat4cars@aol.com

WD 500GB external USB Hard Drive. Excellent Condition. £20 include P&P.
Tel: Michael Cunnane (01452) 303732

KINGSTON 120GB SOLID STATE HARD DRIVE. For sale 120GB Kingston solid state hard drive model SSDnow V300 2.5" Sata3 - compatible with Sata2. Very fast drive. Perfect condition. Free delivery. PayPal accepted. Price £38. *Email: geofry@tiscali.co.uk*

Laptop for sale. Dell Latitude E5420 i5 2.5 ghz, 4GB RAM, 500GB hard drive, DVDRW, built in camera. Genuine Windows 7 64 bit professional. Only £150 plus £12 for next day delivery. Payment via Paypal or cheque or bank transfer, cash. Fantastic condition very fast. Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

Laptop for sale. HP NC 6400 Core 2 DUO 2.0mhz 3gb ram 80gb hard drive DVDCDRW Fingerprint reader fantastic and fast . Genuine Windows 7 35 bit professional. Only £60 plus £12 for next day delivery. Fantastic condition very fast.
Tel: Dave Thomas (07828) 982930 or (01942) 706571
Email: davethomas96@aol.com

Laptop for sale. HP Compaq 6910p Core 2 DUO T7300 2.0mhz 3gb ram 80gb hard drive DVDCDRW Fingerprint reader fantastic and fast , Genuine win 7 35 bit professional Only £60 plus £12 for next day delivery. Fantastic condition, very fast. Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

HP 88 Inkjet Cartridges eight time expired boxed HP cartridges £5. Tel: Ian (01932) 856971 Email: a2345@btinternet.com

PC Desktop Ram (DIMM) Memory. 64MB Siemens PC100-322-620 MT8LSDT864AG-10CZ5. £8.
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

WD 3TB internal Hard Drive. Excellent Condition, £65 inc P&P. *Tel: Michael Cunnane (01452) 303732*

WD Internal SATA 3.5" 2TB Hard Drive. Excellent Condition. £37.50 included P&P. Flat screen monitors. Mainly 15" £20+p&p and 17" £30+p&p but have others on request. When packing I will make sure they have lot of padding to reduce rick of damage. Please email or call me for more information. *Tel: David (01616) 888119* *Email: pcmadnessltd@yahoo.co.uk*

IBM Thinkpad T30 laptop for spares or repairs. Excellent condition, but does not bootup. Not sure why. Could be an easy fix or for parts/spares. £15 plus P&P. *Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com*

Webcam (Trust Spacecam). Boxed with CD of installation software and instruction manual. Perfect condition. £10. *Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com*

HP Photosmart C4585 All-in-One multifunction colour printer. Perfect condition. Includes software and manual. £20.00 *Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com*

Laptop Hard Disk Drive. Fujitsu. 20GB. Excellent condition: £10.00. *Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com*

ASUS P5QL-EPU Motherboard - 775 Socket - DDR2. Tested and removed from a working environment, comes with I/O Plate. £45 inc Free Courier. Payment via PayPal. *Email: info@jmcomputing.info*

PC Desktop Ram (DIMM) Memory. Siemens PC100 - 222- 620 16M x 64 SDRAM. HYS64V16222GU-8 Only £8. *Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com*

Western Digital Cavier SE Desktop Hard Disk Drive 160GB. Perfect condition. Only £10

Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com

Asus Z97 Gryphon Armor Kit. Steel backplate with plastic top and auxilliary fan. Also some minor plastic bits. £20. Email for more details. *Email: graham_rocknell@yahoo.co.uk*

Netgear DG834N Rangemax Next Wireless N Modem Router kit. Excellent condition complete with power supply, network cables, telephone cable, ADSL filter and setup CD. £10.00. *Tel: David Ewles (01295) 253554 Email: david@ewles.gb.com*

Laptop for sale. Toshiba Portage i5 2.5GHz Model R830-13c 4GB RAM, 320GB HDD. Wi-Fi, fingerprint scanner, HDMI ouput. Sold on eBay for over £200; only £150 plus £15 p&p. Bargain. Great condition. Very light. *Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com*

LAPTOP HARD DRIVE. 160GB SATA 2.5". WESTERN DIGITAL. Model: WD1600BEVT. Fully tested. Perfect working order. Partitioned and formatted NTFS. Free postage. Price £22. Paypal accepted. *Email: geofry@tiscali.co.uk*

DESKTOP HARD DRIVE. 640GB Western Digital 3.5" SATA model WD6400AAKS. Perfect working order. Partitioned and formatted. Only used as back-up drive. Free delivery. Price: £33. PayPal accepted. *Email: geofry@tiscali.co.uk*

Vintage Amstrad PC1512 HD20. Colour Monitor 20MB Hard Drive 5.25 Floppy Original Amstrad Disks Manuals spare Keyboard and Mouse. This is a rare fully functioning collectable. £60. *Tel: (01949) 876235 Email: hc4203@gmail.com*

4x 1GB DDR2 Ram (OCZ Nvidia SLI PC2 6400 epp 4-4-4-15). £40.00 for all 4 + Post/Packing. Perfect working order. *Email: ken.toole1@virginmedia.com*

Seagate Barraucda 250GB SATA Hard Drive 3.5". Tested and removed from a working environment. £12 inc Free Courier. Payment via PayPal. *Email: info@jmcomputing.info*

Corsair Vengence 16GB (2x 8GB) DDR3 Memory CMSX16GX3M2A1600C10. Never used but box opened. Selling due to wrong voltage, these are 1.5V and I needed 1.35V. Asking £85.00 inc. postage to the UK. *Email: fabstock1@gmail.com*

4x 1 GB DDR2 RAM (Ocz Nvidia SLI PC2 6400 epp 4-4-4-15) for Sale. £40.00 for all 4 + Post/ Packing. In perfect working order. *Email: ken.toole1@virginmedia.com*

HP Microserver n40l / windows 7 Pro / 4GB RAM / 400GB drive / MS Office 2003. This HP n40l Microserver is in excellent condition and comes with Windows 7 re-allocated, activated & updated Feb 2015. Also installed is Minitools Partition Magic, MS Office 2003 HP basic, with codes/COAs. Buyer may have Linux Mint, or a completely bare drive. 2 spare drive frames. I have the original packing as per HP original delivery. So far as I can see, this Microserver will take 16GB memory and up to five drives. See it working before buying, (by arrangement). No refund under any circumstances. Collect from Harrogate, North Yorkshire. £140. Cash on collection. Delivery might cost £8 via Hermes, maybe much more to Highlands/Islands. Payment by Cheque OK subject to clearing, Paypal at £25 additional (to cover their fees). *Tel: (07794) 528857 Email: it_central@ntlworld.com*

Used Asus Wireless Router for sale. Dual-band 4 x GB Ethernet Wi-Fi RT-N66U N-900. £65.00 O.V.N.O. Selling cause I have no need for it since upgrade to BT Home Hub 5. *Email: beme12355@googlemail.com*

SKY PLUS and SKY PLUS HD REMOTEs. Original £7.50 + P&P please email or call me for more information. *Tel: David (01616) 888119 Email: pcmadnessltd@yahoo.co.uk*

US Robotics External 56K Message Modem. Includes V.90 56K Standard X2 Technology. Boxed and complete. Perfect condition. £25 + p&p. Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com

2 x 2GB DDR3 1600 MHz RAM. Recently taken from a 2012 mac mini. As new £25. Email amstereofan@gmail.com XFX GeForce Nvidia 8800Gts Graphics Card for Sale. £40.00 + Post/Packing. Perfect working order. *Email: ken.toole1@virginmedia.com*

XFX GeForce Nvidia 8800Gts Graphics Card For Sale. £40.00 + Post. In perfect working order *Email: ken.toole1@virginmedia.com*

Custom Built modified watercooled gaming desktop. i5 4670K, R9 280X, Silverstone RV-01 USB3, 1000W PSU: parachord sleeving, Z87M OC Formula, 8GB Kingston Fury 1866MHz, 180mm and 120mm Radiator. Mods, Yellow and Black colour scheme! No Storage. Email for pics and info. Buyer collect: Gloucestershire. £800 ono. *Tel: Adam (07426) 874117 Email: flaming_monkey95@hotmail.co.uk*

Asus A8V motherboard, socket 939. Clips holding CPU cooler broke, CPU overheated & shut down. M/B should be OK and there is 4GB of ram on board. Free, collect only. North Wales. Tel: (01286) 678584 *Email: gw7hav@googlemail.com*

Kingston HyperX 2x2GB DDR2 1066MHz RAM. Tested and removed from a working environment. £45 inc Free Courier. Payment via PayPal. *Email: info@jmcomputing.info*

CPU sale. Intel Core 2 Duo E4400 2.0GHz £10, Intel Pentium 4 630 3.0GHz £7, Intel Celeron M 350 1.3GHz £5, Intel Celeron Mobile Dual core T1500 1.866Ghz £6, Intel Pentium 4 630 HT 3.0Ghz 2MB cache £8, AMD Athlon 64 3200 £5 Athlon 64 3500 £6 Athlon 64 3200 Dual core £10 postage £2.

Tel: Jeremy Gill (02089) 430683 *Email: arthur.pewty1@virgin.net*

2 x 512MB PC3200 DDR400. These two sticks were removed from my working system, now redundant. £5, plus £1 P&P. Tel: Alan (02084) 202322 *Email: alan@asandco.co.uk*

DDR2 memory sale. 2 x Nanua PC2 3700 256MB £6 pair, 2 x HP PC2 4200 256MB £7 pair, 4 x HP PC2 4200 512MB £10 pair or £18 for four. Tel: Jeremy Gill (02089) 430683 *Email: arthur.pewty1@virgin.net*

Asus M2N2-SLI Deluxe motherboard bundle. With AMD Athlon 64 4000 CPU, 4Gb Corsair ram, fan, backplate, manual, driver CD. £40 *Email: david.white38@ntlworld.com*

IBM/LENOVO SFF BASEUNIT. P4/ 2.8 H-T, 2GB RAM, 40GB Hard Drive, CD-Rom, 10/100 Network, sound, USB, Clean install XP-pro, fully updated, Office Suite, Anti-Virus, & all usual utilities, COA Licence Sticker & Install media, £25 *Tel: Pat (07710) 348638 Email: pat4cars@aol.com*

FUJITSU-SIEMENS MINITOWER. Pentium D 2.8 Dual-Core, 2GB RAM, 80GB Hard Drive, DVD-RW, Gigabit network, sound, Clean Install XP-pro, fully updated, Office suite, Anti-Virus & all usual Utilities, Legal COA sticker & System Image. £35 *Tel: Pat (07710) 348638 Email: pat4cars@aol.com*

DELL OPTIPLEX GX240 SFF. P4/1.6, 20GB hard Drive, 768MB RAM, CD-Rom, 10/100 network, Sound, Front USB, Clean install XP-pro, fully updated, works OK but slow by modern standards, £15. Tel: Pat (07710) 348638 Email: pat4cars@aol.com

LG Flatron W2246S 22" monitor with power and VGA leads. No dead pixels in very good condition. £50 Buyer Collects

(Verwood, Dorset) *Tel: (01202) 826057 Email: geoffandcynth@themailspot.com*

CD Optical Drive for installation in desktop PC Only £10. *Tel: Gordon (01314) 660205* E-mail: scobieg09@gmail.com

Very rare Viking IBM 16MB Dram Card (15109 66G5109) for Compaq, IBM Thinkpad, Etc Laptop Only £20 *Tel: Gordon (01314) 660205* E-mail: scobieg09@gmail.com

TP-Link 54Mbps 4 port Wireless G Router. Perfect condition and boxed. Model: TL-WR340G. £20.00 plus postage. Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com

Intel Core 2 Duo E4600 3GHz 775 Socket Processor. Tested and removed from a working environment. £10 inc Free Courier. Payment via PayPal. *Email: info@jmcomputing.info*

Addon Wireless LAN USB 2.0 54Mbps 802.11g Adaptor. Boxed with instructions and software: £9. Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com CD Stomper CD/DVD Labelling System: Software, Labels and Label Applicator. Boxed. Unused. £9. Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com

56kb Fax Modem External. £10. Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com

DIR-615 Wireless N Router. Boxed, brand new. £30. Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com

2x 1GB PC2100-648. These two matched sticks were removed from one of my redundant systems. Plus one PC2700 (DDR 333Mhz) and one 512Mb PC3200 DDR400 stick. All for £5 plus £2 P&P. *Tel: Alan (02084) 202322 Email: alan@asandco.co.uk*

Laptop DDR2 memory sale. 2 Corsair Value Select 533mhz 1GB £18 pair, 2 Hynix 800mhz 2GB £26 pair, 2 Generic 533mhz 1GB £15 pair,1 Generic 800mhz 1GB £10,1 Nanua 666mhz 1GB £, 1 Samsung 666mhz 1GB £8. Postage included
Tel: Jeremy Gill (02089) 430683
Email: arthur.pewty1@virgin.net

Two 120GB Maxtor DiamondPlus 9 Drives plus one 80GB DiamondPlus 10. Can be supplied with two plug-in caddies. No reasonable offer refused.
Tel: Alan (02084) 202322
Email: alan@asandco.co.uk

HP Elitebook 8760w i7 2820QM @ 2.2GHz 32GB RAM 750GB HDD Quadro 4000M GPU. Only 2 small marks on whole machine. Cost £3500 when new. £900 ONO
Tel: (07772) 926632
Email: stedaley19@gmail.com

WD 2TB desktop hard disk. Formatted ready for an OS. Runs very nicely. New laptop means my desktop items must go! £40 includes free tracked postage.
Tel: (01619) 501218
Email: jmbest2@sky.com

Toshiba C500D-B-11 laptop. Virtually new cost £279 will accept £150 O.N.O.
Tel: (01217) 535324
Intel 3930K processor. Used, but not overclocked. No box or fan. £220 ono. Will ship to UK address.
Tel: Tim (01623) 624509 Email tim.stirland@btinternet.com.

Amstrad PcW 9256 in good working order with software. Offers.
Tel: John Adams (02088) 641202
Email: meeching@uwclub.net

Asus P8Z68-v LX socket 1155 motherboard. Original box 1/0 cover user guide driver disk fitted core i3 2100 CPU 3-1GHz and 8GB PC1300 memory. No fan. Working fast and fine. £125 + free postage.
Tel: (01619) 501218
Email: jmbest2@sky.com

ASUS P5B Motherboard - 775 Socket - DDR2. Tested and removed from a working environment, comes with I/O

Plate. £35 inc Free Courier. Payment via PayPal.
Email: info@jmcomputing.info

SAMSUNG GALAXY Tab 3 for sale. 2mths old, 8GB, wi-fi, £80 open to offers. Willing to post at a charge.
Tel: Christine (01386) 831836

SoundBlaster Audigy SE 7.1 soundcard for sale. Perfect working order. Selling due to not being needed any more. Just £12 plus postage.
Tel: Ian (01132) 629028
Email: ianmatthewuk@yahoo.co.uk

Asus p8h61-mle motherboard socket 1155. Original box 1/0 cover driver disk manual together with Celeron 91620 dual core CPU and 4 9195 pc1300 memory. Working fine. No fan. £70 + free postage.
Tel: (01619) 501218
Email: jmbest2@sky.com

Toshiba Satellite SA60 laptop. Model PSA60E-092058EN. Windows XP Home Edition with Certificate of Authenticity. For spares or repair - broken power connector on mobo. No power cord. Otherwise in very good condition. £40.00 + p&p
Tel: Peter Scarth (01452) 372350
Email: pscarth@blueyonder.co.uk
Apple Touch 32 GB iPod. Virtually new cost £199 will a ccept £100 O.N.O
Tel: (01217) 535324

400GB IDE drive 3.5 inch formatted ready for use. Only £20 plus £3 for p&p. I can load genuine XP Professional from Microsoft with genuine certificate of authenticity for an extra £10. Refurbished.
Tel: Dave Thomas (07828) 982930 or (01942) 706571
Email: davethomas96@aol.com

Amstrad PcW 9256 in good working condition with software. Offers.
Tel: John Adams (02088) 641202
Email: meeching@uwclub.net

Panasonic KX-P7105 mono laser duplex printer. Some

toner left. Up to XP only – hence £25. Buyer collects from N2, East Finchley
Tel: (02083) 431527
Email: pnnikiel@gmail.com

Amstrad PcW 9256 in good working condition w/ software. Offers.
Tel: John Adams (02088) 641202
Email: meeching@uwclub.net

GEFORCE 1GBYTE 24- PCI express PC card. HDMI DVI VGA PC video card. £10 plus p&p £4.50. 2 for sale. £10 each.
Tel: (01707) 339063
Email: awhishaw@aol.com

HP 4GB memory Microserver with two hard disc drives. £110. One with Linux MINT. Other with Linux FreeNAS. This will also run Windows 7 and Windows Server or Home Server. (Win 8 I've not tried it) Two spare HD slots with appropriate caddies. Slot for your SATA DVD drive also, (or use external usb or DVD drive if needed. four usb sockets on front, two on rear. VGA, network, power sockets on rear. Supplied in original HP box with CD and leaflets etc. Collect from Harrogate, North Yorks, or posted via Hermes for £12 (or less if I can do it cheaper). Cash on inspection and collection (Highlands and Islands might obviously cost more to be delivered).
Tel: (01423) 872045
Email: it_central@ntlworld.com

400GB IDE drive 3.5 inch formatted ready for use. Only £20 plus £3 for p&p. I can load genuine XP Professional from Microsoft with genuine certificate of authenticity for an extra £10. Refurbished.
Tel: Dave Thomas (07828) 982930 or (01942) 706571
Email: davethomas96@aol.com

EPSON PRINTERS T715 12 multipack F.O.C. to good home, just pay postage £2.50. (Tesco equivalent original cartridges £120 current special offer!) Perfect crisp printing etc.
Tel: Pete Dew: (07526) 988594

EPSON PRINTERS T711 6 multipack F.O.C., just pay postage £2. Perfect crisp printing etc. May have others F.O.C. if model older than 12 months.
Tel: Pete Dew (07526) 988594

Lexmark Printer Z601, still working and in good condition, £25.
Tel: (01386) 832758

Intel 3930K processor. Used, but not overclocked. No box or fan. £220 ono. Will ship to UK address.
Tel: Tim (01623) 624509
Email tim.stirland@btinternet.com.
Apple Mac G4 Tower. 400MHZ cpu, 640MB Ram, 2xHardDrive 40GB,20GB. DVD & ZIP Drive. OS X v10.3 Panther+OS9. NO KEYBOARD OR MOUSE. £25 ono Buyer collects
Tel: (07941) 254296
Email: jasonnd@hotmail.com

Wireless Motorised IP Surveillance Camera. White In Colour - Control from your mobile phone/tablet/pc when out of the home - ideal for home security, baby monitoring, has sound and remote recording etc BNIB - £25 Price includes post and packing.
Email:omendata@gmail.com
Dell Inspiron 660 Intel i5 QUAD CORE with ACER 23 Inch LED monitor. AS NEW. Operating System: Windows 8.1. MPN:620MT. Memory (RAM): 4 GB. Hard Drive: 1TB. Processor Type: Intel Core i5. Primary Drive: Optical DVD+/- RW, Processor Speed: 3.0 GHz, Features: Graphics Card GT620 1GB. Acer LED monitor 23" HD. £520
Tel: Hitesh Rao (01163) 198895

PRINTER CARTRIDGES. Suitable for Epson printer range T711 - T714. Work perfectly. 50 pence each, plus postage (brand new unused sealed). Over a dozen available.
Tel: (07541) 222678
Email: petedew@gmx.co.uk

PRINTERS T481-T486 6 multipack F.O.C. to good home, just pay postage £2. Perfect crisp printing etc.
Tel: Pete Dew (07526) 988594

HARDWARE WANTED

Trying to breathe life back into an old machine? Why not submit a wanted ad and see if any of the thousands of computer enthusiasts who read the magazine each week have what you're looking for?

WANTED: Fractal Design Define XL full tower case. R1 (original version) in black.
Tel: (01670) 860146
Email: mm@tectron.co.uk

WANTED: Working Dot Matrix Printer in Good Condition. Thanks!
Email: printer.20.odaily@ spamgourmet.com

WANTED: Acorn computer either an A5000 or A7000. Also book on teaching yourself binary.
Tel: (07817) 861011
Email: Johnhaviland73@gmail.com

SOFTWARE FOR SALE

Do you have any old software that you simply don't use? Why not advertise is with us and see if anyone else can make use of it – you may well be surprised to find that someone is looking for exactly what you don't need!

Adobe Photoshop Elements and Premiere Elements 12 Full Version - Windows/Mac. Original Boxed CD with unused product key. £47.50
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

PCB design software 127 layers, schematic entry, PCB entry, PCB to Gerber file converter, output to printer. £9.99
Tel: Nigel Wright (07967) 527693
Email: cresswellavenue@talktalk.net

Cyberlink PowerDVD 12 Standard. Runs under Windows 8, 7, Vista or XP. Original CD with unused product key £7.50
Tel: Ian (01932) 856971
Email: a2345@btinternet.com
Microsoft Office 2013. Original Software only £100.
Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com

Windows 7 Ultimate 32-bit version . NEW software and license (certificate of authenticity) 100% genuine and unopened software .ONLY £45 including P&P.
Tel: Dave Thomas (07828) 982930 or (01942) 706571
Email: davethomas96@aol.com

Sim City 2000. Boxed and original. Classic gaming. £15.
Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com

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. software and license (certificate of authenticity) 100% genuine and unopened. (Dell branded but will install on any machine) ONLY £15 including P&P
Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

Windows 7 Home Premium 32 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

Nuance Omnipage 18. OCR Runs under Windows 8, 7, Vista or XP, Original CD with unused product key £25.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Acronis True Image Home 2012. Bootable CD. Application runs under Windows 8, 7, Vista or XP. Original Acronis CD with unused product key £5.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Windows 7 ULTIMATE 32 Bit and 64Bit DVD disks incl. SP1 This is my "Get Genuine Kit" from Microsoft not OEM. New install or legalise your copy with full Product

Key. only £50 incl. reg. post
Email: Dave ochdgh@aol.com
Norton Family Premier 2.0. Runs under Windows 8, 7, Vista or XP, Original Symantec unused product key £15.
Tel: Ian (01932) 856971 Email: a2345@btinternet.com
Microsoft Office 97 Professional. Original disc with key £18 inc postage.
Tel: Andrew (01376) 512118

Windows XP Professional. 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&P.
Tel: Dave Thomas (07828) 982930 or (01942) 706571
Email: davethomas96@aol.com

SOFTWARE WANTED

Wanted: I have a BCL 2.4g Wirless Gaming Mouse, Model: RF0P77 (3v 7ma) but no Drivers. Can someone help with a copy of the Original Drivers for this Wireless Mouse please?!?
Email: Cliff Evans cliffordevans603@btinternet.com

Wanted: Driver disc for Toshiba L30-11D PSL33E laptop. Laptop useless without drivers but only worth £40, so cannot pay a lot.
Tel: John Udall (01384) 824494
Email: john.udall@blueyonder.co.uk

Wanted: Windows XP SP2 or Windows 7. I am also looking for a boot disc for Toshiba satellite L40-18Z.
Tel: Mr Cranney (07948) 927384
Email: mcrnny1932@gmail. com

Wanted: Windows 98 CD ROM operating system with boot disk instruction manual and serial number. included.
Tel: Craig (07867) 930265 or (0191) 2093677
Email: craigtin44@hotmail.com

Wanted: LG GSA 2164 D software disc to replace broken original.
Tel: Glen Fremantle (01387)248976
Email:bldamsys@yahoo.co.uk

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Please try to keep your queries brief and limit them to just one question per letter, simply so we can squeeze in as many as we can each week. Please include relevant technical information too.

Aaron

The Private Route

I read the article on using a Raspberry Pi VPN Web Proxy with a great deal of interest. The comment that a modern router could be configured to do the same job intrigued me. How exactly do you do this? Are some routers better than others? I'm running Cyber Ghost.

How much longer do you think the government will let us go on using VPNs before it makes them illegal? I'm also worried that it will stop Brits using privacy conscious email services such as Runbox.

Edmund

VPNs (virtual private networks, for the uninitiated), are increasingly more common in households, and with more and more privacy laws and potential changes to them being made by governments around the world, they'll only get more popular as people attempt to stop prying eyes spying on their internet habits and usage.

There are different ways to use a VPN in the home, and as our feature explored, one of these is to use a Raspberry Pi. You can also set up your own server using a normal PC, run VPN software, such as Cyber Ghost, which you're already familiar with, or you can utilise any VPN features you may have on your router.

To use a router with VPN, the hardware needs to be compatible with it, so yes, there are some routers that are better than others, and if you do plan to use this approach to set up your own VPN, you'd be best starting with a model you know fully supports it.

Many companies produce such routers, including big names like Linksys, Asus, and Netgear. Asus's RTN10P is one such model, and supports Open VPN, as does Netgear's WNR3500L. There's a long list of other models you could go for, but it would be best to first check with whichever VPN supplier you're going for to make sure, or if you're using a

specific open VPN tool, check there first.

*In terms of router-specific firmware, a popular option is DD-WRT (**www.dd-wrt.com**). This is a Linux-based firmware that can be loaded onto a range of routers, and it's perfect for home VPN use. As it's a firmware replacement, however,*

it's not something to casually play around with and should only be used by those confident of their abilities. If used incorrectly it can brick a router, so care is needed. You can find much more information about the software at the website. You'll also need to ensure you use an open VPN firmware.

It's hard to say how long VPNs will be usable in their current form and what, if

any, attention government and other agencies pay to the technology. VPNs offer secure, encrypted connections which is why they're so desirable to many, but if a government really wants access to data, laws can be amended or created and put into action. Will this happen? Who knows? For now, VPNs

> ## 66 It's hard to say how long VPNs will be usable in their current form 99

are seen by many as the best option, and if you're one of these people, there's no real reason not to give them a go. Just be sure to research your VPN options, as some providers, such as Hola, have come under fire recently for allowing user data to be tracked and selling data to third parties.

▼ If you're planning to use your router to set up your own VPN,

Limited FPS

My laptop, which is an Asus G75VX was bought for gaming, which is what Asus advertises it as being for. When I bought it, I found it to be a great computer for gaming, at least for me. I wanted a small, portable gaming system that I could take with me, but one that wasn't underpowered and was able to run the latest games. The G75VX did the job, and overall, I was impressed. I love the various features of the model, such as the dual cooling, and the ergonomic design, and I felt I'd made a good decision. It runs Windows 8, has 8GB RAM, and has an Nvidia GTX 670MX graphics card.

Lately, though, I've run into a problem. I decided to format and reinstall Windows, which is something I've always done every so often to keep my PCs running smoothly. I did this, and when my laptop was all set up and ready to go, I installed the games I'm currently playing. When I came to play these, I found that they were running much slower than usual, with poor framerates. I used to get much better performance before the format, and now it's like I'm playing on a different, less powerful computer.

Do you know why a format would do this, when I'm using the same system and the same games? I've not changed anything about the hardware, so I don't see why things would be different.

Colin

The laptop you have is a fairly decent system to use for games, and you shouldn't have too many problems, certainly not if you ran titles with no issues previously. As you've formatted and found these problems, however, something has clearly changed, and I can suggest a couple of possible options.

Some would say 8GB isn't enough for gaming these days. I'd argue differently, and

unless you're striving to run everything at the very highest settings, 8GB will do for most titles. That said, 16GB will give you a far better level of performance, so this is an option. Of course, you didn't have problems before, so I'd hold off on any upgrades until you try everything else.

> ## " Some would say 8GB isn't enough for gaming these days "

First and foremost, I'd double-check your installed drivers, and make sure that they're all up to date. You may have been running with updated drivers before the format, and have yet to update these, hence the performance woes. Check this,

and if needed, update then run your games again.

Next, check your virtual memory settings. Often a reinstall of Windows may not make full use of your virtual memory, so it can be useful to manually set this, giving the system more virtual RAM to play with. You can find this

by right-clicking on Computer, then going to Properties > Advanced System Settings > Advanced > Performance Settings > Advanced. Now click the Change button in the Virtual Memory section. Here you can increase the amount of disk space your system uses

for virtual memory. Increasing this should give you a performance boost. The exact amount to use will vary from system to system, but if you have room, try giving yourself a few extra GB.

I'd also spend some time having a look at programs that run in the background and boot up with Windows. Use Task Manager to check this and trim down any unwanted items in your boot-up procedure. Also make sure you remove unwanted program that may have been added during the restore, if you've restored your laptop using recovery software instead of manually formatting. Often this adds all sorts of OEM programs you may not need or want, and these can be removed.

▼ **Even gaming laptops can suffer from sluggish performance, and it's best to keep up that housekeeping**

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:
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Contact Jason by email at:
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While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

Model Muddle

My Samsung Galaxy S II was getting a bit long in the tooth, so I've been on eBay and bought a second-hand HTC One (M7). I got this because a friend has one and I've always liked it. My friend's, though, has 32GB of storage and supports 4G, yet mine has just 16GB of storage and appears to only support 3G. I've looked again on eBay and can't see anyone selling an HTC One (M7) with these specs, so what exactly have I bought? Is it a fake, a foreign version, a different model entirely?

F. Somerville, Gmail

The standard HTC One (M7) is model 801n, which has 32GB of storage (sometimes 64GB) and supports 4G. No doubt this is the phone your friend owns. There's also model 801e, however, which has 16GB of storage and only supports 3G. It's rare – I've only ever seen a single example, but I've had dozens of the other model pass through my hands – yet I expect this is what you've bought.

Many phones have both 3G and 4G variants (the 4G variants will also work on 3G, of course). As 4G cell masts become more prevalent and 4G data costs continue to fall, 3G phones are being seen less often, and most of the latest models don't have 3G variants to begin with. With older models, though, buyers need to be wary.

For example, popular in the second-hand market (it's also still available new) is the Galaxy S4 Mini. Usually this is found in the shape of the GT-I9195, which supports 4G. But floating around are examples of the outwardly identical GT-I9190, which supports only 3G. It's easy to come a cropper and end up saddled with a device that doesn't meet your needs.

Was your HTC One (M7) actually listed as having 32GB and 4G? If the seller used one of eBay's catalogue entries – increasingly compulsory – there are good odds it was, as I don't think a catalogue entry exists for the 801e. In that situation, you could open a return request, as the item isn't as described. You'll win the case – even if 'no returns' was specified (it's an almost meaningless phrase on eBay) – and the seller will have to pay all postage costs (though enforcing this can be tricky).

Even if the phone was accurately listed, you could still open a return request, and you'd most likely win – buyers rarely lose cases. But that wouldn't really be cricket if there's nothing wrong with the phone and you simply made assumptions about it that turned out to be false.

▼ *Spot the difference*

Bits And Pcs

This week I have been mostly...
...reading all about the upcoming Android M (Marshmallow? Milky Way? Marzipan?) – see **goo.gl/yqlE2E**.
...playing with Windows 10 Mobile Technical Preview on a Lumia 1320 (I like the improvements over 8.1 but it's an early build and not without issues – build 10136 will be out any day now and looks to be much better).
...watching the detective series *Bosch* via Amazon Prime (I've caved in and signed up for the free trial – but what's the betting I forget to cancel and get charged £79 for a service I'll barely use?).
...listening to the new Muse album *Drones* (with the legendary Mutt Lange in the production chair, I had high hopes, and a few spins tell me they've been met).
...doing without Facebook (how long I'll last is anyone's guess, but I've deactivated my account and gone cold turkey!).

➤ *The new version of Android?*

Connection Inspection

For some reason, I usually get only a slow, limited Internet connection on my laptop, running Windows 8.1, but a good, fast connection on my tablet and phone, both running Android 5.1 (Lollipop). The router is an Asus RT-N56U and the fibre modem is a Virgin Media Super Hub, but I can't see those being the problem. My laptop is an HP Pavilion 15, but I get the same issue on my desktop. This is over wired Ethernet as well as over wi-fi. Any ideas?

Jim Simmonds, Gmail

This could well be a driver problem, Jim. Have you only recently upgraded to Windows 8.1 (perhaps from Windows 8.0)? If so, Microsoft has probably seen fit to install its own driver for your wi-fi controller. User forums were lit up at the end of 2013, when Windows 8.1 launched, with similar tails of woe.

The key is to get hold of the manufacturer's own driver and install this over the top of Microsoft's. For your laptop, visit HP's download portal: **goo. gl/6HyC8J**. I can't give you a direct link, as I'm not sure exactly what laptop model we're talking about. Just follow your nose. Do the same for the desktop – head direct to the manufacturer's support pages.

It's odd that both laptop and desktop are affected, though. And you say that the problem occurs even over Ethernet? That's also odd, as the Ethernet controller is separate to the wi-fi controller and has its own driver, and I'm not aware that Windows 8.1 is known to cause headaches there.

Are you sure you have a Super Hub? You see, this actually has a router built in, meaning your Asus job wouldn't be needed. Indeed, if you'd got two routers running in a chain, I'd be surprised if you *didn't* have problems. If you do have a Super Hub, Jim, and if this does prove to have its own router, take the Asus out of the equation and see what happens.

▼ You can guarantee this will happen just when you're about to click 'Order' on a takeaway pizza and you're fainting from hunger – or when you're submitting a ridiculously late article and the magazine's ten minutes away from going to print...
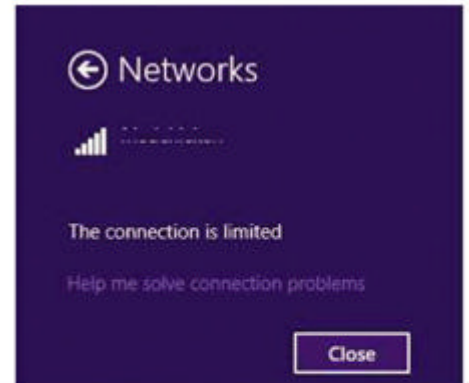
Memory Loss?

A long while back I purchased a Freecom 400GB external hard drive. It connects via USB 2.0 and holds several years' worth of photographs. Until a year or so ago, when I had an Asus P5Q Deluxe coupled with a Core 2 Quad Q6600 (running Windows 7), it was detected without issue. However, since I've upgraded to an Asus Z87-A coupled with a Core i5-4670K (still running Windows 7), I can't get it to show up. Freecom's tech support has proven clueless. Help! There are thousands of precious memories I want to retrieve!

Rick, Gmail

First off, Rick, don't panic. This sort of carry-on happens a lot with external hard drives, especially as they get old. Most likely the drive itself is fine – the fly in the soup is probably the enclosure it's in.

Does the drive fire up? Can you hear it? If you hold the enclosure in your hand and gently turn it in the air, can you feel the inertia from the drive's platters? If not, I expect no power's being delivered. Is the drive a 3.5" job? If so, does the power brick work? Even if there's a working LED, that's no guarantee. I'd suggest trying a different brick, but of course these things often have unusual jacks. If the drive's 2.5", drawing juice from the host PC, power delivery shouldn't be an issue.

The other possibility is that the enclosure's circuitry has failed. This isn't uncommon, particularly on cheaper units (though I've no idea how much yours cost or what brand it bears). The controller can overheat and melt.

Your best best, either way, is to remove the drive from the enclosure and connect it to your PC directly. Break the enclosure open if it's a sealed unit. In nearly all instances, external hard drives are just standard SATA affairs (or IDE/PATA if they're museum pieces). I'm confident the drive will then show up, Rick, and you'll be able to wipe the sweat off your brow as you peruse those photos.

▼ The commonest point of failure in an external hard drive isn't the drive itself but the enclosure (sometimes the controller melts)
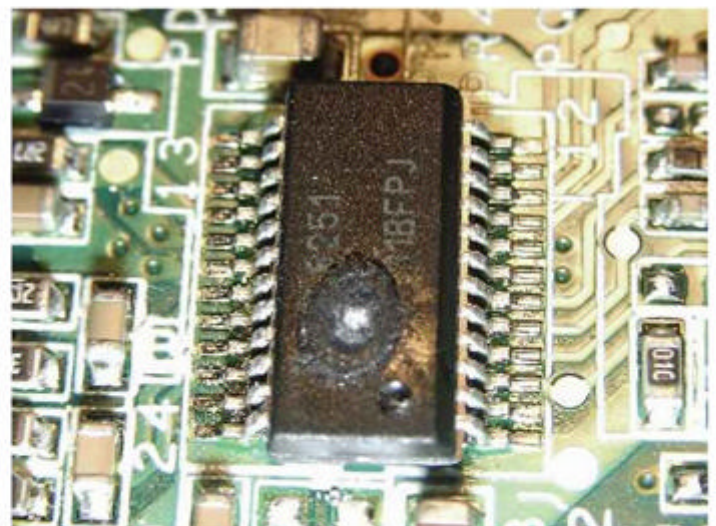
Crowdfunding Corner

This week's Crowdfunding Corner looks at a pair of games which, despite running campaigns at the same time, couldn't be more different. Whether nostalgia or something completely new, we've got a project for you

Shape Of The World

This first-person exploration game is part-*Minecraft*, part-*Proteus*, and all-impressive. Set in a procedurally-generated world, its experimental gameplay uses heavily stylised visuals and music to create an incredibly unique experience. It's already had rave advance reviews from press outlets who have played the proof-of-concept, and if it gets funded it'll be available on PC, Mac and Xbox One!

This is one project where things are going to go down to the wire, though. It's been running almost two weeks and has barely hit a quarter of its CAD 75,000 (£39,350) target, so there's a lot of movement to go yet. The cheapest way to get the game is to back the project for CAD 15 (£8), which nets you a digital download, though you can also play the beta version only for just CAD 10 (£5.25).

It's a tough hill for the developers to climb, but stranger things have happened, so if you're sick of playing first-person shooters and wish games could be more relaxing and exploratory, this is a project worth backing. If you don't believe me, even I've put my money where my mouth is! Just look at that screenshot and ask yourself: would the world be better or worse if this game didn't exist?

URL: kck.st/1B21Vdp
Funding Ends: Wednesday, July 1st 2015

The Bard's Tale IV

If you prefer older gaming titles to weird new experimental ones, then maybe this'll be up your street instead. InXile Entertainment has had great success reviving beloved old franchises through Kickstarter with the likes of *Wasteland 2* and *Torment* becoming big hits – so it's no surprise that they're going back to the well with a new sequel to a classic games series. This time, the hit 80s line of *Bard's Tale* games is getting a modern-day revival with the official third sequel in the series.

Created by developers associated with the original games, *Bard's Tale IV* promises to be a single-player, party-based RPG rich in exploration and combat, with the unique combination of fighting and puzzle solving that made the franchise great. They're promising a lot – a full 3D game available DRM-free for PC, Mac and Linux with an original Gaelic music soundtrack. The initial goal of $1,250,000 (£800,000) has already been hit with a month still to go, and InXile is promising to match that with its own money!

The cheapest tier has already sold out, and it's probable that the second cheapest will also be done by the time you read this, but you can still get a downloadable copy for just $27 (£17), which isn't bad for a game with an estimated retail value of $45 (£29)! It's not due out until 2017, but with a pedigree like this you can guarantee that it'll be worth waiting for.

URL: kck.st/1JhRwwP
Funding Ends: Saturday, July 11th 2015

in-game screenshot
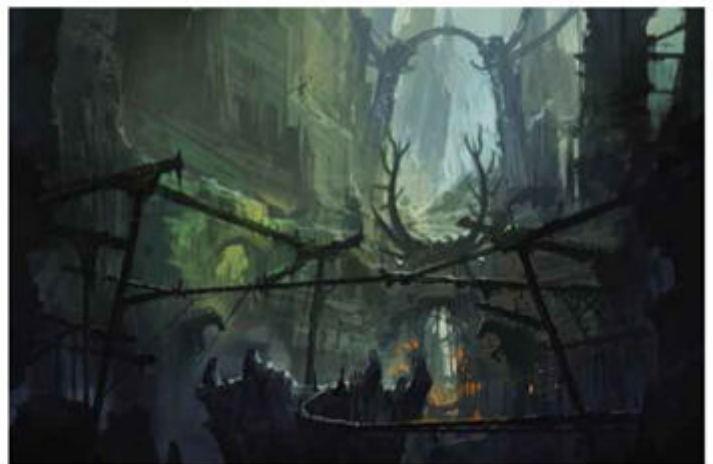
Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week
ExaGear Desktop

The app to bind ARM and x86 code together?

Here's an interesting program that will allow you to natively run an x86 Linux package on a Raspberry Pi. It's quite ingenious, and introduces a new level of software installations for the ARM eco system. It works, basically, by intercepting x86 programs and converting them in real time to ARM compatible code. It's essentially a virtual machine, which creates a virtual i686-compatible processor within an ARM environment – specifically, the Raspberry Pi and Raspberry Pi version 2 – where a guest operating system is used, Debian 7 in the case of the Raspberry Pi.

More From Your Pi?

There are already plenty of applications available for the Raspberry Pi, but often you'll come across some legacy program that hasn't yet been converted over to ARM code. Most of the time the developer isn't able to do the conversion, or it may be too costly to run the conversion. More than often though, those behindf the program simply haven't catered for the ARM environment.

If you've come across situations like this, the usual route is to either run QEMU or simply find an alternative program. QEMU, for all of its good points, can be something of a hit and miss affair, but ExaGear isn't.

ExaGear Desktop, from Eltechs, is a paid-for program that currently runs at around five times faster than QEMU. That means, you're able to install and run x86 code at a better than average speed without the huge overhead that QEMU and such currently demand. With the Pi 2 it's considerably faster still.

Prices for the Pi version of Eltechs ExaGear start at $19.95, and rise to $24.95 for the Raspberry Pi 2 version – you can check out the latest pricing at **goo.gl/O8zVyV**.

An ARMful Of Apps

Interestingly, if you include WINE into the equation, then the list of x86 programs and apps that you can potentially run from a Raspberry Pi with ExaGear installed is pretty mind-boggling. There are limits, of course: you won't be able to run newer games (or Office 2013, naturally), but there are plenty of other programs available for x86 Linux installations and Windows that can easily be executed on the meagre resources the Raspberry Pi has to offer, even when the overhead that ExaGear uses is taken into account.

Features At A Glance

- Better performance than QEMU
- Less memory overhead than other forms of x86 emulation
- Running Wine opens up more x86 programs
- Runs on loads of different devices

Does it work though? In a word: yes. We installed it on a Raspberry Pi model B+ and, although some of the examples we used were a little slow, they did run. That includes the likes of TeamViewer, Skype (albeit with some audio issues we haven't quite ironed out just yet) – and even a couple of older games worked well enough to mention.

Moreover, as well as the Raspberry Pi, you can run ExaGear on ODROID, CubieBoard, CuBox, Utilite, Jetson TK1, Wandboard, and Banana Pi. It's even possible to run ExaGear on an ARM Chromebook, which is a distinct bonus.

Conclusion

You need to be confident in the command line to get the most from ExGear Desktop, and there are times when something will work for a while, then inexplicably stop until you reboot the Pi – even restarting the ExaGear service didn't bring it back.

However, this is a good project that has tons of potential and can help bridge the gap between x86 apps and programs and ARM based packages in a more stable and faster environment than we've previously used. Of course, you'll need to toy around with what you'll require from the program, but Eltechs is pretty quick with its help and response should you require any assistance.

This is certainly a piece of software to look up, try and to keep an eye on. For now, we're going to play around and see what other x86 programs we can get running on our Raspberry Pi.
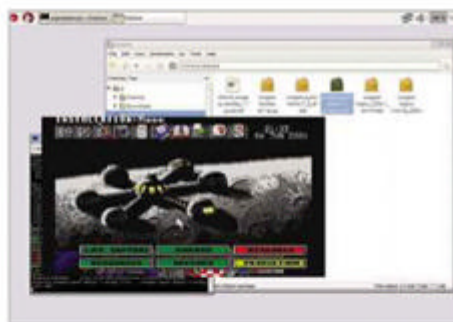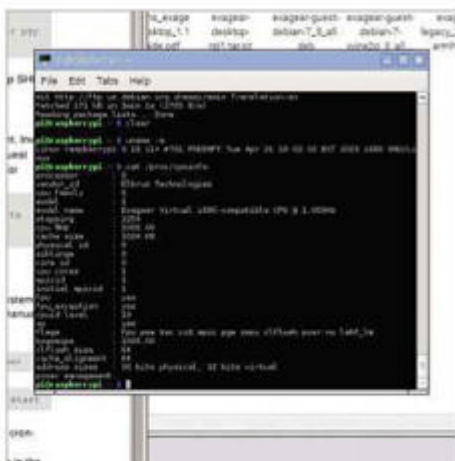
⌃ *Running the x86 version of Hatari under the Raspberry Pi with ExaGear*

⌃ *When running, ExaGear creates a virtual x86 processor with guest OS*

Logging Off

As this is a remarkably fast moving story, where the Fifa scandal might have gone by the time you read this god only knows. But for context, so far in my slice of universe, Jack Warner has just thrown Sepp Blatter under the team bus, and this can of worms is almost fully open.

What's been fascinating about the past few weeks is how the companies closest to Fifa have wished not to be painted with the same toxic slurry and therefore have made some pretty strongly worded statements about how Fifa needs to change.

That's good and to be commended, but they've all made substantial amounts of money working with what the FBI described as a "criminal organisation".

Visa, Coca-Cola, McDonald's and others have made their position clear, it would seem, so how about those tech companies with commercial ties to Fifa?

The obvious representative is Electronic Arts, which through its EA Sports arm has just signed a new licensing deal agreement extending its relationship with Fifa until 2022. At the time, Andrew Wilson, executive vice president and head of EA Sports, said, "EA Sports released the first Fifa-branded football game in 1993, and 20 years later our partnership with Fifa continues to be very strong."

Being in a 'very strong' partnership with an organisation that's currently being indicted for wire fraud, money laundering, tax evasion, racketeering and corruption doesn't sound so great in retrospect. So what does it have to say now?

Nada, zilch and squat. I asked for a statement, but I've not had a response and the company has made no official statement whatsoever on the subject. This seems remarkably brash, in almost a 'What crisis?' Blatter-like approach.

Actually, I'm being a little unfair, because a day after the corruption arrests hit the newsstands, EA did make a Fifa statement.

It was to announce the ground-breaking move to add female players to Fifa 16 – something that was apparently really challenged the development team at EA, presumably because they don't have girlfriends.

I don't want to decry this long overdue addition of female footballers in general, but is this really the most important subject on EA's radar right now in respect of Fifa?

Well, quite obviously, no, it isn't. But for EA to take the view that if it doesn't mention it, then nobody will make the connection, even though it plasters 'Fifa' all over its sports merchandise, does seem perverse if not utterly delusional.

It makes me wonder, quite reasonably I think, given what's happened across the world with Fifa and the truly horrendous things happening right now with migrant workers in Qatar, what exactly would be the point where EA makes a statement? Or, more pointedly, ends its relationship with Fifa?

Is there a specific dead body count or a corruption threshold that EA has in mind, or is it just all 'business' from its perspective?

Frankly, if getting the football game they want on PS4, Xbox One and PC involves people dying, wholesale corruption and dirty dealing, then I'm not sure all those who buy these titles will want to be indirectly part of that business, really.

As once a partner of EA myself, I'd like the company to man-up really fast on this, because otherwise it's revealed itself to be motivated purely by greed and nothing else.

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: 1 Myth, **3** Mousepad, **9** Spinoff, **10** Phorm, **11** Arctic Circle, **13** Ephebe, **15** Format, **17** Preexistence, **20** Ennui, **21** Big Bang, **22** Entities, **23** Rich.
Down: 1 Mistakes, **2** Triac, **4** Office, **5** Supervoltage, **6** Problem, **7** DIMM, **8** Louis Blériot, **12** Strength, **14** Hard Nut, **16** Timbre, **18** NAAFI, **19** Cede.

THIS WEEK'S CROSSWORD

Across
1 A reference to the time during which a device is operational but not in use. (4)
3 Programs that systematically browses the World Wide Web in order to create an index of data. (8)
9 Any of various styles or schools of Chinese martial arts developed by the monks of the this Temple, a Buddhist monastery in China. (7)
10 Having only a limited ability to react chemically. (5)
11 An instrument for measuring the photographic density of an image on a film or photographic print. (12)
13 A critical appraisal of a book or software application for publication in a magazine or online. (6)
15 Someone who expresses a reasoned judgment of something. (6)
17 Exhibiting metathesis. (The transposition of letters in a word) (12)
20 Having or caused by speed approximately equal to that of sound in air at sea level. (5)
21 A tangible acknowledgment that a payment has been made. (7)
22 A preset format for a document or file. (8)
23 A transparent optical device used to converge or diverge transmitted light and to form images. (4)

Down
1 Officers of a corporation or others who have access to private information about the corporation's operations. (8)
2 Commit to memory. (5)
4 A repeating process whose outcomes follow no describable deterministic pattern. (6)
5 Protect media from alteration or erasure. (5,7)
6 Any of the known substances that cannot be separated into simpler substances. (7)
7 A standard for the transmission of email on a computer network. (Abbr) (4)
8 French mathematician and philosopher who invented an adding machine and contributed with Fermat to the theory of probability. (6,6)
12 People who accept the leadership of another. (8)
14 .vn TLD. (7)
16 A strong desire for something; a drink perhaps? (6)
18 A sound used in machinery or computers to alert users of a potentially dangerous condition. (5)
19 A language for transforming XML documents into other XML documents. (Abbr) (4)
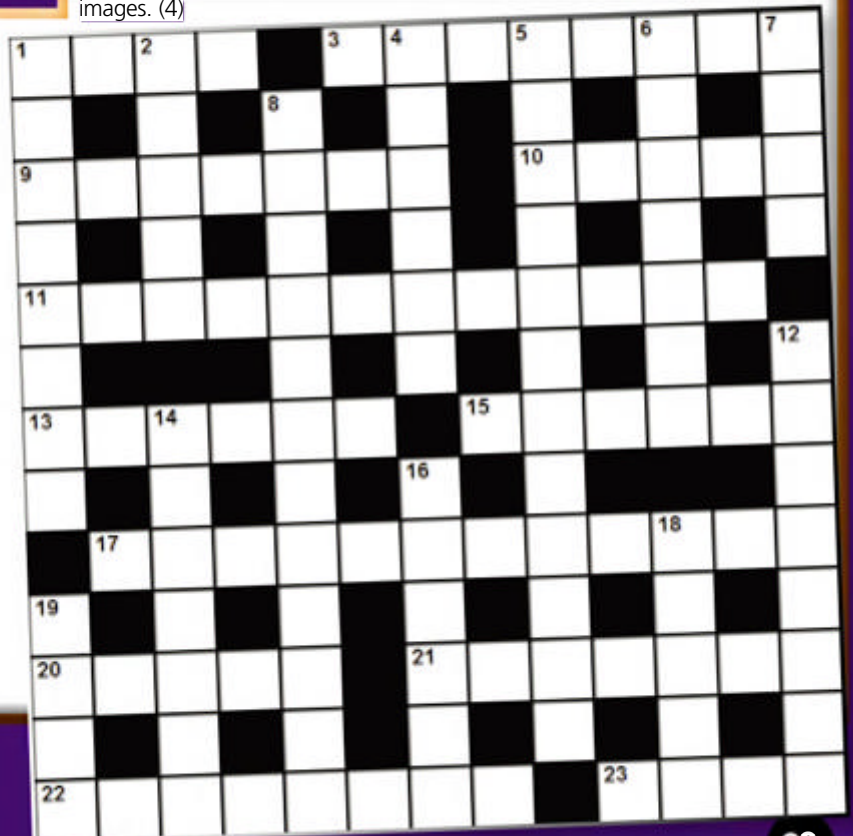
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- **How to play stream media files from your PC to a games console**

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