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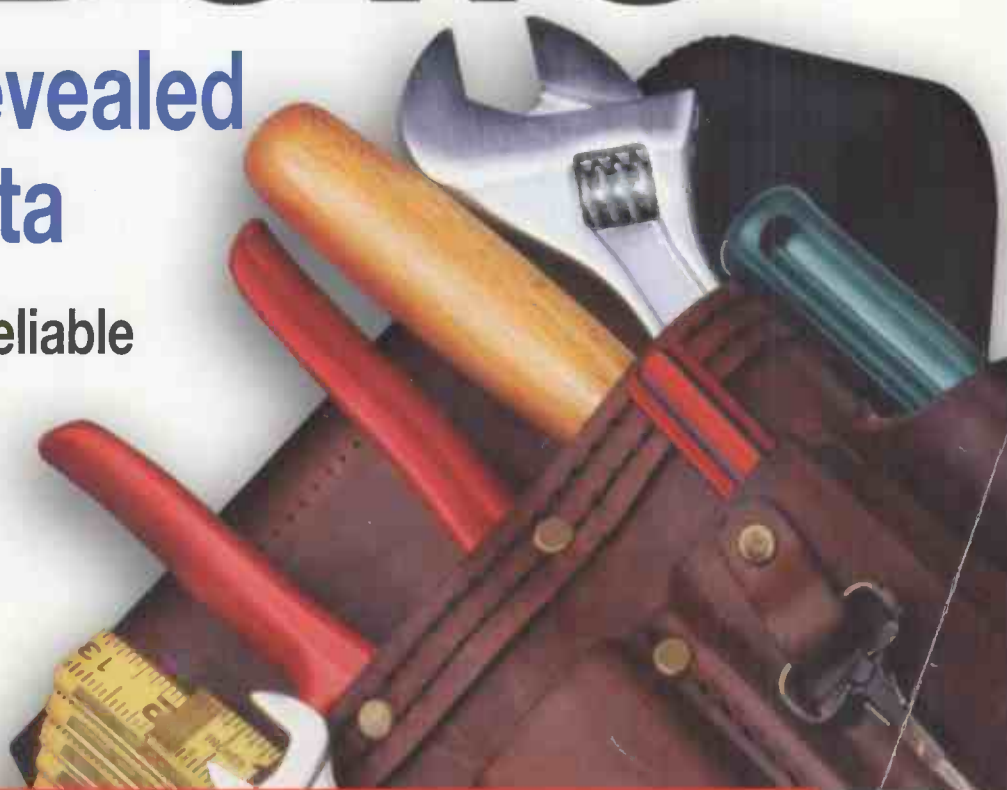

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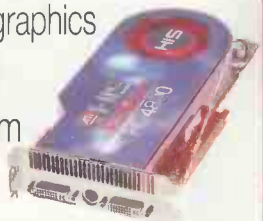

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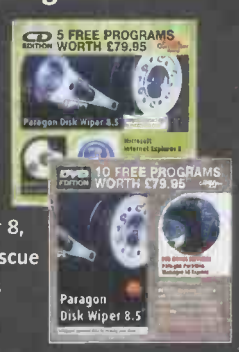

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Editorial

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Ebook evolution continues

The technology behind ebook readers has improved but there are still problems for publishers and users

Ebooks and ebook readers have had a chequered history, but recently they have popped back into the news with the launch of the second version of Amazon's Kindle in the US. Although it's unlikely to appear in the UK in the foreseeable future (unless European mobile phone operators do the unthinkable and agree on something), the Kindle has shown there is a market – of sorts – for portable electronic document readers.

High-street bookshops in the UK have also been heavily promoting ebook readers such as the Sony Reader and Irex Iliad, but with less success.

Having spent the past couple of weeks trying out Interead's Cool-er reader (see page 57), I've realised the problems surrounding ebooks are not quite as cut and dried as I'd originally thought.

I've been involved with producing ebooks for viewing on PCs (such as *PCW*'s digital edition, available at www.zinio.co.uk) for many years, but never for use on dedicated readers. And as I've discovered, there's a massive difference.

'The problems surrounding ebooks are not quite as cut and dried as I'd thought'

Reading straightforward novels on the Cool-er was an excellent experience for the most part – although formatting isn't always perfectly preserved – and the E-Ink Vizplex display really is unbelievably good outdoors, especially in full sunlight (see pictures at http://tinyurl.com/o3m6s9). In fact, in some ways it mimics paper too well – the contrast improves with the ambient light level, and so you still need the light on to read it in bed.

The biggest problem comes when you try to read content with more complex formatting, such as a PDF version of *PCW*, or a product manual. Our news editor, Clive Akass, explains some of the technical problems faced by publishers on page 14. For users, the crucial problem is that multi-column documents mixed with graphical content don't work well.

I'm not sure what the solution is, but my gut feeling says that trying to make ebook readers capable of displaying all content types is not the way to go. Colour E-Ink screens capable of displaying video are still several years away, but there are other companies such as Pixel Qi (www.pixelqi.com) working on low-power video-capable colour e-paper displays for laptops and netbooks: Pixel Qi's screen was demonstrated at the Computex trade show in early June, and it says that production models could ship in 2009.

For text books, fast searching is necessary, again something that products with limited processing power such as the Cool-er can't manage. Make the hardware faster, and immediately you run into problems of heat, battery life and weight.

Perhaps a better way to go is simply to have different models for different purposes – small, cheap, lightweight products with massive battery life for reading novels or news feeds, and chunkier A4 colour screens and faster processors for magazine or text-book use.

It's a fascinating time for readers and publishers alike, and you can be sure we'll be monitoring the developments in technology very closely.

Micro-blogging service Twitter has grown in the three years of its existence from a flaky, niche product beloved of geeks, to a flaky, mass-market product beloved of celebrities. But its power is undeniable – how else could you get a 140-character message out to the whole world in seconds? Starting on page 33 we look at some of the more advanced uses of Twitter, and there's not a celebrity in sight. PCW

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Keep up to date with the news, reviews and competitions in our weekly newsletters. To subscribe go to www.pcw.co.uk

Enter the true pocket ebook

The first of a new generation of ultraportables has arrived with the industry in a creative ferment reminiscent of the early days of desktop computing.

The Cool-er ebook reader (see review p57), is about the size and weight of a reporter's paper notebook. Its E-Ink screen draws little power and can last days between charges.

As we went to press, Elonex was about to launch a similar model that will sell through a major bookseller for around £179-£189. The company has plans to design and manufacture the devices here instead of the Far East. They could sell for as little as £90.

Magazines and newspapers are planning to publish on the ebook platform and other portables. News Corporation chairman Rupert Murdoch said last month that within three years newspapers could be published on 'mobile panels' – though it might take 15 years for them to catch on.

Sam Goult, marketing manager of Elonex, is less cautious. "I think these devices will be the big thing this Christmas," he said. If so, distributor John Menzies will be kicking itself as it has just closed its magazine download service citing "too much uncertainty".

Almost all current ebook readers use a mono epaper layer from E-Ink, which is about to launch a colour version. The screens are sluggish but good for prolonged reading (see Editorial, p7). Plastic Logic will ship a flexible A4 screen next year.

Also close to launch are more powerful, more versatile pocketables using ARM-based systems-on-a-chip (SoCs) from Samsung, Infineon, TI, and Qualcomm. These are unlikely to match the new e-readers for slimness and weight because their LCD screens are bulkier and draw more power; but they can screen video and offer rapid interactivity. The two device classes seem likely to converge in the long term.

Never mind the quality, feel the width... software on the pre-production Cool-er is a little flaky (see review on page 57) but it shows how an electronic notebook can be the size of a paper one

Bigger devices are not going to go away, but these new formats raise the question of how small a workhorse platform can be. This tends to be defined by keyboard size today, though voice and handwriting recognition are very usable and gesture input could evolve into a form of shorthand.

Precisely how these devices will be used is impossible to predict. By putting desktop power into the pocket, they surely represent a transition as important as that of the 1970s when cheap mainframe power reached the desktop. They are potentially a vehicle for a major cultural change: a further shift away from paper, and the creation of what is in effect a new medium with elements of newspapers, TV, magazines, and Web 2.0.

They have already changed the industry, as the news from the Computex trade show in Taiwan makes clear. They are pitting Intel against a ARM SoC manufacturers, and Microsoft's Windows against operating systems including friendlier versions of Linux (see opposite and p10).

Even the browser is under challenge. Jon von Tetschner, CEO of the company behind the Opera mobile browser, says it has to be the primary mobile interface because it is platform independent. Others say standalone modules directly accessing the web will be more important. The two approaches are epitomised by Adobe Flash, which renders rich content in a browser, and Adobe Air that does the same thing on its own (see p14).

Finally, unconnected with these developments, even Google is getting new rivals from a new approach that could transform the web (see page 15). *Clive Akass*

BT broadband users get free 20Mbits/sec upgrade

BT is offering its broadband customers a speed upgrade to 20Mbits/sec, provided they live in areas covered by the 549 exchanges enabled for ADSL2+ links. Upload speeds, important for video calls and P2P sharing, are increased to 1Mbit/sec.

The move brings BT more into line with speeds of up to 50Mbits/sec offered by Virgin Media. BT chief executive Gavin Patterson, in an apparent swipe at Virgin's recent 'free upgrade' which coincided with a small price hike, said: "Unlike other providers, BT is upgrading customers... for free.

The offer is available immediately to BT Total Broadband business customers and will roll out to home users this summer. *Orestis Bastounis*

● Virgin 200Mbits/sec trial – p12.
→ www.pcw.co.uk/2243436

October launch for Windows 7

Microsoft has confirmed that it will launch Windows 7, successor to Vista, on 22 October – and that it will not be offering the operating system on ARM-based ultraportables.

The company has shown every sign over the past weeks of sharing the PC industry's confusion about the new small formats – including Wintel-based netbooks.

Rumours that the company would backtrack on its decision to limit Windows 7 to running three apps on netbooks, with restrictions on graphics and touch capabilities, appeared to be confirmed at Computex when Microsoft OEM division corporate vice president Steve Guggenheimer said the full version would be available.

Guggenheimer also revealed that Microsoft has dropped the term netbook in favour of 'small notebook' because it found people were using the devices as full-fledged computers. The reality is that vendors and Microsoft have been talking down the power of netbooks for fear of undercutting more expensive models, and that users have seen through the pretence.

Confusion still reigns, however. Microsoft is said to have banned vendors selling netbooks with hybrid solid-state and hard-drive storage from using Windows XP.

Microsoft may well be right in thinking Windows 7 is unsuitable for pocketables. The danger is that, in a market already primed by devices such as the iPhone, buyers may have different expectations and create a critical mass for rival software. This is especially so as first-generation non-x86 formats will have an edge over Wintel on portability and battery life.

Windows CE and Windows Mobile already run on ARM but they are not competing well with other smartphone operating systems that are now migrating to larger formats. See page 10 for more on this and other Computex news. *Clive Akass*

Sony Ericsson phone accesses Playstation 3 content

Sony Ericsson's new Aino phone lets you control and access remotely media stored on a Playstation 3 via the internet. It also allows remote viewing of the free PlayTV service.

It is one of four new models launched last month designed to appeal to the youth market. The Yari includes a motion sensor and can be used as a Wii-style gaming device; the Satio has a 16:9 3.5in widescreen, a touch interface, and a 12.1-megapixel camera and is designed to double as media player.

Finally the W995 media phone has a BBC iPlayer application, allowing you to catch up on TV programs, and an 8.1-megapixel Cybershot camera. It is available now; the other three will launch late this year.

The Aino phone lets you view PlayTV remotely

Ordnance Survey frees up map data

Britain's Ordnance Survey (OS) mapping agency is making its data freely available in a major about-turn caused partly by increased competition from the likes of Google Maps.

It has launched an enhanced portal, OS Openspace, which allows businesses, government organisations and individuals to use an application programming interface (API) to use data on sites and other media.

The site includes sample Java code that can be incorprated into web pages and for the first time boundary information on areas such as wards, boroughs, and constituencies is freely available.

Ordnance Survey, which has it roots in 18th century military surveys, gave Britain some of the best and best-loved maps in the world. But it has been widely criticised for charges and restrictions on use of its data since 1999 when it was set up as a self-financing business.

It still needs to fund itself. So users will have to pay for the use of data from which they are directly making money, for instance by charging for a service. And sites getting more than a threshold number of visitors will incur charges.

→ www.pcw.co.uk/2242355

In brief

SP2 frees disk space

There's good news for people who upgrade Vista systems with Service Pack 2. It includes a clean-up ultility that appears to free up gigabytes of disk space (see Test Bed at **www.tinyurl.com/ovsv73**. Check out Test Bed for more on whether this reduces the bloated WinSxS folder highlighted this month by Tim Nott – see p130.

Intel fined £950m

AMD came close to gloating when the EC fined arch-rival Intel around £950m for monopoly abuse. The fine followed a complaint by AMD that Intel strong-armed PC manufacturers into not using its chips. Intel is to appeal but the EC ruling strengthens AMD's case in a damages claim it has filed against Intel in a Delaware court. For more on this see **www.pcw.co.uk/2242180**.

No-brainer sites

Internet service provider 1&1 has just launched a low-cost website creation service for small firms that lack the resources or know-how to design their own. The 1&1 Mybusiness Site offers templates tailored to more than 100 business types. The service costs £9.99 ex Vat per month.

→ www.pcw.co.uk/2242453

Noises off

This Jawbone Prime Bluetooth headset from is available now in a choice of colours, Its noise cancellation is said to be good enough to let you to call home from the pub and pretend you're stuck at the office.

→ www.jawbone.co.uk

Kingston SSD upgrade kit

Memory maker Kingston Technology launched a combination package aimed at facilitating upgrades from traditional hard drives to its SSDNow V value series of solid-state drives (SSDs).

The V Series kits are available in 64GB and 128GB versions and include cloning software and instructions on how to transfer the data and swap drives without needing to reinstall the operating system or lose settings.

The operating system and applications reside on the SSD in the upgraded system, while the old hard drive is used to store data.

An external enclosure is included so you can use the replacement drive as external storage. The 64GB kit will cost £96, while the 128GB pack will be £170.

Faster solid state drives

Storage specialist Sandisk unveiled its next generation of Flash-based solid-state drives (SSDs) designed for use in netbooks.

The pSSD P2 and S2 are said to bolster SSD performance while keeping the price competitive.

Doreet Oren, director of product marketing at Sandisk, said they offer up to 50 times the random write performance of first-generation versions.

Sandisk's engineers have worked with Canonical, creator of the Linux-based Ubuntu, and chip maker ARM to further optimise performance and power consumption.

The new drives are available in capacities ranging from 8GB to 64GB.

Mio TV sat nav

Mio has launched a range of satellite navigation devices with built-in TV tuners. The Moov V500 and V700 range have 4.7in and 7in widescreens respectively. A dual aerial is said to give good video and audio reception.

→ **www.mio.com**

Old guard fights on two fronts

Computing's old guard was fighting on two fronts at Computex with new mobile operating systems challenging Windows and ARM-based systems-on-a-chip (SoC) rivalling Intel in emerging mobile formats.

Novell demonstrated Acer and MSI hardware running its Suse flavour of Linux underpinning Intel's Moblin operating system.

Holger Dryoff, Novell manager of open-platform business development, said Moblin is more than Linux with an Intel front end. Novell had put in a lot of extra technology and Intel had done a lot of work speeding up boot times.

He added that with Novell people could expect the kind of backup and update services they have grown used to with Windows.

Acer showed an Atom-based Aspire One netbook running Google-backed Android, which is also based on LInux. More intriguing was an 8.9in Android model, the T800 from Elitegroup Computer System (ECS) using TI's ARM-based Omap3 SoC.

Vendors have at last discovered that business people need true portables too. Acer is targeting this Aspire One Pro 531 netbook at corporates. It weighs just under 1kg, is 2.5cm thick and has a near full-sized keyboard

ECS sells models for rebadging by other vendors so the T800, expected to launch late this year, could appear under other names.

Asus, in a sign of the sensitivity over this upstart technology, showed an Eee Android netbook using an ARM-based Qualcomm Snapdragon chip and then reportedly began to back off from it, saying there were no plans to launch.

This prompted speculation that Asus was being strong-armed by Intel. But, as the EC has just fined Intel nearly £1bn for doing just this kind of thing (see p10), this seems unlikely – or the company thinks the threat merits the risk.

Intel announced that it is buying Wind River, a major developer of systems using both Moblin and Android. Peter Mychreest, key account manager at Wind River, speaking before the takeover, would not be drawn on which of the two was better. He told me: "The market will decide." *Clive Akass*

Rivals launch new processors at show

AMD launched two dual-cores, the Athlon II X2 250 and the Phenom II X2 550 Black Edition, at Computex, and Intel launches included a new ultra-low voltage (ULV) chip.

AMD says the X2 250, a 45nm re-working of its desktop architecture, is the fastest Athlon ever at 3GHz. It supports faster DDR3 memory and version 3.0 of AMD's Powernow power-saving technology, and has an 2GHz Hypertransport link.

The 3.1GHz Phenom II X2 550 Black Edition extends AMD's Dragon platform and is its fastest dual-core. It is unlocked and can be overclocked using AMD's Overdrive 3.0 software.

Intel is aiming to deliver ultra-thin laptops at mainstream prices with the new 1.3GHz ULV Pentium SU2700. A new GS40 Express mobile chipset is also aimed at ULV-based laptops, with support for HD playback and HDMI video output.

Intel also unveiled three new Core 2 Duo laptop processors, the T9900, P9700, and P8800, clocked at 3.06GHz, 2.8GHz and 2.66GHz respectively. All use a fast 1,066MHz front-side bus. *Danny Robinson*

Rival DirectX 11 video cards coming this year

Nvidia and AMD/ATI will launch next-generation 40nm graphics cards this year. Nvidia's GT300 and ATI's RV870 series will both support DirectX 11.

ATI demonstrated tessellation, a standard feature of DirectX 11, in a video running on DirectX 11 hardware at Computex 2009. ATI is bullish about launching a product around the 22 October launch of Windows 7, although no finished silicon or specifications have been shown to the public. It's widely expected that ATI's new cards will aim to conquer the same price/performance segment as the Radeon HD4800 series.

Although Nvidia has officially kept quiet about GT300, the first engineering samples have been taped out. Rumours suggest the card will be a departure from previous generations, using Intel Larabee-style Multiple Instruction Multiple Data (Mind) parallel processing.

Sources suggest the card will use 512 processing cores, a 512-bit memory interface and GDDR5 memory.

Difficulties in making 40nm chips, which has caused a shortage of Radeon HD4770s, could cause delays. Manufacturing partner TSMC may be dropped in favour of rival Global Foundries, which showed off 32nm and 28nm silicon wafers prior to Computex. *Orestis Bastounis*

Bid to improve multi-core code

Intel has released a set of tools called Parallel Studio, designed to help programmers make better use of multi-core processors.

The move follows claims that most software is not exploiting multi-core power. Programming guru Donald Knuth has gone as far as to say that the problem could be insurmountable, and that multi-core computing could turn out to be a dead end.

Intel senior vice-president Pat Gelsinger admitted last year that a breakthrough was needed.

Parallel Studio consists of three modules costing $399 (£255) each, or $799 (£509) as a suite; a fourth, Parallel Advisor Lite, is available as a free plug-in. All are targeted at C and C++ programmers using Microsoft's Visual Studio.

James Reinders, director of software development products at Intel, said he hoped the new suite would "kick parallelism into high gear by solving problems that have not been addressed before."

Advisor Lite analyses applications to identify tasks that might benefit from parallelism. The other three tools, Composer, Inspector and Amplifier, are designed respectively to help with the verifying and tuning of code.

Intel already had similar tools for Linux, under which it is more usual to find code using multiple threads that can run simultaneously on different cores.

"Parallelism is not very common yet for Windows, so we wanted to make it a goal for programmers to aim for," said Reinders. He pointed out that this would become more important as processors gain dozens and possibly hundreds of cores.

Multi-core programming has become crucial because chip vendors can no longer boost processing power by pushing up clock rates; which have hit a ceiling of around 4GHz in standard systems because of heat problems.

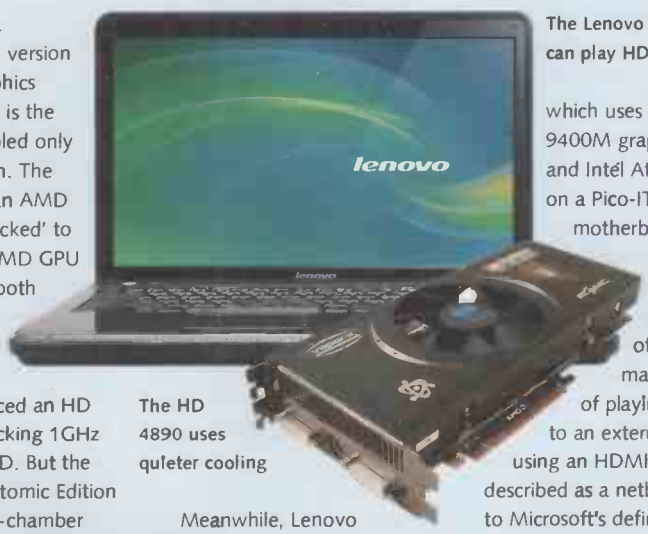
Multi-cores can in theory do more at lower clock speeds but a lot of software can benefit only to the extent that different applications (or virtual machines) can run simultaneously on different cores. Even tasks that could easily make use of parallelism, such as graphics processing, require special coding to use the extra cores.

→ www.pcw.co.uk/2242718

AMD GPU hits 1GHz as Lenovo sets Ion gaming

AMD has launched a 'factory-overclocked' version of the HD 4890 graphics processor that it says is the first to hit 1GHz, cooled only by a heatsink and fan. The difference between an AMD GPU 'factory overclocked' to 1GHz and a 1GHz AMD GPU is not at all clear, as both are presumably guaranteed to run safely at that speed.

Sapphire announced an HD 4890-based card clocking 1GHz two days before AMD. But the Sapphire HD 4890 Atomic Edition uses Vapor-X vapour-chamber cooling which is quieter than using a fan.



The HD 4890 uses quieter cooling

Meanwhile, Lenovo has launched a 12.1in machine using Nvidia's Ion platform, which uses a Geforce 9400M graphics processor and Intel Atom processor on a Pico-ITXe motherboard. Ion gives the Ideapad S12 the performance of a gaming machine capable of playing HD movies to an external display using an HDMI link. It is described as a netbook, contrary to Microsoft's definition, which shows where marketers lead, the public is not sure to follow.

The Lenovo Ideapad S12 can play HD movies

Noisy transistors block power efficiency

Researchers have warned of a new bottleneck in shrinking transistors to produce more power-efficient processors.

They say the theoretical model engineers use to reduce electronic noise problems breaks down at nanoscale. It works well for relatively large devices but its prediction that noise frequencies will increase as transistors shrink has been proven wrong, say US researchers.

They found, during studies of the difference between transistor on and off states, that noise-induced errors get worse as the power decreases and sizes are scaled down.

Lead researcher Jason Campbell said this amounted to a bottleneck for low-power transistors. "We have to understand the problem before we can fix it."

Early launch for AMD's Istanbul

AMD has launched a six-core Opteron, codenamed Istanbul, several months ahead of schedule. It is said to deliver 34 per cent more performance than last year's quad-core Shanghai chip at the same speed while drawing much the same power.

It is designed for motherboards with between two and eight sockets and can be used as a slot-in replacement for Shanghai.

The HT Assist feature boosts the efficiency of the system by using part of each chip's Level Three cache as a directory of what data its partner processors are holding so it can be retrieved faster.

"The CPU knows exactly which processor to go to for the information it needs instead of sending out broadcast requests, making for more efficient memory access," explained Pat Patla, vice-president of AMD's Workstation and Server division.

Istanbul chips rated at 75W are available at clock speeds of 2.6GHz, 2.4GHz and 2.2GHz.

New Itanium delayed again

Intel has once again delayed the release of its next-generation Itanium processor, codenamed Tukwila, until early in 2010. It was originally planned for a 2007 release.

It's the latest hitch in the saga of the chip, jointly developed with HP, which earned the nickname Itanic because it was widely perceived as a disaster. The Itanium uses its own non-x86 architecture.

Intel said the delay occurred after its engineers spotted a way "to enhance application scalability" and allow it to gain market share from rival Risc-architecture systems from Sun and IBM.

Ironically, this is precisely the market targeted by Intel's next-generation x86 Xeon platform codenamed Nehalem EX, which will have up to eight cores, according to a recent briefing by the company.

HTC remains mum on MIDs

Smartphone maker HTC's product manager for Europe, Phil Blair, was at the Wireless and Mobile 09 show in London extolling the value of the smartphone as a corporate tool. He was also showing off HTC's Touch Pro 2, which can be touch or keyboard driven.

It is a good design but your reporter was more interested in HTC's plans for emerging mobile internet devices (MIDs). Blair was keeping mum on the subject, beyond confirming that HTC is looking at the format.

The Touch Pro 2 weighs much the same (178.5g with battery) as the Cool-er ebook reader (see page 8 and 57).

Virgin trial hits 200Mbits

Virgin is trialling 200Mbits/sec access among 100 customers in Ashford, Kent. The increased speeds, the fastest home links yet available in Britain, are enabled by the new Docsis 3 standard which allows multiple upstream and downstream data channels to be used for a single data stream.

The trial service bonds four 50Mbits/sec connections into one.

→ **www.pcw.co.uk/2241767**

5Gbit card slot

Villagetronic has demonstrated a graphics expansion card which is the first product to use the new Express Card 2.0 standard, which offers transfer rates of 5Gbits/sec – 10 times faster than a USB2 link.

→ **www.villagetronic.com**

60GHz group aims for 6Gbits

Major companies including Intel, Microsoft, Samsung and Panasonic are allying to develop a standard for wireless links in the 60GHz band capable of transfer rates of at least 1Gbit/sec.

The Wireless Gigabit Alliance (WGA) says the new Wigig standard will be more versatile than existing Wireless HD, which uses a 60GHz signal to beam HD video across rooms to TV sets. Wigig is designed to link mobile phones, video cameras, PCs and other devices as well, and the WGA says speeds could reach 6Gbits/sec.

Other WGA members include Atheros, Broadcom, Dell, LG Electronics, Marvell International, Mediatek, Microsoft, NEC, Nokia and Wilocity.

Many are also members of the Wireless HD organisation. Analyst Caroline Gabriel, of Rethink Wireless, says the WGA prime movers are Wifi chipmakers who don't want to be outflanked by a new technology.

A notable absentee is Sibeam, which makes a Wireless HD chipset used in a number of TVs. To complicate matters further, an IEEE 802.11 sub-committee has been investigating the use of 60GHz as a new Wifi transmission band. The Wigig specification will allow a number of protocols such as HDMI to be used over its carrier signal.

The 60GHz band has a number of advantages, some double-edged. The frequencies happen to be readily absorbed by oxygen, restricting signals to rooms; but unlike Wifi (see below) it will not cause interference with neighbours. The bandwidth is huge: 2.5GHz compared with a maximum 40MHz for Wifi.

Signals at 60GHz are directional, which normally means you need line-of-sight transmission; but again there is a plus side: focused transmissions are more power efficient and addressing can be done simply by pointing.

Wigig may be the final straw for former front-runner Ultrawideband (UWB). Intel dropped UWB last year and the governing Wimedia Alliance has wound itself up, handing technology over to the Bluetooth SIG, which may (or may not) use it as a fast data pipe.

→ **www.pcw.co.uk/2241869**

Rethink on Wifi nets as 11n goes official

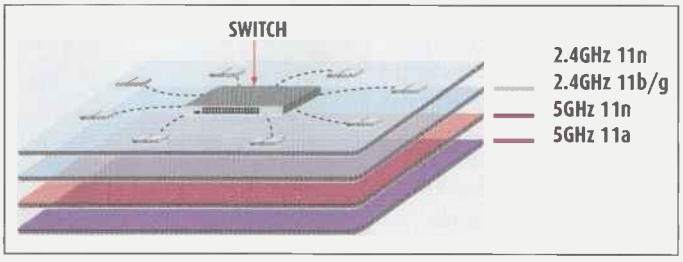
The standard for 802.11n Wifi will be set in stone in September, at least two years after 'draft 11n' products started hitting the shelves. These products should be compatible with the standard, or can be made so with a firmware update.

Phil Belanger, who helped draw up the 11n standard, gave me this news at the Wireless and Mobile 09 show in London with a rare honesty about the drawbacks of the technology.

Companies boast that 11n doubles the effective range of Wifi but omit to point out that this quadruples the area of contention. Similarly they will tell you that the speed is 300Mbits/sec without mentioning that network overheads mean real throughput is much lower and that the top speed anyway relies on you hogging airspace by doubling up channels.

Belanger, who worked on the 11n spec, said: "People don't notice the problems because Wifi, particularly 11n, is so resilient. All they see is a drop in performance."

Belanger can talk openly about these things because his company, Extricom, addresses Wifi problems – specifically those associated with networks that use multiple access points (APs). There is apparently no standard way of setting these up but APs are typically sited for minimal overlap in coverage, with neighbouring ones using different channels.



One for all... a single Extricom smart switch connects up to 16 access points. Multiprotocol overheads are avoided by assigning different channels to different Wifi flavours

The problem with this setup is that the signal strength is erratic and tails off with distance, and 11n performance can be hit badly if the system has to cope with devices using older 11a/b/g Wifi. Also there can be an appreciable hiatus when a user crosses from one AP area to another.

Extricom's approach is to connect all APs to a smart switch and present them to the roaming clients as a single device. The switch can decide, packet by packet, which AP to draw the data from and which extension to use to send data. There is no channel contention, because all APs use the same channel, and no boundary problems because there are no internal boundaries.

A system called Channel Blanketing assigns a different channel to each of the different Wifi flavours, avoiding the overheads of switching protocols (see diagram). Extricom has just launched a new cascading switch that allows you to double up two 16-AP networks, either to double the coverage area or provide a fail-safe.

Clive Akass

→ **www.extricom.com**

HDMI cable brings web to TV

A new HDMI standard supports an Ethernet channel so TVs can connect to home networks and the internet.

The version 1.4 specification allows data transfers of up to 100Mbits/sec in either direction.

HDMI 1.4 also includes an Audio Return Channel (ARC) for external devices.

Other new features announced by the governing body, the HDMI Licensing LLC, are:

HDMI cables... soon there will be five varieties

• Definitions of 3D formats and resolutions for HDMI-enabled devices with dual stream resolution going up to 1080p.

• Support for resolutions beyond 1080p, including 4,096x2,160 at 24Hz.

• Support for colour spaces used by digital still cameras, including YCC601, Adobe RGB and AdobeYCC601.

• A 19-pin Micro HDMI connector supporting up to 1080p for portable devices.

• A specification for in-car HD content distribution.

There are now five standard cables: standard for data rates of up to 1080i at 60Hz; high speed for rates above that including those for 3D; standard with Ethernet; high speed with Ethernet and automotive for vehicles.

Sata 3 enables thinner laptops

Data rates on Serial ATA (Sata) hard-drive links will double to 6Gbits/sec under a new Revision 3 specification. Devices built to earlier Sata specifications will work with the new version but slimline Low Insertion Force (LIF) optical drive connectors will allow some laptops to be thinner.

Nano memory will last a billion years

A new memory device could store a terabyte of data per square inch without corruption for a billion years, researchers say.

It consists of a carbon nano-tube enclosing an iron particle 50,000 times thinner than a human hair. The iron can be shuttled back and forth to represent data.

By contrast Flash memory can fail after three years and all current long-term data storage methods have a relatively short life compared with paper. Professor Alex Zettl, of the University of California, who leads the team developing the memory, gave the example of the Doomsday Book written on vellum, which has so far lasted over 900 years. The digital version of the book, encoded in 1986, failed in less than 20 years. Egyptian hieroglyphs (pictured) are even more resilient than vellum .

Zettl Research Group, Lawrence Berkeley National Laboratory and University of California at Berkeley

Set in stone...Egyptian hieroglyphs

Current long-term archiving requires expensive storage media and a regime of regular refreshes to ensure that data is not lost.

→ http://pubs.acs.org/doi/abs/10.1021/nl803800c

Iomega storage box checks out your home

Iomega and Buffalo were both showing off upgraded versions of their network-attached storage (Nas) devices last month.

Iomega's Storcentre IX2, now with a choice of 1TB or 2TB capacities, comes with new software from parent company EMC that supports remote access.

Iomega's Storcentre now supports remote video

This allows you to access an IP camera from anywhere over the web to check your home for intruders. Iomega has only tested this with the Axis range but in theory any IP camera will do.

But the IX2 does not support features such as intruder alerts triggered by software-based movement sensors.

Buffalo's new Terastation III Nas has four hot-swappable drives and capacities up to 8TB depending partly on how you configure it – Raid levels 0, 1, 5, 10 are supported. It is more suitable for business use than for the home, although it has an built-in DNLA media server. It also supports remote access.

In brief

GPS lives on

The global satellite navigation system is not about to fail, despite fears that satellites are not being restored fast enough to replace those lost to age and technical failure, according the United States Air Force (USAF). The reassurance came after a US General Accounting Office review expressed concern, pointing out Boeing, which is building the next generation of satellites, had suffered major cost overruns and years of delay.

→ www.pcw.co.uk/2242731

Free Humyo apps

Online storage provider Humyo is offering web-based applications free to users – including those using its free basic service. They will be able to edit images and Microsoft Office documents via a browser, even on non-Windows machines thanks to a partnership with online apps provider Zumo.com.

→ www.pcw.co.uk/2242108

Tiscali sold

Talktalk has bought the UK arm of service provider Tiscali, ending months of uncertainty for its 1.8 million subscribers.

→ www.pcw.co.uk/2241908

IPv6 promotion

Ripe NCC, a not-for-profit internet infrastructure organisation, has launched a new website designed to help companies find out more about migrating to the IPv6 protocol, which among other things will end the shortage of web addresses. Most of the web still uses IPv4.

→ www.pcw.co.uk/2242702

Toshiba drives

Fujitsu has sold its hard disk drive (HDD) business to Toshiba. It will now be called Toshiba Storage Device Corporation (TSDC).

→ www.pcw.co.uk/2241579

Designing for the new ebook readers

Multiple screen sizes create problems for epublishers. Clive Akass reports

Hardware formats are not the only issues to be settled with emerging pocketable devices, which are increasingly being seen as the next-generation publishing platform (see page 8).

The raison d'etre of a PDF, one of the most common publishing formats, is that it has the immutable quality of a paper document, and looks the same whichever platform you view it on. The drawback, as you can quickly find on an ebook reader, is that it can be almost impossible to read on a screen smaller than the document is formatted for. You keep having to scroll left and right as well as up and down to read all the text.

The problem is made worse by the fact that current epaper screens lack the rapid interactivity of LCDs, so that zooming is less satisfactory even if the rescaling can produce a readable page.

It also negates a big advantage of ebooks, which is that you can bump up type sizes to suit your eyes – the reason, perhaps, early adopters untypically have included many older people.

Adobe has now introduced what Bill McCoy, its general manager of epublishing business, calls a partial solution in the form of a reflow capability which it has just sold to Amazon for the new Kindle reader.

It consists of a software module on the reader that fits text to the screen size, just as a word processor reflows type.

Amazon Kindle and printed New York Times... will the one see off the other?

"You could say it liquefies the text," said McCoy.

But it will not work with all PDFs. Some are pure graphics files, with even text rendered as a bitmap, when reflowing would be possible only after performing fallible optical character recognition (OCR) on the fly. Most PDFs include text data but even these can be difficult to reformat if they include a mix of images and multiple columns with complex links.

Adobe and much of the publishing industry is now backing another format, XML-based Epub, which supports reflowing. An exception is Amazon, which bought Mobipocket reader software from a French company of the same name; it works on a wide variety of mobile phones as well as Amazon's Kindle.

The downside of Epub is that, unlike PDF, it cannot support complex layouts. "Publishers are going to have to make a choice as to whether that want Epub, which will flow to any size screen, or a PDF that is going to have that high fidelity," said McCoy.

The most common web publishing format is, of course, HTML. This works well enough if you simply want to throw text into a page template but it cannot rise to the design values of printed newspapers and magazines – certainly not at the speed web publishing has to operate.

It is not clear at this stage whether magazines and newspapers will survive in the long term as we know them. Publishers may sell content rather than clumping it under a title, and readers may aggregate this material from various sources, free and paid for.

The electronic edition of the *New York Times* (**www.tinyurl.com/9ysvmt**) shows the way things are going in the short term. It uses video as well as static images, rendered not by a browser but by Adobe's Air engine – basically Flash implemented as a standalone program. (An earlier version used rival Microsoft technology called Silverlight).

The layout adjusts dynamically to your screen size, which works well enough, but there is a danger that the human designer will become sideline. My own view is that the industry should agree on some standard screen sizes, along the lines of those used for paper, to minimise the need for this kind of design by algorithm (see my blog at **www.tinyurl.com/d8236y**).

Popular products like the iPhone may establish de facto standard sizes, just as the ubiquity of Word made its .doc format a de facto standard. But Word also illustrates how difficult it can be to move the world on: how many people use Word 2007's better DOCX format?

Adobe Air and Flash run on x86 platforms under the Mac OS, Windows or Linux. When full versions are available for the emerging ARM-based pocketables, which McCoy says will happen by the end of the year, we could see a fundamental change in the publishing world.

Adobe Catalyst hands more control to the designer

A new Adobe tool helps designers to add interactivity to static designs with minimal need for a programmer.

Flash Catalyst, available to download as a beta for Windows and Mac OSX, is intended to speed up the development of interactive Flash applications.

It is intended for use with an enhanced version of Adobe Flex Builder, now renamed Flash Builder 4 and also available as a beta.

Adobe platform evangelist Andrew Shorten showed how Catalyst allows designers to attach functions and behaviour to elements of designs from Adobe's Illustrator, or to whole images from Photoshop, to produce interface elements such as scroll bars, buttons and dropdown boxes. The output is an XML file that can be tweaked if necessary by a programmer.

Speaking at a London preview of Catalyst, designer Jeremy Baines, of design house Howard Baines, said it let him do work he would previously have handed to a programmer. "It puts more pressure on me but I like it because it gives me more control over the design."

Baines' colleague, Clive Howard, said this gave him more time to work on other aspects of the design process, such as linking to services and data sources.

Searching beyond Google

New search engines work like librarians – and bring us closer to the semantic web

The power of the search engine must be impressive even to those users too young to know what the world was like without one. Google has become a verb and its usefulness so far outweighs its drawbacks that the casual user might be hard pushed to say how it could be improved.

Many of us remember having to make a lengthy trawl through the reference shelves of a local library to get information now available in seconds online. Yet library searches beat Google in a crucial respect: you can have the help of a skilled librarian and can ask your questions in natural language.

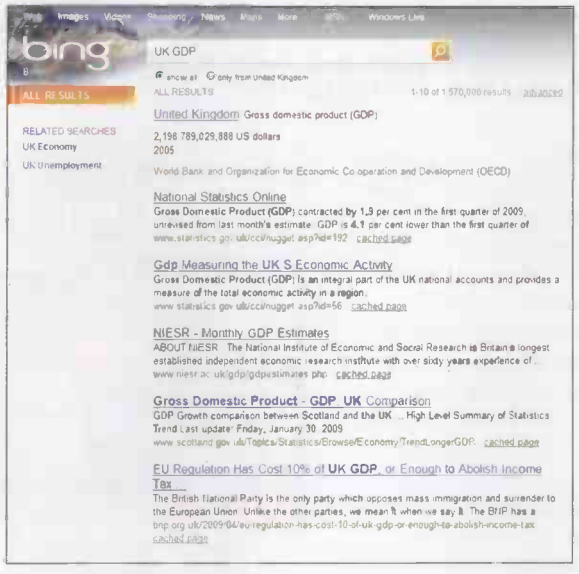
The librarian, roughly analogous to the search engine, truly understands you, easily coping with words that have different meanings according to context. The search is facilitated too by the fact that the information is structured, with books categorised by subject and indexed by topic.

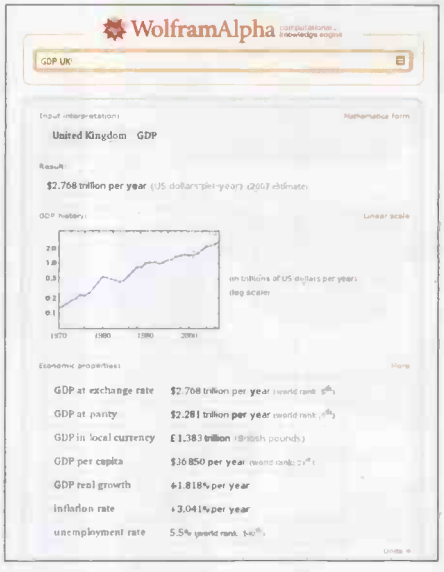
The librarian deals with meaning rather than strings and can answer questions that require collation of information from more than one source, like: "What was the weather like in the capital city of Peru on 1 December, 1887?"

The aim of the much discussed semantic web is to give the internet something of this structure and human expertise. It is a huge task, a major requirement of which is a new layer of metadata, or data about data, and it will take years, perhaps forever, because there are those who believe it will never happen.

More practicable in the short term is to try to achieve similar ends with particular bodies of knowledge. This is one aim of the Wolfram Alpha engine, launched in beta form with much fanfare last month.

Stephen Wolfram, the British-born developer, is best known as the man behind the Mathematica maths suite beloved of many





The other big search news this month was the beta launch of Microsoft's new Bing search engine – or decision engine, as the company calls it. It has a Google-like interface and some nice touches. You can judge for yourself at www.bing.com. But it is very much old-style. Searching on UK GDP gives you a list of sources (left) you need to trawl through yourself for the information you require. Wolfram Alpha (right) extracts the required information from its sources and presents it graphically. It's at www.wolframalpha.com

scientists. This has a remarkable interface, a cross between a word processor and a calculator capable of almost any mathematical operation.

The Wolfram Alpha engine can be seen as an extension of this interface – it will, for instance, solve equations. But it will also respond to natural language questions by finding and relating relevant information from multiple sources, and presenting it meaningfully.

That is the idea, anyway. Its limitations are obvious as soon as you start to use it. For instance when I entered the string 'GDP UK 1930 to 2009' it did not understand the full request. But when I entered 'GDP UK' it charted the figures since 1970 with the option of extending the dates. So it could do what I asked but I had to ask in a non-intuitive way.

Such stumblings do not make it a failure. It can only search the US-centric miscellany of information Wolfram's company has collected and mapped over the years, but its knowledge base will expand. Its natural-language processing could do with some improvement, but it has already raised expectations of what search engines should be able to do.

Gianpiero Lotito, founder and chief technology officer of a search-engine start-up called Facility, says machines alone cannot map information to the level required for these smart searches, "At some point you have to have humans involved."

He explains that semantic searches require information to be described in terms of taxonomy and ontology. Taxonomy extends to all knowledge the hierarchical categorisation that began with the formal classification of animals and plants.

Lotito gives a simple example to illustrate ontology: one source includes London in a list of European capital cities; London is listed by another source as a UK city; ontology relates the two to allow a smart search engine to infer that London is capital of the UK.

His search engine, also called Facility, is designed for use by enterprises or any organisation with a body of searchable information.

Facility comes with a tool that will make a first stab at creating the necessary metadata in the form of tags; but humans have to be called upon to finish the job.

The aim is to achieve what Lotito calls 100 per cent pertinence – that is, users always get the answer they want, if it is available

Lotito came to searching via the publishing world where he was involved in archiving and searching content, and it may be that systems like Facility could power future forms of on-demand publishing.

So could the semantic web perhaps grow piecemeal with different blocks of mapped data referencing each other and expanding until all knowledge is covered? Lotito says the required standards could take years to develop.

We will have to wait until early next year to try out a public beta of Facility. But Wolfram Alpha, though of limited use as it stands, could develop into a very powerful resource. *Clive Akass*

INTERACTIVE

LETTERS

Send your letters to The Editor, *PCW*, Incisive Media, 32-34 Broadwick Street, London, W1A 2HG **Send your email to** letters@pcw.co.uk

LETTER OF THE MONTH

Dear Mr Microsoft

Windows 7 is a triumph for me, and all the little Vista quirks, such as losing Wifi connection after hibernation and the User Account Control aggravation, have disappeared. In addition I love the interface and I am not looking forward to going back to Vista when the Release Candidate expires.

However, as Windows 7 was developed directly from Vista and the experience and feedback of all the early Vista adopters has been instrumental in making Windows 7 the quality OS that it clearly is, don't you think it would be a nice gesture to offer all your loyal Vista users a free upgrade to Windows 7 in recognition of all the free support you have had from the Vista community?

Once the corporate lads move en masse to Windows 7 (and they will) you will clean up anyway and it's always nice to spread good fortune around, don't you think? I await my serial key with anticipation, but without holding my breath.

Jeff Annely

NOT-SO-SMARTPHONE

I use a Palm Treo smartphone, which I sync with Microsoft Outlook on my PC using Windows Mobile; or rather I did until I applied Service Pack 2 for Office 2007. The file format change broke the synchronisation.

Palm's UK support website was useless, full of broken links. Its US Webchat representative suggested that I apply a Windows Mobile file format upgrade. Sounded good, but when I ran it, it told me that I was using the wrong language, and it would terminate. US English versus UK English? No, same result with the file from the Microsoft UK site. Then eventually the penny dropped; temporarily change the language on the smartphone to US English, and it worked.

By this time, the sync interface on my phone was well and truly broken, so I went back to the install disc that came with the phone. It said that it would only run if I had Adobe Reader 8 or above, even though I keep my phone well patched and have version 9.1. Luckily, I remembered what I had to do when I first bought the phone and bored down three levels on the disc file structure until I found something that would run and do the job. And my phone now syncs again.

Would an entry-level PC user have found their way through this maze, or would they have given up and bought a Mac?

John Fleming

HOW TO GET YOUR NORTON FREEBIES

It is easy to get the three installations of Norton Internet Security ('Yet More Norton', Letters July 2009). Just connect to the Norton help centre and let them do the installations remotely.

I recently scrapped one machine and let them uninstall the security suite from one computer then install it on the new one. I have used this service twice and as long as you have internet access on your machines there is no problem.

Cliff Hamer

FLOPPY FAILURE

I've subscribed to this usually erudite magazine for a number of years now, and have been in computing since 1968. During this time I've seen many changes to the world of computers and especially the five-minute wonder of PCs – they still may never catch on. What does always annoy me is the ongoing praise handed out to the likes of Amstrad, which produced dismal machines that were never IBM compatible although often claimed to be. Now you claim that the 1986 IBM Compatible was the first appearance of the 3.5in floppy disk format.

As I recall, as I worked for the company then, ACT Computers with its ground-breaking Apricot range introduced this disk format two years earlier, and was selling products with 3.5in disks to the Government and the Ministry of Defence in copious numbers by 1986. The computer press seems to have woefully forgotten everything that Apricot did for PCs; and especially PC

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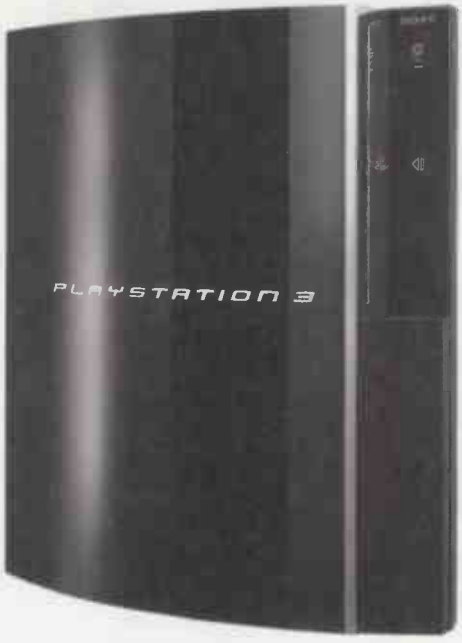
21 Barry Fox

22 Guy Kewney



The PS3 is a versatile media player. And also a games console

networking, first shipped by Apricot before its competition. The code was subsequently bought by Microsoft and is still part of its latest products, exemplified in the still useable networking command prompts.
Bob Lewis-Basson

Kelvyn Taylor replies: What we intended to say was that the IBM Convertible was the first appearance of the 720KB 3.5in drives in an IBM PC. You're correct that Apricot (and HP) launched machines with the 720KB 3.5in drives in 1984. Thanks for pointing out our blooper.

PS3 ROOLZ

Sony's Playstation 3 (PS3) is the most amazing machine for doing (nearly) everything.

I have owned a PS3 for just over a year and it still keeps amazing me. I own the 40GB version, and all my home movies, family photos and most of my music are stored on it. Not only does it play Blu-ray discs very well but it wirelessly connects to the internet.

Recently I took the plunge and brought an HD camcorder. I was amazed that the footage off the SD card with USB adapter played at 1080p with 5.1 surround sound.

I did not want to upgrade the hard disk so I have a 160GB 2.5in USB-powered hard disk, which works fine as long as you format it as Fat32. This plays my media including DivX, WMV and AAC files. It won't play much from the Apple store or some of the more obscure codecs but I can live with that; it's a media streamer too. Did I mention it also lets you play games?

With so many options of media centres, streaming media players and so on, I am amazed that I do not see it included in more articles.
Jez Turner

TAKE THE GLOSS OFF

Am I unusual in thinking that glossy screens on laptops are close to useless? In an amusing bit of double-speak, these are sometimes labelled as 'anti-reflective'. In perfect conditions they give a nice picture but if there is any light on the user or behind them, there's a big reflection.

In sunlight on a train journey, for example, they are hopeless; sit one way and light falls on the screen. Sit the other way and all you can see is yourself. There is a simple solution, use a matte screen. We recently managed to get one by buying last year's model, but it seems glossy is now almost ubiquitous on laptops and, sadly, starting to creep in on monitors. Is there any chance of sense prevailing over marketing?
Peter Hancock

DIAL U FOR UPDATES

There is one aspect of Windows Updates that has not been considered in Torstein Tornes' letter and your response to it in the July issue of *PCW*– that is the impracticality of using the 'Automatic' setting for people who can only get dial-up connections, of which there are shamefully still many, and some of which are slow even by dial-up standards, due to the remoteness of their homes and often poor phone cabling between them and the local exchange.

I maintain several home computers for such people in mid-Wales, and in all cases, to make their computers useable on the internet I have had to disable Automatic Updates. Every time their computers connect to the internet, automatic updates were starting, making the connection virtually unusable for web browsing. It is not unusual for updates to be over 50MB – imagine this on a line that takes eight to 10 minutes per megabyte. The updates never fully download as these people are rarely online long enough. I have had to change their Windows Update settings to 'Notify...' instead of 'Automatic' to make their internet connections usable. In practice, this means that few of these people ever perform updates; most of them are not knowledgeable enough to select only the critical items and decline the over-large ones from the updates available.

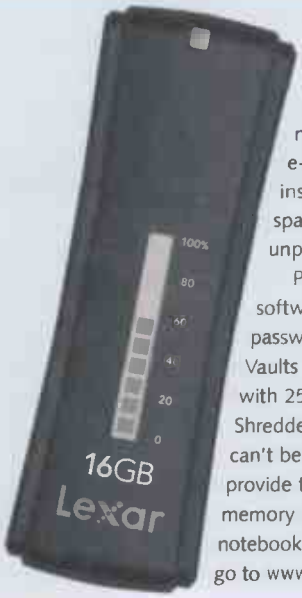
There are often other automatic updates attempting to take place on these computers too, making the situation even worse. The only practical thing to do is to disable all automatic updates other than those for anti-virus programs.

The fact that so many people still cannot get broadband is another topic completely, and is not something that is likely to be resolved by any proposals I've seen so far; most of these people cannot receive mobile phone signals either, and are not likely to in the foreseeable future, so that is another potential option closed to them. The only potential I can see is for connection via satellite, but unless this becomes as easy to install and set up as Sky TV (Freeview is not available in this area either), and is as cheap as a conventional broadband connection, it is not going to be of any interest to these people. Have any of your readers any practical suggestions – other than moving house?
Les Wilkins

OVER THE SEA TO SKYPE

I have an ordinary BT line and five Diverse 4010 Dect handsets using one base station in my house. Four years ago I bought a B2K box on Ebay which has sockets for the incoming BT line, the base station, and a USB port.

WIN Next month's prize is a Lexar 16GB Secure Plus Jump Drive, plus a 2GB Crucial memory upgrade



Lexar's 16GB Jump Drive Secure II Plus is packed full of advanced security features, and is ideal for safely storing and moving your multimedia content. With a built-in e-link capacity meter, it is easy to instantly see the available storage space on the Flash drive – even when unplugged from the computer.

Pre-loaded with advanced security software, you can also create multiple password-protected areas called Encrypted Vaults that automatically protect your data with 256-bit AES encryption, while the File Shredder feature will delete files so they can't be recovered. Lexar Media will also provide the winner with the option of a 2GB memory upgrade from Crucial for their PC, notebook or netbook. For more information go to www.crucial.com/uk.

Incoming Skype calls appear on the handsets just like any landline call, even including the caller ID, and outgoing Skype calls are made by keying a short-code sequence. What more do you need? My daughter can call me from Spain while I am sitting in my garden, I can ask for no more.

I can see from the latest article that things are moving on, and much cleverer things are becoming available, but I am surprised that you have never mentioned this simple solution over the past four years.

Colin Wray

Nigel Whitfield replies: We have looked at Skype gateways before in PCW, but the main thrust of the article was setting up a standards-based system based on Sip, so there was limited space to look at Skype's proprietary solutions. As with much Skype equipment, the B2K gateway requires a PC to be turned on and running Skype – it's not a complete solution in itself. Nor does it offer the advanced functionality, such as a different VoIP account per handset, of products such as the Siemens Dect/VoIP range, or the Fritzbox.

TOUCHED

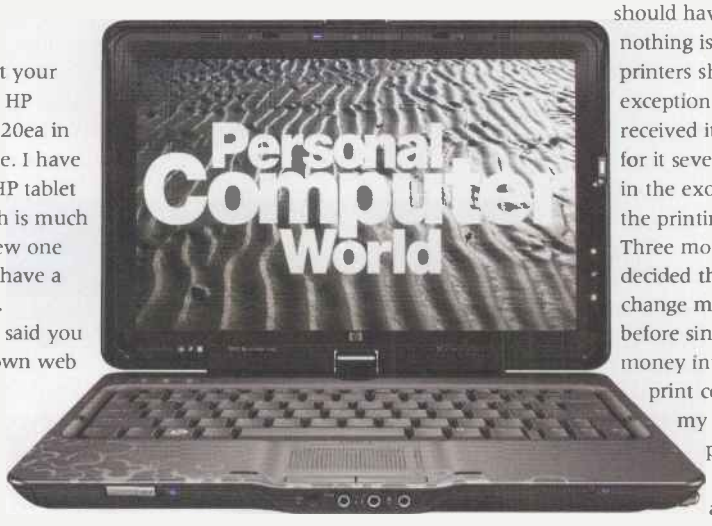
I read with interest your review of the new HP Touchsmart TX-1020ea in the May 2009 issue. I have a lesser model of HP tablet – TX2510ea, which is much the same as the new one except it does not have a multitouch screen.

I note that you said you could not scroll down web pages in Internet Explorer or on documents on the Touchsmart. I am able to scroll up and down on web pages and go back and forward between pages just by a swipe of the finger in IE, and can scroll up and down in other documents. I would be very surprised indeed if HP dropped this basic feature of their laptops.

It requires a flick of the finger and not a drag down the page. I think it is important to check properly whether the capability is there or not because obviously you noted a lack of touch features as a bad point in your review and it probably affected your score.

Becky Holt

Will Stapley replies: It may indeed be possible to scroll through documents using a flick motion with a single finger. However, our complaint was that the tx2 didn't make better use of its multitouch capabilities. What we were hoping for was to be able to scroll through a document by slowly dragging two fingers up or down the screen, which would be far more accurate than using a flick gesture. We therefore stand by our criticism that HP didn't make as much use of the tx2's multi-touch capabilities as it could have done, but we do appreciate your feedback. At the time of writing HP has yet to respond whether or not the 'flick' gesture would scroll through a document.



HP's Touchsmart TX-1020ea can be touch-controlled

Canon's excellent Pixma MP610 multifunction printer is disappearing from stores

PRINTER WOES

I received a free printer when I bought my PC several years ago. I should have known that nothing is free in life and printers should be no exception. Since I received it I have paid for it several times over in the exorbitant price of the printing cartridges. Three months ago, I decided that I should change my printer before sinking more money into my current print costs. I found my multifunction printer features very useful and therefore I was looking for a reliable, cheaper-to-run model. Research showed the Canon Pixma MP610 to be the best buy and this was backed up by *PCW*. However, I have been unable to find Canon MP610s available anywhere (except 'refurbished' ones) because they have been replaced with the MP630.

The consumable costs of the MP630 are significantly higher (cartridges hold smaller amounts of ink at slightly higher costs and same discharge rate) and with the MP630, should any colour cartridge run out of ink, the printer does not print either with the remaining colours or even in black and white, which means that users need to have contingency supplies of all ink cartridges unless they want to risk being in a position that their printers cannot print.

I decided to leave my re-purchase decision in the hope that the marketing department of some printer manufacturing company might decide to make a printer with consumable prices equivalent to the MP610, and therefore gain the market position that the MP610 should have found had it continued in production.

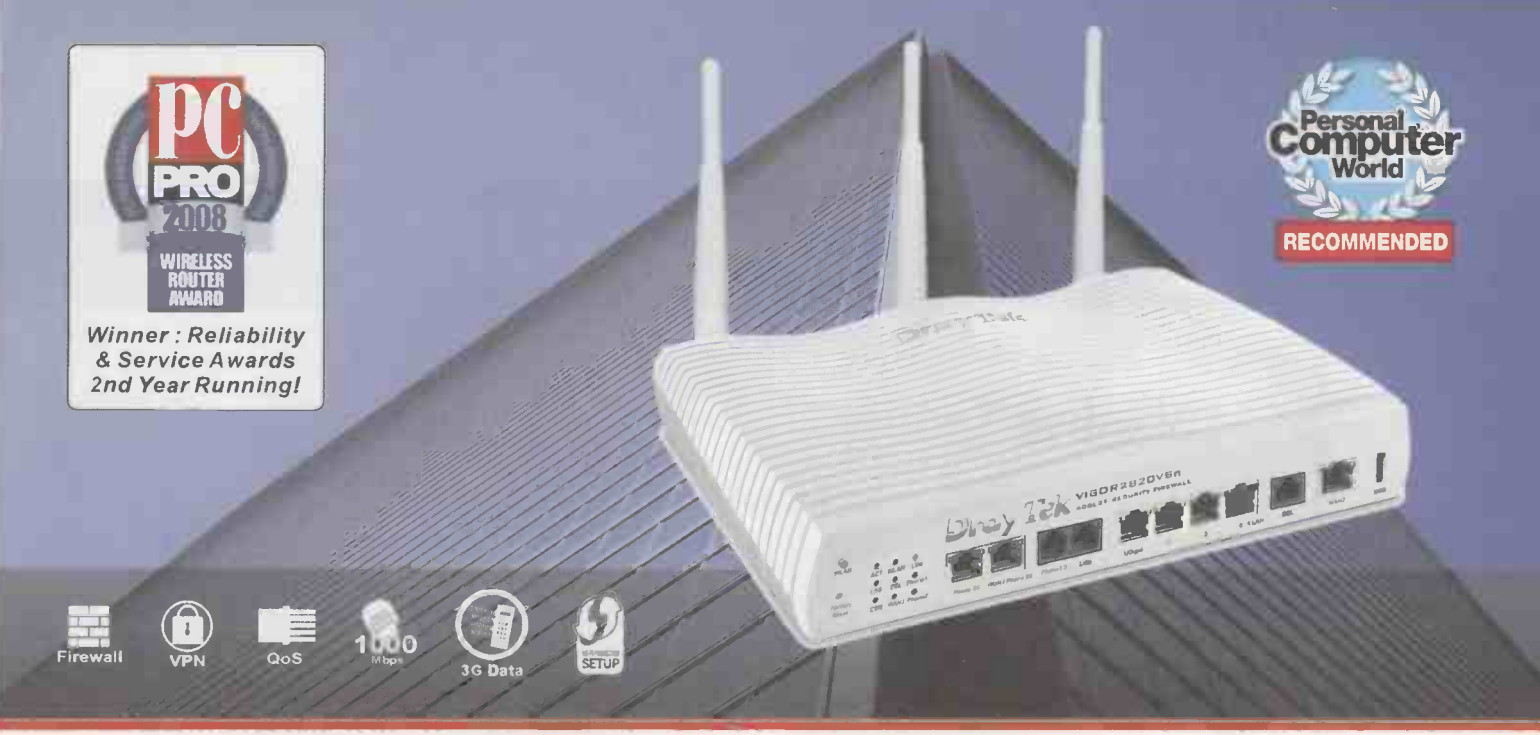
I have been looking to buy a Canon Pixma MP610 for nearly four months now. I know they must be available because one of my most reliable and trusted sources of information, *PCW* magazine, has been recommending it as the Best Buy for at least that length of time. Please can you let me know where I can buy one?

Kim Hampshire

Kelvyn Taylor replies: The MP610 has been discontinued and we will remove it from our Best Buys listings as soon as we review a suitable alternative. Meanwhile, our alternative choice, the wireless HP Photosmart C8180, can now be found online for between £200-£250, which represents excellent value for money.

CLARIFICATIONS & AMPLIFICATIONS

- **Our June Letter of the Month, 'Ripping Yarns', contained an incorrectly edited sentence. This should have read "Look below the surface, and none of these products are qualified for what used to be called the hi-fi market, but they fulfil a purpose which the all-singing and dancing PC (provided you know a suitable workaround and are prepared for endless complications and compromises) will never achieve."**



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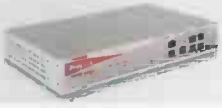

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- QoS for high VoIP Quality
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What happens when your broadband goes down ?

If your business relies on its Internet connectivity, look at DrayTek's flexible and low cost solutions for automatic Internet failover, including 3G data at www.**draytek.co.uk/failover**

DrayTek

www.draytek.co.uk

E&OE. All specifications subject to change. Please check web site for current model specifications.

Gordon Laing

hardware@pcw.co.uk

Long live Spotify

This free streaming music service is great – let's just hope that the business model works

Although I'm a self-confessed technophile, I'm also a bit of a Luddite about music delivery. I'm the fussy audiophile who sees compressed formats such as MP3 as a step backwards, not to mention a risk or inconvenience in terms of backup and security. The CD delivers uncompressed audio and physical backup – plus an attractive booklet in the sleeve.

But one service has made me rethink the way I listen to music. Spotify is an enormous online jukebox that was made available to UK listeners earlier this year. You use the Spotify application to search the collection, click the track or album you want to hear, and moments later it starts streaming to your computer. It's 100 per cent legal and if you're willing to listen to occasional adverts, it's free. You can eliminate the ads by paying for a 99p day pass or £9.99 monthly subscription.

'What Spotify really needs is the ability to stream to non-PC devices'

Like all streaming services, there are pros and cons to the approach. The obvious cons are that you don't own the music and you'll need a permanent internet connection to hear it. Since Spotify also uses peer-to-peer technology in addition to streaming servers, some of your personal bandwidth will be used for uploading, so those on metered connections or mobile networks will need to work out if it's affordable or practical.

The pros are having instant access to a vast music collection without needing to pay, download or wait for anything; and while collectors such as myself will lament the lack of ownership, the counter-argument is not having to store and rip discs or worry about backing up the data. Hard disk crashed? Using a different computer? No problem – just fire up the application and play.

The success of these services clearly depends on the collection itself and the ease with which you can navigate it – and in both respects Spotify excels. There are obvious gaps in the collection, the most famous missing names being The Beatles, Led Zeppelin and Pink Floyd, but it's impressive what is on there. Your first few hours with the service inevitably consist of trying to catch it out. Specialist genres, such as heavy metal and obscure 12in dance records, occasionally return blank results but I found most of what I was looking for.

The real triumph, though, is the Spotify front end which is clean, easy to navigate and surprisingly responsive; it's so fast at reacting to searches and track changes, it's easy to forget you're not playing a collection stored locally.

But what about the sound quality? I'd love to say Spotify delivers lossless audio, but of course it doesn't. The company has, however, opted for the fairly respectable open-source Ogg Vorbis running at Q5, or 160Kbits/sec with the files sourced from the record companies.

Quality obviously depends on the source, and if you head straight for nostalgic classics of the 1970s and 1980s, you may be disappointed. Find higher-fidelity source material, though, and Spotify can sound pretty good, although like all music with lossy compression, it's lacking the impact, depth and involvement of a decent lossless or uncompressed source, especially for jazz and classical music. I'd also recommend switching off Normalisation in the player preferences for improved quality.

What Spotify really needs if it is to take off in the living room is the ability to stream to non-PC devices such as the Logitech Squeezebox, or at least offer a Media Center-style 'six-foot interface'. And if we're really allowed to wish, how about an extra-premium option with lossless audio?

But this is me with my audiophile hat on, testing the system on high-end equipment. Use Spotify under less demanding conditions and it sounds fine, and at least as good as any digital radio. It's also amazing how quickly it can take over your casual listening hours. It's so quick and convenient, I can't imagine anyone downloading pirated music in preference just to avoid some ads. I'm getting to try lots of albums before buying and my CD purchases have increased as a result.

Yes, I'm still buying CDs. I'm an old-fashioned guy who likes collecting physical media and if I find something I like, I want the best-quality version. But, like Google Maps, Spotify is addictive and great fun. I hope the financial model works and missing artists co-operate, because as far as music fans are concerned, it's close to perfect. **PCW**

Barry Fox

barryf@pcw.co.uk

Forward with rollback

The ifs and Bots of restoring your PC to its last working state using Roxio's latest Back on Track software

Windows Restore is supposed to save the state of a PC for rollback when something goes wrong. But Restore can usually be relied on to let you down. Norton Goback was much better but Symantec scrapped it.

Roxio rode to the rescue with Back on Track (Bot); when the PC boots, Bot offers the option to continue with Windows normally or run Bot and choose a state saved when the PC was happy and working well. But when I tried Bot I found a serious bug – it disabled the Windows hard disk check and repair program 'chkdsk', along with proprietary utilities that rely on chkdsk.

"The Chdksk blocking issue has turned out to be a tricky one," admitted Roxio, decently adding, "thank you for finding it. We have a massive Quality Assurance team that diligently goes through all our products and usually finds even the smallest problems. Somehow, this one slipped through our radar."

'I found out the hard way that installing Bot 3 over version 1.3 is not a smooth ride'

After some delays caused by Roxio staff changes, I tried a revised version. Chkdsk now works, but be aware of some other issues.

A stripped-down version of Bot (1.3) comes pre-installed on HP PCs but you will need to buy the Back on Track 3 Suite to get all features. Bot 3 is only available as a download purchase because Roxio's first priority now is selling Easy Creator to compete with Nero.

I found out the hard way that installing Bot 3 over version 1.3 is not a smooth ride, even after using Windows Add and Remove Programs to get rid of version 1.3. The trick is to use the free Windows installation clean-up utility that Microsoft buries at http://support.microsoft.com/kb/290301.

Bot 3 also offers hard disk backup options, including Disaster Recovery to rival Norton Ghost. This worked well on one PC, but not on another; a 150GB backup repeatedly failed part-way through. So far Roxio has not come up with a fix.

Acronis has for years been a benchmark for hard disk backup, but I found I was not alone in hitting serious problems with the new flagship version True Image Home 2009. Over recent months Acronis has sent me more than a dozen possible fixes, which I have spent literally man-days trying. Some were very complex and involved dangerous Registry edits. None stopped True Image sticking at Idle when asked to make a full disk backup.

Now there is a new build of True Image Home 2009 (True Image2009.9709_s_en.exe) that solves the problem. But downloading and installing the update was tricky. Even after using Acronis' own clean-up utility, relics of the old version remained on the PC to perpetuate the original bug. Again, try using Microsoft's free clean-up tool.

Everything points to the fact that some companies are still launching software too soon, and relying on paying customers to find the bugs.

Reviewers cannot afford the time it would take to discover, analyse and warn against this kind of problem. I can only afford to do it sometimes. That's why I threw in the towel on Yoggie, the smart USB key that was developed in Israel to put a first line of network defence against malware outside the PC.

Yoggie's username and password system thoroughly confused me – some are fixed and some have to be set. Clicking Open Management Console failed – the only way to open the setup menu was to enter an odd IP address (https://172.16.0.1:8443/).

Yoggie blocked access to my network hard drive, and sometimes also internet access. Support instructions for adding ports to the Firewall settings, such as 'set the appropriate rule with the required ports for NetBios etc', made no sense.

What Yoggie clearly needs is a user-friendly message system that throws up simple questions such as: 'New network device found, do you want to allow access or block it?'

After many unhappy hours wasted I found it easier to disable Yoggie, which wholly defeats its reason for being.

"Oh my goodness – I'll ask Yoggie to contact you when a more user-friendly device is available," said the company's spokesperson.

That was three months ago and I am still waiting for a response. PCW

Guy Kewney

guykewney@gmail.com

Microsoft in its dotage

The software giant is showing its age with an incomprehensible Windows 7 netbook strategy

What sort of commercial organisation stops people buying its products? I'm thinking of Microsoft, and its decision to ensure that you can't buy a Windows netbook with more than 1GB of Ram or a screen bigger than 10.2in diagonal. A customer looking at one is going to wonder: "Do I really need Windows?"

Almost everybody I know who has daily dealings with Microsoft tells me that the company is behaving like a beehive in which the queen has died.

An old friend reckons that dealing with Redmond senior management is like trying to get through to her demented elderly mother. She says they keep doing things that used to work 20 years ago, are pretty vague about what happened yesterday and keep revising their

'Today's Microsoft stands as a dear old lady... dreaming of days long ago'

memories of recent events, trying to make sense of them.

One of Microsoft's rituals, of course, is licensing. The whole software licensing structure is a lawyer's paradise, built around subscription deals with large corporations. The deals give them lots of things they think they need but which in reality they don't, or which are too complex to invoke the clauses for. They pay what looks like a lower fee but pay it more often.

This is how Microsoft controls the market, not only for Windows itself but for application software. It is hard to find a corporate group of people using PCs who don't run Excel, Word, Powerpoint and so on. And if you compare the price per package of Office to what Adobe will ask you for Creative Suite, you can see it's not a bad deal for the end-user community.

But, from the inside, Microsoft can be compared to a big cathedral conducting High Mass. The theology is in the hands of those who wrote the liturgy; the administrators in the cathedral are more concerned with questions such as: 'Do we have enough candles?' Or: 'I'm distributing the hymn sheets, how many aisles back should I cover?' Or: 'Will the music last as long as it takes for all the congregation to take communion?'

They leave the dogma to others – their concerns are logistics, timing and supplies.

When the market changes, the theology changes. Suddenly, candles are frowned upon. But the individuals who manage the services have a difficult job to do and follow the old routine.

That is why the netbook market was largely non-Windows when it appeared. And it's how Microsoft, having finally provided an XP-based netbook, is now desperately trying to wean the market off XP and provide Windows 7 netbooks – with 1GB of Ram.

Nobody has fallen for this except Intel and Microsoft. Everybody knows that Windows 7 is a big improvement on Windows Vista. But we also know that Windows 7 will be unhappy on a lower-spec machine. You can boot it on a 1GB box, and you can even run a browser, a simple text editor and an FTP application. But try running Word with two documents open, and your experience will be sub-optimal.

That's not the reality that Microsoft executives perceive. They see a threat to their licensing terms and conditions. Windows XP Home is licensed for a netbook. If they start allowing XP Pro pre-installed, it drives a coach and horses through the hedge, leaving sticks of privet and the ruins of ancient rose bushes behind it. Why, it's almost as if someone in the Vatican has forgotten how important candles are!

The world is changing. Bill Gates would, if he were still in charge, be issuing rapid orders on how to update the licensing structure. Microsoft would go through a period where some corporates got rather better deals than Redmond would like on licensing, but the company would emerge as a powerful force in the netbook world.

But today's Microsoft stands in the garden, a dear old lady, gazing at the immaculate hedge with vague pride, holding her shears in one hand and her weed basket in the other, blinking happily and saying "Netbooks? Very nice dear..." and dreaming of days long ago, when she was young and exciting and everybody wanted to dance with her. **PCW**

HP recommends Windows Vista® Business.

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Blue screen blues

Don't live with an unstable PC and regular blue-screen crashes – fix them. Mike Williams shows you how

It's the worst of PC problems. One moment you're deep in thought, application windows open all across your desktop as you work on an important project and then, in an instant, it's all over. The screen turns blue, a cryptic error message appears, the PC reboots and you have lost everything. Hours of work, gone.

After a short pause for swearing, throwing and breaking things, the chances are you'll want to know more about these blue screen errors (aka BSOD for 'blue screen of death'), in particular what caused this one so you can stop it happening again. But the typical advice you'll find online may not be much use. Common recommendations to 'use system restore', 'reduce the number of start-up programs' or 'clean the Registry' sound reasonable enough, but require plenty of time and effort and only solve a small proportion of BSOD crashes.

It doesn't have to be this way, though. Follow our advice and a quick, simple procedure will in many cases identify exactly which driver or application was responsible for the crash, so you can update or remove it and be 100 per cent sure that the problem has been fixed.

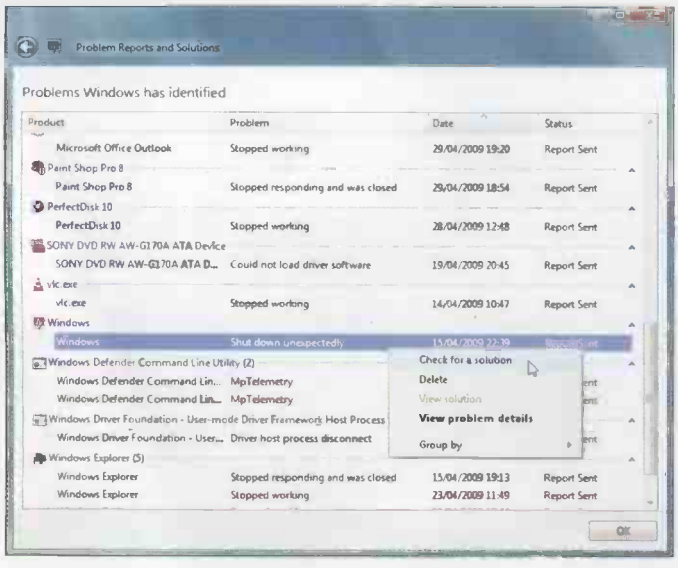
Best of all, the tools you need are free, and easy to use. No matter what your technical knowledge of Windows innards, you really can have a more stable and reliable PC.

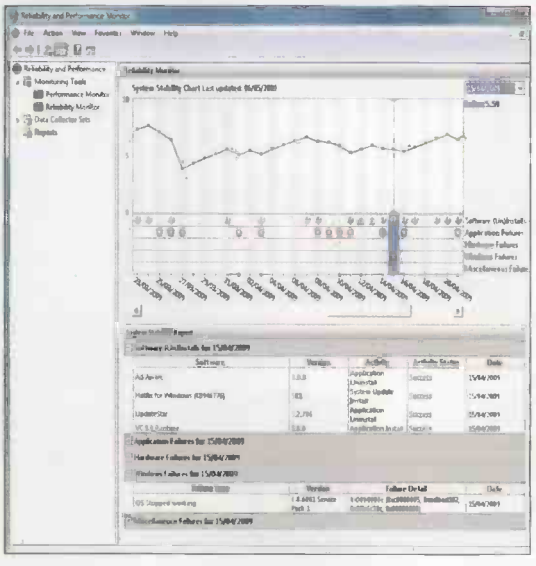
Windows error reporting

Windows XP introduced an error-reporting system where crash information would be sent to a central Microsoft database, which would then offer possible solutions. It was expanded in Windows Vista and is a good starting point for potential crash solutions – assuming it is switched on and configured.

In XP, right-click My Computer and select Properties, Advanced, then Error Reporting. Ensure the Enable Error Reporting option is selected and both the Windows Operating System and Programs boxes are checked, then click Choose Programs and select the All Programs option. You should now be given the option to send an error report to Microsoft following a crash, and if this matches a known problem you may see a message with a link to a potential fix.

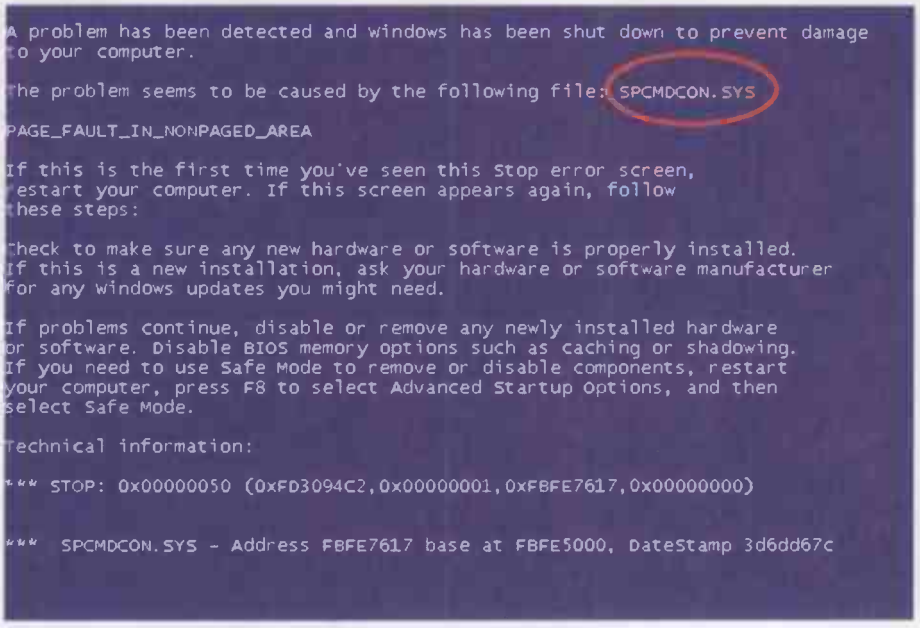
Windows Vista improves on this with a redesigned error-handling system that is much more likely to record the details of a

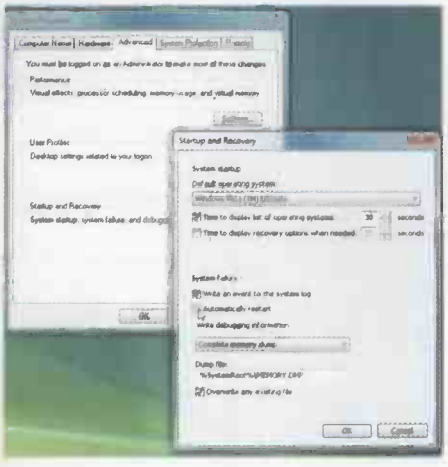




Far left: Windows Vista records most crashes and can sometimes point you to the solution

Left: The Reliability Monitor shows how your PC's stability has varied over time





Above: One quick tweak stops Windows rebooting before you can read the crash error message

Left: Windows will sometimes tell you which file has crashed your PC

BSOD. And better still, it maintains a database of your crashes, so you can check for solutions to those past BSODs. Click Control Panel, System, Maintenance, Problem Reports and Solutions, then Check For New Solutions to give this a try. Vista will fire off details of your errors to Microsoft, then come back with details on updates that might fix the problem.

The Windows Vista Reliability Monitor can also be useful, as it displays major errors and software installations on the same graph. If all your recent problems started when you installed a particular application then it may be visible here. Click Start, type **perfmon.exe** and press Enter, then click Reliability Monitor to view your own personal System Stability Chart and look for potential clues.

Error message

If the standard error reporting tools aren't helpful then next you should to take a closer look at the error message itself. Windows makes this tricky by rebooting a second or two after displaying the error, but this is easily changed. Right-click Computer and select Properties, Advanced [System Settings], Startup and Recovery Settings, then check the System Failure box. Ensure the 'Automatically restart' box is clear and click OK.

Encounter a BSOD after this and Windows will stop at the error screen and give you time to read it. If you're lucky, this may name a file where it says the problem occurred, in which case make a note of it and run a Google search for the file later.

Unfortunately you can't always trust what the BSOD error message says. Let's suppose you have a buggy device driver that overwrites some key Windows data in memory. This might result in the Windows kernel crashing later, perhaps with the error message pointing a finger at NTOSKRNL, but the real culprit – the faulty driver – won't even rate a mention.

Be cautious, then. If the BSOD error points to a file that happens to belong to some application or driver you installed just before the crashes started, then that sounds like a promising lead. By all means look for upgrades, re-install it or remove the program entirely, and your crashes might go away.

But if a Google search tells you the file is

'Unfortunately you can't always trust what a crash error message says'

a core Windows component – nt, ntoskrnl, win32k, hal, ntfs or similar – or an application that you have had for a long time and are positive is working well, then the BSOD error message may simply be wrong. That's something you can check with a free utility that provides a more comprehensive analysis of the crash.

Windows debugging tools

When a BSOD occurs Windows will normally save all the relevant areas of memory to a crash dump file. These files are mainly useful to developers, who analyse them to help figure out why their programs crash. But you can make use of crash dump files, too.

Start by downloading and installing the free Windows Debugging Tools from the Microsoft website (www.tinyurl.com/pg8447).

The debugger will download symbols to help it decode your crash dump files, and you'll need to create a folder to store these. We would recommend C:\Symbols, unless you already have a folder of the same name.

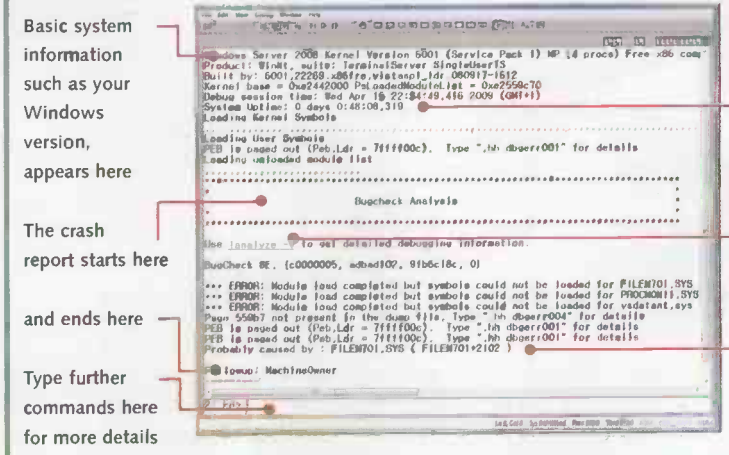
Then click Start, All Programs, Debugging Tools for Windows, then WinDbg, and select File, then Symbol File Path. Type

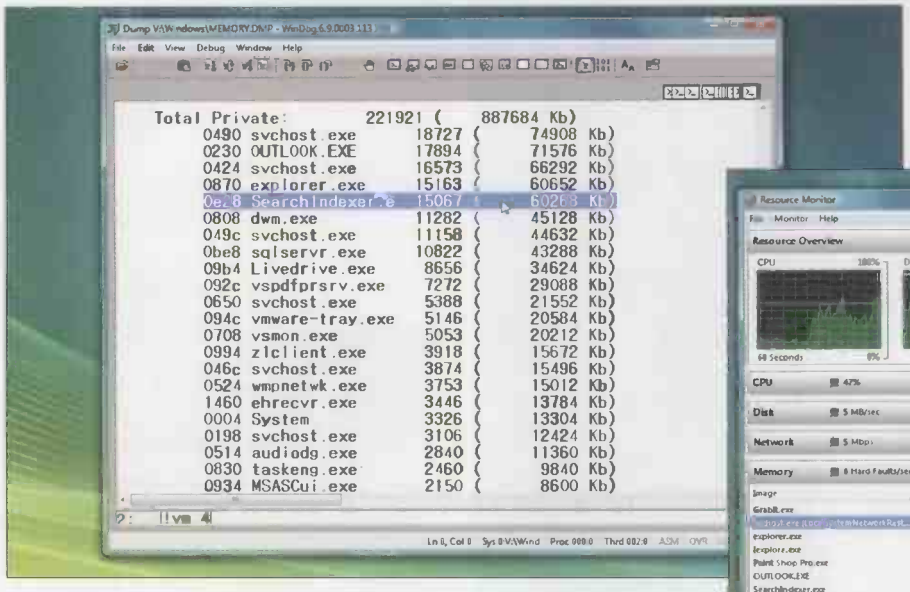
SRV*c:\symbols*http://msdl.↙
microsoft.com/download/symbols

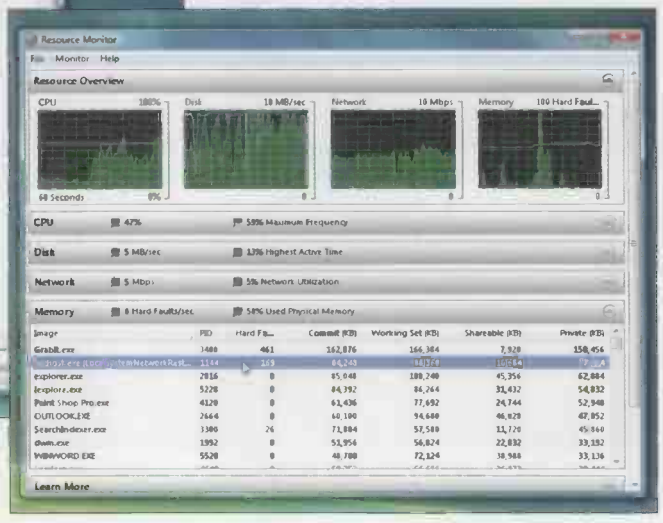
(Key: ↙ code string continues)

in the box (replacing c:\symbols with the path to your symbols folder, if you used

Understanding your first Win Dbg report







Left: The !vm command shows how Ram was being used when your PC crashed

Below: Task Manager and the Vista Resource Monitor can help detect memory leaks

something else) and click OK. Click File, Exit, and click Yes when asked if you want to 'Save information for workspace' to ensure your changes are recorded.

That's the debugger set up properly, but is Windows configured to save crash files? Right-click Computer, select Properties, Advanced [System Settings], Startup and Recovery Settings and make sure 'Write debugging information' is set to 'Complete memory dump' if available, 'Kernel memory dump' if not. Click OK and you're ready to go.

WinDbg

The next time a blue-screen crash occurs, restart Windows and click Start, All Programs, Debugging Tools for Windows, then WinDbg. (Windows Vista users should right-click the WinDbg shortcut and select Run As Administrator.) Then click File, Open Crash Dump, browse to your Windows folder and open the MEMORY.DMP file it contains.

If you can't find the crash dump, Windows will write it to the paging file first. If you have turned off paging, or perhaps set it to a fixed size to improve performance, this may not be possible. Right-click Computer and select Properties, Advanced [System Settings], Performance Settings, Advanced, then Change, and make sure all your paging files are set to 'System managed'. Reboot and a crash dump file should now be created for the next BSOD.

If you skipped the 'Write debugging information' tweak we recommended, and left the setting as 'Small memory dump', then you may have a crash file in a different location. Browse to \Windows\Minidump to look for it.

And sometimes Windows just can't create a crash dump file, perhaps because it's a file system-related driver that has crashed and it's not safe to write to disc.

But if you have found the file then all you have to do is, well, wait. Analysing the crash can take a few minutes, especially if you have a slow PC and a large dump file.

Once WinDbg has finished you will usually see a line beginning 'Probably caused by', that names the DLL or driver most likely to have caused the crash. Exactly what you need to know – make a careful note of this.

The debugger provides a more thorough analysis of your crash than you'll get from the initial BSOD error screen, but there's still the possibility that it has delivered the wrong

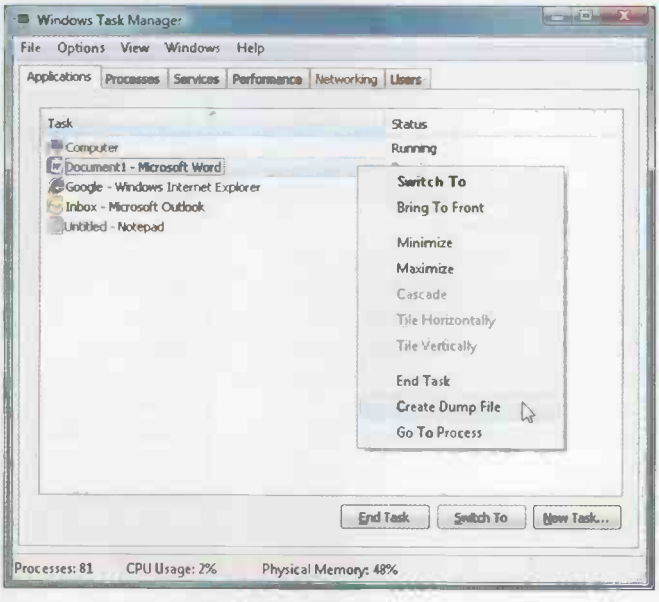
Troubleshoot hung programs

The Windows debugging tools aren't just for crashes. They can sometimes uncover why a program has locked up, too.

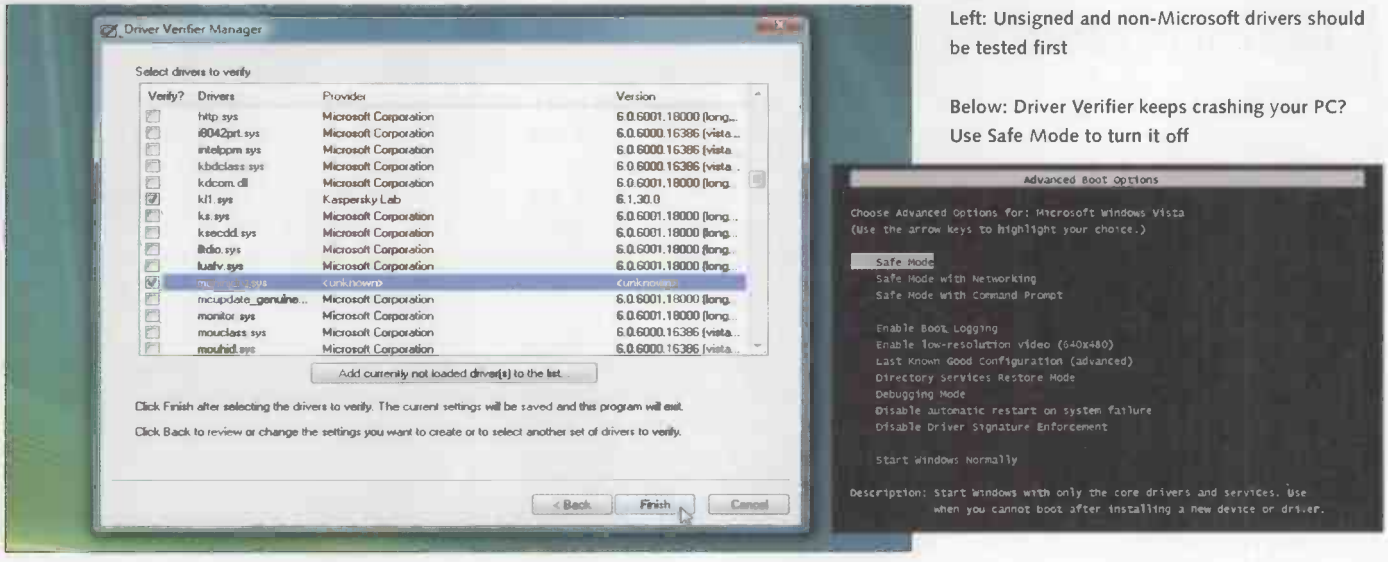
To try this you must first create a file containing a dump of the program's memory. If you have Windows XP then it's a little complicated: you will need to find the program's process ID in Task Manager, open a command window, change to the folder storing the debugging tools, and enter a command such as `ADPlus -hang -p [pid]`. See www.tinyurl.com/ckx2k9 for the full details.

If you have Windows Vista, click the Applications tab, right-click the hung program and select Create Dump File. Windows will create the equivalent of a crash file in your user temporary folder, usually \Users\[UserName]\AppData\Localltemp\progname.DMP.

Now launch WinDbg as normal, click File, then Open Crash Dump, and select the file you have just created. Then click in the WinDbg command line, type `!analyze -hang -v` and press Enter to analyse the problem. WinDbg may be able to point you to a file or Windows resource that has caused the program to lock up. This is less reliable than the crash analysis, and the reports can be more technical, but it only takes a few minutes and is definitely worth a try.



Vista's task manager can quickly save a hung program to disk



Left: Unsigned and non-Microsoft drivers should be tested first

Below: Driver Verifier keeps crashing your PC? Use Safe Mode to turn it off

verdict. So make a further note of any additional files where WinDbg complains that 'symbols could not be loaded'. These will be third-party drivers and DLLs that were active at the time of the crash, and will also be strong suspects for the cause of your BSOD.

Now search Google (and your PC) for these file names. This should quickly tell you which application installed them, and whether others complain that they often cause crashes. If you find a good candidate then check the author's website for support documents that might help. Updating your software may fix the problem, or you could try uninstalling the program if it's not critical.

Resource leaks

If WinDbg has not identified a specific file as the cause of your problems, you may have a more general issue. Many blue-screen errors occur because you have run out of system resources, for instance. An example might be a driver that allocates more and more Ram without ever releasing it, until eventually you run out of Ram and your PC crashes.

To check for this, click in the WinDbg command line to the right of the kd> prompt, type `!vm` and press Enter. You will immediately see how your Ram was being used at the time of the crash.

Scan down the report and look for references to 'paged pool' and 'non-paged pool', for instance, two special areas of memory that Windows and your drivers use to store memory. If this is full then you will see a warning of 'excessive usage'. This can happen if you try to run large numbers of applications – 20, 30, 40 or more – but otherwise it's a strong indication that you have a resource leak of some kind. If it's a slow leak then rebooting more often may help you live with the problem for now, as the driver won't have time to grab all your resources, but ultimately you will need to identify the file involved. Microsoft's informative Performance Team blog has some detailed information that could help (www.tinyurl.com/6p4a8t), and Windows expert Mark Russinovich walks you through a similar real-life problem-solving session on his own blog (www.tinyurl.com/cyohrt).

If you don't see a leak then look at the second part of the report, from the 'Total Private' heading down. This shows you all the processes running on your PC when the crash occurred, and the amount of Ram being used, a useful pointer as to what was grabbing all your memory. If this doesn't help right now, click Edit, then Write Window Text to File and save it for reference. You can then compare this to later crash analyses and look for patterns, perhaps spotting which programs were running when the crash occurred.

'Intentionally crashing your PC isn't something to be taken lightly'

Driver Verifier

If the debugger still isn't telling you anything useful then it's time to turn to another tool, the Driver Verifier. This stress-tests drivers in a number of ways, and if one is buggy then there's a good chance your PC will crash, this time leaving a very clear indicator when you load the crash file into WinDbg.

While Driver Verifier generally works very well, intentionally crashing your PC isn't something to be taken lightly. As with any crash there's a small chance that your hard disk will be corrupted, for instance, so back up anything important first.

When you're ready, click Start, then Run if you have Windows XP, type `VERIFIER.EXE`

Identifying hardware causes of crashes

We've focused on the software causes of blue-screen crashes here, but hardware problems can also play a part.

Faulty Ram, for instance, is responsible for a significant number of BSOD errors. Test your memory by running the Windows Vista Memory Diagnostics tool (launch MdSched.exe and follow the instructions), or a third-party checker, such as memtest86+ (www.memtest.org).

An overheating PC can also become unstable. You can find out how hot your CPU should normally be (see www.processorfinder.intel.com and www.amdcompare.com), then monitor its actual temperature using a tool such as Speedfan (www.almico.com/speedfan.php), or your Bios setup program.

If there seems to be a heat problem, clean the vents and fans, perhaps opening the case to carefully remove the dust, hairs, lint and anything else that has gathered inside. Make sure the CPU heatsink is still properly attached and that the case is well positioned. Don't push it up against a wall, for instance – provide space all around your system to allow proper airflow.

If all else fails, try simplifying your system by unplugging and removing all unnecessary hardware, so only your mouse, keyboard and graphics card are left. This will cut down on power demands, which is handy if you have a failing or overloaded power supply, and should ensure Windows loads fewer drivers, too. If that seems to help, restore your devices one by one, testing each time until you discover what is behind your PC's instability.

Blue screen basics

Regular Windows applications run in 'user mode', an environment where they are isolated from your hardware and each other. If a bug causes a user mode program to crash, Windows knows this can't cause much damage, so it displays a simple error message dialogue box and lets you continue running other programs.

Core Windows components, drivers and Windows services, however, run in 'kernel mode'. They have full access to all your memory and a bug here could be disastrous. If a driver overwrites the disk cache, for instance, your hard disk will be corrupted. So if a kernel mode component crashes, Windows displays a blue-screen error message and reboots your PC. It may seem harsh, but the consequences of continuing, even for a few seconds, could be even worse. If an error occurs, you can probably rule out that it is the graphics editor you've just installed, along with that Zip tool you are trying out and the latest version of Google Earth. Think instead about drivers you have updated or installed recently.

Anything that has installed a service recently is also a suspect. Launch the Windows Services applet (click Start, then Run if you have XP, type **SERVICES.MSC** and press Enter) and check what is running on your PC. Investigate any services required by Microsoft to see if you need them, but don't disable them unless you know what you're doing. Turning off a critical service can crash your PC.

and press Enter to launch the Driver Verifier. Accept the default 'Create standard settings' option and click Next.

Here you will be asked which drivers you want to verify. Choose the 'Automatically select unsigned drivers' option for now, but if that doesn't come up with anything, opt to 'Select driver names from a list', instead, click Next and select all the non-Microsoft drivers you can find. Click Next, then Finish and reboot your PC.

Windows will appear to load as normal, but what you can't see is that Driver Verifier is now running in the background. It may help if you can add a few tests of your own, so try running a few games, some applications, or anything else you suspect might be involved in your blue-screen crashes. But be careful. Always keep in mind that we're trying to crash your PC, so don't work with important files, or carry out actions that might corrupt your system if they're interrupted (install programs, defrag your hard disk and so on).

Ideally you should spend at least 30 minutes doing this. If nothing happens, restart your PC and give it another 30 minutes. Hopefully a blue-screen crash will appear at some point, in which case you can use WinDbg to inspect your new MEMORY.DMP file and discover which driver is responsible. Search Google to find out what it is, then remove or update the driver to fix your problem.

One potential problem here is that Driver Verifier may crash your system during the boot process, which means you won't be able to restart Windows as normal. Press F8 as the boot begins and start Windows in Safe Mode instead. Then relaunch VERIFIER.EXE, select 'Delete existing settings' and click Finish to turn Driver Verifier off. You should now be able to reboot normally and inspect the crash dump file with WinDbg.

If you can restart Windows after a crash, or Driver Verifier doesn't cause a crash at all, it's important to turn Driver Verifier off in the same way (run VERIFIER.EXE, delete your existing settings, click Finish). Forgetting will really hurt your PC's performance and make it more unstable.

More commands

In complicated situations WinDbg might not be able to specifically identify any one file as causing your crashes. But it does provide other commands you might find useful, which will at least tell you more about what was happening on your PC when the crash occurred.

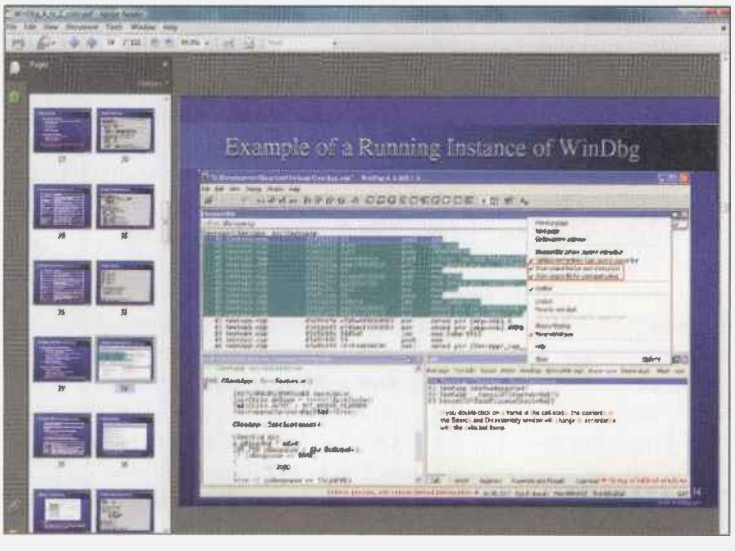
For example, open your crash dump file, type **k** into the WinDbg command window and press Enter to see what the active thread was doing at the blue-screen moment. This will list a sequence of commands that you should read from the bottom up. You don't have to worry about the technicalities, though, just look at the function name and see if you can figure out what was going on. Trying the **k** command on our sample crash dump produced the line 'fltmgr!Fltp CreateFileNameInformation+0x81' at the bottom of the stack, for instance, so it looks like the thread was creating a file. There's no guarantee this had anything to do with the crash, but just in case, it's worth thinking about possible file-related reasons for a crash and how we might prevent them: check the drive for errors, free up hard disk space, delete temporary files, and so on.

Typing the command **!process 0 0** and pressing Enter will display all the processes running when the blue-screen error happened. Click Edit, then Write Window Text to File to save this information, so you can easily compare it with other crash analyses in future.

Now enter **lmkv** to list all the drivers loaded at crash time. Look for non-Microsoft drivers, ensuring you've got the latest version.

Be careful if you move on to explore the WinDbg menus. The program can do some potentially risky things, such as attach to a running process for 'live' debugging, and if you make a mistake this can lock up your PC. If you are interested in taking this further, we would recommend you start by reading more about how others use the program, and the blog of Windows expert Mark Russinovich is a good place to start. We like his tips for troubleshooting buggy drivers (**www.tinyurl.com/8zx6oo**) and real-life problems with an Nvidia motherboard tool (**www.tinyurl.com/5anqxk**), but if you have any interest in how Windows works beneath the surface, the whole blog is worth a read.

Don't spend too long working on a single crash dump file, though. While we have focused on the debugging tools here, they won't solve every issue. If you're getting nowhere, check for hardware issues (see Identifying hardware causes of crashing box on the previous page), or try our more general troubleshooting tips – they just might deliver the results you need.



WinDbg From A to Z has detailed debugging advice for technical users

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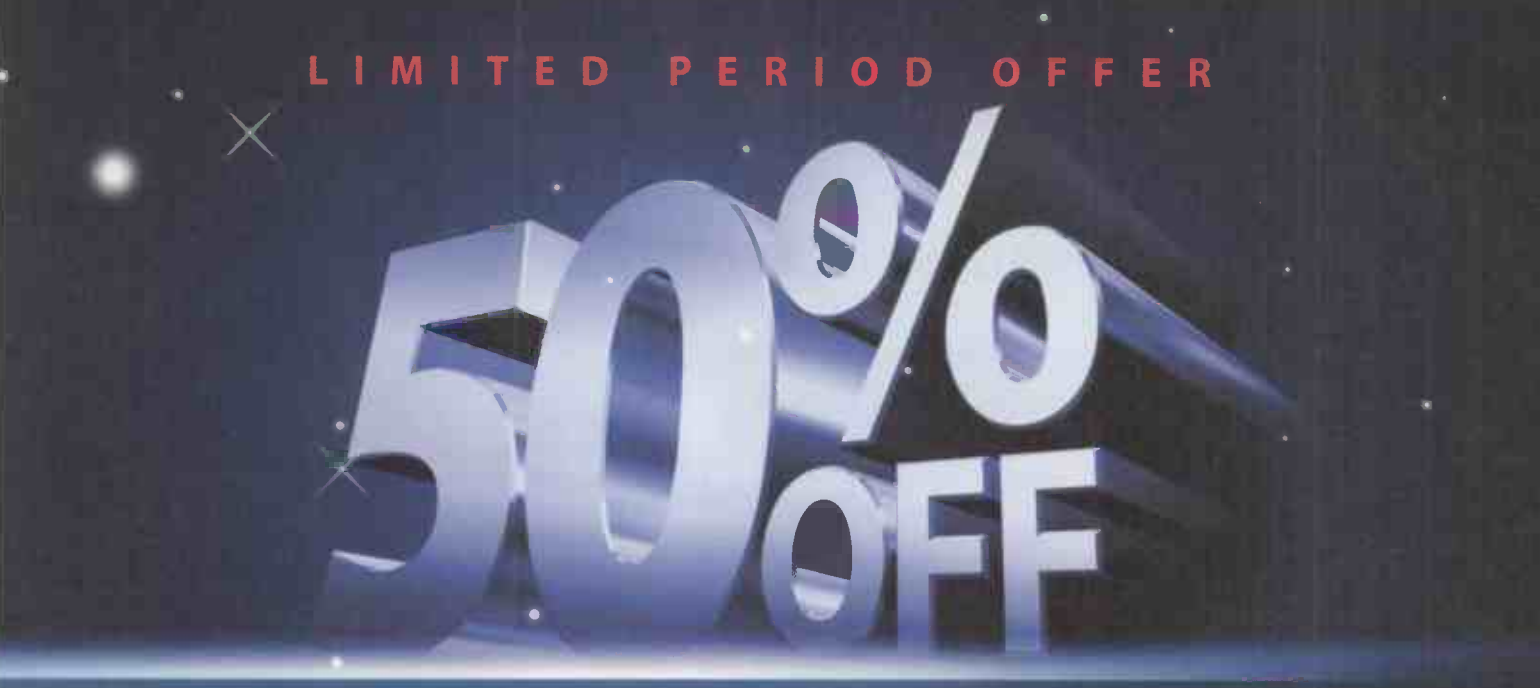

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Further troubleshooting tips to stop crashes

Stop codes

The Windows Debugging tools will often tell you exactly which file is responsible for your blue-screen crashes. But when it doesn't, you will need to spend a little more time researching the problem, and your original blue-screen error message is the best place to start.

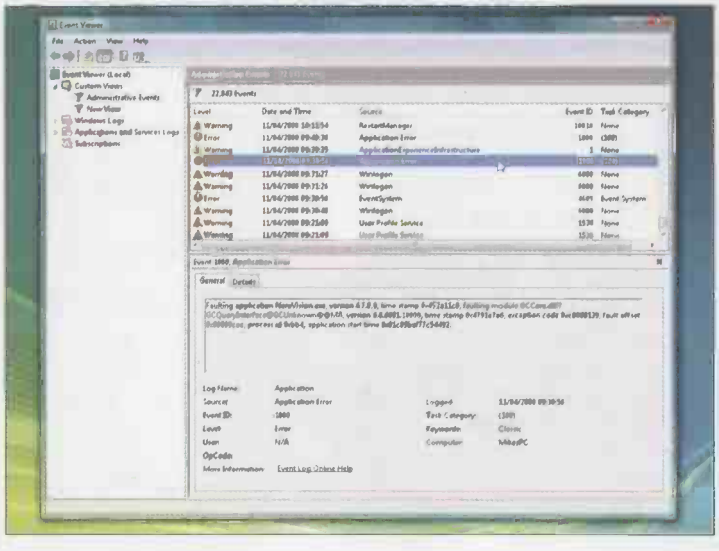
The error message includes a stop code which gives you a general reason for the crash. So 0A and 1E stop codes are commonly caused by faulty drivers, 24 may be caused by hard drive corruption, and 2E or 7F stops are often down to faulty or mismatched Ram. Visit **http://support. microsoft.com/search** and search for the full-stop code – **0x0000001E**, say – for more specific troubleshooting advice.

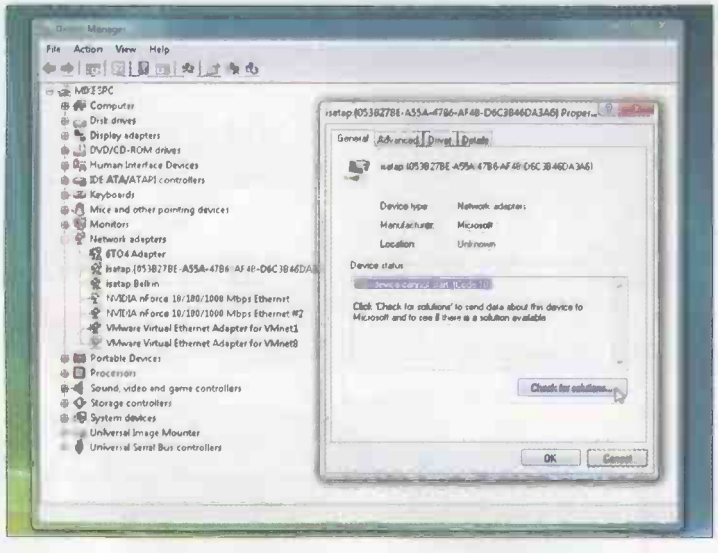
Event Viewer

The Windows Event Viewer can also provide more information on some blue-screen crashes.

If you have XP, click Start, then Run, type **EVENTVWR.MSC** and press Enter. Choose the System log in the left-hand tree, then scroll down the list of events. If you see any labelled 'Warning' or 'Error' from the time of your last crash, double-click them for more details.

In Windows Vista, click Start, type **EVENTVWR.MSC** and press Enter, then click Custom Views, then Administrative Events for a list of recent errors. Again, scroll down and click on any that look crash-related to find out more.

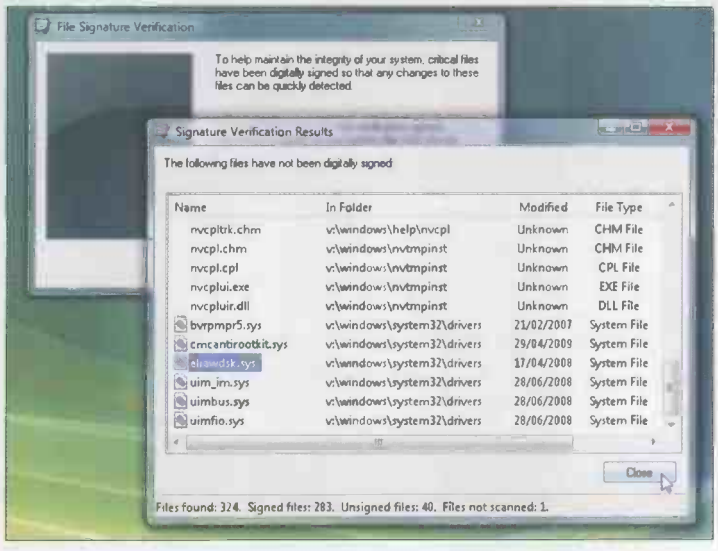




Device Manager

Many blue-screen crashes are caused by faulty drivers, and Device Manager could help you pinpoint any troublesome hardware.

Click Start, then Run if you're using XP, type **DEVMGMT.MSC** and press Enter. If Windows detects a problem, it will expand the relevant section of the tree and display a yellow exclamation mark icon next to the broken device. Double-click those devices and read the contents of the Device Status box for information on the problem. Windows Vista users can click the 'Check for solutions' button to look for possible answers, but this is rarely useful. Check the manufacturer's support site yourself for more advice.



Check your drivers

If the driver is working at a basic level, it won't be highlighted in Device Manager. You can still pick out likely suspects by identifying unsigned drivers, though. Launch the Signature Verifier (sigverif.exe) and click Start to give this a try.

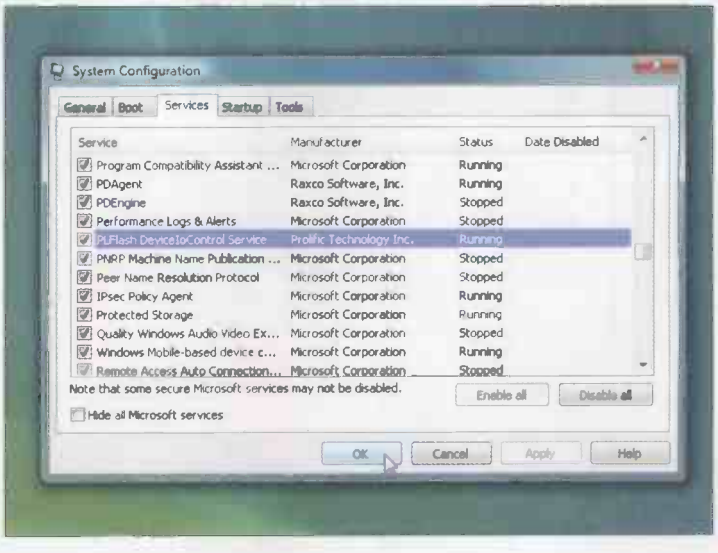
Browse the resulting report looking for drivers in particular – they will probably have a '.sys' extension – and search for each at Google to find out what they do, and perhaps whether others are reporting problems with them. If the driver turns out to be something unimportant, try uninstalling its associated hardware or application, to see if that cuts the crashes. (Don't just delete a driver, though – that could make your problems even worse.)

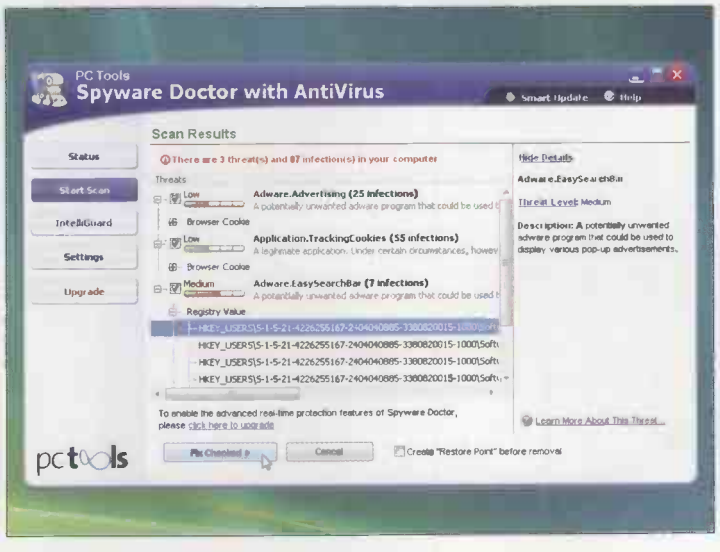
Windows services

Windows services are another common cause of blue-screen crashes, so it's useful to explore these, too. Click Start, then Run if you have Windows XP, type **MSCONFIG** and press Enter, then click the Services tab for the full list.

The standard Microsoft services probably won't be behind your problems, so look for non-Microsoft services that you don't recognise, search for their names on Google to find out where they've come from, and uninstall any associated application if you don't need it any more.

Don't experiment by clearing the box to disable a service, though – that's dangerous. Turning off something critical could disable your PC.





Scan for malware

Malware can often cause blue-screen crashes. Run a scan with your anti-virus tool to detect any threats, and consider installing something like PC Tools Antivirus (**www.pctools.com/free-antivirus**) for a second opinion.

No luck? Try these general tips

- Try Autoruns (**www.tinyurl.com/39338j**) to identify programs that run when Windows starts, and remove as many as you can.
- Update your apps and drivers using Updatestar (**www.updatestar.com**) and Drivermax (**www.drivermax.com**).
- Use CCleaner (**www.ccleaner.com**) to wipe leftover junk from your hard disk.
- And right-click your system drive in Explorer, click Properties > Tools > Check Now to look for and fix errors.

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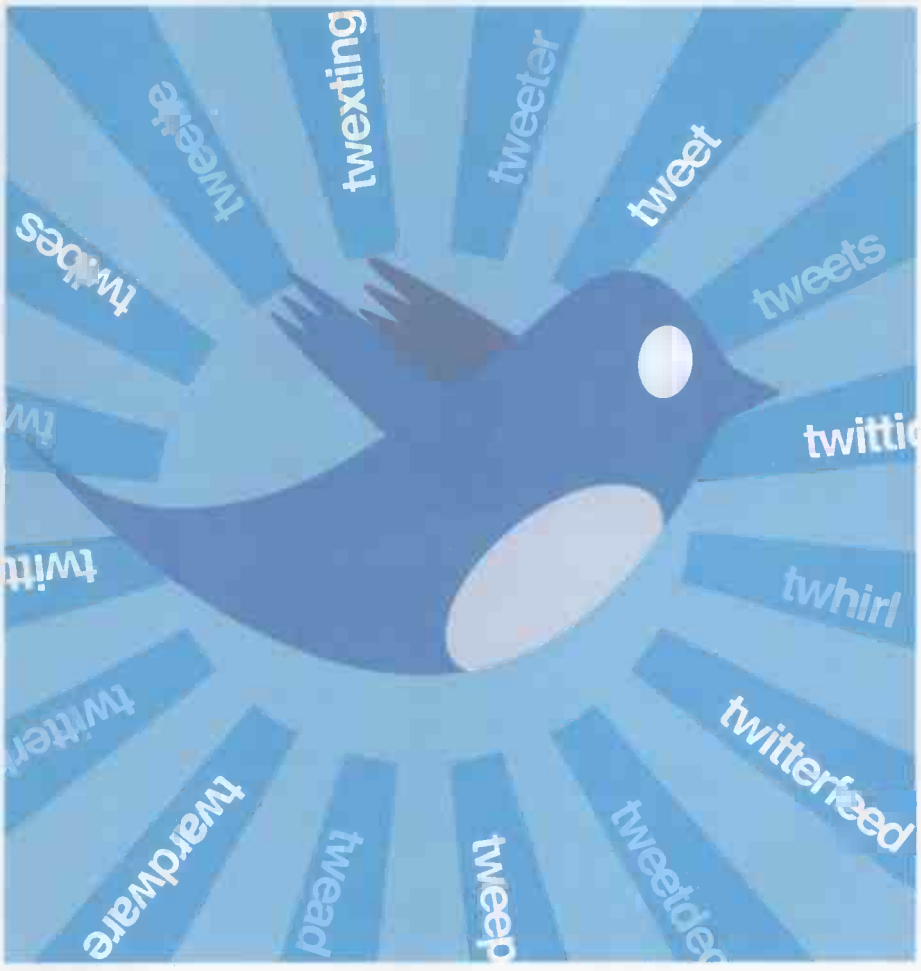
Addicted to tweets

Make your tweets heard. Tom Royal explores the latest techniques for using Twitter



Since 2006 Twitter (www.twitter.com) has grown from a niche service barely heard of outside San Francisco to a media phenomenon. Thanks to high-profile users, such as Stephen Fry and Oprah Winfrey, the website is now rarely out of the news. Whether it's really as revolutionary as many would like to make out is very much up for debate, as is whether the company will ever find a way to make some kind of profit from its users, but one thing is certain: it can be very addictive.

Using Twitter is simple enough: create an account on the website, log in, type your messages and they'll appear at www.twitter.com/yourname for all the world to see. Clicking the Follow button on any other user's profile will make their updates display on your main Home page, allowing you to keep up with their latest news, while others can follow you in the same manner.

This simple approach, however, barely scratches the surface of what Twitter can do and how you can use it. In this article we'll explain techniques, tricks and software that will make your tweeting easier, faster and more productive.

Beyond text

Over its lifespan Twitter has evolved certain conventions that can be put to use to pack more value into your tweets. Probably the best known is addressing messages to a user by including their name prefaced by the @ symbol. Twitter originally treated these messages as 'replies', as they allow for a remark to be directed at a particular user ('@somebody can meet you 2pm'), but it now refers to them as 'mentions' as they can be used to include several users ('@somebody meet you 2pm have received tickets from @somebodyelse').

This is all very handy, but @ mentions have another use: they can be a good way to communicate with users who do not follow you. The Twitter web interface includes a page that lists every mention of your username, whether from your contacts or other users, and other applications that we'll discuss later make this information even more visible. If you want to get some information across to another user who doesn't follow you, this makes sending an @ mention one of the best ways to make contact.

So-called 'hashtags' can also be a useful way to promote your Twitter profile. Prefacing a word in your message with a hash (#) unofficially marks it as a keyword, making it easy for anyone searching the site for similar information to find that tweet. Hashtags are also particularly handy for gathering information about current or temporary events (#election, #budget, #worldcup). If you want to know which topics are being discussed the most at any given moment, check www.hashtags.org.

Beyond the web

Twitter's web interface is simple to use and customise, but it's far from perfect. For one thing, the home screen has no filters. If you find yourself drowning in retweets – messages, witticisms or memes being forwarded from person to person – try www.journotwit.com. This alternative web interface, originally designed for journalists but available to all, separates retweets and images into different containers that you can hide should you choose.

The main Twitter web interface can also be a little too cumbersome for use on a netbook. If you find that your browser is struggling to cope with its frills, or if you simply want a faster interface in a browser window, visit http://m.twitter.com. This stripped-down layout is offered by default to most mobile phones but works well on desktop browsers and can also be more reliable if Twitter's servers become overloaded.

If you want to be able to tweet and follow others easily while getting on with some work then a desktop client might be a better approach. Several are available for Windows, with most using Adobe's Air framework to squeeze a website-like interface into a standalone application. Tweetdeck (www.tweetdeck.com) uses a multi-column

Left: Alternative online interfaces can make it easier to filter out the information you want

Below: Twhirl makes it easy to manage more than one Twitter account at the same time

interface to show your home screen, replies and direct messages but is rather large; alternatively we recommend Twhirl (**www.twhirl.org**).

Twhirl allows you to connect to multiple Twitter accounts – ideal if you are managing an account for a business as well as a personal one – and displays messages in a single column that fits well to the side of a widescreen display. Better yet, minimise the window and it will show new messages as a discreet pop-up above the Windows notification area in a manner similar to Microsoft Outlook's new email indicator. Buttons next to the text entry box allow you to quickly upload and post a photo (using **www.twitpic.com**) or to shorten a long URL for posting, while tab-like buttons allow you to switch to views that filter out mentions of your username and direct messages.

Beyond the desk

Of course, desktop tools such as Twhirl are only of any use when your have a Windows computer and an internet connection. There are many better ways to keep in touch with Twitter when you are out and about.

Perhaps the simplest is Twitter's built-in SMS support. This allows you to send a message to Twitter via text message and, as long as you're on the Vodafone network, to receive tweets from the people you follow. To set it up, log into Twitter then click Settings and Devices – after entering your mobile phone number in international format you will be asked to text in a validation code. Vodafone customers can use two-way communication via text, but there is an option to choose a period during which text alerts will not be sent (at night, say) and a choice, per user, as to whose messages should be sent by text.

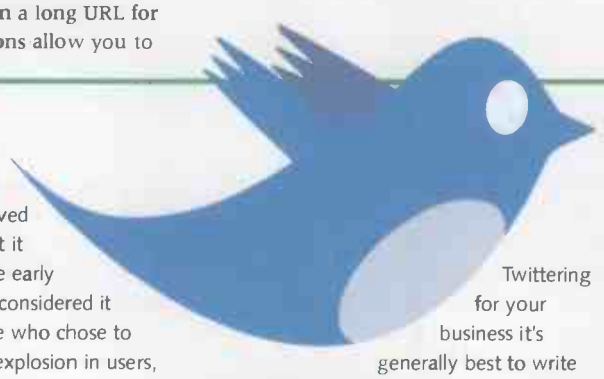
'Putting the contents of your Twitter page on a website is incredibly easy'

For those who prefer not to be bombarded with text messages Twitter has, as we mentioned earlier, a mobile web interface at **http://m.twitter.com**. This interface will suffice for reading posts from followed users or adding the odd update, but it has some serious limitations: you can't easily reply, retweet, delete tweets or even access your private messages.

If you need to tweet regularly when out of the office, and as long as you have a smartphone, then the best solution is to use a dedicated mobile application. The best one to choose depends on the type of handset you own.

There are, perhaps unsurprisingly, dozens of Twitter tools for the iPhone. The general consensus is that Tweetie (**http://tinyurl.com/d8pnco**) is the best of the bunch, and it can be downloaded from the iPhone App store for $3. But if you only want to send tweets

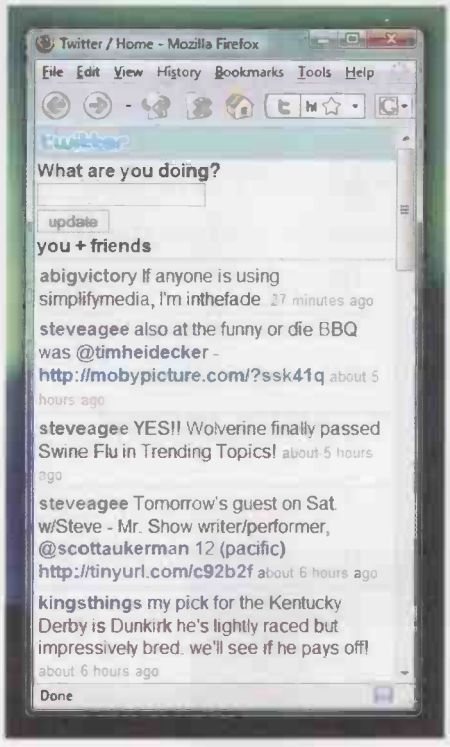
Twittiquette

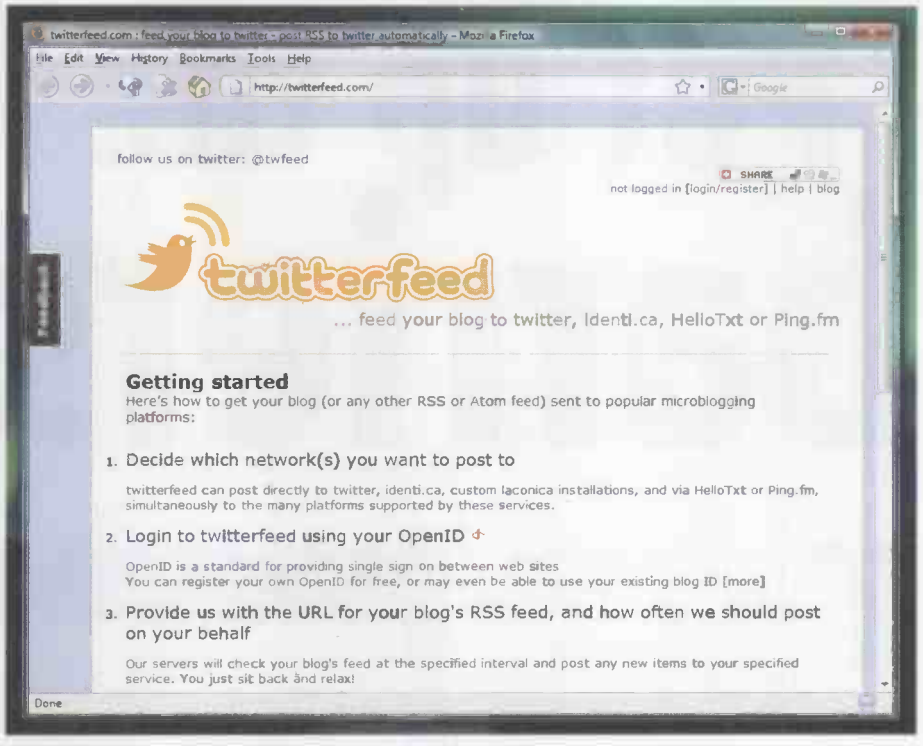


Just like email and usenet postings, Twitter has evolved certain cultural norms that it pays to understand. In the early days of the service many considered it rude not to follow anyone who chose to follow you, but with the explosion in users, bots and spammers this is no longer widely accepted.

Plugging your own products and services on Twitter is accepted to an extent, but is unlikely to win you many followers unless you also post more interesting information. Similarly, Twitter users tend to respond better to personal rather than corporate accounts, so if you plan on Twittering for your business it's generally best to write as a named employee, and in a personal style, rather than as the company itself.

Twitter also has a few traditions that can appear baffling at first. On Friday, for instance, many users tweet the names of people they recommend following alongside the hashtag #followfriday. If someone lists you, it's only polite to thank them.





Above: Twitter's mobile web interface is also ideal for use on the desktop

Above right: Twitterfeed takes content from your website or blog and tweets it automatically

rather than read them, Tweeter is free to download from the App Store and does exactly that.

Blackberry users should try Twitterberry (**http://tinyurl.com/ysxwl2**) while for Nokia smartphones running the Series 60 operating system we recommend Gravity (**http://mobileways.de**), which has a clever multi-page interface and makes it easy to follow users, retweet, reply and visit web links. Gravity costs around £8, although it's free to try for 10 days, and looks particularly good on Nokia handsets with larger screens such as the E71.

Beyond Tweets

So far we have explained ways to make the most basic use of Twitter – sending and reading messages – easier and more effective. However, if you have a website it's possible to integrate that with Twitter. This can be a new way to use the tweets you are already posting, or an entirely new way to create tweets and publicise your content.

Taking the contents of your Twitter feed and putting it on a website is incredibly easy. Anyone comfortable copying and pasting HTML code can get a ready-made widget from **www.twitter.com/widgets** – click Other, then Continue, then choose either the plain HTML or Flash design.

Both widgets can be customised, but for those familiar with web programming it might be easier to simply use the RSS feed provided with each twitter account (look for the link in the right-hand panel of your home screen). This can then be imported into a blog or website using a plug-in such as Feedlist (**http://tinyurl.com/5fh3v9**) or a custom script.

Adding a Twitter feed to a website or blog can be handy, but if you are using Twitter as a way to promote an existing website you may want to transfer information in the opposite direction. Many people tweet links to their latest blog posts by hand, but it's simple to set up a feed that works automatically.

If your website or blog has an RSS feed, one of the simplest ways to automatically tweet any updates is a service such as Twitterfeed (**http://twitterfeed.com**). This regularly checks the RSS feed and, if it finds a new entry, tweets a link. Options allow you to choose what text is tweeted and whether a link should be included.

Mobile applications such as Gravity make it easier to tweet when out of the office

If you are hosting your own site or blog there is no need to rely on a third-party service to tweet your site updates. In particular, there are plug-ins for Wordpress (**http://tinyurl.com/asgyy4**) and Movable Type (**http://tinyurl.com/dz83rq**) that can send new tweets automatically when a new post is published.

Twitter can be a strangely public home for vapid conversations, but it can also be a great way to communicate with people around the world and a useful tool for business. With the tools and techniques outlined in this article, we hope you will find it quicker and easier to stay in touch with the world. **PCW**

API tools

Like any self-respecting Web 2 website, Twitter has an API allowing other websites to make use of its information, and many have sprung up. For an insight into the collective mind of the Twitter community, or rather a glimpse into the abyss where actor Ashton Kutcher rates more highly than the Barack Obama, check **www.twitterholic.com**.

To find out who stops following your messages, and why, try **www.useqwitter.com**. To find a group of like-minded Twitter users, try **www.twibes.com** or for a quick and easy way to manage your followers visit Twitter Karma at **http://dossy.org/twitter/karma**.

Put up the barriers

Our series of articles for novices and forgetful experts continues with the basics of firewall protection. Paul Monckton explains

The internet can be a dangerous place to roam unprotected: the seemingly endless stream of nasties attempting to infiltrate your PC, destroy your data and steal your identity is enough to put many off conducting financial transactions online. But it doesn't have to be like this. For no cost, a firewall can block many of the most subtle attacks, as we'll explain in this feature.

In addition to anti-virus and anti-spyware applications, a firewall is your first line of defence against external attacks. Here we'll show you why you need one, how to make sure you're protected and how to ensure your firewall doesn't prevent legitimate network traffic from getting through.

Windows Security Center gathers together all your security status information in one place

What is a firewall?

According to Windows Vista's help tool, a firewall is 'software or hardware that checks information coming from the internet or a network, and then either blocks it or allows it to pass through to your computer, depending on your firewall settings'.

This means any data attempting to enter your PC from the outside, be it from the internet or a local area network, must first be checked for legitimacy.

However, while this is essentially a true description of a firewall's job, it's only half the story. To be fully protected you must also guard against programs already residing on your PC attempting to surreptitiously access the internet for malicious purposes.

Malware such as Trojans can, once inside your PC, use it as a base from which to carry out whatever internet activities the author desires. So for full protection you will need to prevent unauthorised applications using your network connection without your permission. Thankfully a firewall need not be an all-or-nothing solution. By configuring its settings you can take control over exactly what is allowed through in either direction.

At a basic level, most consumer firewall products operate by examining chunks of network data (packets) destined for your network or PC and checking them against a list of rules. Those that pass the test will be allowed through, but those that fail can be either sent the digital equivalent of an official letter of rejection or silently thrown away into the void. Depending on the firewall in question, a number of more sophisticated technologies may also be used.

The Windows Firewall

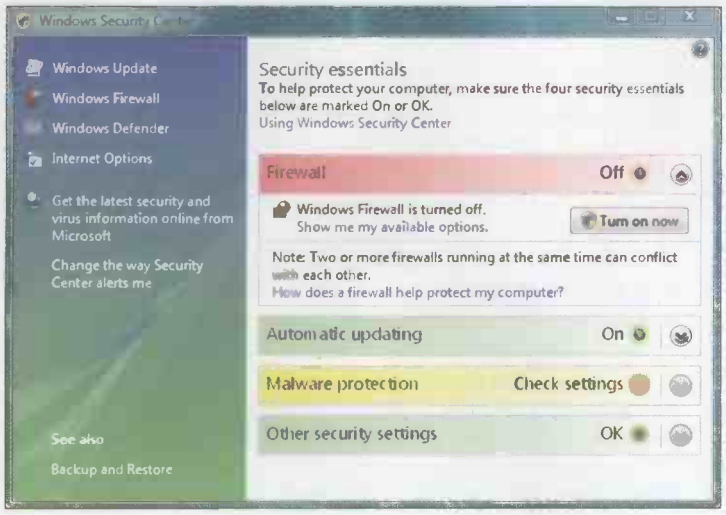
If you're using Windows XP Service Pack 2 or newer, your PC will have the Windows Firewall installed and enabled by default – in the original XP it wasn't enabled by default. If you connect to the internet via a modern router, you probably have both a software firewall and a hardware firewall in place (see the box on page 38 for more on routers).

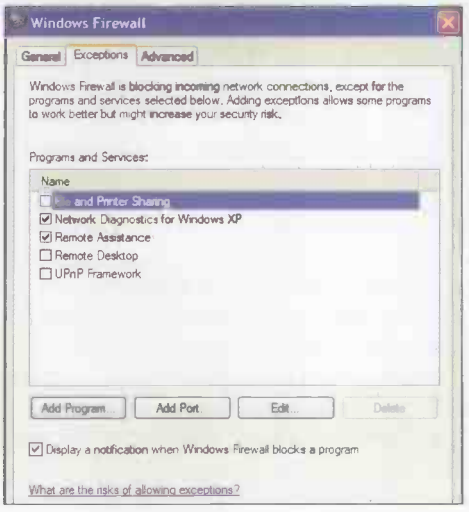
The standard Windows Firewall is relatively basic in operation and is designed to guard against incoming attacks.

If you're running an earlier version of Windows, or you have XP but don't have at least Service Pack 2 installed, we would suggest you install a firewall or upgrade your service pack as soon as possible. If you don't want to do, you should seriously considering installing one of the third-party firewalls mentioned later on.

Vista's Advanced Firewall

If you're running Windows Vista, you'll be pleased to know that it comes with a much-improved version of Windows Firewall. Many features have been added, not least is outbound packet filtering. For





Far left: Here the Firewall section is coloured red, indicating that no Firewall is active. You can activate it by clicking the 'Turn on now' button

Left: Select what programs or services you want the Windows Firewall to ignore

basic functions, the user interface is the same in Windows Vista as it is in XP. However, to access the new features you'll need to log on with administrator privileges. Go to the control panel and select System and Maintenance and then Administrative Tools.

Here you'll find the Windows Firewall with Advanced Security. This is the new firewall introduced with Windows Vista and is also found in Microsoft's newer server operating systems.

The configuration options of this firewall allow you to create rules for both incoming and outgoing connections. You can also specify different firewall profiles that come into force depending on whether you are connected to a public or private network. So, for example, you could take your laptop to a public Wifi hotspot where the public profile would come into force, beefing up security and blocking access to applications you may otherwise find acceptable while at home or in the office. These could include file shares or remote desktop control among others.

Am I protected?

To find out whether you need to fix your firewall's configuration, the first check is to see whether it's installed and running.

First, go to the Windows Control Panel and open the Security Center – in XP this is labelled Security Centre. In Vista you need to click the Security category then the Security Centre link, or type 'Security Center' into the Start menu search box.

The section named Firewall should be displayed in green and labelled 'on'. Clicking on the down arrow here expands the view to show you more detail about your installed firewall. If you're using the Windows built-in firewall it will say 'Windows Firewall is actively protecting your computer'.

If you're running a third-party firewall, its details will most likely be listed here instead. Configuring a third-party firewall is beyond the scope of this article, but the same basic principles apply whatever firewall you use.

If you have no firewall, or it's not running correctly, the section banner will be displayed in red instead, while displaying a message similar to, 'Your computer is not protected: turn on Windows Firewall'.

You will also see a link directly to the Windows Firewall Settings control panel, enabling you to turn the firewall on.

Test your protection

Of course, a green icon in Windows Security Center is simply an indication that your firewall is switched on. It doesn't actually prove you're protected against anything. If you've been making changes to your firewall configuration there could be any number of gaping holes waiting to be exploited.

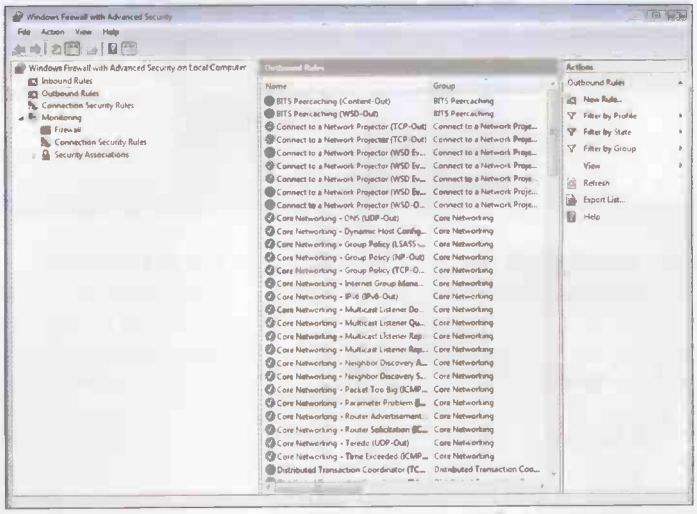
The only true test of your security is to attempt to break in from the outside. There are online services that will do this (safely) for you, probably the most famous of which is Shields Up, at www.grc.com. This service won't actually break into your PC, but it will perform a thorough security check, alerting you to any unguarded entry points, which you can then close manually.

Of course, this test doesn't help with preventing unwanted outgoing connections. To deal with this, you'll need to run anti-virus and anti-spyware software regularly.

Allowing an application through

It's simple to open up your firewall to allow an application access to the internet or vice versa. Usually networked applications will tell you which settings they need to use, although this information is sometimes buried in documentation. More user-friendly applications will offer to reconfigure the firewall for you. The Windows Firewall understands most common applications and adjusts the settings accordingly, after prompting you for permission if it's not sure.

Manual configuration involves allowing applications access via 'ports' in the firewall – ports are numbered destinations in the



Vista's Windows Firewall with Advanced Security adds outbound rules so you can control which installed programs are allowed to send data out onto the network

Is the Windows Firewall enough?

If Windows comes with a firewall, why do products such as Zone Alarm's firewall exist? Originally, the Windows Firewall was designed only to keep undesirables out, and it did nothing to prevent your PC sending out data without your knowledge.

However third-party firewalls exist, both free and paid-for, some of which take the concept much further. Many of them are paid for on a subscription basis, so they can include regular updates, in much the same way as anti-virus or anti-spyware software is maintained. They can also include many more sophisticated security techniques.

Many forms of malware reside on your PC and either hijack it for use in distributed attacks or divulge your personal information, potentially even banking details, by secretly snooping on you and sending your details to a third party. Anti-virus and anti-spyware software should root out these offenders, but only a sophisticated firewall can effectively block them once they are running.

Software versus hardware

A firewall application, like any software running on your PC, is going to consume CPU power and system memory, effectively slowing down your PC. Hardware firewalls are commonplace in corporate networks, but you'll also often find them in the home usually as part of an ADSL or cable broadband router. Although this is technically firmware rather than hardware, the essential point is that it's not running on your PC. This means it won't slow your PC down while it works.

However, this also means it can't block applications on your PC from sending data on your network (although it can use clever techniques, known as stateful packet inspection, or SPI, to try and ensure only legitimate connections are allowed). You'll also find yourself unprotected if you move your PC to another network, as is often the case with notebooks.

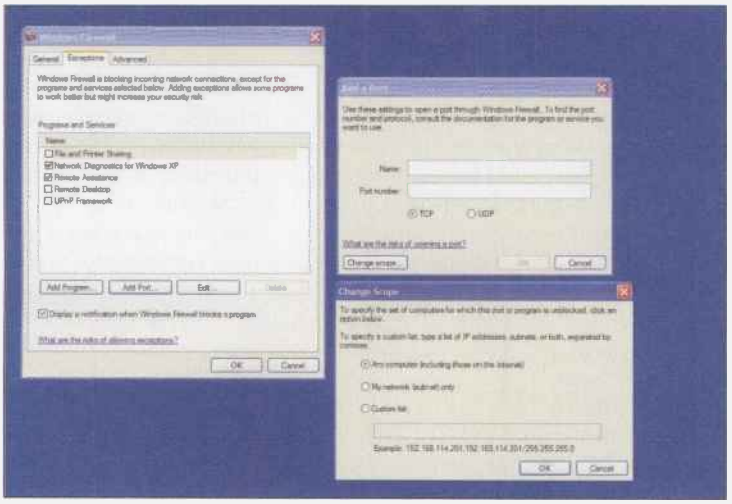
Yoggie Security Systems (**www.yoggie.com**) makes hardware-based firewalls that can be installed in a laptop or PC via a USB or Express Card interface. These offer the performance advantages of a hardware firewall by offloading work from your CPU, and allow for protection of an individual PC whether it's connected to your home network or a public Wifi hotspot (see **www.pcw.co.uk/2197076** for a review).

Hardware firewalls can also be more robust against certain attacks as they can deal with threats before they get to your PC's memory.

If you're interested in boosting your system's security and taking a close look at what's going on in your network, we would recommend taking a look at a third-party firewall such as the free version of Comodo Firewall Pro (**www.pcw.co.uk/2154813**), Outpost Firewall Free 2009 (**www.pcw.co.uk/2241260**), PC Tools' Firewall Plus (**www.pcw.co.uk/2172416**), Webroot Desktop Firewall (**www.pcw.co.uk/2201211**) or Zone Alarm (**www.pcw.co.uk/2128997**). All these products offer enhanced security as well as additional features and a simple user interface. These are all good for giving you basic protection, and some offer upgrade routes to more advanced paid-for versions.

Security suites

A software firewall often comes as part of an internet security suite. These offer the advantage of an integrated package that allows anti-virus, anti-spyware and firewall options to be configured from a single interface. If you do use a third-party firewall, make sure you turn off the Windows Firewall, as it's not a good idea to run two software firewalls at the same time.



Selecting 'Add a port' enables you to open up a specific network port to allow an application to pass through the firewall. You can also give it a name for easy reference later

firewall for network traffic. For example, web pages normally use port 80. For more detailed information on network ports, look at our previous Hands On article online at **www.pcw.co.uk/2173555**.

Panic button

If you think you've made a mess of your settings, or you find the Shields Up test is finding too many vulnerabilities, it's easy to reset the firewall and start again. Open up Windows Firewall, click Advanced then click Restore Defaults to return the firewall to the original default settings.

Router firewalls

If your networked application isn't working, it's possible the Windows Firewall is blocking communication. Temporarily disabling the firewall will allow you to re-try it and find out whether this is the cause of your problem.

If you disable the Windows Firewall and find your application starts working, you'll need to set up appropriate rules to allow it through, or open up the correct network ports. If disabling the firewall doesn't fix your problem, there may be another firewall in place, perhaps in your router. You may also need to configure the network address translation (Nat) on your router to re-direct internet traffic to the correct PC on your network. Nat is a function of most home broadband routers; study the manufacturer's instructions on how to configure it correctly.

If your application and router support Universal Plug and Play (UPnP), you can enable this to have the two negotiate a suitable network port that the router will map and open up on its internal firewall. UPnP is usually disabled in routers by default, so you'll need to spend some time with the documentation.

Keep your guard up

A good firewall does its job with minimum fuss, but third-party products often like to advertise their presence with lots of pop-ups and messages. This can be counter-productive and worry you needlessly, as many applications these days need internet access to do their job. If your firewall just presents you with gobbledegook, perhaps it's time to try a different one, as there's no excuse for making a firewall unusable. After installation, try running as many of your installed programs as possible to help 'train' the firewall – this should help quieten it down. Some offer 'novice' or 'quiet' modes. which will make things less hectic, but all firewalls should let you quickly enable or disable them for troubleshooting purposes. **PCW**

CleverPrint 2009:
Feature Overview

Print multiple pages on one sheet of paper:

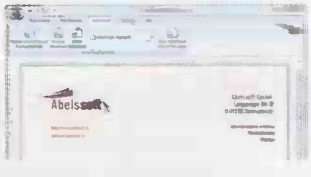
Remove unnecessary pages before printing:

Export your print jobs to PNG, JPG or even PDF:

Cobine documents of various applications:

Remove unnecessary graphics before printing:

Add letterheads to your paper:



Create booklets:

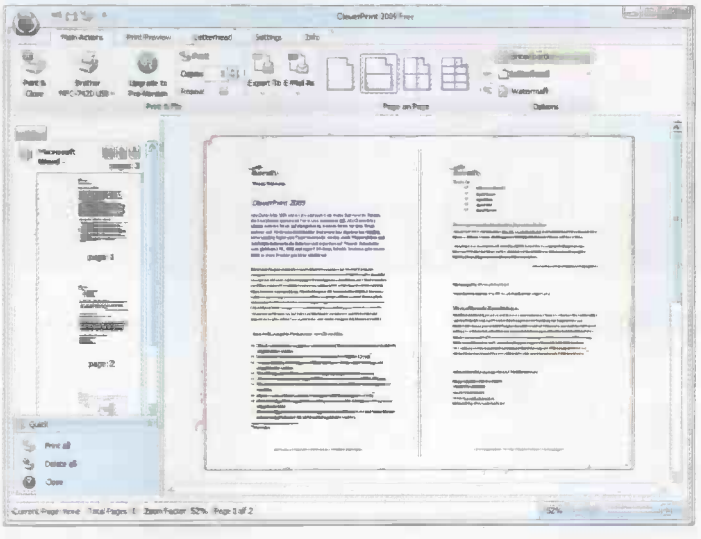
Add watermarks:

CleverPrint 2009

Save Paper, Save Toner, Save Money

CleverPrint may reduce your printing costs significantly: CleverPrint allows you to combine multiple pages on one sheet of paper, to remove pages before printing or to stop the printing process after checking the output in a preview window.

CleverPrint allows you to handle your daily printing sessions in a much more effective way. You can easily print multiple pages on one sheet of paper or you may save your print jobs as a PNG, JPEG or even PDF file. CleverPrint also allows you to save a lot of time by adding your company's letterhead to your print jobs. In addition to this, watermarks can be used to classify a document before it is printed.
Do you know the situation where you printed a website with 2 paper sheets although the second one only contained one line of unimportant text? CleverPrint allows you to get rid of unnecessary pages before you print them. A comfortable preview shows you how your pages will look like and allows you to take control over the full printing process.



- Allows you to print multiple pages into one (print 2, 4 or 8 pages on one)
- Allows you to preview the output and to cancel the printing process
- Allows you to add headers and footers (e.g. letterheads with your logo)
- Allows you to add watermarks with fonts or images
- Allows you to remove unnecessary pages from large print jobs
- Allows you to export jobs into PDF, PNG or JPG
- Allows you to save or load print jobs so that you may reuse them
- Allows you to re-arrange pages or jobs
- Allows you to combine different print jobs unto one page even if they come from different applications (e.g. Access, Open Office, etc.)

Power-Tool

CleverPrint 2009

Company:	**Abelssoft GmbH**
Internet:	**www.AbelsSoft.net/cp**
Price:	**free (Free-Version)** **29,95 GPB (Pro-Version)**

Creature comforts

Good ergonomics are just as important at home as they are in the office. Daniel Griffin explains

The focus of ergonomics has traditionally been on how we interact with our PCs at work. That's hardly surprising given that injuries caused by the repetitive actions of using a keyboard or mouse are estimated to cost UK businesses five million days a year, with up to half a million people estimated to be sufferers. Research conducted by private health firm Bupa suggested that, at some point in their lives, one in 30 people will suffer from carpal tunnel syndrome, a wrist injury related to repetitive strain injury (RSI). Of course, PC use has never been just limited to the workplace; and these days the ubiquity of PCs means that we can often spend almost as much time in front of our home PC as our corporate box.

Whether you use your PC or notebook to pursue a hobby, access the internet, or communicate on the move, an awareness of basic ergonomics has as much of a role to play preventing injury away from the office as it does at your nine-to-five job.

How, when and for how long you use your home PC will determine the kinds of strains that you will be most at risk from. Applying some common-sense thinking such as taking regular breaks and using ergonomically designed peripherals and furniture will help in the prevention of unfortunate aches and pains or worse.

In this feature we'll explore some of the basic concepts of ergonomics and help you get started setting up your home workstation so it's a pleasure rather than a pain to use.

Designing ergonomically

RSI refers to damage caused from repeating an action so often that the part(s) of the body used can end up suffering from nerve compression, tendon damage, muscle strain or joint damage, or a combination of these. Eventually, depending on the amount of activity, the occurrence of such damage will start to overtake the body's ability to heal itself – leading to something more serious and painful. If you suffer from any of these symptoms or variations thereof, the first thing you should do is consult your GP who will advise how to alleviate and treat your symptoms.

The best way to avoid making an RSI-related injury worse is to identify what is causing the problem and to stop doing it. Despite the emergence of touchscreen interfaces, clicking on a mouse or typing at a keyboard are still the most common ways of interacting with your PC or laptop, so we will be concentrating on ergonomics in these areas. Fortunately there are a variety of proven ergonomic peripherals out there to help prevent and aid in the healing of an injury.

The Ergonomics Society (www.ergonomics.org.uk) defines ergonomic design as "the

The curiously shaped Maltron L Type USB Two-handed Keyboard, is designed to keep hand and finger movement to a minimum when in use

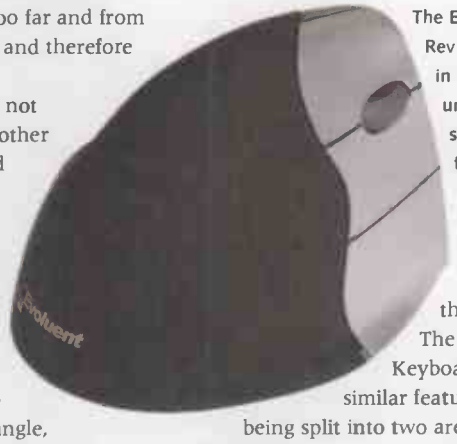
application of scientific information concerning humans to the design of objects, systems and environment for human use". This principle is incorporated into household devices such as your PC by taking into account your capabilities as well as limitations and designing them to fit you, rather than the other way around.

As a manufacturer of one of the world's best-selling ergonomically designed keyboards, Microsoft's initial approach was to split the traditional straight keyboard layout into two angled sections. This better suits the posture of resting the arms, as straight, conventional keyboards, require the wrist to turn and adjust itself accordingly.

Subsequent models incorporated a number of new features, such as increasing the gable angle (or the 'hump' of the keyboard). This feature helps untwist the arms when typing. To avoid putting pressure on one point, padded palm rests have also been incorporated, a feature that stops the wrists from extending too far and from dropping down too low and therefore avoiding strain.

The split keyboard is not the only solution, with other designs featuring curved keybeds and individual keys set at an angle, so reaching fingers can aim at them much more easily.

With traditional straight keyboards, certain keys will end up being struck at an odd angle, which, apart from encourage poor typing and increasing the number of mistakes, requires more force than is necessary. So by arching the most commonly used keys towards the centre of the board; the curved design makes allowances for the fact that our fingers are different lengths. This also encourages a shorter reach for commonly used keys as opposed to those that are required rarely.



The Evoluent VerticalMouse 3 Rev 2 allows the arm to rest in a neutral position which unlike typical mouse design stops the forearm from twisting

The Logitech Wave Keyboard shares a number of similar features but, rather than being split into two areas, keys curve towards you to better fit the resting position of the forearms and wrists.

Although similar in principle to the Microsoft range, UK ergonomic peripherals manufacturer Maltron produces the rather exotic-looking L Type USB Two-handed keyboard. Characteristics such as a split keypad and angled keys are present. The number pad is placed in the centre of the board with commonly used keys sitting in two concave recesses – accompanying this is a raised palm support area as you can see in the picture on the previous page.

Of course there is no one-size-fits-all device, so experiment to see what suits you the best.

'There is no on-size-fits-all device, so experiment to see what suits you best'

Pointing you in the right direction

Pointing devices – especially mice – are another area that has focused the attention of ergonomists. With an array of different approaches to the classic 'mouse' shape available, these range from fixed stationary casings with moveable rollerballs to vertical 'handshake' models.

Tailored left and right-handed devices in various incarnations are particularly popular with gamers who, apart from looking for that extra edge, will need suitable support and comfort given the long hours, rapid keystrokes and mouse clicks synonymous with gaming.

Ergonomic mice tend to encourage better weight distribution for the hand around the device; this is to avoid putting pressure on one point of the palm. Similarly, buttons and scroll wheels are placed to avoid as little travel as possible for fingers from a comfortable, resting position. Left and right-hand designs are, of course, optimised with a specific purpose in mind and, as a result, offer a more bespoke fit. Bear in

Get kids into good habits

Children spend an average of 15,000 hours sitting at a desk during their time at school, yet these days chances are the first thing they do when they get home, is boot up the family PC or console to socialise, play games or study for homework.

Tim Hutchful of the British Chiropractic Association (BCA) says children are particularly at risk from injury as their bones are soft and still developing.

As a result, the BCA recommends that kids don't spend any longer than 40 minutes in front of a PC at any one time. A good chair that supports the spine is also essential.

A BCA study found that, on average, 11-year-olds spend a day and a half each week watching TV and using the family PC.

Apart from this finding highlighting the more sedentary lifestyle children experience today, it is also worth considering if the tools they use (such as a mouse and keyboard) are suitable, given that these peripherals are designed with adults in mind rather than those with smaller hands.

Of the more child-friendly devices available it's worth trying US manufacturer A4 Tech (**www.a4tech.com**), which produces a range of two-thirds sized mice and keyboards with angled, smaller keys.

Notebooks such as the Zoostorm Fizzbook Spin, meanwhile, are also aimed specifically at kids, featuring touchable swivel screens with smaller keys. You can read a review of this notebook at **www.pcw.co.uk/2241670**.

Working from home? What the law requires

Under EU Directive 90/270/EEC employers are legally obliged to assess workstations in order to prevent conditions such as RSI and various musculoskeletal disorders such as backache and upper-body pain. While according to the Health and Safety Executive, The Health and Safety Work Act 1974 (HWSA) states that employers have a duty to protect the health, safety and welfare of their employees, including home workers.

If you use a PC at home for work then the Health and Safety Display Screen Equipment Regulations 1992 (amended 2002) applies to you. Your employer is obliged to ensure that any display screen equipment is safe and does not affect your health. That means an adjustable display is a must so there is no screen flicker or glare. There must also be enough room for a VDU to be placed so that it can viewed without needing any awkward movements. You are also entitled to request a free eye test from your employer.

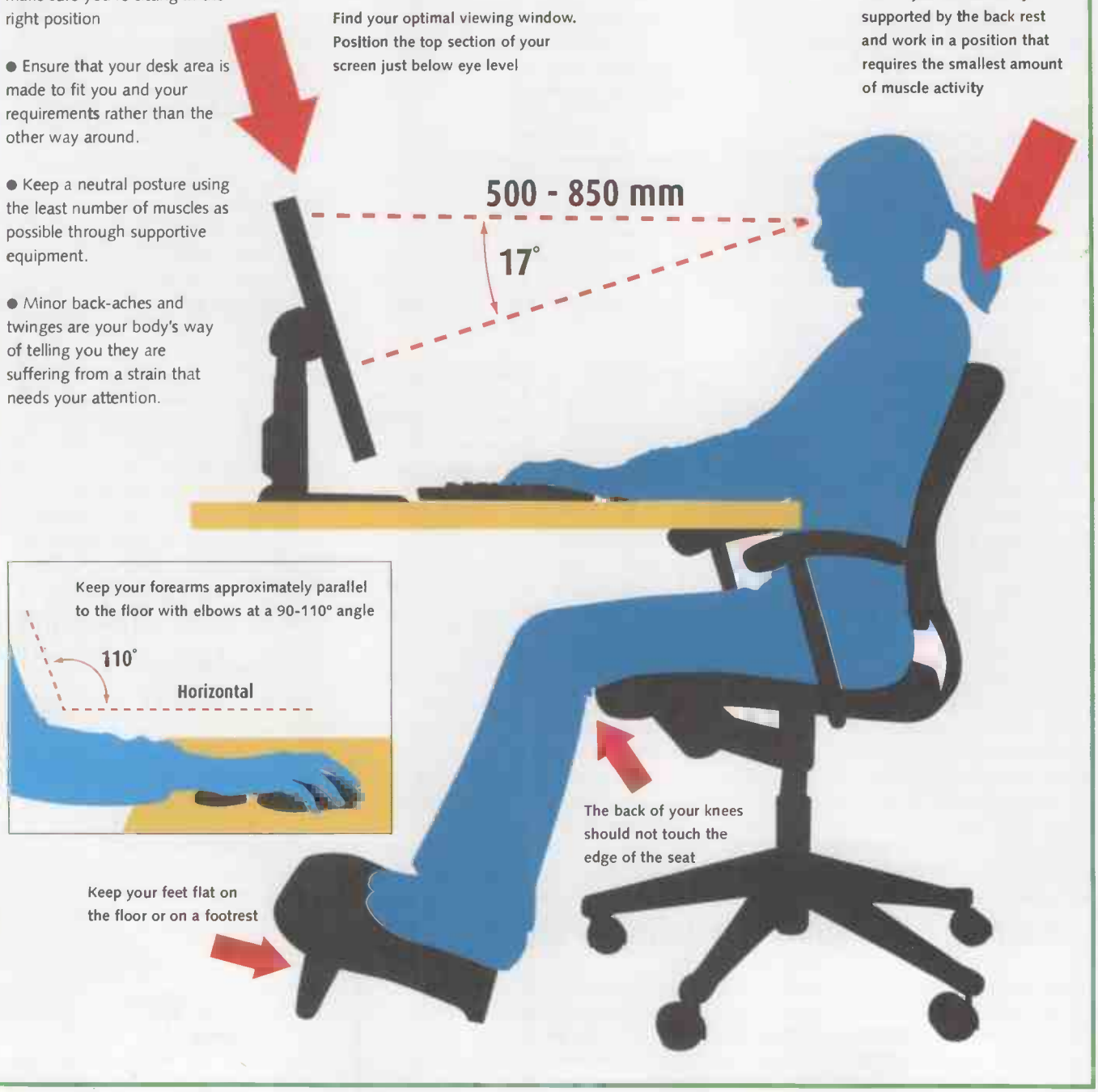
Peripherals such as keyboards must have enough space on the desk so they can be used in comfort, while chairs must also be height adjustable so that you remain in a comfortable position.

www.hse.gov.uk/pubns/indg226.pdf

Posture checklist

Ergonomic office equipment specialist, Fellowes (www.fellowes.com), offers the following basic advice to make sure you're sitting in the right position

- Ensure that your desk area is made to fit you and your requirements rather than the other way around.
- Keep a neutral posture using the least number of muscles as possible through supportive equipment.
- Minor back-aches and twinges are your body's way of telling you they are suffering from a strain that needs your attention.



mind, though, that if your home PC is used by more than one person, then an ambidextrous design may be more suitable.

In a departure from the more traditional design, Vertical mice such as the range from Evoluent keep the arm in a handshake position which helps prevent the forearm from twisting against itself, something that happens when using the traditional 'flat' design. Buttons are placed so the finger and thumb sit in a more natural opposable position and are activated more in a pinch rather than push motion. Again, where possible see what suits you best and try before you buy.

Running around

With the popularity of notebooks continuing to grow, so has the demand for separate mice to use with them. Typically smaller, battery-powered and wireless, they may not adhere to some ergonomic design elements that feature on their bigger desktop counterparts, but are better to use over cumbersome trackpads. A 2002 study showed that when two groups of notebook users (one using a mouse, one the built-in trackpad) were compared, the former reported lower instances of pain, so it may be worth considering in such an

investment if your main home computer is a notebook.

It is also worth remembering to make the most of your hardware's ability to program hotkeys and shortcuts. This will help you reduce the amount of button pressing when undertaking a repetitive action or task.

Are you sitting comfortably?

Although you're spoilt for choice with the amount of cheap, ergonomic peripherals available, it will mean little if you sit on something such as a kitchen chair when using your home PC. Proper support for your spine is essential to prevent back injury, and there are a range of specialist manufacturers online if you would prefer not to have something too office-like in your home.

Key things to look out for include full lumbar support. While high-backed chairs are helpful, they also need to be wide enough to take weight off the lower spine. Manufacturers such as Herman Miller produce the recognisable Aeron range which, although eye-wateringly expensive (starting at several hundred pounds for a custom-built chair) gives a good indication of the design qualities and adjustable features to look for in other makes, if your budget won't stretch that far.

Your chair should also promote the natural curve in your spine, so it is crucial that, although supportive, the chair is also adjustable and not only in height. Your feet should rest flat on the floor, while foot rests can also help prevent crossed legs, or dangling feet depending on your height. Being able to adjust the tilt of the chair is also important as is the ability to maintain good overall posture and adjustable armrests help allow shoulders to relax comfortably.

While we will only briefly touch upon it, consider how well lit the room is when you are using your PC. Sitting in a darkened room with your monitor as the only light source will potentially lead to headaches and eye strain. Modern high-contrast LCD screens can make the problem worse as they're often designed to impress when playing movies rather than when fighting Outlook or Excel.

And while the flicker of the CRT monitor has generally been consigned to history, the screens from many notebooks now feature such glossy finishes that you will end up squinting back at your own reflection whenever the sun comes out. So choose your sitting location with care to try and avoid such reflections.

One final point; the next time you are watching your favourite film or programme on your 24in monitor, ask yourself if you would only sit an arm's length away from the screen if it was on a normal TV? PCW

Ergonomics resources

Peripherals:

Maltron: Ergonomic Keyboards for RSI sufferers
www.maltron.com/index.html

Evoluent: Various peripherals – with a good range of vertical mice
www.evoluent.com

Matias: One-handed keyboards suitable for those with a hand injury or disability
http://matias.ca/halfkeyboard/index.php

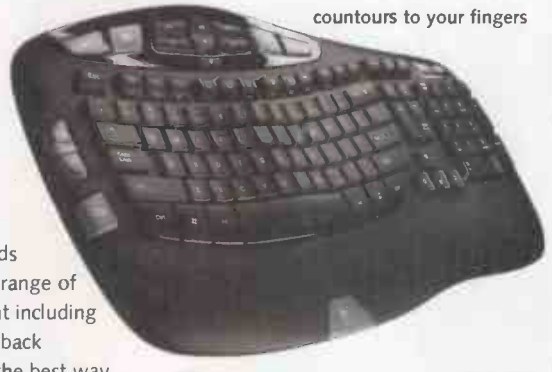
Microsoft: Offer a wide range of popular ergonomically designed mice and keyboards
http://tinyurl.com/49stu

Logitech Wave Keyboard: An alternative to Microsoft's fixed ergonomic keyboard the 'Curve'
http://tinyurl.com/o6qs48

One-handed keyboards may be useful for people with a disabillty

Microsoft sells a wide range of ergonomic keyboards

Logitech's Wave design countours to your fingers



Furniture and accessories:

Herman Miller Aeron Chair: Design icon and ergonomic support chair
www.aeronchair.co.uk or **www.hermanmiller.com**

The Backshop: Offering a wide range of ergonomic-related products from various manufacturers
www.thebackshop.co.uk

Fellowes: Although geared towards small businesses, Fellowes offer a range of ergonomic office-based equipment including notebook supports, footrests and back supports. It also offers advice on the best way to set up your desk area.
www.fellowes.com and **www.ergonomix.info** for useful tips to avoid injury on both notebooks and desktops

Herman Miller's Aeron Chair is ergonomically designed

Organisations

The British Chiropractic Association: The BCA has some good tips for avoiding back pain while surfing the net.
www.chiropractic-uk.co.uk

Back Care: A registered UK charity that offers advice and assistance to sufferers
www.backcare.org.uk

RSI Awareness: The RSI Awareness site provides information and advice for those suffering from a repetitive strain injury caused by using a computer
www.rsi.org.uk

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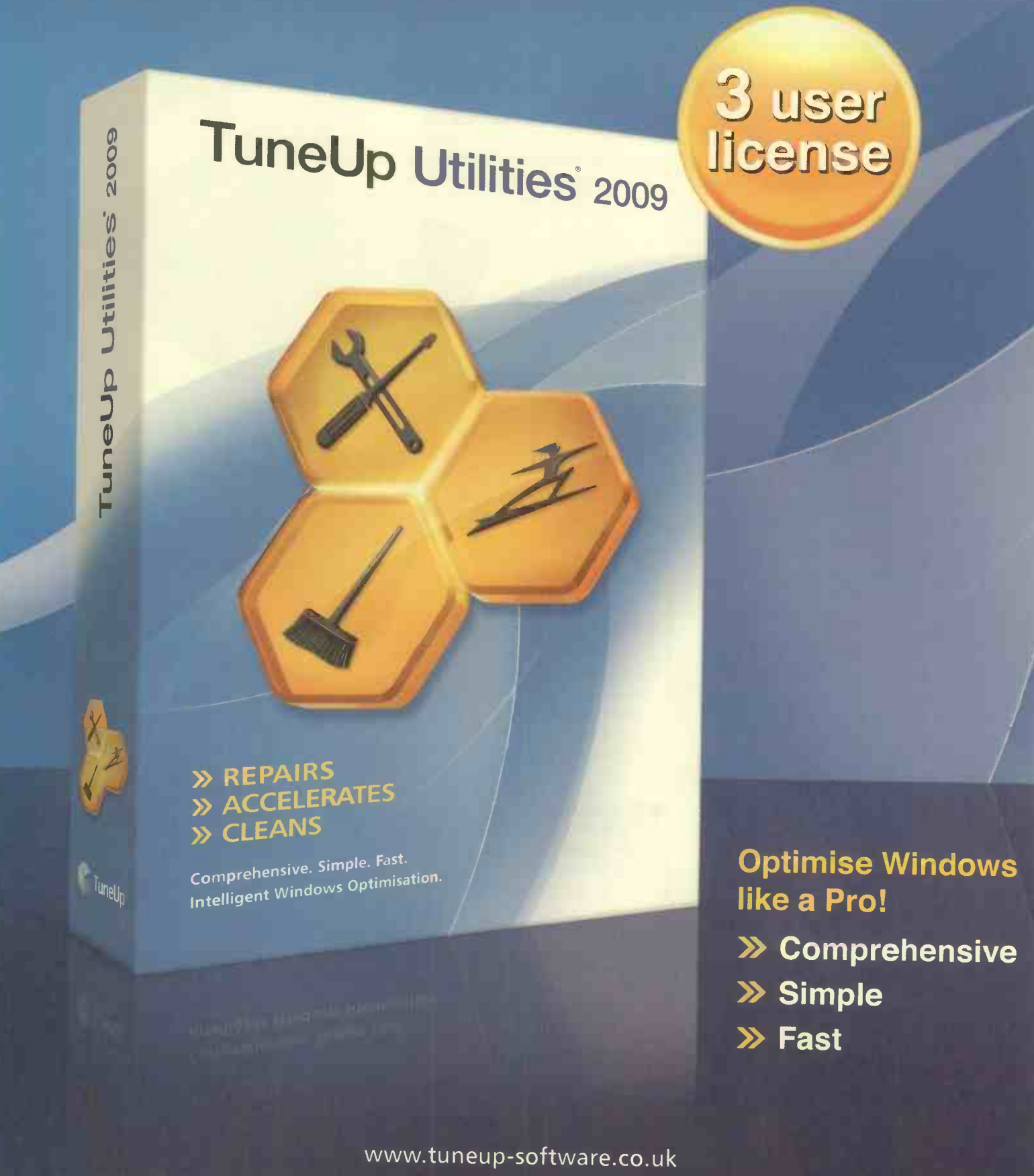

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www.tuneup-software.co.uk

EDITED BY
ORESTIS BASTOUNIS

REVIEWS

FASTER AND BETTER

A unique advantage of the desktop PC as a gaming platform is that it can be upgraded whenever the requirements of modern 3D games become too demanding. Replacing your graphics card will bring game worlds to life, with faster frame rates and higher detail settings. We've put 10 cards through their paces this month, testing them against a variety of games.

While a driving game might have you racing around a track at blistering speeds, driving in the real world isn't quite like that. Before satellite-navigation devices appeared, having to fumble for maps could make journeys tedious. Today's sat navs offer far more than just directions, including traffic information, local places of interest, and the location of speed cameras. We've reviewed five feature-packed models.

Other reviews in this issue include the second Google Android phone, the HTC Magic, and the next-generation netbook from MSI, the Wind U115. We've also reviewed one of the smallest and lightest ebook readers around, and plenty more.

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OUR SCORING

Excellent ★★★★★ Very good ★★★★☆ Good ★★★☆☆ Below average ★★☆☆☆ Poor ★☆☆☆☆

OUR AWARDS

Editor's Choice: The best product in a comparative group test. Anything that wins this award is of better quality than its competitors.
Recommended: A product that combines great features, usability and value for money.
Great Value: Not the best in class, but a product that has superior features and performance for the price.
Best Buy: The best product in its class in terms of performance, features and value for money

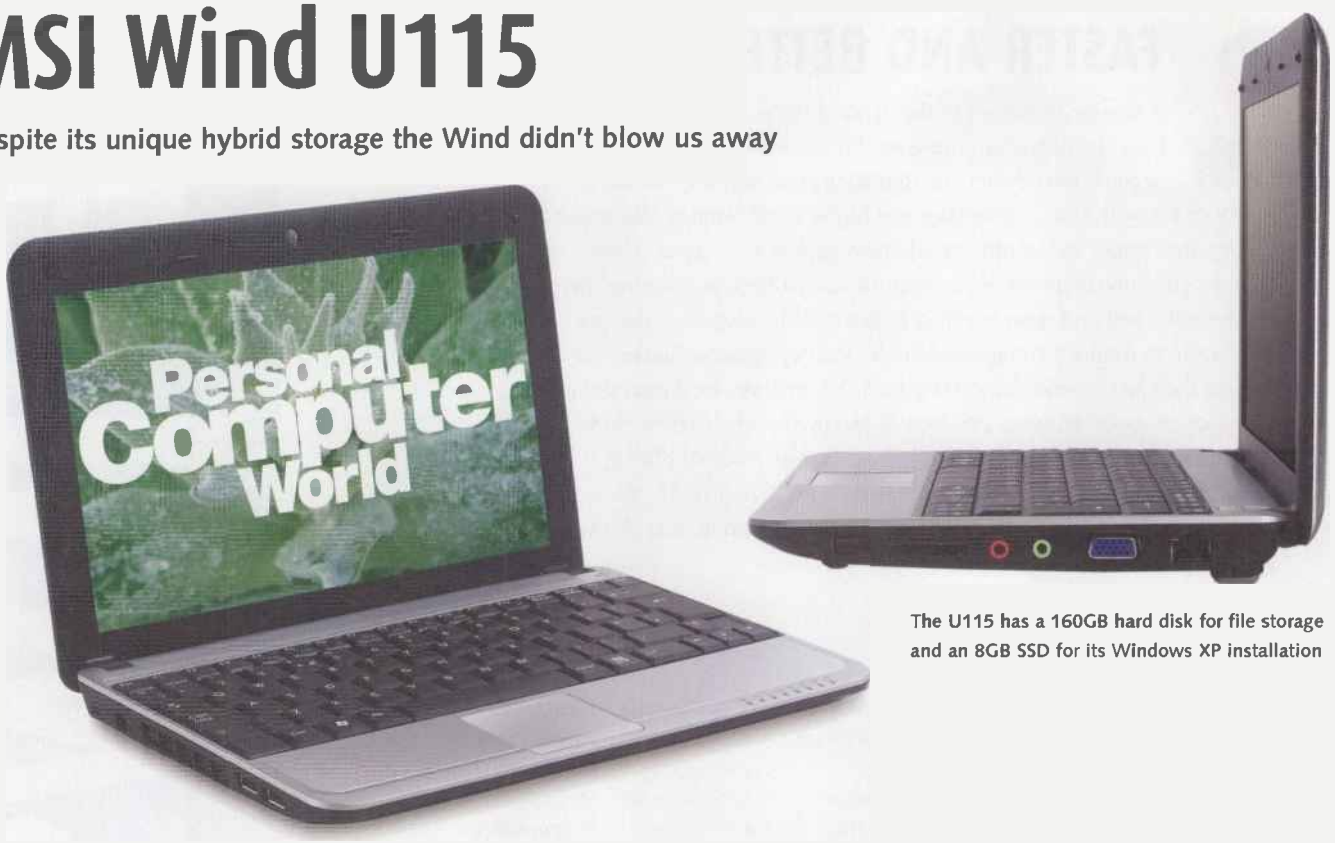
'High-polygon 3D models and detailed textures help create a sense of realism when playing a game'

Read the group test on p78

NETBOOK

MSI Wind U115

Despite its unique hybrid storage the Wind didn't blow us away



The U115 has a 160GB hard disk for file storage and an 8GB SSD for its Windows XP installation

The MSI Wind U115 looks almost identical to the U100, which became the standard that many other netbook manufacturers borrowed and tweaked for their own designs. Under the surface though, MSI has made changes to the processor and storage that make it a different portable computer.

The biggest difference is hybrid storage. The U115 has a 160GB hard disk for file storage and an 8GB SSD for its Windows XP installation. When the U115 isn't plugged into the mains, the hard disk can be disabled to save power. Asus also claims its 1000HE netbook uses hybrid storage, but in that case it's an internal 160GB hard disk and 10GB of online backup storage. No other netbook offers true hybrid storage, so this is a unique aspect of the U115. Although the SSD has decent read speeds, its writing speed is slower than premium SSDs so its main advantage is power saving rather than extra performance.

The processor is now an Intel Atom Z530 rather than an N270. This chip still runs at 1.6GHz, but at a lower voltage and therefore consumes less power and outputs less heat. The chipset is also different, being based on an Intel 'Poulsbo' chipset, with integrated GMA 500 graphics. Although this won't improve the Wind's gaming performance, it can assist with hardware decoding of some video formats.

Connectivity has improved from what was on offer in the original Wind. The U115 now supports 802.11n wireless, a feature some companies added to their rebadged Wind U100 models. The rest of the ports are unchanged from the U100, with three USB ports, VGA output, a four-in-one card reader, Gigabit Ethernet and audio. If you want to upgrade the memory, you can plug another Sodimm module into the memory slot.

The U115 also comes with a 5,200mAh six-cell battery as standard. Combined with all the other power-saving tweaks, this propels the U115's battery life beyond what other netbooks can manage. In eco mode (with the hard disk turned off) we measured a whopping 12 hours during our reader test, and even with the hard disk turned on the U115 lasted for 10 hours 34 minutes. You could buy a nine-cell battery from a third party, although MSI doesn't produce them.

Despite the amazing battery life, the U115 hasn't impressed us as much as its predecessor did. The bland design, colour scheme and frustrating keyboard could all do with an overhaul, as there are plenty of other netbooks on the market that are more stylish and easier to type on than the Wind. Placing the Fn key in the position normally occupied by Ctrl on standard Qwerty keyboards was universally criticised, but MSI has missed the opportunity to swap the keys around. OEMs that rebadged the MSI Wind U100 also managed to squeeze a few extra keys in, such as Home and End, but with the U115 you still need to invoke a combination of keys to access these.

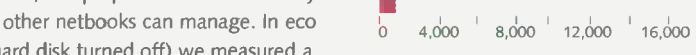
Worst of all is the increased price. The extra hardware and larger battery add to the manufacturing cost, but with a retail price of £450, it's hard to see the U115 flying off shelves, regardless how long its battery lasts. MSI has overlooked a key aspect of netbooks – a low price – and the U115 is now in the same price range as certain mid-range 17in entertainment laptops.

MSI hasn't improved its netbook design in the same way Asus constantly evolves the Eee range. Overall, we found the U115 to be disappointing, although its battery life is superb and the SSD is an excellent addition.

Orestis Bastounis

Performance

PCmark05 **1,379**



3Dmark06* **88**

*Tested at 1,024 x 768 in 32-bit colour

Verdict

Pros Hybrid storage; insanely long battery life; eco mode

Cons Bland design; mediocre keyboard; more expensive than other netbooks

Overall While the U115 is a solid netbook, MSI has neglected to improve some of the poorer aspects of the original Wind's design

Features	★★★★☆
Performance	★★★★☆
Value for money	★★☆☆☆
Overall	★★★☆☆

Price £450

Contact http://uk.msi.com

Specifications Intel Atom N270 processor • 1GB DDR2 memory • Intel US15W chipset • 160GB hard disk • 8GB SSD • Three USB2 ports • One VGA port • Bluetooth • 802.11 b/g/n Wifi • Four-in-one card reader • 1.3-megapixel webcam

NOTEBOOK PC

Acer Aspire Timeline 3810T

This thin and lightweight Macbook Air-a-like is quiet but expensive

It has taken a while for PC manufacturers to catch up with a trend set by Apple. Steve Jobs first showed how thin the Macbook Air is (by removing it from an envelope) 18 months ago, but only recently have makers of Windows notebooks tried to emulate. Dell's Adamo and HP's DV2 **(www.pcw.co.uk/2243052)** have already appeared, and now Acer's Aspire Timeline series.

Of those, the 3810T here is the 13.3in model, with a 1,366x768 widescreen display. It's only 2cm thick with the lid shut, and very lightweight at 1.25kg (both its height and weight are the same as the smaller-screened HP DV2). The screen itself is fine, although the resolution was a bit low for our liking. Unlike most netbooks, there is a full-size keyboard, which enabled comfortable typing and, while the trackpad below is a little small, it worked well.

A low-power Intel Core 2 Duo SU9400 processor, clocked at 1.4GHz, powers the computer, backed up by 2GB of memory. The processor is an ultra-low-voltage model designed specifically for thin computers, which means low heat output and long battery life. Combined with software settings to minimise power use, the 5,600mAh six-cell battery lasts just over five hours. There's a 320GB hard disk, which is plenty for storage, but no optical drive – instead you'll need to install programs via USB or a network.

Though the Acer Timeline is considerably cheaper than the Macbook Air, it doesn't share the Mac's sense of style, looking essentially like Acer's other notebooks, only thinner. It's also more expensive than HP's DV2, although that computer has a smaller screen and suffers from a noisy system fan.

The 3810T has a lot to commend it, but the price premium makes it less attractive. *Anthony Dhanendran*

Verdict

Pros Thin and lightweight; quiet in operation; decent keyboard
Cons Fairly expensive; small trackpad; relatively low-resolution screen
Overall Stuck between the Macbook Air and HP and Dell laptops, the 3810T doesn't offer enough for its asking price

Features ★★★☆☆
Performance ★★★★☆
Value for money ★★★☆☆
Overall ★★★☆☆

Price £609
Contact Acer www.acer.co.uk
Specifications Intel Core 2 Duo ULV SU9400 processor (1.4GHz) • 2GB DDR3 SD-Ram • 13.3in WXGA TFT LCD (1,366x768 pixels) • Gigabit Ethernet • Three USB ports • VGA/HDMI video out • 802.11a/b/g/draft-N wireless network connectivity • 5,600mAH battery • Webcam • Memory card reader • Kensington lock port

NOTEBOOK PC

Fujitsu Lifebook P8020

A lightweight and portable Centrino 2 notebook

You might think the average netbook is adequate as an inexpensive business computer, but there are benefits to using a fully fledged notebook such as Fujitsu's Lifebook P8020. Superior performance and build quality, an integrated DVD writer, Express card slots, a 3G modem and enhanced security are a few extras that set the P8020 apart.

The P8020 is based on an ultra-low voltage Intel U9400 processor running at 1.4GHz. It has a bright LED backlit WXGA 12.1in display, an area that's much easier to work with than the 10.2in screens in netbooks, but small enough for the P8020 to be called 'ultraportable'. The P8020 weighs just 1.32kg.

Although it's lightweight, the P8020 measures 4cm, at its thickest point, a lot more than the Macbook Air. It rivals other ultraportables such as Sony's Vaio TT series but its appearance isn't nearly as stylish.

The dual-core Core 2 Duo U9400 outperforms Atom processors by some margin. Cinebench scores were much higher, a respectable 495 for multi-core performance and 3,338 in PCmark05.

A fingerprint reader and Trusted Platform Model (TPM) provide a layer of security. There's 2GB of PC3-8500 DDR3 memory, and a six-cell battery, although longevity was disappointing at less than three hours.

The 3G module performs admirably, although with most 3G connections you rarely get the maximum 7.2Mbits/sec download speeds, as speeds depend on your location and choice of network. The Intel Wifi Link 5300 module supports 802.11n in both 2.4GHz and 5GHz wavelengths, and there's also Bluetooth.

The P8020 is nice to use, but its lack of style and average performance don't do justice to the wad of cash you will need to buy one. *Orestis Bastounis*

Verdict

Pros Low-voltage processor; 3G; dual-band 802.11n; bright screen
Cons Expensive form factor; tinny speakers; average battery life
Overall The high price can be attributed to the screen and very low weight of the P8020, rather than a top specification. It's a good choice if you want better performance from a netbook-sized computer

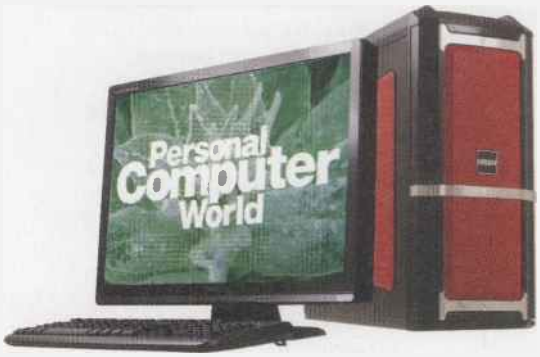
Features ★★★☆☆
Performance ★★★☆☆
Value for money ★★★☆☆
Overall ★★★☆☆

Price £1,770
Contact Fujitsu www.fujitsu.com/uk
Specifications Intel Core 2 Duo U9400 • 2GB DDR3 SD-Ram • 160GB SD-Ram • 12.1in TFT • DVD-RW • Webcam • Windows Vista Business • 274x210x28mm (wxdxh) • 1.32kg • Three USB slots • Express Card slot • HSDPA modem • Fingerprint scanner

GAMING PC

Mesh XGS PII iQ

Phenom II desktop PC bundled with a 26in monitor



Mesh has traditionally offered a wide range of AMD systems and, with the launch of Phenom II, the company has revamped its line of standalone desktop towers to use the new processor. The XGS PII iQ comes with a 26in Iiyama monitor, Hercules 5.1 speakers and a Logitech keyboard and mouse.

AMD's Phenom II X4 925 quad-core processor runs at its stock speed of 2.8GHz. It comes with 4GB of PC2-6400 800MHz DDR2 memory, sitting in an Asus M4A78 Pro motherboard, which uses AMD's 780G chipset. This isn't as up-to-date or fast as AMD's 790FX chipset and DDR3 memory, but its lower cost allows Mesh to price this bundle at £999. The configuration helps the XGS PII iQ achieve 10,142 in PCmark05, which isn't one of the highest scores in our PC performance leaderboards, but this PC is no slouch. Inside is a His HD4850 IceQ graphics card, a variant of ATI's Radeon HD4850 card with improved cooling. The PC manages respectable gaming performance, as the average of 32fps in World in Conflict shows.

The Iiyama Prolite E2607WS-B1 widescreen TFT has a maximum resolution of 1,920x1,200, three inputs including HDMI and a whopping screen size of 26in. This is larger than the majority of PC monitors and should give you an excellent gaming experience.

The XGS Xtreme Gaming case provides plenty of drive bay space. One of the six 5.25in drive bays is occupied by a Blu-ray combo drive, while only one of the four 3.5in drive bays is filled by a 750GB Samsung drive, so there's plenty of space to upgrade.

The Mesh's XGS PII iQ is more than capable as an office, multimedia or gaming machine, and the giant screen is a great addition, although you can save some cash by opting for a smaller display. *Simon Crisp*

Verdict

Pros Reasonable performance; tidy cable management; 26in monitor
Cons Much of the budget spent on the unnecessarily large monitor
Overall This is priced competitively, although there are better performing systems that cost less, except they don't come with a gargantuan display

Features	★★★★½
Performance	★★★½☆
Value for money	★★★½☆
Overall	★★★½☆

Price £999

Contact Mesh Computers
www.meshcomputers.com
Specifications AMD Phenom II X4 925 (2.80GHz) • 4GB PC2-6400 800MHz Ram • Asus M4A78 Pro motherboard • 512MB His HD4850 IceQ graphics card • Blu-ray combo drive • 750GB hard drive • 52-in-1 card reader • Digital/analogue TV card • Iiyama Prolite Prolite E2607WS-B1 26in TFT • Hercules 5.1 speakers • 1-year RTB hardware warranty

GAMING PC

Cyberpower Gamer Ultra Perseus

A high-end AMD desktop gaming PC with a great cooling system

AMD's latest Phenom II X4 and X3 processors perform better at standard clock speeds and will overclock further than the first Phenom line. Rather than use a quad-core Phenom X4 chip inside its liquid-cooled Gamer Ultra Perseus, Cyberpower has opted for a triple-core X3. It has overclocked the AMD Phenom II X3 720 BE from 2.8GHz to 3.7GHz, using an XSPC liquid-cooling kit. Backing this up is 4GB of OCZ PC3-10666 DDR3 memory, split over two 2GB modules, sitting in an Asus M4A78T-E. This motherboard uses AMD's most up-to-date 790GX/SB750 chipset combination.

The Ultra Perseus performed astonishingly well, with a PCmark05 score of 10,986. A Palit HD4870 Sonic 1GB graphics card occupies the topmost PCI-Express slot. This card has plenty of interesting features, such as only a single DVI output, rather than the usual two. In its place are VGA and HDMI ports, and a Display Port connector, which is still rare. The card has a 'Turbo' switch which increases the core clock speed by up to 775MHz (from 750MHz) and adds 200MHz to the effective memory speed to run at 4,000MHz. Its performance is good without the turbo anyway; in standard mode it gave an average frame rate score of 49fps in World in Conflict's built-in benchmark.

The large Antec Twelve Hundred case allows more components to be put inside without becoming too messy. Despite the large number of fans: six case fans including a giant 200mm one in the case roof and two graphics card fans, the system is surprisingly quiet.

Unlike their forebears, the Phenom II X3 processors are great and, despite having one less core than normal, it doesn't greatly affect performance, as our results show. *Simon Crisp*

Verdict

Pros Performance and build quality
Cons Why not a Phenom II X4 at this price?
Overall This PC hows off the overclocking ability of AMD's latest processors and is one of the neatest liquid-cooled systems we've seen

Features	★★★★½
Performance	★★★★★
Value for money	★★★½☆
Overall	★★★★½

Price £1,199

Contact Cyberpower
www.cyberpowersystem.co.uk
Specifications AMD Phenom II X3 720BE triple core (2.8GHz overclocked to 3.7GHz) • XSPC custom liquid cooling • 4GB OCZ PC3-10666 Ram • Asus M4A78T-E motherboard • 1GB Palit HD4870 Sonic graphics card • 6x Blu-ray drive • 750GB hard drive • 700W PSU • Creative X-Fi Xtreme Audio 24 soundcard • Vista Home Premium 64-bit SP1

SMARTPHONE

HTC Magic

The second Android phone, slimmer and better than the G1

The Magic handset has a far more complete feel than its predecessor, the G1

When the predecessor of the HTC Magic was released, the HTC Dream or G1, both the handset and the Android operating system felt unfinished. The 'Google phone' has still attracted followers, but for those hoping for an iPhone-killer, it was a little disappointing.

With the HTC Magic, most of those initial criticisms have been answered. The materials used in the casing are of better quality, with a superior finish. The handset's curved back sits comfortably in the hand, it's lighter and slimmer and there's less wasted space at the lower portion of the handset. The essential rollerball has increased in size, is more responsive and durable and the 3.5in touchscreen is just as accurate and reliable as the G1's. The biggest design departure is the Magic's lack of a Qwerty keyboard.

The Magic's on-screen keypad is quite accurate though, despite the somewhat small keys. While you won't be as speedy at typing with this as with a physical keyboard it's good enough not to cause too many problems and is something you quickly adapt to.

Poor battery performance dogged the G1's reputation but the Magic has more than made up for this. Swapping files using Bluetooth, as well as using the built-in Wifi, made only a little dent in the battery performance. After this we downloaded several apps and used the MP3 player for two hours, and the web browser for another hour. That still left us with a 60 per cent charge in the battery. We even managed to make a few calls in between which were clear, audible and quick to connect.

The 3.2-megapixel camera is an improvement on the G1's woeful effort, but it still lacks a flash, although you can at least record video now. HTC has repeated the mistake of not including a standard 3.5mm headphone port, instead relying on a mini-USB connection. The results through the bundled headphones are predictably poor.

The Magic's white casing has also been criticised as it's the only colour available in the UK (mainland Europeans have the choice of black, too). However once in your hand, the device isn't as gaudy as you might think, mainly due to the quality materials used and the glossy finish. We thought it made a nice change from the typical black slabs.

The real pull of the Magic has to be the Android OS and, as a result of the recent upgrade (version 1.5, known as Cupcake), many of its shortcomings have been ironed out. Browsing is a joy and most websites fit the screen well, with sites such as Wikipedia and the BBC defaulting to their mobile versions.

The open-source nature of the Android Marketplace makes it a fantastic site to find some excellent apps. Although these are not as polished or numerous as some applications available from the iPhone Store you can easily find some excellent software to install. Downloading and managing your apps is simple and you'll quickly find yourself in the habit of browsing for something handy when you need it, such as a local cab firm or a local weather report.

There's still room for improvement with the Magic of course, but the leap in hardware quality between the G1 and G2 is significant. The Cupcake upgrade is also a move in the right direction, and it's encouraging that Google and HTC took onboard previous criticisms. In exchange for a lengthy contract with most retailers, you'll get a solid, good-looking handset running on the ever-improving Android OS. *Daniel Griffin*

Verdict

Pros A well-made handset with a great OS

Cons No 3.5mm headphone socket and the camera needs a flash

Overall The Magic is a great phone and one you'll still be happy using in 18 months' time

Features	★★★★½
Performance	★★★★½
Value for money	★★★★½
Overall	★★★★½

Price Free with 18-month Vodafone contract at £35 per month

Contact Vodafone www.vodafone.co.uk

Specifications Qualcomm MSM7200A 528MHz processor • Android OS • 512MB Rom • 288MB Ram • 113x55.56x13.65mm (hxwxd) • 116g • 3.2in TFT-LCD flat touch-sensitive screen • 320x480 HVGA resolution • Network HSDPA/WCDMA • Quad-band GSM/GPRS/Edge: 850/900/1,800/1,900MHz • Internal GPS antenna • Connectivity: Bluetooth 2.0, Wifi 802.11 b/g • 3.2-megapixel camera with auto-focus • Audio: AAC, AAC+, AMR-NB, MP3, WMA, WAV, AAC-LC, Midi, OGG • Video: MP4, 3GP • 400 minutes' talk time for WCDMA and 450 minutes for GSM • 660 hours' standby time for WCDMA and 420 hours for GSM

MEDIA STREAMER

Netgear Digital Entertainer Elite

The EVA 9150 is an excellent performer and is easy to set up

Netgear's EVA 9140 media streamer supports a wide range formats and comes with a four-in-one remote control device

Considering how integral digital media is to modern-day entertainment, it's almost embarrassing to think that we can still count the number of truly capable media streamers on one hand. A company that can lay fair claim to occupying one of these digits is undoubtedly Netgear which, while not exactly prolific, has released some pretty tidy products in the past.

The EVA 9150, or Digital Entertainer Elite, is its new model for 2009, and improves on previous devices by offering a 500GB built-in hard disk, integrated 802.11n wireless and plenty of support for modern media formats and codecs. A range of connectivity includes HDMI, 10/100 Ethernet and two USB ports for attaching external storage, though the rather bulky design means that aesthetically it's unlikely to win any awards.

Provided you can find room for the box amid the rest of your home-cinema equipment, setup is refreshingly straightforward, using install wizards on both the computer and TV side to configure the device correctly for your screen and set up network shares. Netgear has decided against a UPnP server approach and instead uses straightforward folder sharing via your operating system. While this does mean it's easy to browse by folder structure, the Elite encourages the use of ID3Tags for media access and, if this isn't already set up on a collection of video files, the supplied Tagtool application makes these easy to create.

Performance is excellent for media playback, and at the top end we found 1080i resolution files streamed admirably across a wireless network, though depending on the signal strength, wired or locally stored playback may be a better option for 1080p. Format support is similarly impressive with all the latest codecs and file types included, so those who like to share a library with portable devices, for example, should be able to avoid unnecessary conversion. One notable feature here is the ability to play back protected content and, provided the appropriate WMP/iTunes software is installed on the host computer, the EVA 9150 has access to this as well.

The Entertainer Elite also offers excellent control over playback of all media types via the four-in-one remote supplied. This is streets ahead of the cheap, unresponsive controllers that come with most other streamers and is intuitively laid out to offer fast access to the various features on offer. Video playback allows for aspect-ratio adjustment, subtitle support, quick-searching using the directional keys or numeric keypad and auto resume. Audio can be compiled into playlists with repeat and randomise functions and slideshows can be created for photos with varying transitions and timings.

Aside from media playback, you can also access Youtube directly from the device, enabling you to do direct-text searches or a quick browse of featured and highly rated content. This is similarly responsive and, though there's a slightly longer delay before playback starts, it rarely takes longer than 10 seconds and is there to ensure further buffering is not required.

Additional online access includes Flickr, internet radio, news and weather and the ability to add channels and RSS feeds, rounding off a comprehensive degree of support in this area.

After a very impressive showing, the biggest problem we have with the EVA 9150 is the price. At around £350 it's one of the most expensive streamers on the market, so is certainly not a choice for the casual user. When you consider the fact that the previous model, the EVA 8000, is available for around half this price and that the only real improvements are the internal hard disk and a faster processor to streamline operation, this might seem like a better bet.

Paul Lester

Verdict

Pros Wide range of format support; excellent performance; built-in 11n Wifi; good access to online content; easy to set up and use

Cons Very expensive

Overall It's difficult to think of a better streamer in the current market, but you're paying a lot of money for this level of performance

Features	★★★★★
Performance	★★★★★
Value for money	★★★½☆
Overall	★★★★½

Price £350

Contact www.netgear.co.uk

Specifications Wired Lan: 10/100 Ethernet, RJ-45 • Wireless 802.11a/b/g/n dual-band • Audio support: MP3, WAV, WMA, AAC, Flac, WMA-Pro, M4A, M4P, AC3, DTS Passthrough, PCM, LPCM, AIFF • Video format support: AVI, DivX, Xvid, WMV9, MOV, M4V, VOB, MPG, MP1, MP2, MP4, ISO, IFO, MKV (with AC3 only), TS, M2TS, PS • Photo support: JPEG, BMP, PNG, TIFF • Playlist support: WPL, ASX, WAX, WVX, PLS, M3U, RMP • 432x51x254mm (wxhxd) • 2.5kg

HIGH-DEFINITION CAMCORDER

JVC Everio X GX-X900 EK

A small, feature-rich camcorder that captures 1080p video

JVC's Everio X is one of the smallest 1080p camcorders we've ever seen. It eschews a hard disk in favour of an SDHC card slot, which accepts cards up to 32GB.

The Everio captures 1080p HD video using a 10.3-megapixel Cmos sensor – slightly more sensitive than a digital SLR such as Canon's EOS 1000D – which displayed fine details such as skin blemishes in the higher resolutions. The facial recognition feature identifies 16 targets and there is also a focus mode, which outlines subjects in red against a monochrome background on the screen. JVC's new image stabilisation technology, which mitigates camera shake mechanically at the lens rather than the processing stage, formed consistent capture results without a tripod.

The Everio shoots still images at nine megapixels without any interpolation and can even take five-megapixel images while recording in 1080p. The 5x optical, 8x dynamic and 200x digital zoom, modes all produce decent images too. Macro mode is another useful addition, operating superbly at around 5cm and colour reproduction was accurate.

Another feature is high-speed recording at 500 frames per second (fps), albeit at 640x72 pixels. Using the 100fps setting increases image size to 480x270. Furthermore, the continuous shooting mode, operating at nine megapixels, can take six shots at 15fps – five times the speed of a Nikon D80 SLR camera.

Navigating the Everio X's functions is easy using the responsive backlit touch-slider and separate menu buttons surrounding the screen.

Everio Mediabrowser, the bundled Windows-only software for the Everio range, allows simple edits and one-touch upload to iTunes and Youtube (Mac users can use iMovie 08). *Laurence Gunn*

Verdict

Pros Wide range of video and stills features; aesthetic design; easy to use
Cons Oddly positioned internal microphone; average image quality
Overall Feature-rich all-rounder, let down by average picture quality

Features	★★★★★
Performance	★★★★½
Value for money	★★★★½
Overall	★★★★★

Price £900

Contact JVC www.jvceshop.co.uk
Specifications F3.4 to 5.6, focal length 6.7-33.5mm • Power consumption: 3.7W (approx) • 4:3 and 16:9 formats • Dolby Digital sound (two channel) (48KHz, 256Kbits/sec) • MPEG-4 video • Stills: JPEG – 3,456x2,952 (4:3) and 3,456x1,944 (16:9) • Recording modes: EP, SP, XP, UXP • USB2, AV, component and HDMI out • Video resolution: 1,920x1,080 • 298g • 37x66x124mm (wxdxh)

PORTABLE CAMCORDER

Genius G-Shot HD520

A portable HD camcorder for less than £100

Like the Flip Mino HD reviewed last month, the G-Shot HD520 is a pocket-sized camcorder that can record 720p resolution video. However, the G-Shot can also capture still images, function as a webcam, MP3 player and ebook reader, has a 2.5in rotatable flip-out LCD and its internal storage can be expanded with SD cards. And, incredibly, it's much cheaper than the Flip Mino HD.

When recording video the G-Shot is meant to be held with your arm outstretched, pointed like a gun. It isn't as light or portable as the Flip, measuring 4cm deep at its widest point. On the right-hand side is a control for 5x digital zoom, along with a button to manually turn the flash on or off when taking still images. Four buttons sit under your thumb for going through menus, selecting options and deleting files. A switch on the top lets you switch focus settings between normal and macro recording.

Regardless of which macro setting you use, the G-Shot won't produce brilliant-quality video, thanks to its low-quality lens. We spent time recording indoors and outside, and both times the results were mediocre. Video was either grainy or blurry, with artefacts obscuring small details, which negates the benefit of recording in high definition. It isn't terrible though and is perfectly suitable for recording video for the web.

The G-Shot's other features range from good to useless. The MP3 player works well as expected, but the small 2.5in screen isn't suited for reading ebooks. Its still images are reasonable, although most dedicated compact cameras produce far better quality.

Still, you'd be hard pressed to find another HD camcorder less than £100. The G-Shot isn't nearly in the same league as the Everio, and falls short of the Flip Mino HD. However, it's perfectly suited for recording while on holiday, or for anyone who likes to share online video. *Orestis Bastounis*

Verdict

Pros Produces 720p video; expandable memory; HDMI output, 2.5in LCD
Cons Average image quality; no optical zoom; some of the extra features aren't useful
Overall An inexpensive portable camcorder that can record in HD resolutions, although the images aren't particular high quality

Features	★★☆☆☆
Performance	★★★★½
Value for money	★★★★★
Overall	★★★★½

Price £99

Contact Genius www.geniusnet.com 020 8664 2727
Specifications 5-megapixel Cmos sensor • 1,280x720 resolution • 720p video at 30fps • H.264 compression • SD card slot (up to 8GB cards) • Face detection • 2.5in LCD screen • Motion detection • Z Lighting effect • 71x40x115mm (wxdxh) • 160g

WIDESCREEN MONITOR

Lenovo L2440X

A great display with LED backlighting

Unlike conventional LCDs, which are backlit by cold-cathode fluorescent lights, Lenovo's L2440X uses an array of LEDs. This means that it uses less power than similar displays and, being free of both mercury and arsenic, the L2440X is certainly green too. These are peripheral concerns for most users though, who are more concerned with whether or not it displays a good picture.

Thankfully, it does. The backlight proved completely even when displaying our solid-colour tests. We could spot no crosstalk or blurring, leaving each pixel pin sharp. We noticed a side-effect where the brightness of the entire panel adjusted when switching between a dark window and a bright one, which initially proved distracting. With the default calibration, the image was a too pink for our liking, but it turned out that this was caused by the colour profile being set on a preset called 'Reddish' – the Neutral setting looks better. Calibrating the screen using an X-Rite Eye-One only required a slight change.

Physically the L2440X is as impressive as the images it produces. It pivots by 90° into portrait orientation, and the height is adjustable. The screen can be tilted and the edge of the bezel moved from 2.5cm to 13.5cm off the desk. There are VGA, DVI and HDMI inputs built in, along with a USB hub, with three of the USB ports located on the left edge of the display. There are no speakers – which is no loss, as fitting quality speakers is difficult – but there's a 3.5mm audio output for connecting an external set.

The L2440X is an excellent monitor, but there's a catch: the L2440X can display a great picture, but other 24in displays can be bought for less. Dell's G2410, for example, might not have HDMI, but it can be found for just £265. *Tom Royal*

Verdict

Pros Great image quality; impressive green credentials
Cons Expensive
Overall A very good display, but expensive compared with some other 24in panels

Features	★★★★☆
Performance	★★★★★
Value for money	★★★★☆
Overall	★★★★★

Price £456

Contact Lenovo www.lenovo.co.uk 0844 800 0550
Specifications 24in LCD • 1,920x1,200 (WUXGA) native resolution • 16:10 screen format; inputs: DVI, VGA, HDMI • 90° pivot • HDCP-compliant • Four-port USB hub • Audio output

WIDESCREEN MONITOR

Viewsonic VX2433wm

24in widescreen monitor with HDMI

The VX2433wm is a smart-looking display. Its 1,080p resolution and 16:9 aspect ratio matches the shape of a widescreen TV and is ideal for displaying HD content. Finished in a glossy piano black, it has a single silver power button at the front. The remaining controls are tucked out of sight on the right-hand side, keeping the appearance neat and tidy and retaining minimalistic good looks.

Viewsonic's menu system is not the easiest to navigate. This is partly because the design precludes the use of unsightly button legends.

The menu contains some useful functions, including control over aspect ratio and the ability to turn the dynamic contrast system on or off – we prefer to leave it disabled. While this boosts the specified contrast ratio from 1,000:1 to 20,000:1, it's unhelpful for most applications other than watching video. It also lacks any one-button display presets, such as text, movie or photo modes. This means you'll have to tweak the individual functions manually.

If you do want to watch video, the display will cope admirably with a variety of sources, thanks to its built-in HDMI connector, which will allow you to hook up a Blu-ray player or games console with a single cable and enjoy 1,080p HD video and sound through a pair of built-in 2W speakers. You also get DVI and analogue VGA ports, so you can connect up to three devices at once and switch between them from the front panel.

In use, the VX2433wm delivers a bold, sharp picture, thanks to its excellent contrast. However, colour reproduction was less vivid than some of the competition – as revealed by our test results.

Overall this is a smart, good-looking display with excellent connectivity and better-than-average performance. Look online for discounted prices of around £200 inc Vat. *Paul Monckton*

Verdict

Pros HDMI; multiple inputs; sleek
Cons Tilt-only stand; colours not particularly vivid
Overall A good-looking, reasonably priced monitor with multiple inputs

Features	★★★☆☆
Performance	★★★☆☆
Value for money	★★★☆☆
Overall	★★★★☆

Price £279

Contact Viewsonic www.viewsoniceurope.com
Specifications 23.6in TN panel with 1,920x1,080 resolution • 170° viewing angles • 5ms (on/off) 2ms (grey to grey) response time • 300cd/m² brightness • 1,000:1 contrast ratio (20,000:1 dynamic) • Inputs – VGA, composite, S-video, Component video, HDMI, HDCP • Two 2W stereo speakers; Vesa 100 mount • Two-year warranty • Power: 45W typical, 37W optimised • 572x418x231mm (wxdxh) • 5.6kg

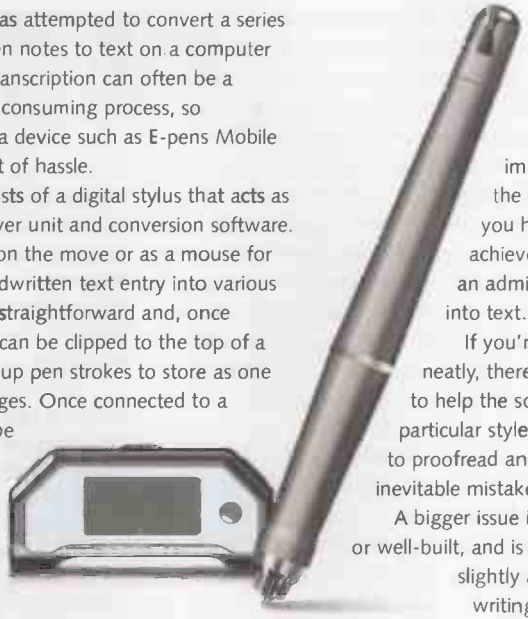
DIGITAL PEN

E-Pens Mobile Notes

A quick and easy way to transcribe handwritten notes

Anyone who has attempted to convert a series of handwritten notes to text on a computer knows that transcription can often be a painstaking and time-consuming process, so automating this with a device such as E-pens Mobile Notes could save a lot of hassle.

The package consists of a digital stylus that acts as a regular pen, a receiver unit and conversion software. It can either be used on the move or as a mouse for tablet PCs, or for handwritten text entry into various applications. Setup is straightforward and, once charged, the receiver can be clipped to the top of a pad of paper, picking up pen strokes to store as one of up to 50 virtual pages. Once connected to a computer, these can be imported using the supplied software and converted to digital text using optical character recognition, with a range of settings available to denote language, writing style and end-format.



In addition to this, switching to mouse mode means that pen movements control the pointer on screen, with a tap on the page, or click of the control button on the pen, activating left and right click.

We were generally very impressed by the responsiveness of the stylus and receiver and, though you have to write fairly neatly to achieve 100 per cent accuracy, it does an admirable job of converting scrawl into text.

If you're unable or unwilling to write neatly, there's a recognition trainer provided to help the software get used to your particular style of writing, although you'll need to proofread and alter text after writing to correct inevitable mistakes.

A bigger issue is that the pen doesn't feel solid or well-built, and is prone to slipping in the hand slightly after extended use. For normal writing, a premium fountain or ballpoint pen is much more satisfying. However, the Mobile Notes package is still an effective product for saving time when transferring handwritten notes onto a PC.

Paul Lester

Verdict

Pros Easy to set up and use; impressive accuracy; can learn your handwriting

Cons Pen feels a little cheap; image recognition can be awkward

Overall If you spend a lot of time writing notes on paper, Mobile Notes could be just what you need

Features	★★★☆☆
Performance	★★★★★
Value for money	★★★☆☆
Overall	★★★★★

Price £89.99

Contact Digiscribe
www.digiscribble.com

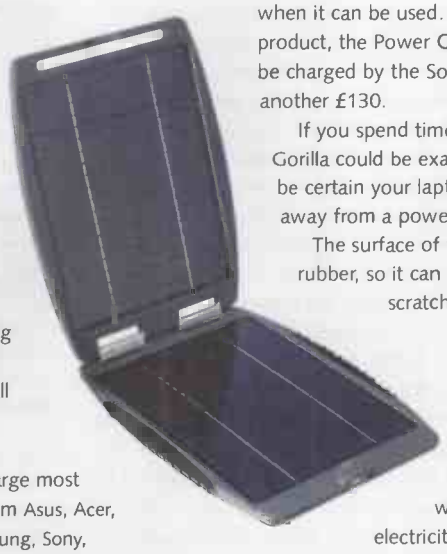
Specifications Stores up to 50 A4 pages • Three-hour use from receiver • USB charging • supports up to 15 languages • Windows XP/Vista only

PORTABLE POWER CHARGER

Powertraveller Solar Gorilla

An eco-friendly way to charge mobile devices

The Solar Gorilla is a portable solar panel that can charge an MP3 player, mobile phone, or even a laptop. It's quite a bulky unit that comprises two photovoltaic panels that open like a clamshell to capture energy from direct sunlight. You plug a device into either the 5V USB or 20V laptop power using one of the supplied adapters. There are plenty of these for all the shapes and sizes of power connector used by different manufacturers, so you can charge most notebooks, including those from Asus, Acer, Compaq, Gateway, Epson, Samsung, Sony, E-machines, Viewsonic, Dell, Panasonic, but an Apple Macbook needs an adapter.



It doesn't store any energy, so you can't rely on the Solar Gorilla as an alternative battery. Instead, to charge a device, you have to leave it plugged in while the Solar Gorilla is in direct sunlight, which restricts when it can be used. Powertraveller sells another product, the Power Gorilla, a portable battery that can be charged by the Solar Gorilla, although this costs another £130.

If you spend time camping or hiking, the Solar Gorilla could be exactly what you need if you have to be certain your laptop or mobile phone will work away from a power source.

The surface of the Solar Gorilla is covered in rubber, so it can survive a few knocks and scratches if you're on the move. It's quite thin, so will easily slip into a laptop bag or a rucksack, but be aware it weighs 700g.

It's a free source of energy, but it might take a while before the savings to your electricity bill match the initial cost of the device.

The Solar Gorilla is an excellent solar-powered charger, but aside from giving you a warm feeling that your laptop is being powered from a source of eco-friendly energy, it's only useful in limited situations, most of them travel-related.

Orestis Bastounis

Verdict

Pros Free source of energy; compatible with many devices; rubberised casing

Cons Quite heavy; doesn't store power directly; only usable in daylight

Overall The Solar Gorilla's large solar panels mean it's one of the most powerful green chargers we've seen, and one of the few that can charge laptops

Features	★★★★½
Performance	★★★★½
Value for money	★★★½☆
Overall	★★★★½

Price £137

Contact Powertraveller
www.powertraveller.co.uk
01420 542 980

Specifications Water-resistant (excluding power connectors) • 20V power socket • 5V USB socket • 200x264x19mm (wxhxd) • Neoprone zip case • 15-connector pack • 2m USB extension cable

DIGITAL ORGANISER

O2 Joggler

A 7in personal organiser that tries to be jack of all trades

The O2 Joggler is supposed to be a straightforward way for busy families to share information about appointments and events. It doesn't require an O2 subscription to use. The heart of this multimedia device is its calendar function, but it's a bit of a letdown as it's locked to O2's calendar. If you use Outlook or another calendar, you won't be able to sync them. Individual calendars can be set up for family members and you can easily toggle between them. A nice touch for O2 mobile customers is that you can set up free text alerts as appointment reminders. A less appealing aspect of the Joggler is that it doesn't flag impending appointments on the screen.

The Joggler also offers live features such as traffic information from Trafficmaster, news and weather reports, which are strangely addictive, and O2 is promising more in the future. Internet radio is something to look forward to, but absent for now.

There are some niggles with the device; it tended to crash on us occasionally and it seems O2 has bundled too much spurious functionality. While letting it double as a digital picture frame is admittedly a nice touch, is it necessary to use the Joggler to stream music or videos from a PC? Other devices manage this better, and the addition of games is overkill.

The hardware is of a high standard though, and the 7in touchscreen is superb – bright and wonderfully responsive. It is simple to set up; if you don't have Wifi then you can also connect an Ethernet cable at the back, which is joined by a headphone and power jack, with a USB connector at the side.

The Joggler is more versatile than a fridge door full of scribbled notes and we like the idea; but O2 still has some work to do on making this device an indispensable household item. *Dinah Greek*

Verdict

Pros Great touchscreen with some useful applications

Cons The calendar lets it down; user is not given alerts on screen for appointments

Overall The Joggler is a nice idea let down by unnecessary content and online calendar restrictions

Features	★★★☆☆
Performance	★★★☆☆
Value for money	★★☆☆☆
Overall	★★★☆☆

Price £149.99 or free alternative to mobile phone upgrade on O2 contract

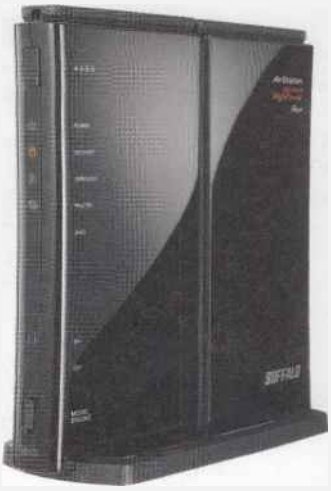
Contact O2 www.o2.co.uk

Specifications 180x130x115mm (wxdxh) •700g • Mains power only • Broadband connection required • Audio formats supported: MP3, WAV, WMA • Video format: MPEG-2, MPEG-4 part 2, MPEG-4 part 10 (H.264), WMV 9, DivX, VC1, FLV (iTunes files not supported).

WIRELESS ROUTER

Buffalo WZR-HP-G300NH

Fast speeds when channel bonding, but no 5GHz mode



Buffalo's latest router is a sleek-looking device, aimed at cable broadband users, since it has no built-in ADSL modem.

It is surprising that the WZR-HP-G300NH doesn't feature a 5GHz 802.11n mode, relying on the more congested 2.4GHz spectrum only. But we still experienced some decent speeds during testing. When using the router with Buffalo's Wireless-N USB adapter, we transferred a 349MB file in 63 seconds, giving a throughput of 44Mbits/sec. Switching the channel bonding mode on, the same file transferred in just 33 seconds (an impressive 85Mbits/sec), however your neighbours won't thank you for hogging two wireless channels. These speeds were achieved at close range, and when we moved to around 30m away speeds dropped to under 15Mbits/sec, which is still respectable.

Buffalo has furnished the WZR-HP-G300NH with a few useful extras, including a Bittorrent client that allows for peer-to-peer downloads requiring a PC to be switched on. To use this feature, you will need to attach some form of storage to the USB port at the rear of the router. Once attached, the router will also function as a basic network-attached server (Nas) device.

A switch on the front of the router lets you turn the Movie Engine mode on. Essentially a quality of service (QoS) feature, this prioritises media traffic to reduce the likelihood of video stuttering. However, we had no trouble streaming HD video through the router, whether the setting was enabled or not.

There's plenty to like about Buffalo's latest router, but it's rather disappointing it can't manage 802.11n on the less-cluttered 5GHz spectrum. *Will Stapley*

Verdict

Pros Decent throughput; Bittorrent client; Nas functionality

Cons No 5GHz 802.11n mode

Overall A good router let down by the lack of 802.11n 5GHz support

Features	★★★★☆
Performance	★★★★☆
Value for money	★★★☆☆
Overall	★★★★☆

Price £89.99

Contact Buffalo 01344 381 700 www.buffalo-technology.com

Specifications Two adjustable antennas • Four-port Gigabit switch • Wan port • 802.11b/g/n • Frequency: 2.4GHz • Wep, WPA, WPA2 • Bittorrent client • USB port • 165x30x158mm (wxdxh) • 340g

PERSONAL STORAGE DEVICE

Leyio

16GB of portable storage with support for wireless transfer

The Leyio is an oddity – a matchbox-sized personal storage device styled and marketed to appeal to young people, yet with features more likely to attract a professional market. It costs £159.99, but why buy one when you can get a USB key with the same 16GB capacity for around £25?

The Leyio has a 1.5in OLED screen, which lets you view photos and list files. There are two layers of security: a fingerprint sensor that you also use to flick through file listings and a nested USB drive that can be pulled out to transfer files to a PC. This drive empties when you plug it back in, blocking possible malware.

It's possible to plug any USB drive into the device's second port in order to swap data. The Leyio can be directly connected to a PC for charging or file transfer, when it appears as a standard USB drive.

The Leyio's main party trick is that you can literally throw data from one device to another. First you pair the two devices by holding them close and pressing a button on each. Then you choose a folder or file that you want to transfer and flick the Leyio as if you were throwing it away.

This feature is fun and quite impressive. But for now, possibly forever, it can't be used for anything really useful, such as extracting pictures from a digital camera, because the data is sent using Ultrawideband (UWB) radio technology, which now seems unlikely to be widely adopted.

The transfers are nowhere near as fast as UWB proponents promised. Leyio claims 80Mbits/sec and we clocked 60Mbits/sec, similar to 802.11n wireless, though probably easier on batteries.

The Leyio is an interesting proof of concept, but we aren't convinced its unique features make it a must-have purchase. *Clive Akass*

Verdict

Pros Some nice design touches; file transfer system works well; long battery life

Cons A standard USB drive costs much less and does the same job

Overall Some interesting features – well designed in themselves – don't quite gel into something with an obvious market. They might migrate to more versatile products, though

Features	★★★☆☆
Performance	★★★☆☆
Value for money	★★☆☆☆
Overall	★★☆☆☆

Price £159

Contact Leyio www.leyio.com

Specifications 16GB MLC Nand Flash memory, with 2GB nested USB drive • 1.5in 128x128-pixel OLED screen • ARM EJS 320MHz processor • Li-Polymer battery lasts estimated 30 days between charges

RFID READER

Violet Mir:ror

An RFID kit for home that's charmingly loopy

The French are experts at creating quirky technology and they don't come quirkier than Violet's Mir:ror RFID (Radio Frequency Identification) reader.

The Mir:ror starter kit ships with a Mir:ror USB RFID reader, two nano:ztag miniature RFID rabbits and three RFID ztamp:s adhesive tags to stick on everyday objects. The Mir:ror itself is a small white circular reader with an LED-illuminated rim that glows in several different colours depending on its status. There's also a small audio beeper in it.

To get started, you create a user account at Violet's website and download the Mirware application. Once your Mir:ror is connected, you need to assign actions to your RFID-enabled objects by placing one on the reader then registering and naming it either using the Mirware application or directly using your account area on the website. Each tagged object gets its own unique email address, allowing you to do surreal things such as send emails to your umbrella. It will recognise any ISO-compliant RFID chip, so we could register both an Oyster card and an RFID-enabled Barclaycard as triggers to launch applications.

You can associate any number of applications with each object. There are several general-purpose apps such as 'launch a program' or 'open a URL' so you don't need to do any programming to get started. Available applications include launching a Youtube video, podcasts or RSS news services using text-to-speech conversions. The quality of text-to-speech isn't brilliant, though. Applications can be chained together. There's no easy way to create your own applications, but you can use a tag to send metadata to any web-based application.

Mir:ror has some good novelty value and is simple to use, although it's not yet a must-have product. But as a technology demo, it's impressive. *Kelvyn Taylor*

Verdict

Pros Easy to use; quirky; comes with rabbits

Cons Can't turn off LED lights or beeper except by putting it in standby mode

Overall If the 'internet of things' appeals to you, Mir:ror is a simple way to get started

Features	★★★☆☆
Ease of use	★★★★☆
Value for money	★★★★☆
Overall	★★★★☆

Price £49.99

Contact Violet www.violet.net

Specifications Permanent internet connection • Windows XP/Vista, Mac OSX, Linux • USB2 port • 10.3cm diameter, height 1.4cm • 90g

MOTHERBOARD

Asus Rampage II Gene

A Micro-ATX Core i7 motherboard with loads of features

Micro-ATX motherboards aren't as popular with enthusiasts as full-sized ATX boards, as their feature set is often comparatively limited. The latest addition to Asus' Republic of Gamers family bucks this trend, as the Rampage II Gene is a Micro-ATX board built to support Intel's high-end Core i7 processors and the X58 chipset. The Gene is the most feature-rich mini-motherboard we've seen, cramming plenty of hardware into a small printed circuit board.

The X58 chip and ICH10R southbridge are passively cooled, with two full-speed PCI-Express slots and six memory slots, which support up to 24GB of triple-channel DDR3 memory, using Dimms rated up to PC3-16000 (DDR3-2000) when overclocked. The Gene also comes with seven Sata connectors, six of which support Raid 0, 1, 0+1 and 5. Eight-channel audio is included in the form of an integrated Creative SupremeFX X-Fi.

The Bios also has many options for overclocking your Core i7 processor. Although the passive cooling keeps noise levels down, this could make the Gene less stable if you increase the chipset voltage when overclocking beyond the presets.

To make the most of the limited space, Asus has used a novel locking system for the memory slots that places them closer to the graphics card.

One of the most useful aspects of Intel's X58 chipset is its support for Crossfire and SLI technologies, something the Gene retains. But you might have problems with dual-slot cards, as you will lose access to a single x1 PCI-Express and a standard PCI slot.

Intel's reference design for the X58 chipset drops the ATA connector, but Asus includes one on the Gene. This is handy for anyone with older optical drives.

The Gene is a great alternative to a full-sized ATX motherboard, although smaller doesn't mean cheaper, as it's more expensive than some other X58 motherboards, such as MSI's X58 Pro. *Simon Crisp*

Verdict

Pros Micro-ATX X58 motherboard; supports triple-channel memory; detailed options in Bios; passive cooling; power, reset and clear Cmos buttons built onto board

Cons Passive cooling might prevent extreme overclocking; pricier than full-sized ATX motherboards

Overall A good choice as the basis of a Micro-ATX Core i7 PC

Features ★★★★★
Performance ★★★★½
Value for money ★★★½☆

Overall ★★★★½

Price £201.12

Contact Asus www.asus.co.uk

Specifications Micro-ATX, Socket LGA1366 • Intel X58/ICH10R • Six Dimm slots • Two PCI-Express x16 slots • One PCI-Express x1 slot • One PCI slot • Seven Sata ports • Creative SupremeFX X-Fi audio • Six USB • One eSata • One Firewire

USB TV TUNER

Hauppauge WinTV Ministick HD

Watch free-to-view TV – but a rooftop aerial is a must

Hauppauge has expanded its range of portable TV tuners to include the WinTV-Ministick HD, a portable USB-based tuner capable of picking up local free-to-view TV channels, including those in HD. The device is no bigger than a thumb drive, with an RF port at one end to connect to an aerial. A portable mini-aerial is supplied as is the latest version of WinTV for accessing and recording channels.

Setup is straightforward, provided you have access to a strong signal. During our tests we found the supplied aerial to be all but useless, very occasionally picking up a few channels only to lose them after reconnecting, so we'd strongly advise anyone considering a purchase to use a rooftop aerial. This restricts its versatility somewhat, but isn't the only factor that can affect playback. After successfully scanning for and detecting a range of channels using the setup wizard, we discovered our test notebook was severely under-powered and had to resort to carting a desktop machine to a location close enough to an aerial wall socket.

Reception and picture quality improved dramatically, but the listed system requirements are only a bare minimum, and might not be enough for consistently smooth playback.

WinTV is a basic application that provides all you might need from a TV tuner, such as the ability to pause, time-shift and record programmes. It includes a seven-day electronic programme guide (EPG) and the ability to set up and schedule recordings, show subtitles and Teletext.

Generally we were impressed by the image quality, portability and operation of the Ministick HD, but only in an optimum environment. The potential signal issues are a problem, but this is also true of many other TV tuners. If you have a powerful PC, this is an effective way to access digital television and HD. *Paul Lester*

Verdict

Pros Easy to set up and use; decent signal with the right equipment; small, portable design

Cons Requires a powerful PC and a rooftop aerial for smooth operation; single-tuner only; basic software

Overall Effective with the right equipment but its features are limited and it's not really a portable option

Features ★★★☆☆
Performance ★★★★☆
Value for money ★★★☆☆

Overall ★★★½☆

Price £49.99

Contact Hauppauge www.hauppauge.co.uk

Specifications Windows Vista (32-and 64-bit) • XP SP2 (32-bit only) • Soundcard or onboard sound • USB2 port

Standard definition: 1.2GHz or faster processor • Graphics card with 64MB of memory

High definition: 2.8GHz Intel Core 2 Duo processor or AMD equivalent

EBOOK READER

Interead Cool-er

Pocketable ebook reader at a price that won't hit your pocket

The Cool-er ebook reader caused much excitement in the *PCW* office as a first example of what will surely become a common format for truly portable computers (see Test Bed comment at **http://labs.pcw.co.uk**). It is the size of a small, very thin paperback, not only pocketable but light enough at 180g to be carried without you noticing the weight. Ideally the 6in screen would be bigger, an improvement that looks as if it would be possible without changing the overall size.

The Cool-er has 1GB of built-in memory plus an SD card slot capable of taking up to 4GB more, so you can carry a sizeable library around in your pocket. And at £189, it is the cheapest model we have yet seen, despite being the best size.

It's similar in performance, interface and technology to most of the other ebook readers currently on sale – including the fact that it uses an E-Ink bi-stable screen. It has no touch layer and cannot be operated using a pen.

Hard controls consist of a power button on the top edge of the device, and four feature buttons down the side, including one that changes the page orientation. A navigation wheel on the front is reminiscent of the one used on iPods, but is rather heavy on the thumbs and doesn't support scrolling.

On the bottom edge is a headphone socket – the Cool-er will play music – and a USB socket for charging and uploading files. Firmware updates are carried out through the SD slot.

We were warned the pre-production review machine might have bugs and indeed an up/down button on the right edge billed as a volume control and page turner did not seem to work.

File formats supported include digital rights-protected PDF and Epub. As with all the current crop of ebook readers, PDFs can be tricky to navigate unless specifically formatted for the device. A bonus is that users get 25 per cent off books at Interead's **www.coolerbooks.co.uk** website. *Clive Akass*

Verdict

Pros Excellent format; available in a choice of eight colours

Cons Interface a little clunky – presumably pre-production bugs will be ironed out before release in June

Overall Although it's obvious some cost-cutting measures have been used on the Cool-er to keep its price down, its small size alone makes it preferable to other more expensive ebook readers

Features	★★★☆☆
Performance	★★★☆☆
Value for money	★★★★☆
Overall	★★★★☆

Price £189

Contact Interead
www.coolreaders.co.uk

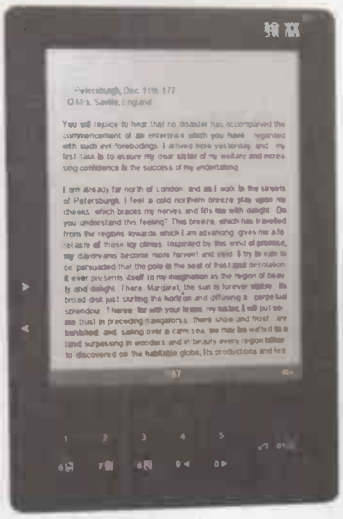
Specifications Runs Linux on ARM-based Samsung SC32440 • 117x101mm (wxh) • 6in 8-greyscale E-Ink screen • Mac- or PC-compatible • SD card slot • USB connector • 1GB internal storage

EBOOK READER

Hanlin e-Reader

A lightweight ebook reader for less than £200

Ebooks have been around for a while, but haven't captured the imagination. That's slowly changing, though – well-known shops carry them, and as well as all the worthy, out-of-copyright texts, current bestsellers are available too. The Hanlin V3 e-Reader uses E-Ink technology, which gives a pale-grey background on which black text appears. It only uses power when the screen updates, so the battery is lightweight and will only need charging every 9,000 page turns.



The e-Reader has two buttons to the left of the screen for page turning, 10 numeric buttons below it, plus OK and Back. The 9 and 0 keys also turn pages, so you have a choice of where to grip. Pressing OK brings up a menu, with options depending on the type of book you're reading, and some of the number keys have specific functions too, such as 8 to zoom, or 6 for bookmarks.

The screen's easy to read, but the menus are quirky – with a Mobipocket format book, for instance, you have to press the menu key when reading the contents, 6 for 'Follow link' then type in the number of the link, and press OK. And while Mobipocket's DRM is supported, so you can buy books from their store, Epub DRM system isn't yet, although an update is promised. By way of comparison, Sony's £224 PRS505 does support Epub DRM, but doesn't support Mobipocket at all.

There's a good range of other formats supported on the e-Reader, including HTML, CHM and PDF – but reading a PDF isn't that elegant as the zoom levels are fixed, so you can't scale easily to match the screen size. With a test file it was a choice of slightly too small, or only half a page at a time, and in landscape mode.

If the books you want are available in formats supported by the e-Reader, or you want to carry DRM-free material with you, this is well worth a look. But don't throw out your book collection. *Nigel Whitfield*

Verdict

Pros Good format support; paperback weight

Cons No Epub DRM support; interface can be fiddly; limited zoom options

Overall If you have Mobipocket books, this is worth a look – but it's let down by lack of support for Epub DRM

Features	★★★☆☆
Performance	★★★★☆
Value for money	★★★☆☆
Overall	★★★☆☆

Price £193.99

Contact Pixelar
www.mye-reader.co.uk
0800 078 9301

Specifications 6in diagonal screen • 600x800-pixel resolution • 4-grayscale E-Ink • SD card slot • mini-USB • MP3 playback • 512MB internal memory • battery life approx 9,000 page turns per charge • 220g • Mac or PC compatible

PC Essentials

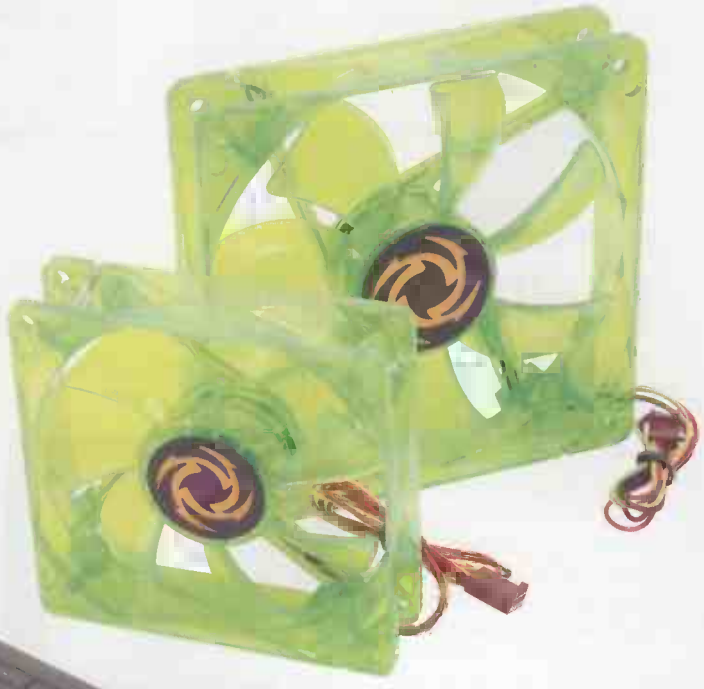
Our pick of the latest components and accessories

Arctic Cooling MX-2 thermal compound
Price: £4.99
Quiet PC www.quietpc.com
Overall: ★★★★☆

While the average computer user doesn't consider the importance of thermal paste, enthusiasts know just how useful it is to ensure your CPU's heatsink and fan are running efficiently. Arctic Cooling's MX-2 combines high thermal conductivity and low thermal resistance for optimum heat dissipation. Arctic Cooling claim that MX-2 is durable for at least eight years.

Shure X2U XLR-to-USB Signal Adapter
Price: £113.95
Contact: www.dolphinmusic.co.uk
Overall: ★★★★☆

A very useful gadget if you record live music onto your PC. The Shure X2U connects any XLR microphone to a USB port in a PC or laptop to give better-than-CD-quality recordings. It has an integrated pre-amp, with a microphone gain control so you can adjust the input signal strength.

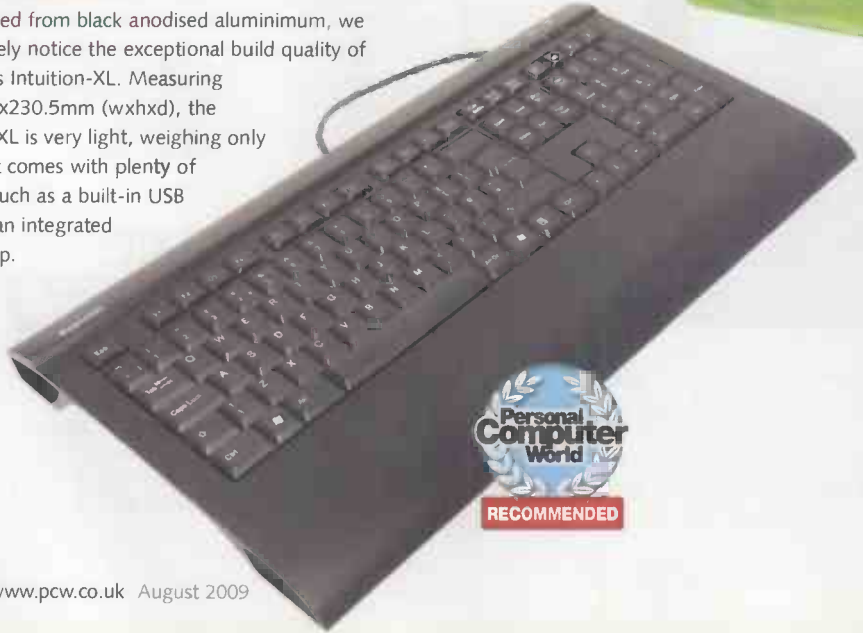


Revoltec Dark Green LED case fans
Price: £3.65 (92mm) £6.30 (120mm)
Ebuyer www.ebuyer.com
Overall: ★★★½☆

The majority of LED fans being sold are blue, so it's refreshing to have the opportunity to bathe your chassis in green light instead. These sleeve-bearing fans come in both 92mm and 120mm sizes with green plastic frames and four green LEDs. They have rated spin speeds of 1,500rpm (92mm) and 1,200rpm (120mm) with quoted noise levels of up to 22.5dBA.

Keysonic Intuition-XL (ACH-5600 AL+) keyboard
Price: £55.17
Scan www.scan.co.uk
Overall: ★★★★★

Constructed from black anodised aluminimum, we immediately notice the exceptional build quality of Keysonic's Intuition-XL. Measuring 471x26.5x230.5mm (wxhxd), the Intuition-XL is very light, weighing only 670g, but comes with plenty of features such as a built-in USB hub and an integrated sound chip.



Zalman VF2000 LED Hybrid Cooler CPU/VGA cooler
Price: £33.99
Quiet PC www.quietpc.com
Overall: ★★★★☆

Zalman is well known for offering innovative cooling solutions and the VF2000 continues this trend. It can be used to cool both Nvidia's G92 series of graphics cards and AMD's RV700 series. It comes with additional retaining clips so it can be used to cool Socket 775/AM3/AM2+/AM2 CPU's, but only processors with a Thermal Design Power (TDP) rated below 110W.

Icy Box IB-318 External HDD enclosure
Price: £29.58
Novatech www.novatech.co.uk
Overall: ★★★☆☆

The aluminium Icy Box IB-318 is a black-finished external hard drive enclosure for 3.5in Sata drives. It has both a USB2 and e-Sata interface, so you shouldn't have any problems hooking it up to a notebook or desktop. There is only one screw to hold the external case to the chassis so it only takes a few minutes to set up the Icy Box.

Elixir DDR3-12800U 6GB Triple channel memory kit
Price: £135
Elixir www.elixir-memory.eu
Overall: ★★★★☆

Elixir isn't a well-recognised memory brand, but it's the retail arm of Nanya, one of the world's largest producers of D-Ram chips. The DDR3-12800U triple memory kit is aimed at enthusiasts and comes in the form of three 2GB modules of 1,600MHz DDR3 memory, complete with attractive gold heatsinks.

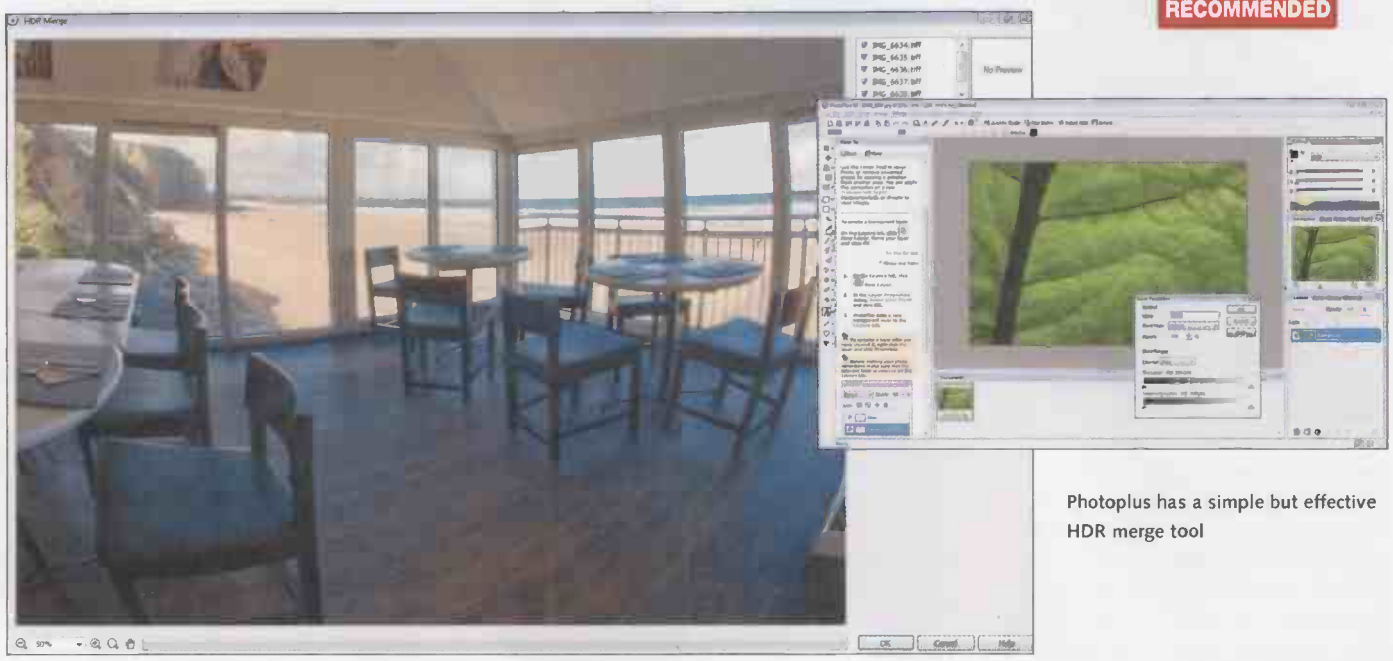
Reeven RCCT-0901SP CPU cooler
Price: £29.99
Quiet PC www.quietpc.com
Overall: ★★★☆☆

Reeven's efficient RCCT-0901SP uses three 6mm copper heatpipes, 39 aluminium cooling fins and a 92mm fan to dissipate heat away from the CPU. The cooling fins have a unique bent design to help airflow pass across the motherboard. It's suitable for most CPU sockets but not Intel's LGA1366 or AMD's AM3.

IMAGE-EDITING SOFTWARE

Serif Photoplus X3

Plenty of tools for both novice and advanced photographers



Photoplus has a simple but effective HDR merge tool

Serif has christened version 11 of its image-editing software Photoplus X3. This could be an effort to go one better than Corel's Paint Shop Pro Photo X2, or perhaps Serif simply felt it sounded less prosaic.

The name is not the only change, of course. This release adds support for Camera Raw images, High Dynamic Range (HDR) merging, support for 16-bit-per-channel images and some new effects. These additions expand on an already comprehensive suite of existing tools and features that places Photoplus X3 squarely in the realm of the serious photographer.

The Layers palette often provides a good indication of a photo editor's capabilities and this one allows you to add new layers and organise them into groups, independently lock their transparency, pixels and position, adjust their opacity and blend modes plus add adjustment layers, layer masks, layer effects and depth maps (otherwise known as displacement maps).

In a tabbed group within the Layers palette you'll also find a Channels palette, vector paths and a macros palette – X3 supports recording and playback of macros as well as batch processing.

X3 does a good job of making these advanced features and other editing tools accessible to beginners or anyone unfamiliar with the program. There's a Quickfix Studio window that provides a range of image adjustments and effects including white balance, brightness and contrast, cropping, red-eye and blemish removal, noise reduction and sharpen tools, in a single location. The only complaint here was that it didn't seem to work with 16-bit images.

There's also a How To panel, which provides guided help for a range of editing activities broadly categorised into Getting Started, Image Adjustments, Retouching, Makeover Studio, Black and White Studio, Creative Effects and Photo Finishing. This has been well thought out and implemented.

Any editing application that aims to attract serious hobbyists has to offer support for Camera Raw formats. The Photoplus X3 documentation doesn't say which Raw formats are supported, though the open dialogue box now specifies CRW, CR2, ORF and NEF, that includes Canon, Olympus and Nikon and we were also able to open Adobe DNG files.

The Raw Studio importer provides a good set of conversion controls including white balance, exposure, highlight recovery, noise reduction and chromatic aberration. You can export files with either eight or 16 bits per channel, tagged with a colour space profile. It doesn't offer the sophistication of more expensive Raw converters but nonetheless does a great job.

High Dynamic Range (HDR) tools, which produce a composite image from a set of bracketed exposures, are becoming common in photo applications, but both ease of use and quality of results have been lacking; X3 manages to score well in both these areas.

Using HDR Merge we imported six 16-bit TIFFs and produced an excellent tone-mapped composite image in a matter of seconds. The HDR merge controls include a local contrast radius slider, which helps to overcome the flatness problem typical in HDR images, and colour temperature and saturation controls to save you having to make these adjustments subsequently. You can then save images as eight- or 16-bit tone-mapped files or in EXR or HDP formats.

Photoplus X3 is up there with Photoshop Elements and Paint Shop Pro Photo X2 in its ability to cater for digital photographers of all levels. *Ken McMahon*

Verdict

Pros Excellent HDR photo-merge, good range of advanced tools, good support

Cons Some tools and effects don't work with 16-bit images.

Overall Photoplus X3 offers enough tools and format support to rival Adobe and Corel's image-editing applications, and all at a very reasonable price

Features	★★★★★
Ease of use	★★★★½
Value for money	★★★★½
Overall	★★★½☆

Price £59.99

Contact Serif www.serif.com 0800 376 7070

System requirements Microsoft Windows XP or Vista • Pentium processor • 128MB memory • 328MB hard disk space

MEDIA-CREATION SUITE

Cyberlink DVD Suite Ultra

CD and DVD tools for the ever-increasing HD crowd

Above: Media Show is a capable tool for organising your photos and videos

Left: The Power Starter program launcher is elegant and easy to use

There was once a time when CD- and DVD-creation suites had a few simple jobs to do – burn data discs, rip music from audio CDs and handle disc images. Now it's more complicated. Suites have become bloated with features, from backup tools to photo editors, and now Blu-ray recorders are more affordable, more people want to create and watch high-definition discs. Cyberlink's DVD Suite Ultra is an interesting package as it combines these simple old-fashioned disc tools with cutting-edge HD features.

The suite installed without problems on our test system, and includes a launch tool called Power Starter that acts as a front end to the included programs. This breaks the various tasks down into seven categories, with an eighth group that allows you to store your favourites for quick access. Power Starter has a clear design and an elegant animated backdrop that looks far better than that of Nero's Smartstart, for example.

The Music category allows you to rip audio CDs to MP3, burn audio CDs or burn MP3 files to a data disc. The data category is similarly straightforward, giving you a choice of burning files to a CD, DVD or Blu-ray disc. After an option is selected, the Power 2 Go burning tool opens for you to easily drag and drop files onto the disc and burn it.

The Movie Player category launches Power DVD 8, allowing you to watch DVDs or Blu-ray video discs. Most Blu-ray drives come with similar software, but if you're upgrading this could allow you to pick up a cheaper OEM model instead. It's a shame Cyberlink doesn't include the newer Power DVD 9 instead, which integrates well with Windows Media Center.

The Video and Photo category contains most of the interesting tools. Manage Videos and Manage Photos both launch Cyberlink Mediashow, which allows you to organise photos and videos by date, view them, choose a collection of photos to be used as a screensaver, print photos and so on. The ability to upload photos directly to Flickr is especially handy. Photos can be edited using the Photos Now tool, but this is rather basic compared with dedicated applications.

The video-editing tools are better. Power Director 7 allows both timeline and storyboard-based editing, with a decent range of effects, titles and transitions. More impressively, you can work with HD video files and create Blu-ray or AVCHD DVD discs. Pulling 720p video from an AVCHD hard disk camcorder then burning it to disc, complete with a graphical menu, was fairly straightforward using the Power Producer tool.

The rest of the suite comprises useful but mundane tools to copy or erase discs and create or burn disc images. The Power Backup tool can work to a schedule and back up files to either a hard disk or optical discs.

DVD Suite Ultra competes against Roxio Creator 2009 and Nero 9, but neither of these includes the ability to create Blu-ray discs without paying for an extra plug-in, which brings the price of the packages more in line. Nero in particular offers some advanced tools that aren't present in DVD Suite, such as a recovery tool for deleted files, but then DVD Suite's interface is far more elegant and easier for less technical users to get to grips with. Our only complaint is that the constant adverts asking you to upgrade are a little annoying in such an expensive suite.

If you have no interest in Blu-ray or HD video DVD Suite Ultra is a little too expensive to recommend. If you do use those formats, or plan to upgrade in the near future, it's the burning suite to buy. *Tom Royal*

Verdict

Pros Elegant and simple interface; Blu-ray player; edits and burns HD video

Cons Not as feature-packed as its rivals

Overall DVD Suite Ultra is impressively easy to use, and a great buy if you're new to HD video

Features	★★★★½
Ease of use	★★★★★
Value for money	★★★★½
Overall	★★★★½

Price £79.99

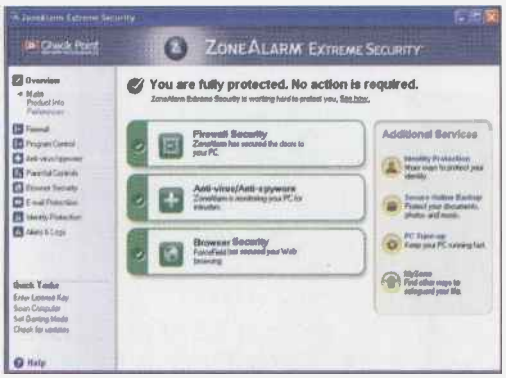
Contact www.cyberlink.com

System requirements For editing HD video: Windows XP or Vista, Core 2 Duo E6400 or Athlon 64 X2 5200+ or equivalent • 2GB memory • 60GB hard disk • Suitable optical drive (DVD or Blu-ray)

SECURITY SUITE

Zonealarm Extreme Security

PC tune-up tools have been added to the security suite



Zonealarm Extreme is Checkpoint's answer to Norton 360, adding backup and tune-up tools along with its impressive Forcefield online protection to the Internet Security core engine.

After a rather lengthy installation that requires a combination of scans and updates, it becomes apparent that the 'headline' additions, namely backup and tune-up, must be installed separately and behave as standalone tools. These are both fairly rudimentary, as backup includes encryption and useful options such as multiple file-version support and live monitoring, but it can only be used to save files to the 2GB of online space provided.

The tune-up tool is focused around scanning, backing up and repairing the Registry and is hardly comprehensive, so we were a little disappointed not to see a level of integration comparable to Norton 360. The Forcefield component works well though, protecting Internet Explorer and Firefox against a range of threats using a virtual browser, which also allows you to prevent any traces of a current session from being recorded.

The security-related aspect of the suite is typically effective and Zonealarm maintains its excellent and well-deserved reputation with a powerful firewall and comprehensive threat detection. Scan times are reasonable, at around six minutes for a quick scan and just under an hour for a normal scan and, as with Norton 360, these decrease as the software gets to know your system.

There's little to criticise when it comes to core components but we were disappointed by the limited additional tools and poor integration. There's still a commendable collection of security and protection on offer but we'd question the value in paying extra for the new additions to this particular version. *Paul Lester*

Verdict

Pros Impressive firewall and threat detection; Forcefield protects against threats; automation of certain tools
Cons Additional 'extreme' tools are underpowered and poorly integrated; interface now looks quite dated
Overall Impressive level of protection, but can't compete with rivals' usability and integration

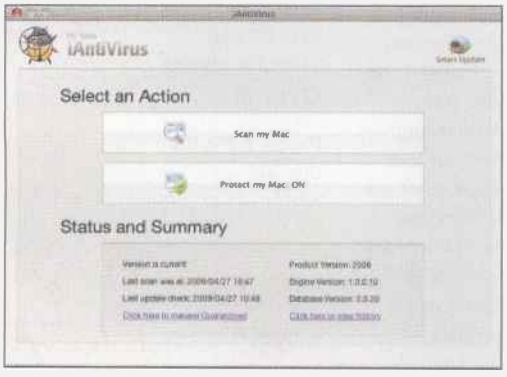
Features ★★★★☆
Ease of use ★★★★☆
Value for money ★★★☆☆
Overall ★★★★☆

Price £55 (3 users, 1 year)
Contact Zonealarm
www.zonealarm.com
System requirements **Windows Vista:** 2GHz 32-bit or 64-bit processor • 2GB (32-bit) or 4GB (64-bit) Ram • 250MB hard disk space **Windows XP:** SP2 or SP3 • 1GHz (32-bit) processor • 768MB Ram • 250MB free hard disk space

ANTI-VIRUS SOFTWARE

PC Tools iAntivirus For Macintosh

A simple and affordable anti-virus program for Mac users



We recently heard reports about the first ever Trojan to attack the Mac. The offending malware, known as iServices.A, was present in pirated versions of Apple's iWork software suite that had been downloaded using Bittorrent. There's also a variant called iServices.B that was linked to pirated copies of Photoshop.

The moral of this story, of course, is not to download pirated software. But if you'd rather be safe than sorry, you could take a look at iAntivirus from PC Tools. Unlike its two main rivals – Norton Antivirus for Macintosh and Intego's Virus Barrier – iAntivirus is available in both free and paid-for versions. The two versions are identical, but if you pay the full $29.95 price for the program, you get online technical support with guaranteed 24-hour response times as well.

The program is extremely easy to use. Its main window provides just two options – Scan and Protect. You'll want to run a scan the first time you install the program, and the 'Quick Scan' option took less than 30 seconds to work through our Macbook's 120GB hard disk, while a more thorough scan took about 24 minutes.

You can then leave the program running in the background in order to provide constant protection, or just run it occasionally in order to perform a quick virus check as required. You can schedule additional scans whenever you like, as well as downloading regular updates for no additional charge.

Admittedly, most Mac users happily get by without any anti-virus software at all, but the ability to download iAntivirus for free and then upgrade at a later date if you want the full technical support package makes it a good choice for Mac users who want to keep their options open. *Cliff Joseph*

Verdict

Pros Free download and upgrade for additional technical support
Cons Not as fully featured as some of its rival Mac anti-virus software
Overall A good option for Mac users who just want to run the occasional precautionary virus check

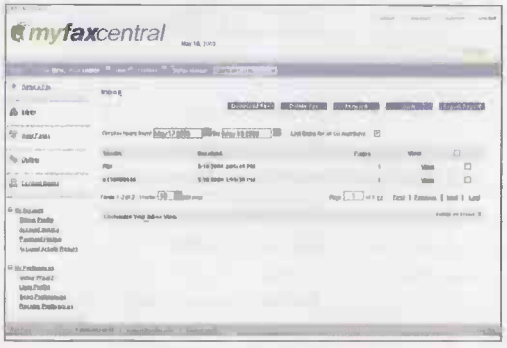
Features ★★★☆☆
Ease of use ★★★★☆
Value for money ★★★★★
Overall ★★★★☆

Price Free to download, or $29.95 with technical support
Contact PC Tools
www.iantivirus.com
System requirements Intel-based Mac with OSX v.10.5 • 20MB hard disk space

FAX SOFTWARE

Myfax

Send and receive faxes from a regular email account



Now that email is the preferred way to transmit documents, fax machines are a bulky relic of a less efficient and less environmentally friendly age. However, they're still in common use in many offices. Thankfully, if you need to send or receive faxes, you no longer need to buy a physical fax machine if you have software such as Myfax.

After quick registration, you're sent a confirmation email, fax number and account setup details. This involves following a simple step-by-step procedure to send a test fax, set up a password and view an (optional) demonstration video. An online account is created that shows current usage and allows you to send and receive faxes, but the service also integrates with pre-installed email applications.

To send a fax, the fax number and country code must be entered into the To field, appended with '@myfax.com', with the subject line carrying the name of the recipient and any body text forming the cover sheet. Up to eight attached documents will then form the fax message itself.

Received faxes take the form of attached PDF documents and are delivered directly to an Inbox, where files can be saved, printed or sent on. If you have trouble at any stage of the process there's full documentation, a quick-start guide and freephone support number, alongside the demonstration video.

We were impressed by the straightforward setup and operation of the service and, although it can take a little while for faxes to arrive (between 30 seconds and one minute per attached page), this is still going to be more convenient than dealing with reams of paper.

A free trial is available to test out Myfax, but at just £5 per month for up to 100 sent and 200 received pages, this is a cheap and convenient method of remaining fax-capable without investing in dedicated hardware. *Paul Lester*

Verdict

Pros Send and receive faxes from any email account; easy setup; excellent support

Cons Faxes can take a while to arrive

Overall Myfax allows you to send and receive faxes without needing a fax machine, saving office space, electricity and paper

Features ★★★★½

Ease of use ★★★★★

Value for money ★★★★½

Overall ★★★★½

Price £5 per month

Contact Myfax 0808 804 0015 www.myfax.com

System requirements PC or Mac • internet connection • Email address

PANORAMA CREATION SOFTWARE

Panoweaver 6

Create 2D and 360° panoramic images easily

Stitching together a panoramic image to give web users a virtual tour of a location is usually time-consuming and fiddly. Panoweaver 6 makes the process a lot easier, and can be used to create both 2D and 360° immersive panoramas, which can be exported to Flash, Quicktime or Java player formats.

We've reviewed the standard version, which is the cheapest at £87, but there are also Professional and Batch editions that cost £439 and £791 respectively.

Version 6 adds plenty of tweaks, such as automatic recognition of the lens used, cylindrical panorama production, dual-core CPU support and improved Flash player export options.

The major new feature is support for 'normal' and wide-angle lenses. Previous versions of Panoweaver concentrated on producing panoramas from images shot with fisheye lenses. That makes sense because you can cover a 360-degree field of view in only four shots with a fisheye lens (including the overlap).

According to Easypano the Standard edition is restricted to non-fisheye images, but using the trial version, we managed to stitch a 360° spherical image from four images shot with a Sigma 8mm fisheye lens. Another limitation is that it doesn't include the Smartblend algorithm, which does a superb job of seamlessly blending stitched images together.

The really impressive thing about Panoweaver is ease of use. The interface isn't pretty, but it's very effective. Within a few minutes of importing our photos we had a fully stitched panorama ready for export to a Flash, Quicktime or Java player format.

Panoweaver's autostitching engine did a good job, though it was necessary to add control points between two of the images to indicate matching overlapping detail. After we added these, the result was perfect.

For applications such as estate agency tours and for amateur panographers, Panoweaver 6 could save you a lot of time. *Ken McMahon*

Verdict

Pros Simplifies production of Panoramic images; outputs in a range of formats; supports normal and fisheye lenses (thought not in Standard edition)

Cons Professional and Batch editions are a lot more expensive

Overall Panoweaver takes a lot of the hard work out of producing panoramic images. If your website could benefit from the inclusion of a panorama, Panoweaver might be the tool you need

Features ★★★★½

Ease of use ★★★★½

Value for money ★★★½☆

Overall ★★★★½

Price £87

Contact Easypano www.easypano.com

System requirements Windows 2000/XP/Vista • Intel Pentium III 800MHz • 512MB Ram • 100MB free disk space

THIRD-PERSON ADVENTURE

The Godfather II

A sandbox adventure game with no conscience

All the best aspects of the Godfather film trilogy – its plot, style and fascinating characters – take a back seat in The Godfather II video game, in favour of protection rackets and violence. Like the film, it begins in Cuba on New Year's Eve 1958, when Fidel Castro takes power, and you must flee to America. From then on, you control a Corleone lieutenant, Dominic, who must extort money from businesses in New York and Miami.

At first, the game plays like a run-and-drive sandbox adventure, similar to Grand Theft Auto. You take over businesses in any order, attacking competing crime organisations and building up a posse of loyal gangsters who provide extra fire power.

Each gangster has a profession and can be equipped with further skills or weapons as you become wealthier.

The Godfather II adds a strategy element too, as your skills, businesses and bodyguards can be controlled in 'The Don's view'. This provides a top-down view of your crime empire, as you direct individual gangsters to do missions by themselves.

In theory, the game has all the right ingredients but, while violence is somewhat justified in the films as the characters act to protect their families, the game's cut-scenes lack emotion and, as a result, it feels wrong to vandalise shops and murder members of the public.

The graphics are functional but lack detail, and there are some short draw distances. Your gangsters sometimes magically transport into different rooms and you can easily escape the cops by saving and reloading.

Much of the film's charm has been drained from The Godfather II, but if you enjoy third-person sandbox games, there's still some innovation behind the bugs and poor plot. *Emil Larsen*

Verdict

Overall The Don's View strategy element is refreshing, but bugs and unlikeable characters make The Godfather II less fun

Overall ★★★☆☆

Price £29.99

Contact EA www.eagames.co.uk

System requirements Pentium 4 2.8GHz or Athlon 64 3000+ • 2GB Ram • Radeon X1600 graphics card or equivalent • 9GB hard disk space

THIRD-PERSON ADVENTURE

Velvet Assassin

Tomb Raider meets Call of Duty

Velvet Assassin uses the unlikely combination of a steely female lead character in a World War II setting, with a smattering of stealth combat thrown in. Apparently inspired by the historical British secret agent Violette Szabo, you play as the fictional character Violette Summer, a captured agent who lies dying in hospital at the beginning of the game.

You guide her through her World War II career via a series of flashbacks, which mainly involve sneaking through the shadows and knifing Nazi soldiers in the back. Guns occasionally enter the equation, but you can also whistle to draw an enemy's attention, or use morphine (administered in your hospital bed), which lets you move at a lightning-fast pace during the flashback. You can also improve your combat skills by finding items scattered across every level.

The hospital cut-scenes and flashbacks have quality textures and realistic animations throughout, while the voice acting mostly sounds authentic.

Large sections of the game are frustrating, since it seems trial and error is sometimes essential to progress and because Violette dies after a single shot. Even worse, there is a lot of unnecessary repetition, since every time you die, you'll have to restart from an earlier auto-save point which could be at the start of a level.

The levels are very linear; you can't pick up dead enemies' weapons – they disappear, probably to stop the game from being too easy – and you have to push waist-high objects aside rather than jump over them.

We expected an epic masterpiece of storytelling, given the history the game is based on, but the plot is rather thin. We think it would have been more touching if Violette Szabo's actual war experiences had been retold, but these are ignored, leaving behind an unremarkable stealth-action game. *Emil Larsen*

Verdict

Overall Not the plot or action we had expected from a Violette Szabo game, but still reasonably good fun

Overall ★★★☆☆

Price £29.99

Contact South Peak Games www.southpeakgames.com

System requirements 3GHz Pentium 4 • 512MB memory • DirectX 9.0c Graphics card with 256MB Ram • 256MB Ram • 5GB hard drive space

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Cooling:	High Performance Air TEC/Water Optional

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Cooling:	High Performance Air TEC/Water Optional

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Graphics:	Zotac GTX 295 Overclocked, Quad SLI optional
Memory:	6GB PC3-14400 Triple channel, Overclocked
Cooling:	Extreme Water Cooling Phase Change Optional

Custom PC Benchmark record March 2009

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Personal Computer World

How we test

Performance testing is a vital part of PCW's reviewing process, and to obtain our results we use the UK's best PC testing resource. Here, we'll explain our most used benchmark programs. At the core of our PC performance tests are industry-standard benchmarks from Bapco and Futuremark

The combined experience of our labs staff adds up to more than 20 years. We have tested a vast range of PCs and components, and contribute to the development of industry-standard benchmarks through our full membership of Bapco (www.bapco.com), the non-profit benchmark consortium. Listed below are the main benchmarks we use for testing PC systems and components.

Test beds

To test components such as motherboards, graphics cards and hard disks, we use standardised AMD and Intel-based test setups, which are usually upgraded once a new generation of components becomes available. Our current test platform is an Intel Core i7 920, 6GB of PC3-8500 DDR3 memory, and an Intel X58 motherboard.

Futuremark PCmark Vantage

PCmark Vantage is the latest version of Futuremark's synthetic benchmark, used to test the performance of a PC's major subsystems across a range of common tasks, such as viewing and editing photos, music and video, gaming, communications, productivity and security in five test suites. It's designed to be run on 32- or 64-bit Windows Vista-based systems.

Used to test: Desktop PCs, notebook PCs, motherboards, processors.

Futuremark 3Dmark Vantage

The latest version of Futuremark's graphics card benchmark can only run on Windows Vista, as it requires DirectX 10. 3Dmark Vantage tests the performance of a graphics card using real time 3D graphics and processor tests via four built-in presets that run at different resolutions: Entry (1,024x768), Performance (1,280x1,024), High (1,680x1,050) and Extreme (1,920x1,200).

Each preset contains nine tests: two GPU tests, two CPU tests, and five feature tests (Texture Fill, Color Fill, Parallax Occlusion Mapping, GPU Cloth, GPU Particles and Perlin Noise). We test using three out of the four presets, ignoring the Entry test.

Used to test: Desktop PCs, notebook PCs, motherboards, processors, graphics cards.

Futuremark PCmark05

PCmark05 is less up to date than PCmark Vantage, which places a higher emphasis on multimedia performance, but PCmark05 is supported by 32-bit versions of Vista and XP. This makes it useful for testing the overall system performance of XP-based systems such as netbooks, and it makes the results easier to compare with other computers. It comprises five test suites: System, CPU, Memory, Graphics and Hard Drive. Each suite then runs some further tests to get a score.

Used to test: Desktop PCs, notebook PCs, motherboards, processors, hard disks, netbooks.

Futuremark 3Dmark06

As with PCmark05, we still use an older version of 3Dmark for use on machines that don't have Windows Vista, such as netbooks. It also provides a handy comparison with older computers.

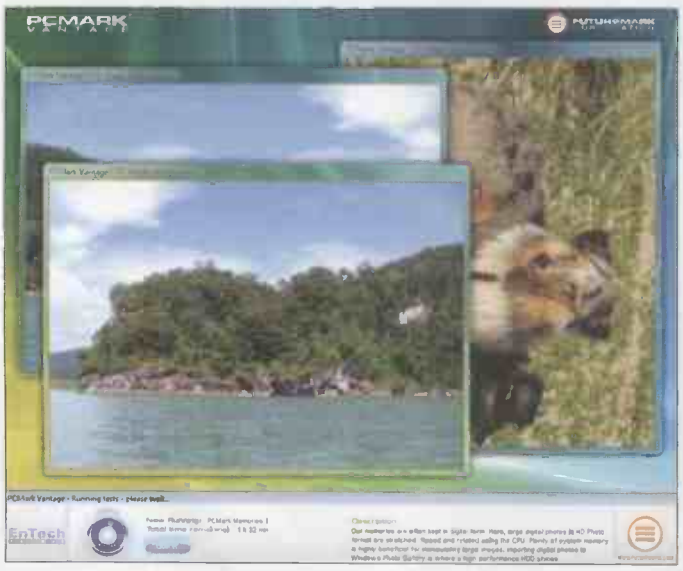
3Dmark06 has two CPU tests and seven feature tests as well as two shader tests, for Shader Model 2.0 and two for Shader Model 3.0.

Used to test: Desktop PCs, notebook PCs, motherboards, processors, graphics cards, netbooks.

Bapco Sysmark 2007 Preview

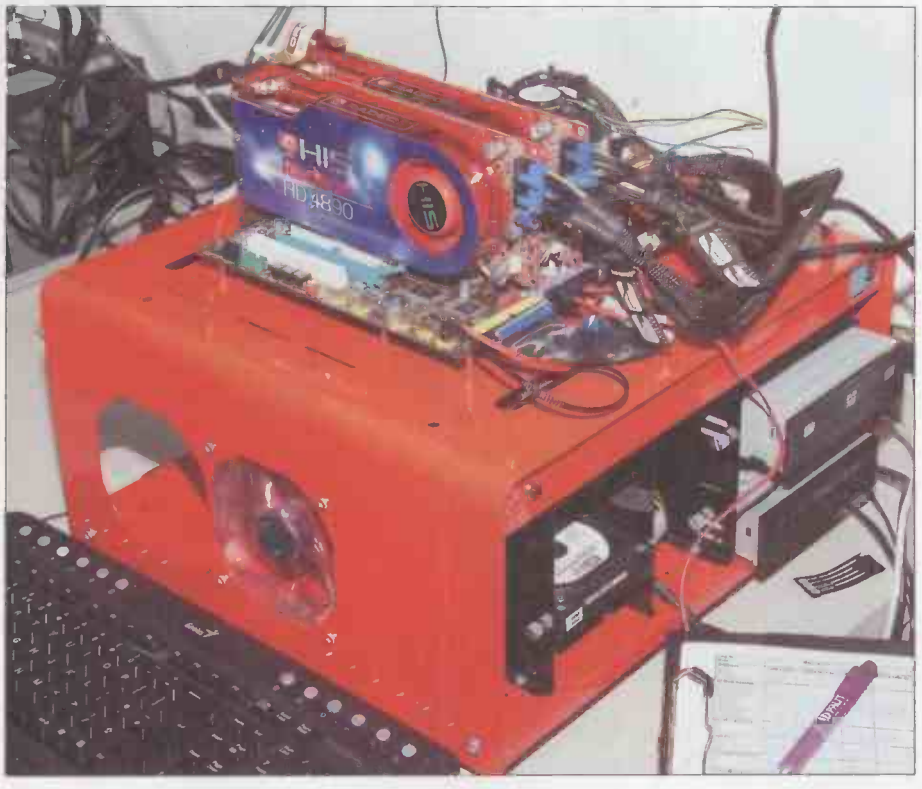
Sysmark 2007 Preview is the latest version in a long line of Bapco benchmarks and is compatible with both 32-bit and 64-bit versions of Windows Vista, XP Professional and XP Home. An application-based benchmark that tests real-world system performance by running full versions of 14 market-leading applications in four distinct business usage scenarios: office productivity, e-learning, video creation, and 3D modelling.

Used to test: Desktop PCs, notebook PCs, motherboards, processors.



PCmark Vantage places a strong emphasis on image manipulation

The New Calico test in 3Dmark Vantage puts the GPU under load by animating an entire asteroid field



One of PCW's test machines

Bapco Mobilemark 2007

Mobilemark 2007 is the latest version of Bapco's battery life benchmark for notebooks running on 32-bit and 64-bit versions of Vista and XP Professional and Home. It features four modules; Productivity, Reader, DVD Playback and Wireless. Mobile Mark relies on an optical drive for its tests, so we use Battery Eater Pro for netbooks, as most don't have optical drives.

Used to test: Notebooks.

Maxon Cinebench R10

Cinebench is a suite of real-world performance tests, and is based on the Cinema 4D animation software. It comprises two separate tests – CPU and graphics. We only use the CPU test, as our separate graphics benchmarks are a better indicator of performance.

The CPU is tested by rendering a photo-realistic image from a 3D scene file, using features that push a processor to its limits, such as reflection, area lighting, procedural shaders and ambient occlusion.

The test comprises two runs, the first only tests a single CPU core while the second uses all the cores available. It's a good way of assessing multithreaded performance of a CPU.

Used to test: Desktop PCs, notebook PCs, motherboards, processors, netbooks.

Disk tests

To test disk performance, we measure the speed of the drive using HD Tach, HD Tune and Performance Mark. As these benchmarks are synthetic, they don't perfectly represent real-world performance, although if a drive is faster in these tests, it's generally faster in normal use too.

Used to test: Hard drives, solid-state drives.

Games

We currently use World in Conflict's built-in benchmark with every notebook and PC that comes into the lab. When testing graphics cards, we use a more extensive list of games, which is certain to change when even more graphically detailed games become available. At the present time the suite comprises Crysis Warhead, Company of Heroes, Lost Planet, Far Cry 2 and Unreal Tournament 3.

Used to test: Desktop PCs, notebook PCs, motherboards, processors, graphics cards.

Power consumption

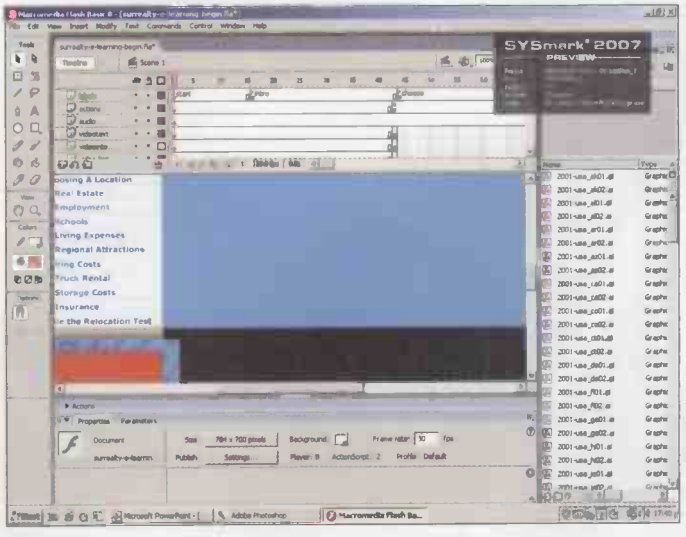
To test power consumption, we use a watt meter that measures power draw between a device and a wall socket. We look at average idle power, measured when the computer has booted, and average peak power, calculated while the PC is running through a 3Dmark test.

Used to test: Desktop PCs, notebook PCs, motherboards, processors, graphics cards, netbooks.

More information

We use a wide range of benchmarks on everything we test, but sometimes there are differences between each class of PC or component that we test. Space limitations in the magazine mean not all the results may be printed, but full results, along with more information about our testing procedures and benchmarks can be found on our Labs website **www.reportlabs.com**.

When the graphical effects of 3Dmark06 were cutting-edge, even high-end video cards could be brought to their knees



Macromedia Flash 8 is just one of the real-world applications that Sysmark uses to test a PC

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intel Core 2 Duo inside

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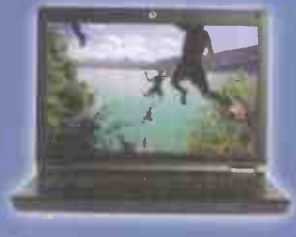

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Best Buys

Your one-stop guide to the best-value products reviewed by PCW

With countless products available, shopping around for a new PC, peripheral or software package isn't an easy task, but with our Best Buys guide, you can make a quick purchase with confidence. We've split our Best Buys into 40 of the most popular categories, covering everything from desktop and notebook PCs right through to digital cameras and software.

Every month we'll update our Best Buys to include our most recent reviews and check the current pricing, although that's not to say you won't find a bargain online (try our price comparison site at www.pcw.co.uk/bestprices). You'll also find the date of the magazine in which the product was first reviewed, along with an alternative suggested product for that category. If the Best Buy entry has a web code listed alongside it, this means you can read the full product review on our website. Simply head online and use the format www.pcw.co.uk/[web code] – for example, www.pcw.co.uk/2208243.

Each Best Buy product has gone through our rigorous testing and reviewing procedures, making this your one-stop guide to the best products on the market.

BUDGET PC

Zoostorm 3364-2354
Price: £499
Reviewed: July 2008
www.pcnextday.co.uk
Web code: N/A
This PC comes with a quad-core Intel Q6600 processor, 2GB of Ram, a 250GB hard disk and a 19in TFT. The only downside is the integrated graphics, but with expansion opportunities inside the case, this can be rectified.

ALTERNATIVE

Chillblast Fusion Sentinel
£699 www.chillblast.com Web code: 2211955
A well-built, quiet PC with a quad-core processor, good all-round performance and space inside for future upgrades. It also features a Geforce 8800GT graphics card.

HIGH-END PC

Cryo Velox
Price: £3,995
Reviewed: July 2009
www.cryopc.co.uk
Web code: N/A
Almost every component in the Velox is top of the range. Star of the show is an overclocked Intel Core i7 965 processor. If you want the best-performing PC possible, regardless of price, this is what you should buy.

ALTERNATIVE

Wired2Fire Diablo Extreme
£3,299 www.wired2fire.co.uk Web code: N/A
A fast and well-featured machine based on the new Core i7 architecture. It's relatively quiet with plenty of future-proofing.

BUDGET NOTEBOOK

Samsung Q210
Price: £675.98
Reviewed: November 2008
www.samsung.com/uk
Web code: N/A
It's not suited to gaming, but this notebook has all the benefits of Intel's latest Centrino 2 platform. Powered by a T8400 Core 2 Duo processor clocked at 2.26GHz, it's a stylish workhorse computer.

ALTERNATIVE

Hi-Grade D7000SRL
£499 www.hi-grade.com Web code: N/A
With a stylish chassis, decent performance, Bluetooth and HDMI, you get a lot for your money with this 15.4in notebook.

HIGH-END NOTEBOOK

HP Pavilion dv7-1000ea
Price: £899
Reviewed: December 2008
www.hp.com/uk
Web code: N/A
Based on Intel's Centrino 2 platform, this notebook combines stylish design with high-end performance. It also has a Blu-ray reader and a crystal-clear 17in display. It's heavy, but as a desktop replacement it's perfect.

ALTERNATIVE

Acer Aspire 8920G
£1,289.99 www.acer.com Web code: N/A
Thanks to a recent price drop, this 18.4in notebook is now even better value for money. Highlights include a 2.5GHz processor and Blu-ray drive.

WINDOWS HOME SERVER

Fujitsu Siemens Scaleo 1900
Price: £469
Reviewed: July 2008
www.fujitsu-siemens.co.uk
Web code: N/A
It might not be the most attractive piece of computer kit, but this Windows Home Server from Fujitsu Siemens has good read-and-write performance and comes with some useful added extras.

ALTERNATIVE

Belinea O.center
£386.58 www.belinea.com Web code: N/A
With a striking design and solid performance, the O.center is a great little Windows Home Server with easy hard-disk access and good diagnostic tools.

ULTRA-MOBILE PC

Acer Eee PC 1000HE
Price: £329
Reviewed: July 2009
www.asus.com
Web code: N/A
The Eee PC 1000HE features a 10.2in screen, the latest Atom processor and a stylish keyboard design. Its battery life is great, too. The Eee PC 1000HE firmly re-establishes Asus as the master of netbook design.

ALTERNATIVE

Acer Aspire One
£200 www.acer.co.uk Web code: 2220487
This portable notebook combines a decent keyboard, clever storage system and a great design. Its Intel Atom processor runs at 1.6GHz, backed up by 512MB of Ram.

BUDGET GRAPHICS CARD

His Radeon HD4770
Price: £79
Reviewed: August 2009
www.hisdigital.com
Webcode: N/A
For a casual gamer who doesn't want to spend too much, play games in giant resolutions, or care about multiple levels of anti-aliasing, the His HD4770 is easily the best value card out there.

ALTERNATIVE

Asus EAH2400Pro
£32.89 http://uk.asus.com Web code: N/A
This card features low power consumption and, although not as fast as the Radeon HD 2400 Pro cards, it's cheap and has some impressive video capabilities.

HIGH-END GRAPHICS CARD

Zotac Geforce GTX 275 AMP Edition
Price: £229
Reviewed: August 2009
www.zotac.com
Webcode: N/A
Zotac has overclocked the memory and core engines of this card, with a core speed of 702MHz, while the memory speeds along at a very impressive 1,260MHz.

ALTERNATIVE

XFX Geforce GTX 295 GX-295N-HHFF
£447 www.xfxforce.com Webcode : N/A
The GTX 295 is the fastest graphics card on the market. We recommend it if you're after the best performance possible, although it's expensive.

TFT (17-22IN)

Benq M2200HD
Price: £179
Reviewed: June 2009
www.benq.co.uk
Web code: N/A
This fully featured display includes HDMI among three inputs and boasts an integrated webcam along with a four-port USB hub. It's also very well constructed, with a sturdy base and a clear menu system.

ALTERNATIVE

Philips 220WS8
£189 www.philips.co.uk Web code: N/A
This 22in TFT screen has superb image quality, is evenly lit and with a power draw of just 35W is also extremely efficient. A great buy.

TFT (24IN+)

Lenovo L2440X
Price: £456
Reviewed: August 2009
www.lenovo.co.uk
Webcode: N/A
Lenovo's L2440X uses an LED backlight, which was completely even when displaying our solid-colour tests. We could spot no crosstalk or blurring, leaving each pixel pin sharp.

ALTERNATIVE

Iiyama B2403WS
£299.60 www.iiyama.co.uk Web code: N/A
The 24in B2403WS from Iiyama offers a good balance of performance and features, and is suitable for a wide range of uses.

SMARTPHONE

Apple iPhone 3G
£ from free
Reviewed: December 2008
www.apple.com/uk
Web code: N/A
It might not have as many features as some of its rivals, but the iPhone benefits from outstanding ease of use, a superbly stylish design, 3G (new to this version) and an online applications store.

ALTERNATIVE

RIM Blackberry Bold
£ from free http://eu.blackberry.com Web code: N/A
Once the sole domain of business users, the Blackberry now features a similar level of consumer features as high-street phones.

SAT NAV

Mio Navman Spirit S500
Price: £179.99
Reviewed: August 2009
www.mio.com
Web code: N/A
Mio has combined plenty of features into a sat nav that's easy to use, without getting lost in menus or screen clutter. The Mio also has great audio quality, louder and more audible than the competition.

ALTERNATIVE

Mio 620t
£269 www.mio-tech.be Web code: N/A
Mio's new software is impressive and, considering the range of features, it's priced competitively. The maps look great and performance is equally good.

DIGITAL CAMCORDER

Canon HV30
Price: £700
Reviewed: November 2008
www.canon.co.uk
Web code: N/A
With fantastic picture quality, this camcorder is the one to buy if you're looking to make the most out of your HD television. It also has a great selection of manual controls and lets you edit your footage.

ALTERNATIVE

Panasonic HDC-SD9EB
£450 www.panasonic.co.uk Web code: N/A
Able to capture decent HD footage yet remaining light, portable and cheap, this Panasonic camcorder is a great buy for those on a budget.

DIGITAL CAMERA

Samsung NV24HD
Price: £249
Reviewed: October 2008
www.samsungcamera.com
Web code: N/A
With excellent build quality, a 10.2-megapixel CCD and wide-angle 24mm lens, this digital camera is perfect for taking detailed outdoor shots. It also features 720p movie recording, so you can capture video in high definition.

ALTERNATIVE

Canon Powershot G10
£369 www.canon.co.uk Web code: N/A
If you want the quality and features of a digital SLR without the bulk or hassle of carrying extra lenses, you'll find it hard not to be impressed by the Powershot G10.

PORTABLE MEDIA PLAYER

Apple iPod Nano
Price: £109
Reviewed: December 2008
www.apple.com/uk
Web code: N/A
Stylish and thinner than ever before, the new iPod Nano features motion sensors, allowing it to detect whether you're holding it in portrait or landscape mode, and a quick shake activates the shuffle mode.

ALTERNATIVE

Sony NWZ-A815
£89 www.sony.co.uk Web code: 2203060
It might lack some of the extra features found on rival players, but this Sony model excels in terms of audio quality and is easy to navigate.

MEDIA STREAMER

D-Link DSM-330
Price: £135
Reviewed: October 2008
www.dlink.co.uk
Web code: N/A
With its excellent usability and simple setup procedure, this device makes sharing your media collection simple. It features an HDMI port, can output 720p video and performs extremely well.

ALTERNATIVE

Archos TV+
£249 www.archos.co.uk Web code: 2210545
With a 250GB hard disk, this device not only streams media across a network, but can also store your entire video, music and photo collection locally.

LASER PRINTER

Brother HL-4040CN
Price: £195
Reviewed: June 2009
www.brother.co.uk
Web code: N/A
This printer gives you a lot for your money: networking comes as standard, running costs are cheap and it performs well, producing high-quality colour and mono output.

ALTERNATIVE

Dell 1320c
£206 www.dell.co.uk Reviewed: June 2009
In both our mono and colour print tests, the 1320c impressed. Text was crisp while photos were detailed and not blighted by over-saturated colours.

PHOTO PRINTER

Canon Selphy CP750
Price: £110
Reviewed: October 2007
www.canon.co.uk
Web code: 2193769
It's a little bulky when in use, but this dedicated photo printer can produce high-quality prints in under 70 seconds. And a 2.4in display allows you to perform basic image editing before printing.

ALTERNATIVE

Sony DPP-FP90
£150 www.sony.co.uk Web code: 2196751
It's not particularly cheap to run, but this printer produces high-quality photos from a variety of sources and is reasonably fast as well.

MULTIFUNCTION PRINTER

Canon Pixma MP610
Price: £139
Reviewed: November 2008
www.canon.co.uk
Web code: N/A
Canon's compact and stylish MFD has a decent mix of top-notch quality and fast printing and can also print directly to DVDs. Running costs are relatively low, which is surprising given the low price tag.

ALTERNATIVE

HP Photosmart C8180
£298.45 www.hp.com/uk Web code: N/A
An expensive, but hugely impressive MFD, the Photosmart C8180 is packed full of useful features and is also incredibly easy to use.

NETWORK-ATTACHED STORAGE

Netgear Readynas Duo RND2150
Price: £279.99
Reviewed: May 2009
www.netgear.co.uk
Web code: N/A
This Nas device has excellent power management, a scheduled on/off facility and top-notch PS3 and Xbox 360 playback. The price is brilliant and includes a three-year warranty.

ALTERNATIVE

Acer Aspire Easystore
£499 www.acer.co.uk Web code: 2206105
This Nas device features 2TB of storage (other sizes are available), along with wireless, so you can place it anywhere in your home.

POWERLINE NETWORKING

Solwise NET-PL-200AV Push
Price: £50
Reviewed: March 2008
www.solwise.co.uk
Web code: 2207035
You'll need at least two of these to get your powerline network running, but they're the best around. Based on the Homeplug AV standard, they're fast, resilient to electrical noise and great value for money.

ALTERNATIVE

Devolo Dlan 200 AV
£149 www.devolo.co.uk Web code: N/A
Small and well designed, these Devolo powerline devices use the Homeplug AV standard and have pre-programmed quality of service rules built in.

WIRELESS ROUTER

Belkin N+ Modem Router
Price: £100
Reviewed: May 2009
www.catalog.belkin.com
Web code: N/A
Excellent performance and features make this router a compelling purchase, though it may be a little large if your needs are basic. It has a strong feature set and the configuration software is easy to use.

ALTERNATIVE

Solwise Engenius Wireless-N Gigabit Router
£120 www.solwise.co.uk Web code: N/A
It might be a little pricey, but this router performed well in our tests and comes complete with some advanced network filtering tools.

EXTERNAL HARD DISK

CMS V2ABS-CE-120
Price: £175
Reviewed: Christmas 2007
www.cmsproducts.com
Web code: 2202396
A portable USB2 external hard disk that weighs a mere 150g and comes with built-in 256-bit AES encryption. Inside the case sits a 2.5in 120GB 5,400rpm Sata notebook hard disk.

ALTERNATIVE

Western Digital Mybook Studio
£204 www.westerndigital.com Web code: 2206075
This stylish 1TB external disk comes with USB2, Firewire 800/400 and eSata interfaces for ultimate flexibility.

INTERNAL HARD DISK

Western Digital WD20EADS
Price: £299
Reviewed: June 2009
www.westerndigital.com
Web code: 2203061
Western Digital has produced the first 2TB hard disk, the Caviar Green WD20EADS. To achieve this capacity, the drive has four 500GB platters and uses a 32MB cache, but it only spins at 5,400rpm.

ALTERNATIVE

Toshiba MK2035GSS
£79 www.toshiba.co.uk Web code: 2203064
Weighing just 98g, this 200GB 2.5in Sata hard disk is perfect for increasing the storage capacity of your notebook.

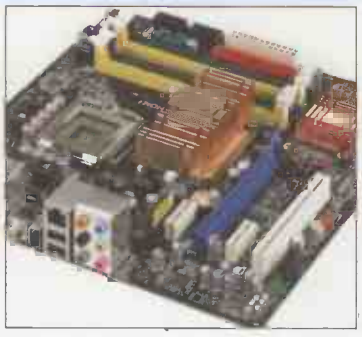
AMD MOTHERBOARD

Gigabyte GA-MA78GM-S2H
Price: £60
Reviewed: June 2008
www.giga-byte.co.uk
Web code: N/A
With a wide range of ports, including eSata, and a good selection of options in the Bios, this is a great AMD board. Finally, after two years of losing to Intel, AMD's engineers have a winner on their hands.

ALTERNATIVE

EQS AB1S-RS690MKM
£46 www.eqscomputers.com Web code: 2204803
The cramped design limits upgrade potential, but it's a keenly priced AMD motherboard that features an on-board HDMI port for HD video.

INTEL MOTHERBOARD



Asus P5E-VM HDMI
Price: £81
Reviewed: June 2008
http://uk.asus.com
Web code: N/A
This board has a great range of features. With the integrated graphics enabled, we comfortably overclocked it to 3GHz with our 2.4GHz Core 2 Quad Q6600 attached, so enthusiasts should take note of its capabilities.

ALTERNATIVE

Gigabyte GA-G31MX-S2
£53 www.giga-byte.com Web code: 2202711
Considering the price, you get plenty of features on this Intel board, including Intel's G31 Express chipset and ICH7 Southbridge.

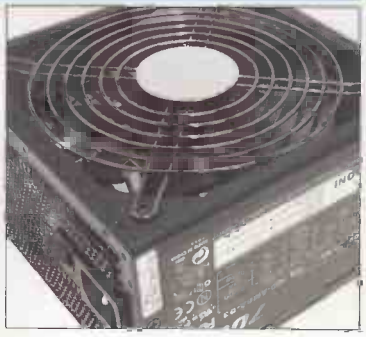
PC CASE

Zalman GS1000
£110.62
Reviewed: April 2009
www.quietpc.com
Web code: N/A
With superb build quality and design throughout, together with a very reasonable price tag, Zalman's GS1000 is an ideal case for the gamer or to build a workstation into.

ALTERNATIVE

Akasa Omega
£139.81 www.akasa.co.uk Web code: N/A
Excellent build quality and some interesting design features make this a great case for those who are often changing components.

POWER SUPPLY



Cooler Master Silent Pro M700
Price: £86.18
Reviewed July 2009
www.coolermaster.com
A great all-round power supply, the Silent Pro M700 should satisfy gaming PCs and office computers alike. Despite having modular cabling, it costs less than some PSUs that don't have this feature.

ALTERNATIVE

Enermax Galaxy 1000W
£233.83 www.enermax.com.tw Web code: 2164011
The 1,000W Enermax Galaxy power supply will suit those with SLI graphics and other power-sapping components, but it comes at a fairly high price.

OFFICE SUITE

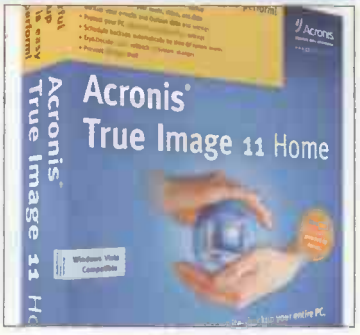
Microsoft Office 2007
Price: £357
Reviewed: May 2007
www.microsoft.com
Web code: 2183475
The new interface to Office is something you'll either like or loathe. We like it, but upgrading comes at a price, both in cash and in effort. Despite this, it's still the leader in office productivity software.

ALTERNATIVE

Corel Wordperfect X3
£276 www.corel.co.uk Web code: 2149856
This latest version of Corel's office suite includes tools such as PDF exporting, along with improved compatibility with other office applications.

SYSTEM UTILITY

Acronis True Image 11
Price: £39.99
Reviewed: April 2008
www.acronis.co.uk
Web code: 2208669
True Image 11 is an excellent backup and recovery solution that offers an unprecedented level of control over disk cloning, scheduled backups and secure file deletion. Despite the range of features, it's easy to use.



ALTERNATIVE

Paragon Hard Disk Manager
£29.99 www.paragon-software.com Web code: 2205339
A comprehensive, all-in-one suite of hard-disk maintenance and backup tools that's easy to get to grips with and comes at a good price.

IMAGE EDITING

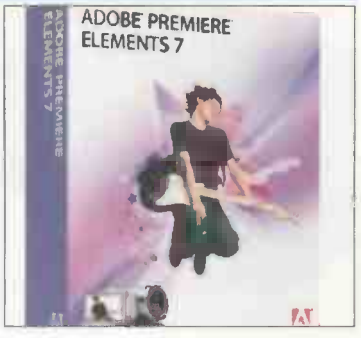
Adobe Photoshop Elements 7
Price: £76.38
Reviewed: December 2008
www.adobe.co.uk
Web code: N/A
Some of its advanced tools and special effects might not be required by most amateur photographers, but Adobe Photoshop Elements remains the standard that rival image editors must compete against.

ALTERNATIVE

Serif Photo Plus X3
Price: £59.99 www.serif.com Web code: N/A
Photoplus X3 offers enough tools and format support to rival Adobe and Corel's image-editing applications. It has lots of advanced features but is also easy to use.

VIDEO EDITING

Adobe Premiere Elements 7
Price: £74.75
Reviewed: March 2009
www.adobe.co.uk
Web code: N/A
With an unbeatable combination of fun and easy-to-use features, including support for HD cameras and Blu-ray burning, together with accessible professional tools, this is an ideal tool for users at all levels.



ALTERNATIVE

Muvee Reveal
£53 www.muvee.com Web code: N/A
If you're more interested in simply getting good results than in opportunities to tinker, this is an ideal package for home video editing.

PC SECURITY

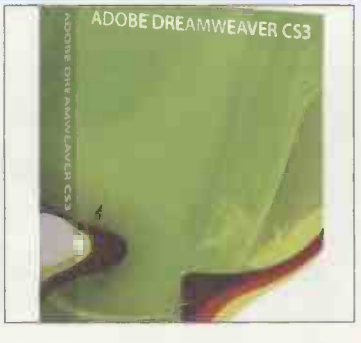
Norton 360 3.0
Price: £59.99
Reviewed July 2009
www.symantec.co.uk
Web code: N/A
The latest version of Norton 360 does a great job of keeping your computer secure, and running efficiently. There's lots of features included, but thankfully, without compromising the usability of the software.

ALTERNATIVE

Kaspersky Internet Security 2009
£39.99 www.kaspersky.com Web code: N/A
An excellent security suite with top-class anti-virus protection and one-click problem solving.

WEB DESIGN

Adobe Dreamweaver CS3
Price: £393
Reviewed: July 2007
www.adobe.com
Web code: 2186591
Powerful HTML coding and design tools along with CSS templates and Ajax widgets will help non-programmers get started. There's also a big emphasis on CSS, including a CSS Advisor tool for newcomers.



ALTERNATIVE

Microsoft Expression Web
£260 www.microsoft.com Web code: 2185242
Expression Web is a very good web-editing suite and features CSS support and a powerful interface, if you accept the inevitable Microsoft bias.

BUSINESS PC

Dell Latitude D531
Price: £586
Reviewed: October 2007
www.dell.com
Web code: N/A
With a dual-core AMD Turion processor clocked at 1.8GHz, 2GB of Ram and Vista Business, this is a good budget model. It also features a built-in DVD writer, 120GB Sata hard disk and both Wifi and Bluetooth.

ALTERNATIVE

HP Compaq dc7800
£598 www.hp.co.uk Web code: 2207533
The space-saving design of this affordable business desktop is very compelling and it can attach directly to an optional HP TFT screen.

BUSINESS PRINTER

HP Laserjet P1505n
Price: £205.63
Reviewed: June 2008
www.hp.com
Web code: N/A
Compact, stylish and quick, this Laserjet from HP is a very capable small-business printer and is stunningly good value to boot. It also features an integrated network interface.

ALTERNATIVE

Zebra P100i
£1,245.50 www.zebracard.com Web code: 2212221
A great device for small businesses needing to print plastic cards in volume. It takes up little desk space and can print in full colour.

NETWORK SECURITY

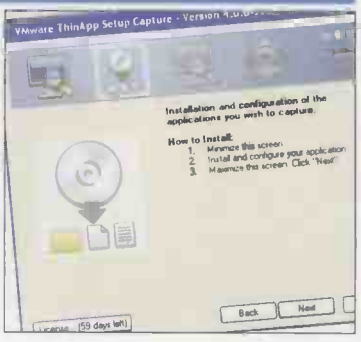
Smoothwall Smoothguard 1000-UTM
Price: £3,231.25
Reviewed: September 2007
www.smoothwall.net
Web code: 2194393
A comprehensive array of security tools, load balancing and failover facilities, plus extensive reporting options, mean this network security device justifies the high price.

ALTERNATIVE

Webroot Antispyware Corporate
£22.56 www.webroot.com Web code: N/A
This is the per-seat price for a one-year licence, which is great value. It also covers two key client security bases in one go.

NETWORK MANAGEMENT

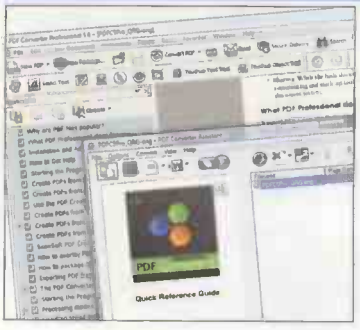
VMWare Thinapp 4.0
Price: £2,937.50
Reviewed: November 2008
www.vmware.com
Web code: N/A
Although its cost may be an issue for small businesses, Thinapp overcomes many of the issues associated with deploying and managing applications. It features on-demand streaming, USB key deployment and more.



ALTERNATIVE

Prefix IT PrefixNE
Up to £2.94 per PC per month www.prefixit.com Web code: 2205651
Easy to install and use, this network management application allows you to keep track of all the kit on your network and is perfect for small businesses.

COLLABORATION SOFTWARE



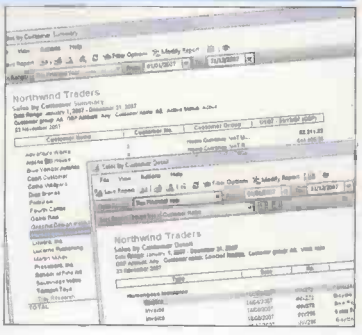
Nuance PDF Converter Professional 5
Price: £99
Reviewed: June 2008
www.nuance.co.uk
Web code: N/A
It may often take second billing to Adobe Acrobat, but this latest release is cheaper and just as good – if not better. The only problem is there are so many new tools to learn.

ALTERNATIVE

C2C Archive One Policy Manager
£40 www.c2c.com Web code: 2212370
This is a well-conceived and easy-to-implement exchange storage management tool that can enhance performance and even reduce costs.

BUSINESS ACCOUNTS SOFTWARE

Microsoft Accounting 2008
Price: £149
Reviewed: February 2008
www.samsung.co.uk
Web code: 2207529
A late entrant to the UK accounting market, Office Accounting 2008 is easy to use, feature-rich and will shake up the competition. It also offers in-depth integration with Outlook 2007 Business Contact Manager.



ALTERNATIVE

Intuit Quickbooks Pro 2008
£299 www.quickbooks.co.uk Web code: 2203178
A sensible update to what is one of the most accessible and easy-to-master small-business accounting packages around. Syncs with Outlook.

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HD 4890
AMD
ASUS
RADEON
HD 4850 X2
FUELED BY
ATI
GIGABYTE

ON TEST

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Editor's Choice

'With a powerful graphics card you can turn on as many effects as possible, and your games will look better and should run smoothly'

The graphics game

High resolutions, detailed effects and fast frame rates are vital for today's PC games. Simon Crisp and Orestis Bastounis test 10 graphics cards to see if they deliver in modern 3D games

PC gaming performance is inextricably linked to a single component – the graphics card. The majority of games use 3D graphics, and game developers love to cram as much visual detail as possible into each scene.

High-polygon 3D models, detailed textures, dynamic shadows and lighting effects all help create a sense of realism when playing a game. And with a powerful graphics card, you can turn on as many of these effects as possible, and your games will look better and should run smoothly.

The big names in gaming graphics hardware are Nvidia and ATI (owned by AMD). These two companies design reference specifications for graphics cards that are then produced by board partners, who can adjust the design. Manufacturers such as Asus, Zotac and His often tweak their cards to be slightly faster than the reference design.

This month, we've tested 10 graphics cards aimed at all budgets using a multitude of modern games and benchmarks.

Asus EAH4350 Silent

Price £27 **Contact** Asus http://uk.asus.com

The EAH4350 Silent is one of the cheapest and smallest graphics cards to arrive in our labs. It's one of the few cards to not require an additional PCI-Express power connector. Only a passive single-slot heatsink is needed to keep the chips cool, rather than a noisy fan. This makes it perfect for using in a media centre system, as it will fit into the more cramped Micro-ATX cases. It's also silent, so if you use it in a living-room PC, it won't drown out the soundtrack of your film.

Another benefit of using the EAH4350 in a media centre is its onboard Avivo features that take some of the load off the CPU when decoding video. Depending on the CPU it's paired with, this can make the difference between being able to play back high-definition video and not. Asus intends the EAH4350 to be used in this way, as an HDMI connector is included at the back, in addition to a DVI and D-Sub connector, making it a breeze to connect the EAH4350 to a television.

The EAH4350's lack of 3D gaming performance is all too apparent from its pitiful benchmark results. A mere 3fps (frames per second) in Crysis Warhead at a 1,280x1,024 resolution is far from playable. It was also unable to manage double digits in World in Conflict at the same resolution. That's not to say it's completely useless for gaming. If you want a graphics card that will let you play an older, less-demanding title such as Eve Online or World of Warcraft in medium detail on an office PC, you could just about get by with the EAH4350, although a card such as the Nvidia Geforce 9400GT is similarly priced but much better in games.

The EAH4350 is inexpensive and a perfect companion for a silent media centre, but if you're serious about gaming, it makes sense to spend a little extra and get a more capable card.

Verdict

Pros Silent; slim; HDMI output; doesn't need additional power connector

Cons Mediocre performance in gaming

Overall A reasonable choice of graphics card for media centres or low-powered desktops, but a little extra expenditure means a lot more gaming performance

Features	★★★☆☆
Performance	★★★☆☆
Value for money	★★★★½
Overall	★★★½☆

Asus Geforce ENGTX285 Ultimate Edition

Price £283 **Contact** Asus http://uk.asus.com

The Asus Geforce ENGTX285 Ultimate Edition is a factory-overclocked version of Nvidia's Geforce GTX 285. It's a descendent of Nvidia's GTX 280, but quite a lot has changed. The Geforce GTX 285 uses the 55nm GT200b core instead of the 65nm GT200 core, and this die shrink reduces the power load (183W instead of 236W). It also allows the card to reach higher clock frequencies than the GTX 280.

Asus' ENGTX285 uses two six-pin PCI-E power connectors. It uses the same 512-bit memory interface and 1GB of GDDR3 memory as the older card, which gives it a memory bandwidth of 159Gbits/sec.

The core clock speed of the standard GTX 285 has risen to 648MHz, compared to the 602MHz of the GTX 280, and the memory clock has also had a boost from 1,107MHz up to 1,242MHz (2,484MHz effective) while the 240 stream processors are clocked at 1,476MHz.

Asus' Geforce ENGTX285 Ultimate Edition has a core clock that runs at 712MHz, a shader clock that runs at 1,620MHz and the memory running at 1,380MHz (2,760MHz effective) while the 240 stream processors are clocked at 1,476MHz.

These numbers make a big difference in games performance, especially at higher resolutions. In every game at 1,280x1,024 it beats all the other single-GPU cards. At higher resolutions, it still holds its own, jostling for second place with Sapphire's Radeon HD 4870 X2 2G, although at 1,920x1,200 the XFX Geforce GTX 295 is still some way ahead.

This Asus card is comparable in price and performance to Sapphire's 4870 X2. If you never play a game at a resolution lower than 1,920x1,200, the 4870 X2 is a better performer, but the ENGTX285 still offers great performance at lower resolutions too. However, the Zotac Geforce GTX 275 AMP Edition isn't far behind and it's much better value for money.

Verdict

Pros Overclocked out of the box; now uses six-pin power connectors; unsurpassed at 1,280x1,024

Cons Most expensive single-GPU card available

Overall Even though it's the fastest single-GPU card in this line-up it's hard to recommend, as Nvidia's latest round of price adjustments makes the Zotac Geforce GTX 275 AMP Edition a better all-round purchase

Features	★★★★☆
Performance	★★★★★
Value for money	★★★☆☆
Overall	★★★★½

Gigabyte Geforce GTS 250 GV-N250OC-1GI

Price £142 **Contact** Gigabyte www.giga-bye.co.uk

When ATI released the Radeon HD4850, priced for the mainstream market, Nvidia had no new mid-range card to compete with it. A similar situation has been repeated with the launch of the Radeon HD4770, which is cheaper still.

Nvidia's answer is the Geforce GTS 250, which re-uses the same 55nm G92 chipset, the basis of the Geforce 9800GTX, and has redesigned it into a shorter, cheaper printed circuit board. Its lower power use means it needs a just single six-pin power connector.

The reference clock speeds for the GTS 250 are the same as the 9800GTX, namely 738MHz for the core engine while the 128 stream processors run at 1,836MHz. As standard the card uses 512MB of GDDR3 memory, running via a 256-bit interface. Nvidia has introduced a version of the card with 1GB of memory, which runs faster than on the 512MB version, up from 1,000MHz (2,000MHz effective) to 1,100MHz (2,200MHz effective) giving the GTS 250 a memory bandwidth of 70.4Gbits/sec.

Gigabyte's Geforce GTS 250 GV-N250OC-1GI, is different still, as it comes with non-standard cooling. Instead of the usual Nvidia cooler, it uses a reference Zalman VF1050 heatpipe cooler and fan.

The cooler uses four copper heatpipes to dissipate heat away from the GPU. The heatpipes and cooler fins are cooled by a fan embedded into the fin array. The downside to this cooler is that it makes the GV-N250OC-1GI take up two slots in your case.

When it comes to performance, we weren't blown away by this card. It puts in a reasonable show in most games, but can't touch the Radeon HD4890, with even the His Radeon HD4770 coming close to matching it. Gigabyte's GTS 250 isn't a terrible purchase, but there are plenty of other options available, and some of them cost less.

Verdict

Pros Quiet Zalman cooler; onboard HDMI

Cons G92 chipset beginning to show its age

Overall While the GV-N250OC-1GI offers better cooling than the standard GTS250, it is now overshadowed by the Radeon HD4770 line

Features	★★★★☆
Performance	★★★☆☆
Value for money	★★★☆☆
Overall	★★★½☆

Gigabyte 9400GT GV-N94TOC-1GI

Price £47 **Contact** Gigabyte www.giga-bye.co.uk

Nvidia's current entry-level graphics card is the 9400 GT. It's well suited as a cheap and basic upgrade for computers that have previously had to rely on integrated graphics with no 3D support. As the 9400 GT supports Nvidia Purevision, it can also be used to assist with video decoding in a media centre PC.

The reference design for the 9400 GT has a mere 16 stream processors running at 1,350MHz, with a core engine clocked at 550MHz and 512MB of 400MHz GDDR2 memory (800MHz effective) running through a 128-bit bus. This isn't nearly as impressive as the more expensive cards on test, and not well suited for modern games, even at lower resolutions.

Gigabyte's 9400GT GV-N94TOC-1GI variant has all the same clock speeds as the reference 9400 GT, but receives a boost from its 1GB of GDDR2 memory. This extra capacity does little to lift its gaming performance though, as even at the lowest resolution it didn't manage a smooth 30fps in any game.

The GV-N94TOC-1GI works better in a media centre, as an HDMI port is included, sitting alongside a VGA and DVI port. You might have some trouble fitting it in small cases, as it's a full-height card. It should be fine in a compact case that allows horizontal fitting of the graphics card, but these are quite rare. Otherwise, Gigabyte offers another 9400GT, the GV-N94T-512I, which is the required half-height so you'll have no problems fitting it.

Given a choice of the 9400GT and the Asus EAH4350 Silent, the other graphics card on test that's well-suited to media centres, we'd pick the EAH4350.

Although the 9400GT surpasses the EAH4350 in gaming performance, it uses a fan for active cooling, so it isn't completely silent. The 4350 is only cooled by a heatsink, so it outputs no noise whatsoever.

Verdict

Pros Inexpensive; onboard HDMI; no external power connector

Cons Low gaming performance; too large for some micro cases; requires a fan

Overall A nice card for the bigger HTPC, but a shame it's not passively cooled

Features	★★★☆☆
Performance	★★★☆☆
Value for money	★★★★☆
Overall	★★★½☆

His Radeon HD4770

Price £79 **Contact** His www.hisdigital.com

Although we received a reference ATI Radeon HD4770 board last month, the His Radeon HD4770 is a retail version. It differs from the retail board in that it has a smaller cooler design.

The HD4770 is a nifty graphics card, as it combines excellent mid-range performance with a very low price. It's based on ATI's RV740 chip, built on a 40nm manufacturing process. The HD4770 only uses a 128-bit memory bus, but it has a core clock speed of 750MHz, the same as the reference Radeon HD4870, along with 640 stream processors. Although its memory frequency is slower, it makes up for this by using GDDR5 memory, which ramps the bandwidth to 51.2Gbits/sec, previously unheard of for a sub-£90 card.

It may only be £50 more expensive than the Asus EAH43540, but the His Radeon HD4770 is leagues ahead in performance. World in Conflict and Far Cry 2 were playable at 1,280x1,024 and although 18fps in Crysis Warhead doesn't sound impressive, our benchmark was at maximum detail so, by turning the settings down slightly, this card should handle the most demanding game on the market. The HD4770 has a similar performance to the Gigabyte Geforce GTS 250, although that card is more expensive, so the HD4770 wins on performance per pound spent.

Our only issue with the HD4770 is its cooler. Although smaller than the reference design, it still takes up two slots, which prevents you from using the adjacent PCI slot on your motherboard. This can be forgiven, since it helps keep the card cool and lowers the noise output, which were problems with ATI's last single-slot cooler design, the Radeon HD4850.

For the casual gamer who doesn't have a monitor capable of giant resolutions, doesn't want to spend too much or care about multiple levels of anti-aliasing, the His HD4770 is easily the best value card out there.

Verdict

Pros Brilliant price to performance ratio

Cons Dual-slot cooler

Overall The HD4770 is an excellent debut for 40nm graphics cards and is unmatched in its price bracket

Features	★★★★☆
Performance	★★★★★
Value for money	★★★★★
Overall	★★★★☆

His Radeon HD4890 Turbo

Price £217 **Contact** His www.hisdigital.com

The 4890 is currently the fastest single-GPU card that ATI produces, but it isn't radically different from the 4870. The RV790 chipset is still based on a 55nm process and many aspects of the card are unchanged, such as the number of stream processors. The main difference is that ATI has rearranged the components and tweaked them to coax extra performance from the same design, improving the card's thermal efficiency and allowing it to ship the 4890 with faster clock speeds.

The His Radeon HD4890 Turbo is overclocked further still, bumping the core clock from the reference 850MHz to 900MHz and the memory frequency from 975MHz to 1GHz (4GHz effective). This pushes the memory bandwidth to 128Gbits/sec from 124.8Gbits/sec in the reference card. Unlike the Radeon HD4870, the 4890 comes with 1GB of GDDR5 memory as standard.

These faster clock frequencies produce some decent benchmark scores, slightly faster than a stock-speed 4890 and considerably faster than the Radeon HD4870, quite impressive considering the components are almost identical. In most games, the HD4890 performs superbly, maintaining 28fps in Crysis at 1,280x1,024 with all details set to high.

At higher resolutions it fares less well, although Crysis Warhead is the only game in which the HD4890 can't maintain 30fps at a resolution of 1,920x1,200, which shows just how punishing the Cryengine can be to even the latest graphics cards.

The His Radeon HD4890 Turbo is competing directly with the GTX 275, however it did not beat Zotac's Geforce GTX 275 AMP Edition in any of our tests. And in some games, such as World in Conflict, it lags behind significantly. It is still a good performer, though, and in games that favour ATI hardware it could outperform Nvidia's cards.

Verdict

Pros High-performance graphics

Cons Not particularly faster then a Radeon HD4870

Overall The His Radeon HD4890 Turbo is a great card; it's fast and good value for money

Features	★★★★☆
Performance	★★★★☆
Value for money	★★★★☆
Overall	★★★★☆

Sapphire Radeon HD 4850 X2 2G

Price £227 **Contact** Sapphire www.sapphiretech.com

The Radeon HD4850 X2 is the second of ATI's dual-GPU cards, pairing two 4850s in a single package, with an internal Crossfire bridge. Each card is identical to those sold individually, with 1GB of local GDDR3 memory (2GB total), running at 993MHz (1,986MHz effective), with core and shader clocks running at 625MHz and a 256-bit memory interface.

The Sapphire Radeon HD 4850 X2 combines two cards for additional performance, but the 4850 isn't a high-end performer in the first place. The 4870 has faster clock speeds and lots more memory bandwidth, so the Radeon HD 4870 X2 is a better performing dual-GPU card. This could be one reason the only company bothering to manufacture 4850 X2 cards is Sapphire.

With the exception of Far Cry 2, in our tests Sapphire's Radeon 4850 X2 2G was outgunned by both the Sapphire Radeon HD 4870 X2 and some Nvidia cards by varying margins. The 4850 X2 was 37 per cent slower than the 4870 X2 in Crysis Warhead at 1,280x1,024 where it only managed an unplayable 18fps at 1,920x1,200 with all the detail settings enabled. In some tests, an overclocked Radeon 4890 outperformed the 4850 X2.

There are four dual-link DVI outputs, so you can connect four monitors to it. With the extra two DVI outputs, Sapphire has had to remove the exhaust grille from the back panel, so the card's two fans blow air back into the system rather than out of the case.

Although the 2GB 4850 X2 can be found on the web now at a similar price as the His Radeon HD4890 Turbo and Gigabyte Geforce GTX 275, we would pick either of these single-GPU cards over the 4850 X2. These cards provide more consistent test results across the majority of games, while drawing less power, although the 4850 X2 managed to put up a good showing in some benchmarks.

Verdict

Pros Four monitor outputs; cheapest dual-GPU card on the market

Cons Higher idle and peak power use than better-performing cards; no exhaust grille

Overall Although the Radeon HD 4850 X2 2G isn't a bad performer, your money is better spent elsewhere

Features	★★★★½
Performance	★★★★½
Value for money	★★★½☆
Overall	★★★½☆

Sapphire Radeon HD 4870 X2 2G

Price £310 **Contact** Sapphire www.sapphiretech.com

The Radeon HD 4870 X2 2G combines two 55nm 4870 GPUs into a single package. It's still the most powerful ATI graphics card available, unless a 4890 X2 is ever announced. The card has 2GB of memory, along with 1,600 shader processors (800x2). It's almost identical to two 4870s working in Crossfire, with double the number of resources available. One difference is that on most 4870 X2 cards, including this Sapphire model, an alternative interconnect between the two GPUs is available, called a side-port. This should improve bandwidth between them, but the feature remains disabled in ATI's drivers, even though the card has been out for a while.

The 4870 X2 is thirsty for power. Our test system drew 367W under load, more than any other card in the test, including the XFX Geforce GTX 295. The GTX 295 is a newer second-generation card though, and has power-saving enhancements to its design.

In games the 4870 X2 is impressive, although performance varies depending on the title. In Crysis Warhead it does very well, especially in higher resolutions where the extra memory and stream processors make a big difference. In World in Conflict at lower resolutions, it is outperformed by some of Nvidia's single-GPU graphics cards.

Like the GTX 295, the 4870 X2 is expensive but powerful. As long as you're sensible about detail settings, you can expect a smooth gaming experience with this card, in most games, in resolutions up to 1,920x1,200 – the native resolution of 24in monitors.

When the 4870 X2 was released, it would certainly have been one of the recommendations for anyone who wanted the most 3D graphics performance as possible. Now though, there's the option to spend the extra on a GTX 295, which has topped the 4870 X2 in every benchmark, by a large margin.

Verdict

Pros A very fast graphics card

Cons Inefficient power use; performs better in some games than others

Overall The 4870 X2 is still a great choice for really high-end performance

Features	★★★★½
Performance	★★★★½
Value for money	★★★★☆
Overall	★★★★½

XFX Geforce GTX 295 GX-295N-HHFF

Price £447 **Contact** XFX www.xfxforce.com

Under the matte-black cooler of the XFX Geforce GTX 295 GX-295N-HHFF is a Geforce GTX 295, Nvidia's fastest graphics card. This is Nvidia's answer to ATI's dual-GPU Radeon HD4870 X2, which outperformed Nvidia's flagship GTX 280 card (in some games) when it was released last year.

The GTX 295 uses two 55nm GT200b-series GPUs, each clocked at 576MHz, linked by an internal SLI bridge, with 480 stream processors running at 1,242MHz. The card comes with 1,792MB of GDDR3 memory clocked at 1,998MHz effective, but each core can only access half (896MB) through a split 448-bit memory bus (for a total 896-bit bus size).

You need to make sure you have space inside your case as, at 26.5cm, the GTX 295 is extremely long. It can easily overhang past the edge of ATX motherboards.

Tucked away on the back plate, an HDMI slot accompanies the two DVI ports, a feature left off many cards (to avoid paying royalties) but with a premium graphics card such as this, no expense has been spared.

The GTX 295 is in a league of its own for performance. In 3Dmark Vantage it's 30 per cent faster than its nearest rival. In Crysis Warhead, it storms ahead of the 4870 X2 by a whopping 17fps at 1,280x1,024. Although the higher memory bandwidth of the GDDR5 used in the 4870 X2 shortens the performance gap when gaming at 1,920x1,200, the GTX 295 is still a clear winner.

The GTX 295 is the fastest graphics card on the market. We recommend it if you're after the best performance possible. However, we question whether many games (with the exception of Crysis Warhead) need this level of performance. As the GTX 295 isn't cheap, we would rather buy a mid-range card such as a Geforce CGT 275 model or Radeon HD4890, and still get great performance from the majorty of games.

Verdict

Pros The best 3D graphics performance possble

Cons Expensive; heavy; possibly too big for many PC cases

Overall If money is no object then the GX-295N-HHFF is the card you need, but recent price adjustments have made it more affordable than ever befor

Features	★★★★½
Performance	★★★★★
Value for money	★★★½☆
Overall	★★★★½

Zotac Geforce GTX 275 AMP Edition

Price £229 **Contact** Zotac www.zotac.com

A standard Geforce GTX 275 is a cut-down GTX 285, with less memory and a narrower memory interface. The GTX 275 isn't the fastest card around, but is excellent value for money, priced to compete directly with ATI's Radeon HD4890.

The Geforce GTX 275 has a 448-bit memory interface as standard, compared to the 512-bit interface used in the GTX 285. Likewise, the GTX 275 has to make do with less GDDR3 memory than its bigger sibling – 896MB instead of 1GB. To keep performance up, Nvidia hasn't reduced clock speeds much below the GTX 285's 648MHz core and 1,242MHz (2,484MHz effective) memory. The reference GTX 275 has a 633MHz core and 1,134MHz (2,268MHz effective) memory.

However, Zotac's AMP Edition family of cards are overclocked variants of Nvidia's reference designs, so are overclocked further still. With the AMP edition of the GTX 275, Zotac has overclocked the memory and core engines so much, they've even surpassed the default clock speeds of a standard GTX 285, with a core speed of 702MHz while the memory speeds along at a very impressive 1,260MHz (2,520MHz effective).

These clock frequencies give Zotac's GTX 275 a great advantage in our benchmarks, topping the His HD4890 in every test, and even eclipsing the Sapphire Radeon HD 4870 X2 2G in some games at lower resolutions. In Far Cry 2 at 1,280x,1,024 there's a 23 per cent performance difference between the GTX 275 and the 4890. In Crysis Warhead at 1,280x1,024, the GTX 275 is faster than both the 4870 X2 and the 4890. At higher resolutions, the GTX 275 is still a great performer, being within a whisker of the GTX 285, and not far from the 4870 X2 either.

A year ago, we would have argued the 4870 offered the best value for money of any graphics card. Now, the same is true of the Zotac Geforce GTX 275 AMP Edition.

Verdict

Pros A clear winner for price versus performance

Cons Length of card might be a problem in some small cases

Overall Zotac has done a stunning job of tweaking the core and memory clocks on the GTX 275 AMP Edition and gets our award for the best card on the market right now

Features	★★★★½
Performance	★★★★★
Value for money	★★★★½
Overall	★★★★★

Enjoy extra performance from a second card

If you want to boost gaming performance even higher, adding a second graphics card for SLI (Nvidia) or Crossfire (ATI) is an alternative to replacing your existing one. In the past, you would have had to purchase an identical card to the one already in your PC, but now there aren't as many restrictions.

A welcome feature of Core i7 motherboards is that they support both Crossfire and SLI. Previously, only Nvidia chipsets supported SLI, so even if your motherboard had the required pair of PCI-Express slots, you couldn't use two Nvidia cards with an Intel chipset (or a pair of ATI cards in an Nvidia motherboard).

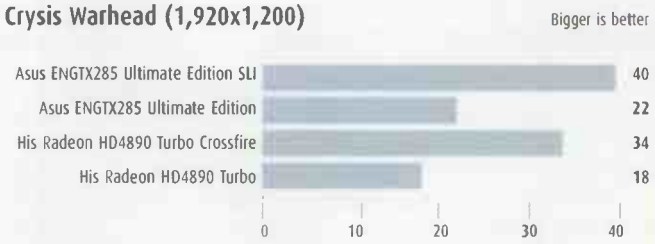
We tested a pair of Radeon HD 4890s and a pair of Geforce GTX 285s, using the same benchmarks we used for the individual cards. We've compared this with the scores each card achieved on its own at different resolutions. We also measured the total system power draw with two video cards, comparing it with the power used when only a single card is present. It should be noted that you never get a 100 per cent performance increase from adding a second card.

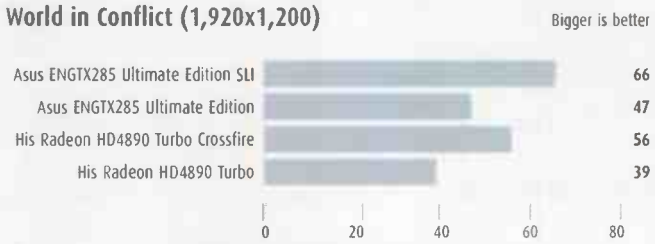
If you play games in a high resolution (such as 1,920x1,200), you have the most to gain from adding a second video card. The difference at 1,280x1,024 is in most cases negligible, as at this resolution the performance bottleneck is the processor rather than the graphics card. In Far Cry 2 at 1,280x1,024, we noticed that two 4890s in Crossfire performed worse than a single card. Unfortunately, sometimes the overhead of running two cards together outweighs the performance advantage they can provide.

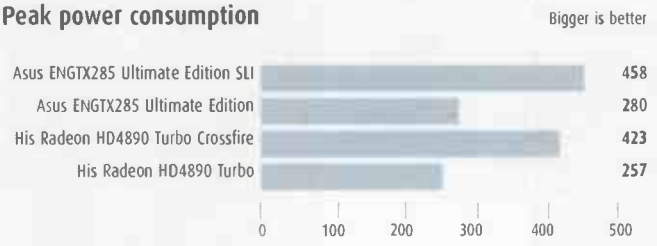
The game that benefits the most from dual graphics cards is Crysis Warhead. With two GTX 285s, we finally saw an average frame rate well above 30fps, with the maximum detail in the highest possible resolution. The detailed physics, textures and polygon counts in Crysis Warhead eclipse every other game on the market, so if you love this game, you have the most to gain from SLI.

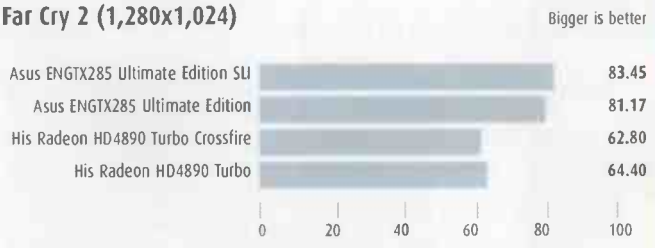
We advise you to think carefully before purchasing two graphics cards though. As with the GTX 295 and 4870 X2, less of a performance advantage can be achieved at lower resolutions. When ATI and Nvidia inevitably release a new generation of graphics cards, often these new models cost less than a pair of older cards, and outperform them too. When deciding whether or not you want two cards, consider the games you play, the size of your monitor, the specification of your PC (a slow CPU will also hold 3D performance back) and, of course, how much you want to spend.

Two Radeon HD4890s, four six-pin power connectors, four monitor outputs, one Crossfire connect, plenty of performance









Lab results

We tested each card in three different games, in three resolutions, measured performance using our benchmarks and recorded the peak power usage

3Dmark Vantage Performance (overall)

Bigger is better

Peak power use in watts (running 3Dmark Vantage)

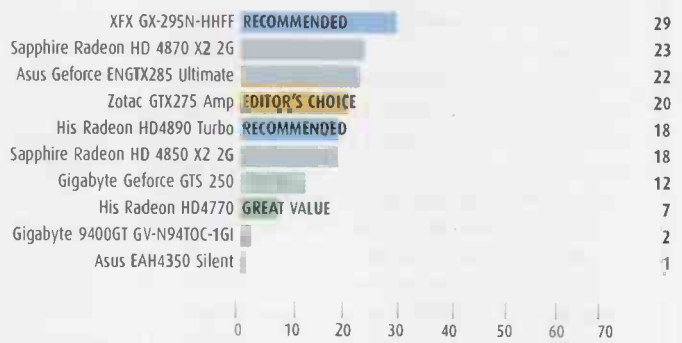
Bigger is better

Crysis Warhead (1,280x1,024, average)

Bigger is better

Crysis Warhead (1,920x1,200, 4xAA, 4xAF, average)

Bigger is better



World in Conflict (1,280x1,024, average)

Bigger is better

World in Conflict (1,920x1,200, 4xAA, 4xAF, average)

Bigger is better

Far Cry 2 (1,280x1,024, average)

Bigger is better

Far Cry 2 (1,920x1,200, 4xAA, 4xAF, average)

Bigger is better

Intel squares up with Larrabee

Nvidia and ATI's 3D graphics hardware and approach to rendering have dominated the market for the past few years. Intel's integrated graphics chipsets have been comparatively weak performers, although these are currently found in more computers than those of its competitors. Intel is hoping to change this when it launches a discrete graphics card next year, codenamed Larrabee, and leapfrog the two better-established names in graphics.

Larrabee is currently the subject of a lot of interest, as it throws out the rulebook of GPU design. Rather than rendering scenes using specialised graphics hardware, as with today's graphics cards, Larrabee will use a software renderer, spreading the load across a parallel array of x86 processor cores, with cache-coherent memory.

These simple cores will be based around a Pentium P54C, part of the original Pentium line during the 1990s. Being based on the x86 instruction set, any software designed for a standard PC could theoretically be executed by Larrabee, including entire operating systems. Graphics code can be written in standard languages such as C++, without needing the unwieldy OpenGL or DirectX APIs. Larrabee adds new instructions (LRBni) to the x86 instruction set, specifically for graphics.

Intel initially touted Larrabee's capability for real-time ray tracing, which would be a milestone for computer graphics, as it could bring movie-style CGI visuals to computer games. There are no ray-traced games on the market though, so to compete with ATI and Nvidia's graphics cards, Intel has emphasised that Larrabee's initial focus will be on traditional rasterising for Direct3D and OpenGL software.

Rendering on Larrabee will be performed by splitting a scene into a series of tiles, a technique that worked well when it was used before by the short-lived Kyro family of graphics cards. The software renderers of Larrabee will be more adaptable than current rasterising hardware, easier to extend and modify, but very little is known about how Larrabee's performance will compare with traditional hardware when running today's games. So far, Intel has revealed few details about the retail Larrabee products that will go on sale during 2010, with no details about the number of cores it will have, the amount of local memory or even a product name.

The closest we've got to actual Larrabee hardware was when Intel's Pat Gelsinger held up a wafer of Larrabee processors at IDF 2009 in Beijing.

Uncovering DirectX 11

The next version of DirectX was first announced at Gamefest 2008. It's expected to be included with the imminent Windows Vista Service Pack 2 and is already available with the Windows 7 Release Candidate. It brings some key changes to the API, including multi-threaded rendering, tessellation, and compute shaders. Some of these new additions will benefit existing DirectX 10 and DirectX 10.1 graphics cards such as the Nvidia Geforce GTX 280 and ATI Radeon HD4870.

Tessellation is the most important new feature, as it has the potential to offer a leap forwards for graphical detail in DirectX 11 games. It replaces the current LOD (level of detail) system, which puts the GPU under a lot of work, by adding another few stages to the rendering pipeline, which reduce the number of triangles needed to render objects at a distance. Games will scale better across a range of hardware, and game developers will be able to fill their worlds with more objects.

As of DirectX 10.1, ATI hardware already supports tessellation, but this hasn't received much support from game developers. New hardware with a built in fixed-function unit called a tessellator is needed to take advantage of DirectX 11 tessellation. A small improvement to graphics performance will also come from improved texture compression algorithms.

Multithreaded rendering is promised to be supported by DirectX 10 hardware. Game developers will be able to create multiple 3D buffers and allocate them individual resources from the GPU, getting around the problem that rendering is an inherently serial task. Performance with multi-core CPUs should be improved, as processing threads can be spread out more evenly.

Support for compute shaders heralds Microsoft's vision for general-purpose computing on graphics processing units (GPGPU). It opens up the GPU to be used for tasks unrelated to graphics, such as physics processing, in the same way languages such as Cuda and OpenCL do. It will work with Nvidia and ATI cards, as well as Intel's Larrabee.

The changes in DirectX 11 aren't as fundamental as Direct X 10's in games that only look marginally better than DirectX 9 games. When DirectX 10 first appeared with Windows Vista, few games used it, partly because you needed to buy a new graphics card to use any of its features. Microsoft has ensured a broader range of hardware will benefit from DirectX 11, and it hopes this will encourage more game developers to support it.

The DirectX 11 runtime will be available for both Vista and Windows 7, but not for Windows XP. New graphics cards are expected later this year that will fully support DirectX 11.

Graphics cards

MANUFACTURER	ASUS	ASUS	GIGABYTE	GIGABYTE
Model	EAH4350 Silent	Geforce ENGTX285 Ultimate Edition	Geforce GTS 250 GV-N250OC-1GI	9400GT GV-N94TOC-1GI
Price	£27	£283	£142	£47
URL	http://uk.asus.com	http://uk.asus.com	www.giga-byte.co.uk	www.giga-byte.co.uk
GPU	ATI Radeon HD4350 (RV710)	Nvidia Geforce GTX285 (GT200b)	Nvidia Geforce GTS250 (G92b)	Nvidia Geforce 9400GT (G96)
Core clock speed (MHz)	600	712	738	550
Memory size (MB)	512	1,024	1,024	1,024
Memory type	GDDR2	GDDR3	GDDR3	GDDR2
Memory clock speed (MHz)	400	1,380	1,100	400
Effective memory clock speed (MHz)	800	2,760	2,200	800
Memory bus width	64-bit	512-bit	256-bit	128-bit
Memory bandwidth (Gbytes/sec)	6.4	176	70.4	12.8
Gigaflops	96	1063	726	67
Total shaders/stream processors	80	240	128	16
Shader clock speed (MHz)	600	1,620	1,836	1,400
TDP (watts)	25	183	150	50
Power connectors	None	2 6-pin PCI-E	1 6-pin PCI-E	None
Type of cooling	Dingle slot passive	Dual-slot heatsink/fan	Dual-slot heatpipe/fan	Single-slot heatsink/fan
DVI ports	1	2	1	1
Additional display outputs	VGA, HDMI	TV-out	VGA, HDMI	VGA, HDMI
Additional hardware	None	1 DVI-HDMI, 1 DVI-VGA adapters, S/PDIF audio, S-video to RCA adapter, dual 4-pin Molex to 6-pin PCI-E power adapter	1 DVI-HDMI adapter, S/PDIF cable, dual 4-pin Molex to 6-pin PCI-E power adapter	1 DVI-VGA adapter, S/PDIF cable
Additional software	Driver CD	Driver CD	Driver CD	Driver CD
Width (cm)	9.7	9.8	9.8	9.8
Length (cm)	16.7	26.7	20.2	16.7
Warranty	3 years	3 years	3 years	3 years
SCORES				
Features	★★★☆☆	★★★★★	★★★★☆	★★★☆☆
Performance	★★★☆☆	★★★★☆	★★★☆☆	★★★☆☆
Value for money	★★★★☆	★★★☆☆	★★★☆☆	★★★★☆
OVERALL	★★★☆☆	★★★★☆	★★★☆☆	★★★½☆

HIS	HIS	SAPPHIRE	SAPPHIRE	XFX	ZOTAC
Radeon HD4770	Radeon HD4890 Turbo	Radeon HD 4850 X2 2G	Radeon HD 4870 X2 2G	GX-295N-HHFF	Geforce GTX 275 AMP Edition
£79	£217	£227	£310	£447	£229
www.hisdigital.com	www.hisdigital.com	www.sapphiretech.com	www.sapphiretech.com	www.xfxforce.com	www.zotac.com
ATI Radeon HD4770 (RV740)	ATI Radeon HD4890 (RV790)	2 ATI Radeon HD4850 (RV770)	2 ATI Radeon HD4870 (RV770)	2 Nvidia Geforce GT200b	Nvidia Geforce GTX275 (GT200b)
750	900	2 x 625	2 x 750	2 x 576	702
512	1,024	2 x 1,024	2 x 1,024	2 x 896	896
GDDR5	GDDR5	GDDR3	GDDR5	GDDR3	GDDR3
800	1,000	2 x 993	2 x 900	2 x 1,000	1,260
3,200	4,000	2 x 1,986	2 x 3,600	2 x 2,000	2,520
128-bit	256-bit	2 x 256-bit	2 x 256-bit	2 x 448-bit	448-bit
51.2	128	2 x 63.5	2 x 115.2	2 x 111.9	139
960	1360	2,000	2,400	1,788	933
640	800	2 x 800	2 x 800	2 x 240	240
750	900	2 x 625	2 x 750	2 x 1,242	1,512
80	110	230	290	289	219
1 6-pin PCI-E	2 6-pin PCI-E	1 8-pin, 1 6-pin PCI-E	1 8-pin, 1 6-pin PCI-E	1 8-pin, 1 6-pin PCI-E	2 6-pin PCI-E
Dual-slot heatsink/fan	Dual-slot heatsink/fan	Dual-slot heatsink/2 fans	Dual-slot heatsink/1 fan	Dual-slot heatsink/1 fan	Dual-slot heatsink/fan
2	2	4	2	2	2
TV-out	TV-out	TV-out	TV-Out	HDMI	TV-out
1 DVI-HDMI, 1 DVI-VGA adapters	1 DVI-HDMI, 1 DVI-VGA adapters, component out dongle, S-video to RCA adapter, Crossfire connector, dual 4-pin Molex to 6-pin PCI-E power adapter	1 DVI-HDMI, 1 DVI-VGA adapters, component out dongle, S-video to RCA adapter, Crossfire connector, dual 4-pin Molex to 6-pin PCI-E, single 4-pin to 6-pin PCI-E power adapters	1 DVI-HDMI, 1 DVI-VGA adapters, component out dongle, S-video to RCA adapter, Crossfire connector, dual 4-pin Molex to 6-pin PCI-E, single 4-pin to 6-pin PCI-E power adapters	1 DVI-HDMI, 1 DVI-VGA adapters, S/PDIF audio, dual 4-pin Molex to 6-pin PCI-E power adapter	1 DVI-HDMI, 1 DVI-VGA adapters, S/PDIF audio, dual 4-pin Molex to 6-pin PCI-E power adapter
Driver CD	Driver CD, Stalker Clear Sky	Driver CD, AMD/ATI Ruby ROM 1.1, 3Dmark Vantage, Cyberlink PowerDVD v7, DVD Suite v5	Driver CD, AMD/ATI Ruby Rom 1.1, 3Dmark Vantage, Cyberlink PowerDVD v7, DVD Suite v5	Driver CD, Far Cry 2	Driver CD, 3Dmark Vantage Advanced Edition
9.8	12.5	9.8	9.2	9.7	9.8
20.6	24.6	28.3	26.6	26.6	26.7
2 years	2 years	2 years	2 years	2 years	5 years
★★★★½	★★★★½	★★★★½	★★★★½	★★★★½	★★★★★
★★★★★	★★★★★	★★★★½	★★★★½	★★★★★	★★★★★
★★★★★	★★★★½	★★★½☆	★★★★½	★★★½☆	★★★★½
★★★★½	★★★★☆	★★★½☆	★★★★☆	★★★★½	★★★★★

How we tested

To test the graphics cards we used an Intel Core i7 motherboard and processor. The PC's specs were: Intel Core i7 920 2.66GHz processor, MSI X58 Pro motherboard, 6GB Crucial Ballistix PC3-10600 1,333MHz DDR3 memory, 150GB 10,000rpm Western Digital Raptor hard drive, Windows Vista Ultimate SP1 64-bit

We tested the cards using Futuremark's 3Dmark Vantage benchmark and some games. 3Dmark Vantage has four preset detail settings that run at different resolutions. We tested each card using three of these presets: High (1,280x1,024), Performance (1,680x1,050) and Extreme (1,920x1,200). Each preset contains nine tests – two GPU tests, two CPU tests and six feature tests (Texture Fill, Color Fill, Parallax Occlusion Mapping, GPU Cloth, GPU Particles and Perlin noise).

The three games we chose were World in Conflict, Crysis Warhead and Far Cry 2, which all support Direct X10 and will push a gaming PC to its limits. The games were run at the same three resolutions as 3Dmark Vantage with all the game detail settings at their highest possible levels. At the two higher resolutions, we also applied 4x anti-aliasing and 4x anisotropic filtering.

World in Conflict and Far Cry 2 both have handy in-game benchmarks. For the Far Cry 2 test we ran the Range Small demo and in Crysis Warhead, we used the Airfield demo.

Each gaming benchmark was run four times and we ignored the first run (which may be affected by initial caching) and took an average of the last three runs.

We also measured the system power consumption with each card, both at idle and peak, when running the New Calico test in 3Dmark Vantage. We haven't printed all the tests we ran, but you can see more detail about the cards at **www.reportlabs.com**.

Editor's Choice

Editor's Choice Zotac Geforce GTX 275 Recommended His Radeon HD4890 Turbo • XFX Geforce GTX 295 GX-295N-HNFF Great Value His Radeon HD4770

Zotac Geforce GTX 275 AMP Edition

His Radeon HD4890 Turbo

His Radeon HD4770

Twelve months is a long time in the world of graphics and, since the Geforce GTX 280 and Radeon HD4870 were released last year, Nvidia and ATI have released new faster variants, and dropped their prices. Last year, the 4870 might not have outperformed the GTX 280, but it cost a lot less, giving a much better overall price-to-performance ratio and deserved our recommendation.

This time, Nvidia has redesigned its cards and priced them more aggressively, so ATI's cards have less of an advantage when it comes to price versus performance. ATI, though, now has a stronger grip on the mid-range markets, as the His Radeon HD4770 is a winner, worthy of a Great Value award. It doesn't match the Gigabyte Geforce GTS 250's performance, but it's not far off, it costs a lot less and uses less power.

The dual-GPU cards such as the Sapphire Radeon HD 4870 X2 2G are the most expensive, but will give excellent performance. Make sure your PSU can output enough power to keep up with two GPUs though. The XFX Geforce GTX 295 topped most of our benchmarks, so gets a Recommended award. However with a less powerful, cheaper card, most games will still run fine, so this card isn't for everyone.

XFX Geforce GTX 295 GX-295N-HHFF

The fastest single-GPU card was the Asus Geforce ENGTX 285 Ultimate Edition, but we're hesitant to recommend a card costing around £300 that's only marginally faster than much cheaper cards. When building the ultimate games rig, a pair of these cards will be a very powerful setup, and something we would choose over the XFX Geforce GTX 295, although you might need a banker's salary to afford the cards and the electricity to run them.

With two remaining, the decision once again comes to ATI versus Nvidia – the Zotac Geforce GTX 275 AMP Edition or the His Radeon HD4890 Turbo. Both are overclocked, and neither is the fastest on the market so, again, it boils down to price versus performance.

The GTX 275 is slightly more expensive, but outperforms the 4890 in every test. The performance gap varies depending on the test, but Zotac's GTX 275 consistently delivers, regardless of game or resolution, so receives our Editor's Choice award. If His' Radeon 4890 was the same price the 4870 was at launch, the GTX 275 wouldn't have looked so appealing. However, the HD4890 is still a great card, so it receives a Recommended award too. **PCW**

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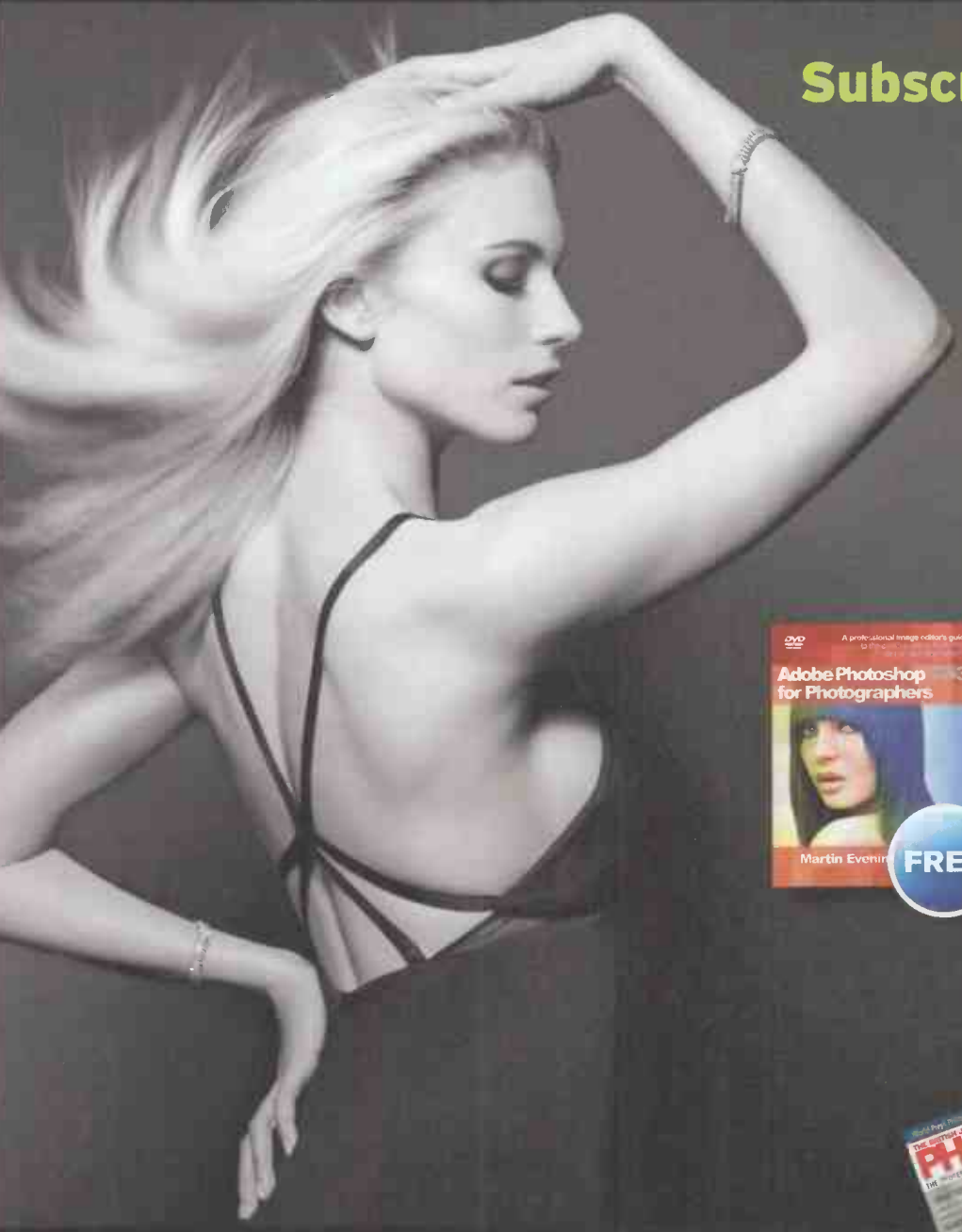

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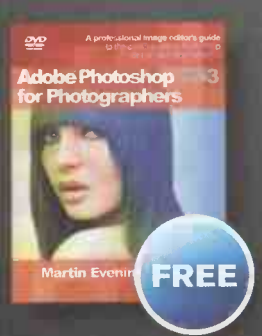

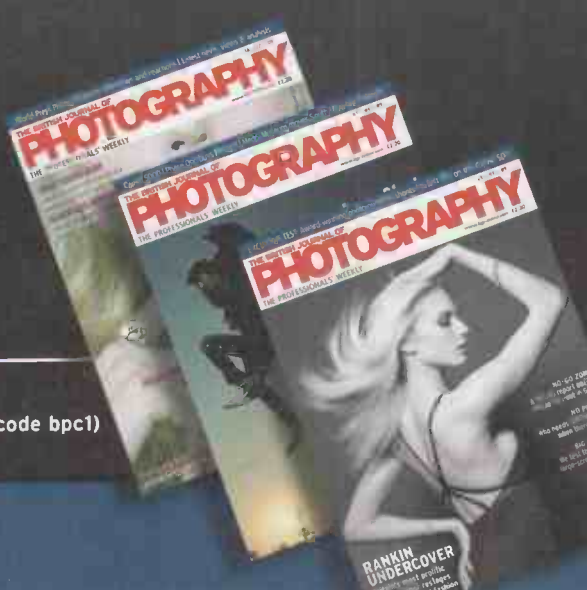

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Voice Command
Take Me Home
options

ON TEST

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Editor's Choice

'What used to be fairly simple devices offering turn-by-turn instructions now offer huge amounts of data'

Find your way with a sat nav

Are we there yet? Satellite-navigation devices can help you find the answer to that question and provide many other useful things too. Nigel Whitfield tests five top-of-the-range models

For many people, a satellite-navigation (sat nav) device has replaced the road atlas, especially now that they can be bought for less than £100. And if you just use one from time to time, that might be all you need.

But for those who spend more time in the car, a sat nav needs to be about more than going from A to B. Traffic information helps avoid tedious motorway jams, and can even re-route you if problems crop up on the journey, but often requires a hefty subscription. Adding Bluetooth to a sat nav makes it easier to comply with the law on using a mobile when driving – but is it practical to combine the two functions in one device?

And when the journey's over, how easy is it to track down a place to eat, somewhere to sleep or a parking space? Will you be able to find your way from the car park to the hotel or business meeting without getting lost or being directed to walk down a dual carriageway?

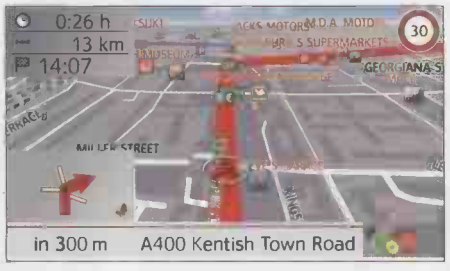
With the extra features included in sat navs and the information they can provide, such as safety camera warnings, local businesses, estimated times of arrival and more, what used to be fairly simple devices offering turn-by-turn instructions now offer huge amounts of data, which all has to be taken in at a glance when you are on the road.

In this round-up we have looked at five high-end sat navs, each of which provides hands-free calling together with traffic information, so turn the page to find out what's on offer if you are prepared to spend the extra cash.

↘

Becker Traffic Assist Pro Z250

Price £319 **Contact** Becker www.mybecker.com



The navigation screen is too cluttered with PoI information, and when you tap the bottom right for options, it flips back to 2D

Becker is one of the less well known sat-nav manufacturers, in the UK at least. It's a bigger name in the car audio world and has a range of sat navs. The one we tested is the 'Ferrari' edition, which accounts for the red trim on the casing and the on-screen design.

The unit is rectangular, the left-hand side has an SD card holding both European and US maps, with a power/reset slide switch. The right-hand side carries two USB ports – a USB-A and a USB mini-B, together with a headphone socket that doubles up as a connector for the supplied Traffic Message Channel (TMC) antenna. There's also a volume control and on the front is a switch labelled 'On'.

The back of the device has an array of contacts which can, with an optional cable and cradle, be used to send a mute signal to your car stereo, or even to feed the audio into the system, and link an additional microphone, which would result in much better integration.

Setup is simple; the supplied cradle is fairly chunky and doesn't articulate as well as some of the others, but it does the job. If you want TMC, you will have to attach the wire antenna to your windscreen with the suction cups, which looks messy. The power is supplied via the USB mini-B connector.

The software included is from Navigon, though it's not the latest version that is included on Navigon's own unit. It includes 'reality' view, which shows you what you will see at motorway junctions – though not at others – and there's a reassuring click sound when you tap your finger on the screen. Pressing the On button briefly takes you back out of menus.

We found the software more difficult to use than on other units. There are some handy features, such as being able to have three types of point of interest (PoI) set up for quick access – cash machines, petrol and food, for example – so you can find them easily, and a split-screen display uses half the screen to show a larger turn indicator, with the map on the other side.

However, it didn't appear possible to selectively disable the display of some types of PoI, which can make the map look a little cluttered. More annoying is that, while the main 3D driving view is free of extra options, as soon as you tap to call up the icons for other information, the map switches back to 2D.

Some of the options appeared fiddly too – even setting the home address was awkward, and neither the quick-start manual nor the one on the supplied CD shed any light on it – we did it in the end, but we are not confident we could repeat it.

Bluetooth support was good, with the Becker able to copy the phonebook from our N95, and even show the network and signal level on its display – but the call quality, while reasonable, simply wasn't loud enough. If you use the phone a lot, investing in the optional cradle with connections to the car audio system would be a must.

Extras include music and video players and a photo album, and the USB-A port means you can view pictures that are stored on a memory key, for example. There's even a 'mood light' either side of the screen that can be set to red, blue or off, and a collection of Ferrari images installed.

Ultimately, though, there just isn't enough here for most users to make the Becker stand out from the other units that we tested.

Verdict

Pros External microphone and audio mute options

Cons Driving display not as clear as the competition; external TMC antenna

Overall If the branding is important to you, or you want to integrate with a car audio system, this is worth a look, but the software isn't up to the level of the competition

Features	★★☆☆☆
Performance	★★☆☆☆
Value for money	★★☆☆☆
Overall	★★☆☆☆

Garmin Nuvi 865T

Price £399.99 **Contact** Garmin www.garmin.com/cms/site/uk

Garmin maps are bright but don't provide as much lane guidance as some others

Garmin's Nuvi 865T is a solid-feeling device that looks a little less modern than the Mio and Navigon models, but not excessively so. There are no physical controls at all on the front; a slider switch on the top turns the unit on and off, while the left-hand side has headphone, mini-SD and micro USB-B connectors. On the bottom is a cradle connector and a port for an external GPS antenna – useful if you have a car with a windscreen coating that blocks GPS signals. The supplied car power cable connects to a port on the cradle, and includes an FM receiver for TMC – complete with wire antenna and suction cups to fasten to your windscreen. Also included is a button to strap to your steering wheel, which can be used to trigger the voice commands – a very good idea.

The main screen is pretty simple – something Garmin has long been in favour of – with two large buttons for 'Where to' and 'View map,' with smaller icons below for Hands Free, Volume, and Tools.

Subsequent screens are uncluttered, and it's easy to set up routes or search for POIs. You can also do most things with voice controls – a tap on the screen, or a press of the remote button starts recognition. As well as saying options such as 'Music player' you can also say the number of an option on screen. You can set a destination, too, by speaking the city, street and house number, or navigate to some POIs.

In navigation, the screen felt a bit cluttered, certainly compared to the Mio. While spoken road names may sound useful on the face of it, at major junctions, it would be more useful to be told the road you're turning onto is the 'A1020' rather than 'Royal Docks Road', as you'll be lucky to spot a sign with the latter on it. We also felt that the lane information wasn't as clear as it should have been, and the 'lane guidance' screen only appears at some junctions; as with the other products that promise 'realistic' views, it tends to be motorways only. It was also a little annoying to be repeatedly told to 'enter the roundabout' as there's seldom an opportunity to do anything else.

Pedestrian navigation is supported, but you have to burrow through the menus to find the option, making it more fiddly than it should be.

We found the voice instructions reasonably clear, but the Bluetooth hands-free option wasn't really clear or loud enough, and was one of the weak points of the product. It also didn't offer to synchronise the phonebook from our N95.

Unusually, the software locked up once during our testing, the only unit to do so. While driving, the display stopped updating, though the instructions continued to be given correctly; we had to remove the battery when we reached our destination to reset.

On the positive side, the FM transmitter worked reasonably well and, so that you don't have to listen to hiss when there are no instructions, you can copy MP3 or FLAC files to the Garmin and play them via FM; a mixer setting allows you to choose the relative volume of music and instructions. A photo-navigation option allows you to navigate to images downloaded from Panoramio – it didn't recognise images that had been geotagged and then copied from our mobile phone.

The Garmin includes much of what people will need in a sat nav, but appears to lack some of the polish of other products; if it were cheaper, that would be more excusable, but it's one of the most expensive here.

Verdict

Pros Simple interface; good voice control; external antenna connector; steering wheel button for voice command

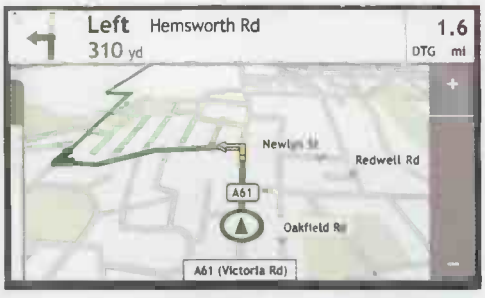
Cons Hands free not too clear; lane guidance could be improved; external TMC receiver; expensive

Overall A competent sat nav, with with good voice control, but not quite as polished as some of the alternatives.

Features	★★★☆☆
Performance	★★★☆☆
Value for money	★☆☆☆☆
Overall	★★★½☆

Mio Navman Spirit S500

Price £179.99 **Contact** Mio www.mio.com



Mio's maps are simple and clear, without unnecessary clutter – though some Pols are shown on screen

Mio has recently acquired Navman and the new Spirit range is one of the first fruits of that collaboration. The S500 is the slimmest sat nav in this test, the top panel has an on/off slider, while the bottom has a micro-SD card slot and a USB mini-B connector, which supplies power. Annoyingly, it's positioned such that you have to unplug the cable before removing the unit from the car cradle. The only other control isn't that noticeable; towards the top left of the front panel, is a touch-sensitive spot that returns you to the top-level menu. At 4.7in, the screen is fractionally larger than the 4.3in of the others on test.

The interface is one of the things that sets the Mio apart; the main menu comprises eight large squares, each clearly labelled and in a different colour. You can choose to use finger scrolling, as used on the iPhone – complete with a flick to scroll long lists – or scroll buttons. As well as obvious buttons such as Find, Map and Traffic there are quick buttons for petrol, SOS, food, tourist, parking and cash, together with home, phone, Google search and 'Mio More,' which provides information such as weather or a quick link to call roadside assistance.

At first glance it seemed as if it wasn't possible to locate Pols; they're accessed by 'Find Nearby', which might make more sense for anyone who's new to sat navs. When you've found an address, or a Pol, a quick tap on the same screen will change mode from driving to walking. Route options when driving include 'economical' as well as the usual fastest, or shortest, so it's easy to use the Spirit on foot. Tapping at the side of the screen calls up options, tapping again hides them – it's simple to get to grips with.

The main menu's Explore option lets you tap on the map and see Pols in the area highlighted, and another tap can call up their information, and plot a route, or make a phone call. Our one real quibble with the interface is the touch-sensitive button on the front – when you are holding the unit, it's right underneath your left thumb.

For phone call quality, and audio in general, the Mio is the best of the bunch, louder and more audible than the competition. The spoken instructions are excellent too, especially with regard to lane guidance, where information such as 'left two of four lanes' is more helpful than just 'keep left'.

The map view – even though it shows Pols – is clear and uncluttered, the best of the bunch, with extra information at motorway junctions, as is becoming the norm.

By linking with your phone, Google's local search can track down businesses and services not included in the maps, or you can retrieve weather information. Geotagging photos is also supported, though we weren't able to test this, as our early sample didn't come with the desktop software, which also allows you to update the maps within 30 days of purchase.

Also worth noting is that you can connect to a Bluetooth headset too, if you prefer to hear the instructions that way, and we had no problem making the Mio use our Parrot hands-free system – though of course you'll lose the ability to use the hands-free option for calls if you do that.

Overall, Mio has done a great job. It's the slickest sat-nav interface we have seen for a while, packs in plenty of features and manages to be one of the lowest-priced in our test.

Verdict

Pros Slick interface; uncluttered display; Bluetooth headset support; no voice control

Cons Menu button too easy to press; annoying USB port location

Overall Mio has combined plenty of features into a sat nav that's easy to use, without getting lost in menus or on-screen clutter – and all at a very attractive price.

Features	★★★★★
Performance	★★★★½
Value for money	★★★★★
Overall	★★★★★

Navigon 7310

Price £299.99 **Contact** Navigon www.navigon.com

Navigon's maps are fairly clear, and 3D landmarks may appeal to some but we're not yet convinced

Navigon's 7310 is a sleek-looking unit, with a curving back and a front panel that has a shiny front reaching almost to the edges. There's an anti-glare film in the box, too, in case you need it. The top of the case has a small power switch, while the lower edge has micro-SD, USB mini-B, headphone and reset buttons. The rear panel has a connector for an external GPS antenna.

The main screen provides four large buttons – New Destination, My Destination, Take Me Home and Voice Command. Below, smaller buttons give access to power, options and telephone functions. The Voice Command option allows you to speak an address – you will be asked to say the town, street and number. It works pretty well, and if you have to correct the town, for example, it will then update the streets to match those in the correct town.

There are also 3D landmarks, so you can see a representation of the Eiffel Tower, for example, along with the edges of other buildings – but we're not really convinced this adds anything to map legibility.

When navigating, the map is fairly clear – and less garish than the Tomtom or Garmin – though there are a lot of icons on the screen. The display includes terrain information, and 'reality view' signs for motorway junctions, where the names of the destinations on the signs are read out along with the junction number, which is helpful. PoIs are visible on screen, and tapping one will display information, and allow you to go directly there or make a phone call.

The New Destination screen can be customised with three categories of PoI for quick access, and entering addresses is straightforward, with an adaptive keyboard that greys out invalid letters as you go. Annoyingly, if you enter a full postcode, you cannot enter a house number as well.

A system called My Routes presents a choice of up to three routes to a destination, with an overview map so you can see the difference, including time and distance, and choose the one you prefer. The system will learn your preferences over time.

The Bluetooth copied the phone directory from our N95, and you can have four speed dials on the main phone screen, which is a good touch. However, though clearer than the Becker and Garmin units, it was quiet – a problem we also had with the spoken instruction. They were good, with fairly clear lane information, but even with the volume turned up full, we had trouble hearing them if the radio was on.

There's a good range of settings – even down to spoken warnings when a bend in the road is coming up, or how many miles above the speed limit to warn you at – though the interface for these is a little quirky, in that you can tap anywhere on an option line to change its settings. In practice that means that for volume and brightness, you can't tap left to go down, right to go up. Each tap increases the setting by one notch until it gets to full, when it goes back down to zero, and starts again. Fortunately, you can change the volume more easily from the main navigation screen.

With its relatively straightforward driving display, and the choice of alternative routes presented when you're planning a trip, the Navigon is a classy bit of kit, and with 40 countries included, it's pretty good value – but the competition's fierce and, though it's preferable in some ways to the Tomtom, the low sound level counts against it, as does the fact that it's just not as feature-packed as the Mio.

Verdict

Pros Clear navigation display; easy access to PoIs; learns route preferences; external GPS connector

Cons Too quiet; some parts of the interface are a little quirky

Overall A stylish sat nav with voice control and a clear display, but it's not quite as slick as the Mio

Features	★★★★☆
Performance	★★★☆☆
Value for money	★★★☆☆
Overall	★★★☆☆

Tomtom Go 940 Live

Price £391 **Contact** www.tomtom.com

Tomtom's familiar screen looks gaudy in comparison to the Mio; a quick-access option allows you to create your own menu of commands

Tomtom has been top dog, at least in terms of sat-nav device sales, for quite a long time, and there's no doubting that its products are simple to use and do most things required of them. The 940 Live is the top-of-the-range model and includes maps for both Europe and the US; if you don't want the US maps, the 740 Live covers 32 countries for £323.

The Go 940 is a smooth, curvaceous unit, with a power switch on the top panel, plus a micro-SD card slot on the base, along with a dock connector. There's no other power or USB connector – to charge or link to the PC, you have to put the device in the supplied desktop cradle. The car mount includes a similar connector, and the USB charge adapter plugs into the back. An optional cradle will allow you to control an iPod – though we think at this price, you shouldn't have to spend even more money on a different cradle.

There's also an FM transmitter and music player built in; the settings let you play music via FM but oddly don't offer it as an option for the spoken instructions. Bluetooth is available to both, but we couldn't make the Tomtom connect to our Parrot car kit or a Nokia headset for this.

One of the key additions that sets the Live range apart is the inclusion of a SIM and GSM module, which means that traffic information can be provided by a data connection, rather than relying on TMC. Extra tricks, such as finding the price of fuel in the area, are possible, along with weather information, buddy location and Google local search. Type in 'kebab' and you'll find the nearest purveyor of late-night delights, although this doesn't come free – you get three months, and then you have to pay £7.99 per month.

Routing information is excellent, with clear lane guidance and instructions, thanks to data gathered from mobile networks, among other sources – though we would have liked instructions to be louder. There's full voice control too – just tap the screen and say a command such as 'Navigate to an address' or 'Decrease volume'.

It's also possible to choose certain functions you would like to be accessible from a quick menu on the main navigation screen. However, we feel the main screen now looks a little cluttered and garish when compared to the likes of Navigon and Mio, which manage to convey plenty of information very clearly.

Like all Tomtoms, tapping the screen takes you into the menus, with a few clear icons and a Next button on the screen. And this is where it needs a complete overhaul, as there are now eight pages in the Settings menu. Tap Next one too many times and you will have to cycle through them all again, which is frustrating.

It's great to have all the extras, such as automatic updates of home-work traffic, weather forecasts, and so on, but finding the right setting can be frustrating. With most of the other products offering a lot of similar options, though admittedly not in quite as much detail as Tomtom Live, without requiring an ongoing subscription, the Go 940 in particular looks quite expensive, as well as less straightforward to use. If you're not taking your car to the US (and how many people do?), then the 740 is better value, but unless you spend most of your time in the car, the Mio Spirit is a cheaper, slicker choice.

Verdict

Pros Excellent routing; built-in connectivity

Cons Interface clutter; ongoing subscriptions required; price

Overall It's certainly packed with features, and the routing and traffic info is first class – but Tomtom's interface hasn't really kept pace, and it's becoming increasingly hard to find the options you want

Features	★★★★★
Performance	★★★☆☆
Value for money	★★☆☆☆
Overall	★★★★☆

Has the Portable Navigation Device had its day?

All the devices we have tested here fall into a category known as Portable Navigation Devices (PNDs). When we last looked at these a few years ago, there were quite a few more companies selling them. Michelin's Viamichelin range is no more; the AA-branded models are discontinued, Novogo went, and both Magellan and Navman have been acquired by Mio.

While sales of PNDs are still healthy – millions are sold each year – they are no longer growing. One of the main reasons is the number of mobile phones that can run GPS software. Even if your phone doesn't come with the software, it's not too expensive to buy, and you may even get the phone free. The screens are smaller, and even touchscreen interfaces suffer as a result, but a phone means just one device to carry with you, and built-in connectivity means information can be updated easily, which is something that traditional PND firms are looking to copy with connected sat navs.

Add a Bluetooth hands-free unit to your car, such as the Parrot CK3100 in one of our test vehicles, and you will almost always end up with a better hands-free experience, that will in many cases also automatically mute your car audio when the sat-nav software gives instructions.

For the best integration, buy a new car with a manufacturer-fitted system. But you may be shocked at the price. BMW charges £455 just for Bluetooth on a new 530i, while Citroën will set you back around £200, or around £1,500 for a system combining sat nav and a hands free.

In these straitened times, most of us won't be buying a new car anyway. So the choice is between PND or mobile phone. If navigation is key, then the better screen of a PND will probably swing it – but if good-quality hands-free calling is more important, we would go for a GPS phone and a proper Bluetooth hands-free system.

Above: Using an Bluetooth hands-free unit in your car will give a much better experience
Right: Many mobile phones now come with GPS software, which has affected sales of PNDs

The hidden costs of sat nav

There's a huge variation in the cost of the sat navs we have tested, even taking account of the different features they all offer. But simply buying based on the headline price isn't a good idea, even allowing for differences.

There's the thorny issue of how much it will cost to run, and that's not always as obvious as it might seem. For example, Tomtom's Live range has plenty of useful features, such as detailed traffic information, local petrol prices, and Google local search. But you'll only get that for the first three months, after which you have to pay £7.99 per month to maintain the service.

However, it's not just a case of paying for traffic data. Use the Mio to fetch weather information or for a Google local search, for instance, and the link is made through your mobile phone's data connection. That's fine when you're at home, if you have a reasonable data tarrif, and the amounts involved are pretty small, but if you're roaming you could be stung for hefty charges, especially if you're billed in large chunks, so it's worth checking beforehand. The Tomtom, Incidentally, doesn't suffer from the roaming trap, as all the costs are included in the monthly fee.

Unlike a few years ago, all the products we tested that include traffic information via TMC have it included, so there aren't any ongoing costs for traffic data.

The biggest hidden cost is map updates; Mio and Tomtom both have a guarantee that you can get the latest updates when you use your sat nav for the first time – so if it has been sitting under the Christmas tree, or on a retailer's shelf, you don't have to worry about maps being out of date. And all the manufacturers offer map updates – at a price – so you can ensure you keep up to date with new or changed roads. You may also have to pay for updates to safety cameras – we've included information in the features table overleaf about how much you can expect to pay to keep up to date with UK and European map and safety camera information for two years.

Hands-free sat-nav devices

BRAND	BECKER	GARMIN	MIO	NAVIGON	TOMTOM
Model	Traffic Assist Pro Z250	Nuvi 865T	Navman Spirit S500	7310	GO 940 Live
Website	www.mybecker.com	www.garmin.com/cms/site/uk	www.mio.com	www.navigon.com	www.tomtom.com
Price	£319	£399.99	£179.99	£299.99	£391
Maps included	Europe and US	Europe	Europe	Europe	Europe and US
Price for UK & Europe maps	N/A	£399.99	£179.99	N/A	£323 (740 Live)
Price for UK/Ireland only	N/A	N/A	£149.99	N/A	£274 (540 Live)
Screen size (inches)	4.3	4.3	4.7	4.3	4.3
Weight	209g	176g	160g	180g	224g
Dimensions (wxdxh) mm	126x20x80	125x18x78	132x14x85	116x19x75	127x23x85
Traffic info	Via TMC	Via TMC	Via TMC	Via TMC	Via internet
CONNECTORS					
Headphones	✔	✔	✘	✔	✘
TMC	✔	Via cradle	✘	✘	✘
USB	A, mini-B	Mini-B	Mini-B	Mini-B	✘
Power	Via USB	Via USB	Via USB	Via USB	Via cradle
GPS antenna	✔	✔	✘	✔	✘
Memory card	SD	Micro-SD	Micro-SD	Micro-SD	Micro-SD
BLUETOOTH					
Hands free	✔	✔	✔	✔	✔
Headset support	✘	✘	✔	✘	✔
Phone book sync	✔	✘	✔	✔	✔
OTHER FEATURES					
3D landmarks	✔	✘	✘	✔	✘
FM transmitter	✘	✔	✘	✘	✔
Fuel price info	✘	✘	✘	✘	✔
Google local search	✘	✘	✔	✘	✔
Music player	✔	✔	✘	✘	✔
Photo viewer	✔	✔	Navpix	✘	✔
Video player	✔	✘	✘	✘	✘
Voice command	✘	✔	✘	✔	✔
Weather	✘	✘	✔	✘	✔
Map updates	£99 per DVD	£99.99 for life	Information not available	£15 (until end 2010; normally £80 for two years	£7.95 per quarter
Safety camera information	£25 per update	£29.99 per year after 30 days	Information not available	£25 per year	£7.99 per month after three months
Total cost for two years' ownership	£468 (based on 1 map and 2 camera updates)	£559.96	Information not available	£364.99	£622.39 or £554.39 for GO 740 Live
SCORES					
Features	★★★☆☆	★★★☆☆	★★★★★	★★★★½	★★★★★
Ease of use	★★☆☆☆	★★★☆☆	★★★★½	★★★½☆	★★★½☆
Value for money	★★☆☆☆	★☆☆☆☆	★★★★★	★★★½☆	★★☆☆☆
OVERALL	★★☆☆☆	★★★☆☆	★★★★★	★★★½☆	★★★★½

How we tested

All the sat navs were tested in the same car, in areas around north-east London, including the North Circular (A406) and M11.

For the basic routing test, we asked each to take us from a home location to a retail park some distance away; each sat nav was tested at roughly the same time of day, so traffic conditions were similar. The fastest route was requested, and traffic information was enabled.

In addition to routing between two known points and following the sat nav's directions, we also deliberately deviated from planned routes, to see how well re-routing was performed. Our test routes included well-known junctions with complex lane arrangements, to help evaluate the amount of guidance given, both verbally and on screen.

For the Bluetooth tests, each unit was paired with a Nokia N95 phone, and calls were made to the same person, so we could assess the relative sound quality of each; these tests were done with the car stationary. Our 'control' for comparison of call quality was a Parrot CK3100 Bluetooth hands-free system, which costs around £100 and integrates with the existing speakers of a car audio system.

To evaluate how easy it is to listen to the instructions, we checked for the quality and volume of spoken directions when driving at a range of speeds, including with the car window open. Where available, we also repeated these tests using the FM transmitter to send signals to the car stereo.

The stylish automobile in which all our sat navs were tested

Editor's Choice

Editor's Choice Mio Navman Spirit S500
Recommended Tomtom Go Live 940

Mio Navman Spirit 5500

Tomtom Go Live 940

Any of these sat navs will take you from A to B, without becoming lost. But then, so will any of the cheaper models that cram the shelves of electronic and car stores. If you're spending the extra money, you really need something that will stand out, be easy to use and offer plenty of additional functionality.

One of the things that struck us about most of these sat navs was that they simply weren't loud enough – as cases have become slimmer, the speakers have shrunk, and all too often you will have to do without the radio in your car if you want to hear the instructions. Bluetooth call quality, too, wasn't as good as our standalone car kit, so it's perhaps best considered as an extra rather than a core feature.

There's little difference between the models on size – all have more or less the same external dimensions, and though the Mio is the slimmest, it's only by a small margin. But when it comes to installation in the car, we prefer the built-in TMC receivers to the external cables of the Becker and Garmin.

Navigon's enhanced lane information – albeit only on motorways – and the ability to touch a point of interest on the navigation screen to go there are useful tools, plus the choice of three routes to a destination will appeal to many users. It narrowly misses out on an award.

Tomtom is one of the best-known brands, and its Go 940 Live is certainly a very capable performer, with just about everything you could want from a sat nav. But though the number of features has increased with each generation, the Tomtom interface remains the same, and it's starting to become fiddly to use, with more screens to page through. That, and the ongoing costs for traffic information means that the Go 940 Live, while a great unit, receives only a Recommended award.

With a clear, uncluttered map, bundled traffic information, and the best sounding of the bunch, Mio's Navman Spirit S500 is a slim, sexy device. It also provides an 'economical' option for route planning, and a slick interface that's useful for exploring an area too, it's well deserving of this month's Editor's Choice. PCW

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BUSINESS

A FREE (VIRTUAL) LUNCH

Conventional wisdom has it that there's no such thing as a free lunch, but when it comes to the latest virtualisation technologies that's not strictly true. Most of the leading products are now free and, as we explain in this month's feature, smaller companies can do without many of the management and other chargeable add-ons too.

There's free virtualisation in the latest Debian 5.0 Linux distro too, and this heads up this issue's reviews. We then put Kodak's new network scanner, the Scan Station 500, through its paces before checking out what Device Defender from EncryptX can do for companies looking to prevent data getting into the wrong hands when removable storage devices are lost or stolen.

We also have a review of a four-bay network-attached storage appliance from D-Link, before we finish off by testing Password Depot 4, which is designed to be used to manage and securely share all your user's passwords.

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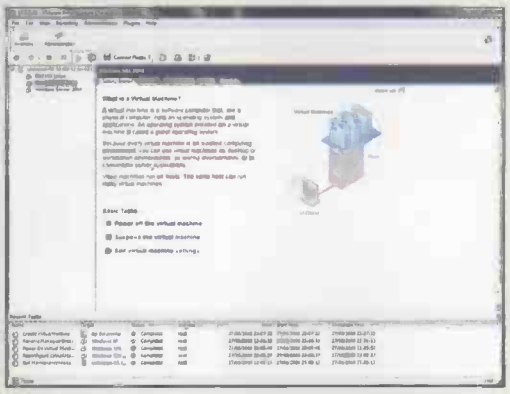


OUR SCORING

Excellent ★★★★★ Very good ★★★★☆ Good ★★★☆☆ Below average ★★☆☆☆ Poor ★☆☆☆☆

OUR AWARDS

Editor's Choice: The best product in a comparative group test. Anything that wins this award is of better quality than its competitors.
Recommended: A product that combines great features, usability and value for money.
Great Value: Not the best in class, but a product that has superior features and performance for the price.

Editor's Choice Business

Recommended Business

Great Value Business

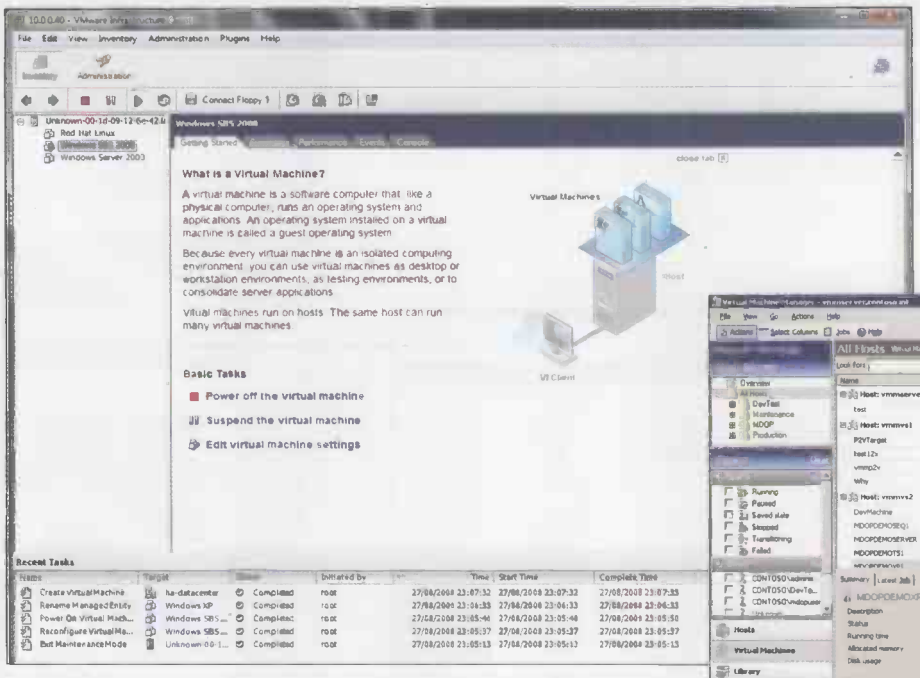
The business awards are used for products that are more suited to home offices or small businesses.

'D-Link's DNS-343 storage device can accommodate up to four Sata disks, but lacks external drive and backup facilities'

Read the review on page 109

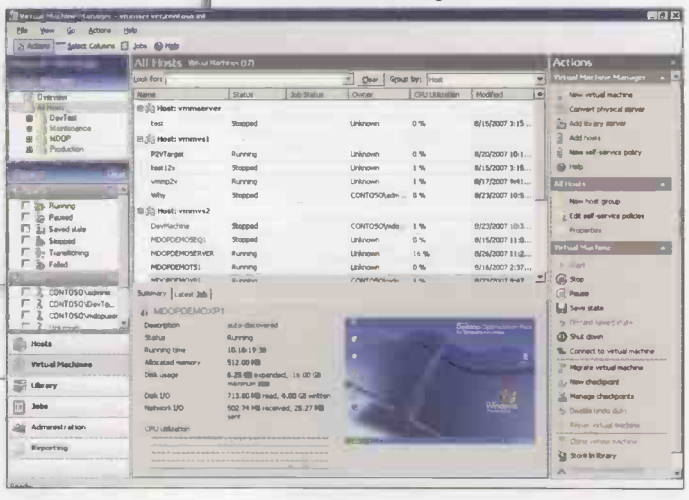
Virtually free

There are benefits and drawbacks to using the latest free PC virtualisation software. Alan Stevens explains



Left: VMware ESXi includes basic web-based management tools, but to take advantage of the more advanced features you will need to upgrade to a Virtual Infrastructure licence

Below: To manage more than one Microsoft Hyper-V server you need to buy System Center Virtual Machine Manager



Virtualisation is rapidly becoming a commodity technology, leaving vendors to focus on the development of management and other add-ons. As a result, a lot of the leading PC and server virtualisation products are now free – but is there a catch?

In this feature we look at what the virtualisation freebies have to offer the small business and whether you will need buy any extras to maximise the benefits.

The virtual landscape

PC virtualisation products are primarily aimed at developers, system testers and support staff looking to run virtual machines (VMs) locally. As a result, the only management required is the ability to build and run the VMs and, perhaps, organise them into groups, take backups, clone and copy virtual machines and so on. All this will typically be done interactively by the user of the host PC.

Server virtualisation tends to be used in quite a different way. It can, and often is, used for development and testing purposes but will more often be deployed in a production server environment to maximise and consolidate hardware resources.

Servers tend to be locked away and left unattended, so it is important to monitor VM activity, dynamically allocate and re-assign resources to balance VM workloads, and move virtual machines from one host to another as seamlessly as possible. Indeed, the holy grail of server virtualisation is 'live' migration, where VM workloads can be moved from server to server without having to be stopped and re-started.

Some of these facilities can be found in the free products, but none offers a complete solution. Most only let you manage a single host server unless you buy, sometimes quite costly, add-on management tools. That's not a major issue in a lot of small businesses, where it's common to have just one or two physical servers hosting important, but far from mission-critical, virtual machines. This is mainly because, in such cases, it's easy enough to arrange for backup systems to be available to cope with hardware problems and to manually monitor, fine tune and migrate VMs as needed using the tools included with the free products.

The downside of this hands-on approach is that it takes a lot of work and doesn't suit everyone, especially as the number of servers rises. When that happens management add-ons become increasingly important, although even with the largest and most complex of deployments you may not need everything on offer.

So, we've summarised what is included as standard in the leading free server virtualisation products (from VMware, Microsoft and Citrix), and given an idea of what you might need to add for each one to make larger deployments easier to manage.

The VMware story

Virtualisation market leader, VMware (a part of EMC), has two free server products for small businesses: VMware Server and ESXI.

The main difference between the two is that VMware Server is implemented as an application, hosted by a standard Windows or Linux server OS, whereas ESXI is a hypervisor, loaded straight onto the server with no need for a host operating system.

In terms of core virtualisation facilities ESXI is the more scalable. In effect, you're getting the same hypervisor behind the

company's large enterprise solution, VMware Infrastructure. But VMWare Server is good, capable of hosting virtual machines running a variety of 32-bit and 64-bit operating systems, including Windows Server 2008 and Red Hat Enterprise Linux 5. Each VM can have up to two virtual processors, 8GB of Ram and 10 virtual network interfaces.

With VMware Server the host can support up to 64 virtual machines, more than enough for most small businesses. However, you get very little in the way of management, beyond the ability to remotely create, start and stop VMs and take backup snapshots.

And it's much the same story with ESXI where, as with VMware Server, you get a web-based console that lets you manage VMs on a single host. In order to do more than that, you need the VMWare Virtualcenter Console, included as part of the Virtual Infrastructure solution. Depending on what you can afford, you will then be able to manage both VMware Server and ESXI systems with (where the hypervisor is involved) support for live migration of virtual machines (VMware calls this VMotion) plus other tools such as dynamic allocation of host resources and high availability failover.

Microsoft's tale

Like VMware, Microsoft has two server virtualisation products; one is a hosted application, the other a hypervisor. The hosted product is Windows Virtual Server 2005 which, as you might expect, requires Windows Server to run. The latest R2 release includes 64-bit implementations, although you can't host 64-bit virtual machines on Virtual Server 2005 and you can't allocate more than one virtual processor per VM, despite support for symmetric multiprocessing hosts.

Management is via a web-based interface on a single server basis with the usual tools to create, start and stop VMs, take snapshots and so on. There is little scope for load balancing and definitely no support for live migration of virtual workloads. Indeed, much of the development effort in this area has gone into the hypervisor product, Hyper-V.

Microsoft Hyper-V is delivered as part of Windows Server 2008, including the Small Business Edition and is reliant on hardware drivers provided by Windows. However, a standalone Hyper-V Server is also available which includes Windows Server Core to support it. The Hyper-V Server product is free, but licences are needed for Windows running in host VMs whereas the Hyper-V in Windows Server 2008 will be licensed for one or more Windows VMs depending on the edition purchased.

A very scalable hypervisor, Hyper-V can host virtual machines running 32-bit and 64-bit versions of both Windows and Linux guest operating systems. Basic management tools are freely available, offering features similar to those in Virtual Server 2005.

Access to more comprehensive management facilities is provided through System Center Virtual Machine Manager 2008 (VMM2008). This can be used to manage both Virtual Server and Hyper-V platforms with support for dynamic resource allocation and migration of virtual workloads from one server to another (Hyper-V only). The current release of Hyper-V doesn't allow for live migration but it is in the R2 release which should have shipped by the time you read this. VMM2008 can also manage Citrix Xenserver implementations (see below).

What you get from Citrix

Citrix has just one server virtualisation product – Xenserver, the commercial implementation of the Xen hypervisor technology also available in a number of Linux distros. The licence fee for the latest Xenserver 5 release was dropped in February.

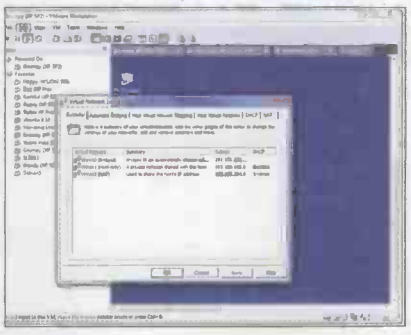
Xenserver is a very scalable product with support for up to 32 processors and 128GB of memory on the host systems with guest VMs able to have up to eight virtual CPUs and 32GB of Ram each to run both 32-bit and 64-bit implementations of most Windows and Linux operating systems.

Citrix retains many of the more advanced features offered with the original licences including the ability to manage multiple host servers from the Windows-based Xencenter console plus live migration of virtual workloads. You also get integrated P2V (physical to virtual machine) and V2V (virtual to virtual machine) conversion tools and support for a wide range of back-end storage technologies.

To add dynamic provisioning of virtual machines, workflow automation, load balancing and high availability failover, you need to buy the one of the Citrix Essentials add-ons: Citrix Essentials for Xenserver or Hyper-V. Citrix and Microsoft have agreed to work together to develop management tools able to work with virtualisation products from both companies. PCW

Inside VMware Workstation

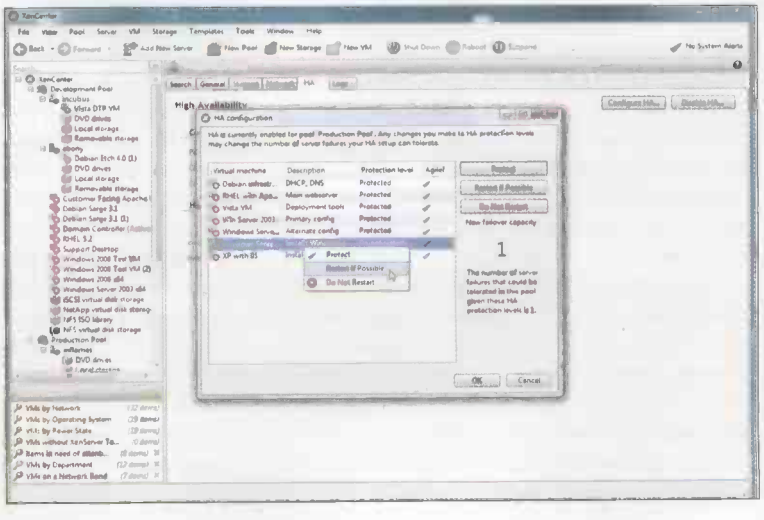
With the exception of Microsoft's Virtual PC 2007 and Sun's Virtualbox, free virtualisation products to run on your local desktop PC are pretty rare. Market leader VMware refuses to ditch the price for its VMware Workstation. It argues that it delivers a lot more than virtualisation, such as tools to model network workloads, record and replay virtual machine sessions and debug applications running in them.



The built-in extras make VMware Workstation popular with its intended development/testing market which doesn't mind paying for these facilities.

Meanwhile if you just want to run virtual machines VMware Player can be downloaded for free, although you will need VMware Workstation or another product to create the VMs in the first place.

VMware Workstation includes integrated network modelling and other tools



Multi-server management and live migration are included in the free Xenserver 5 product, but high availability and automation features have to be paid for

LINUX

Debian Project GNU/Linux 5

Debian almost catches up with the rest of the Linux crowd

Over 23,000 pre-compiled packages are available for the Debian 5 platform

Debian GNU/Linux (Debian for short) is often criticised for the length of its development cycle but is, as a result, a very stable Linux distro, popular with business users. This trend looks set to continue with the launch of the long-awaited Debian 5 release ('Lenny' to its friends), designed to bring the platform into line with all but the most go-ahead members of the Linux pack.

The Debian 5 distro is based on the 2.6.26 Linux kernel. It's not cutting edge, but that's not hugely important if you're interested in Linux for business use where stability and security are the main issues. Gnome is the default desktop, based mostly on Gnome 2.22 code which is also pretty recent, if not the latest there is. You can choose the K Desktop Environment, but the latest 4x release didn't make it in.

You also get Iceweasel 3 (Mozilla Firefox with a different name) and Icedove 2, the Debian incarnation of the Thunderbird email client.

Openoffice.org comes as standard, but it's the 2.4 release – 3 wasn't launched until after Lenny was finalised. Still, upgrading to the newer version isn't difficult and there are a lot of new features in Debian 5, including Java support. And there's plenty for netbook users including ACPI scripts specifically written for the Eee PC.

The Xen hypervisor is included for server users, together with Samba (3.2.5), the Apache Web server (2.2.9), plus MySQL and PostgreSQL databases. Indeed you can download over 23,000 ready-to-run packages – enough to keep even the keenest of Linux enthusiasts busy until the next release.

Debian has extensive platform support, from Intel/AMD-powered desktops and servers (32-bit and 64-bit) to Mips, PowerPC and Sparc-based systems. There is even an S/390 implementation, plus versions for handheld computers and some Linux-based storage appliances. Getting hold of the software and installing it is also easy and free.

One way is to download a complete set of CD/DVD images, although the files are large and you probably won't use most of what they contain. Plus there's a new bootable Live Version that can be run without installing to hard disk. However, we chose the preferred 'netinst' route, based on a relatively small bootable image (153MB for x86 platforms) that lets you choose the packages you want to include, then download and install the required code via the internet.

Our desktop installation took around 45 minutes over a broadband connection, but a variety of server and custom setups can also be installed this way. The latest security updates are automatically applied before the first boot, and SELinux is installed, if not enabled.

Once it was up and running we found it quick and responsive and there were no surprises in the way the software was managed or any interoperability issues such as those often encountered with the Debian-based Ubuntu. For example, the X.Org 7.3 server automatically configured the display for the hardware we had, the network connection was configured correctly and we were able to browse Windows network shares instantly with no extra setup required.

Sure, it's not flashy like Ubuntu and you will have to download proprietary add-ons such as codecs to match what you get with the Ubuntu distro. But Debian is one of the most reliable and usable of the free distros, with Debian 5 looking like it should easily hold on to that title.

Alan Stevens

Verdict

Pros Wide platform support; 23,000+ packages; simple internet install; stable distro with long development cycle

Cons Old version of Openoffice.org; no proprietary code included; community support only

Overall Not quite cutting edge, but one of the most stable of the free Linux distros and bound to appeal to business users

Features	★★★★½
Ease of use	★★★★½
Value for money	★★★★★
Overall	★★★★½

Price Free download

Contact Debian www.debian.org

System requirements Supported processor (AMD/Intel, Sun Sparc, IBM PowerPC, Mips, plus others) • Minimum 64MB memory (512MB or more recommended) • 1GB disk space

NETWORK SCANNER

Kodak Scan Station 500

A fast scanner with a big appetite for work

The Scan Station 500 has its own Intel Atom PC, complete with a built-in colour touchscreen

Kodak's Scan Station 500 is a real workhorse. It can scan 30 double-sided pages per minute and is able to cope with 1,500 pages per a day. It can convert those pages to a variety of formats before distributing by fax or email, or by saving to USB memory key or shared network. It can even add voice annotations to help with document identification and workflow, and all without the need for a PC.

The reason why you don't need a separate PC is that there's one built in, based on an Intel Atom processor with 1GB of memory, a 160GB hard disk and an integrated 8in colour touchscreen. The end result is pretty bulky, but well engineered and very flexible. We used it to scan all types of original material from standard A4 documents to ID and business cards, alongside media such as books and magazines. A separate flatbed scanner is also available and can be plugged in at the back.

Documents to be scanned are loaded into a 75-page feeder towards the rear of the unit, with pages quickly passed across the dual CCD scanning heads before being deposited into a foldout catch tray at the front. Controls and connectors are minimal, with a 10/100Mbits/sec Ethernet interface for Lan attachment, alongside a phone jack for the built-in fax modem and four USB ports. These can be used to attach a local keyboard, or to connect a printer or plug-in memory key.

Virtually all the software required is on the machine already, enabling it to automatically de-skew pages if misaligned, eliminate blank pages and crop images as they are being scanned. The end results can then be saved as TIFF or JPEG images or as simple, searchable and encrypted PDF documents, with options to scan to a shared network, memory key, email, fax or printer. This is all controlled from the built-in touchscreen.

Of course before we could try any of this for ourselves we had to spend a little time customising the Scan Station settings. However, unlike most network devices, there is no web management interface. Nor is it possible to configure the Scan Station 500 from the built-in screen. Rather, it is configured using a separate Windows application (called the Configuration Manager), which creates XML setup files copied onto the Scan Station via the USB memory key supplied.

It sounds archaic, but is a very robust and tamper-proof solution. Moreover, each user can be given a memory key with their settings on it which, when plugged into the scanner saves them from having to change any settings, remember or search for destination folders, fax numbers or email recipients.

Unfortunately, it can take a while to build these custom configurations with, for example, no ability to browse for shared networks or link to an email address book, although addresses can be imported in .csv format. A step-by-step setup guide would be a welcome addition and life would be easier, too, if the USB ports were at the front rather than tucked away round the back.

Still, once all the setup work was done, the Scan Station 500 was very easy to use. Jams were rare, results were available in seconds and the scan quality was excellent. The voice annotations were muffled and didn't impress, but overall the Scan Station 500 did a good job and is worth looking at if you need to digitise large volumes of paper documents on a regular basis.

Alan Stevens

Verdict

Pros Very quick, double-sided, scanning; colour touchscreen; scan to fax/email/network share; user profiles stored on USB memory stick

Cons Bulky; noisy fan; complicated initial setup

Overall A robust and very self-contained network scanner for companies looking to digitise large numbers of documents

Features	★★★☆☆
Performance	★★★★☆
Value for money	★★☆☆☆
Overall	★★★☆☆

Price £1,581 (£1,375 ex Vat)

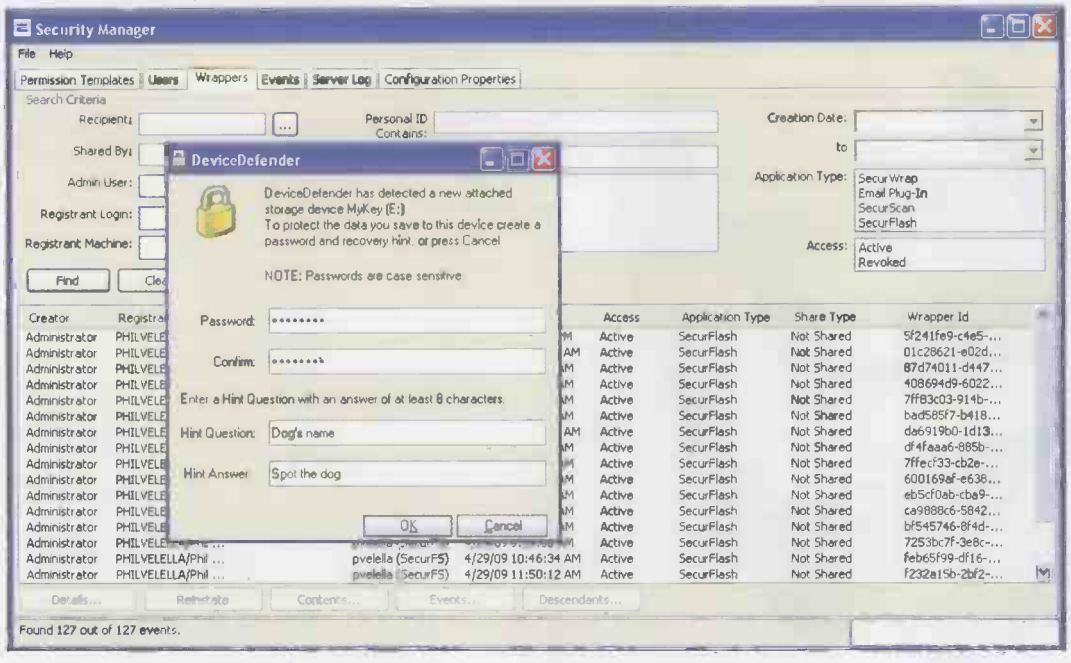
Contact Kodak 0870 850 2351 www.kodak.com/go/docimaging

Specifications Dual CCD colour scanners • 600 dots per inch (dpi) resolution • 30 pages per minute at 200dpi 1.6GHz Intel Atom processor • 1GB Ram • 160GB hard disk • 8in 800x400 colour touchscreen • 10/100Mbits/sec Ethernet interface • Integrated 56K fax modem • 4 USB2 ports

STORAGE SECURITY

EncryptX Device Defender 3.1

Prevent others from accessing your portable storage devices



Files are automatically encrypted when saved using Device Defender

Removable storage devices, such as USB sticks and SD cards, are a cheap and easy way of transporting data, but they're also easily mislaid or stolen. EncryptX has addressed this issue with its Device Defender solution, which can be used to automatically encrypt information copied to almost any kind of removable storage medium.

For this type of tool to work it has to be all-encompassing and very easy for users to understand. To this end Device Defender installs into the File System on Windows PC to automatically encrypt/decrypt files saved to a range of storage devices, requiring little more than a simple password the first time a device is used. Virtually any kind of removable storage can be protected, including most NTFS format disks.

We trialled the software using Windows XP and Vista, although it can be used with any version from Windows 2000 onwards. There's also a server implementation which, similarly, can be used with Windows Server 2000 or later, however there's no 64-bit support for either desktop or server platforms.

Another prerequisite is Java 6 which has to be in place before the Device Defender setup program will run. This is not a problem for individual users, but a real bind if rolling out to lots of PCs, an issue further compounded by a lack of any tools to help with large-scale deployment.

Once installed Device Defender is fairly unobtrusive, only making itself known when a removable storage device is plugged into the PC. If that device has not been used before, you're prompted for a password for use by the 256-bit AES encryption technology, plus a hint question and accompanying answer in case you forget the password later on. You're then asked to choose one of three options – to always encrypt any unprotected files found on the device, only encrypt once or encrypt new files as and when written.

The device can then be used normally, with Device Defender automatically encrypting files when they're saved and, assuming you have provided the correct password, unscrambling them again when they're opened. A small utility (OpenSecureFiles.exe) is also copied to the device to open encrypted files on PCs without Device Defender. This can be run without being installed and lets you save and encrypt files under manual control.

For larger companies another option is centralised management via the Device Defender Administrator Server (£800 ex Vat plus installation). A Java application running on Apache Tomcat with a MySQL database, the server can be used to track protected storage devices and enforce company password policies, with the option to recover lost user passwords remotely if needed. The Administrator Server can also revoke user rights if no longer trusted and prevent devices being used if lost or stolen with McAfee anti-virus/anti-malware scanning soon to be added as an option.

We found it all very easy to set up and manage with the end result a near foolproof way of protecting data held on removable devices. We say 'near foolproof' as CDs/DVDs burnt using third-party applications, such as Nero, can't be encrypted. Nor is there support for the Windows Live File System available in Vista. Otherwise it's pretty comprehensive and worth investigating if you're worried about storage security.

Alan Stevens

Verdict

Pros Unobtrusive; avoids having to lock down USB and other ports; 256-bit AES encryption; optional policy-based management server

Cons Not supported on 64-bit Windows; CD/DVDs created using third party tools can't be encrypted; Windows Live File System on Vista not supported

Overall Device Defender won't stop users losing storage devices, but it does make it easy to protect the data they contain

Features	★★★½☆
Ease of use	★★★★½
Value for money	★★★½☆
Overall	★★★½☆

Price £27 (£23.77 ex Vat) per PC

Contact Avanquest Solutions 01752 318 078 www.avanquest-solutions.co.uk/security

System requirements Windows 2000 or later • Java Runtime Environment v6 or above

NETWORK-ATTACHED STORAGE

D-Link DNS-343

Get the power of four in the latest D-Link storage appliance

D-Link's DNS-343 storage appliance can hold up to four Sata disks but lacks external drive and backup facilities

D-Link's DNS-343 is a four-bay network storage appliance that is easy to set up, with a good choice of Raid options to enhance both performance and reliability. However, its lack of external expansion, backup and other features is likely to put business buyers off.

The DNS-343 certainly looks the part, housed in a smart black metal casing with a bright organic LED information display at the front. Power comes from a somewhat large external AC adapter with a single USB port and a Gigabit Ethernet connector round the back.

Unfortunately you can't use the USB socket to plug in external hard disks – as you can on storage appliances from vendors such as Lacie, Netgear and Synology – just a limited range of printers or an Uninterruptible Power Supply. That is a real shame as it limits the options when it comes to expansion and backup. Indeed, it is now common to be able to both expand storage by plugging in external USB or eSata disks and take backups to those drives using built-in software. With the DNS-343 you will have to make separate arrangements to take backups over the Lan.

Disks aren't included with the DNS-343, but that is not a problem as most 3.5in Sata drives will work and won't add hugely to the overall cost. Moreover, they're very easy to fit, with no need for any tools. Just slide the front panel off the box, push the disks into the bays and you're done. Getting them out again is just as easy, thanks to small ejection levers at the rear. You will, however, need to power down should you want to add or swap disks around.

Once installed the disks can be formatted separately or configured as a single JBOD volume with Raid 0, 1 and 5 configurations also possible to enhance performance and/or reliability. Choosing one of these is pretty easy, but if you change your mind the disks will be reformatted and any existing data destroyed. For best results matching drives of the same capacity should be used.

We installed a full set of four Western Digital Sata disks configured as a Raid 0 stripe set. Once formatted, a single Windows share is created by default, but it's easy enough to further split the available space with access controls that can be applied at both the user and group level. Quotas can also be enforced, but users and groups have to be configured and managed on the device itself with no facilities to authenticate users against a Windows domain or Active Directory.

On the plus side there is a built-in FTP server, SMB/CIFS sharing and an iTunes server for streaming your music.

You can also schedule the DNS-343 to download files, either from HTTP/FTP servers or designated network shares. A copy of Memeo Autobackup is also included to back up network PCs to the DNS-343.

We ran some simple read and write tests, with the D-Link appliance averaging around 30Mbytes/sec when reading data and about half that when writing. Reasonable enough, but nowhere near as fast as other business devices we've tested, and it could struggle as user numbers increase. Add that to the lack of expansion and backup support plus the built-in web and database servers found on other products, and the DNS-343 is unlikely to win over many small-business buyers. *Alan Stevens*

Verdict

Pros Four bays; tool-free Sata disk installation; Raid 0, 1 and 5; USB printer sharing

Cons No support for external USB disks; no backup facilities; no Windows domain integration

Overall A well-engineered Nas appliance but lack of features and performance marks it down against the competition

Features	★★☆☆☆
Performance	★★★☆☆
Value for money	★★☆☆☆
Overall	★★☆☆☆

Price £700 (£608.69 ex Vat)

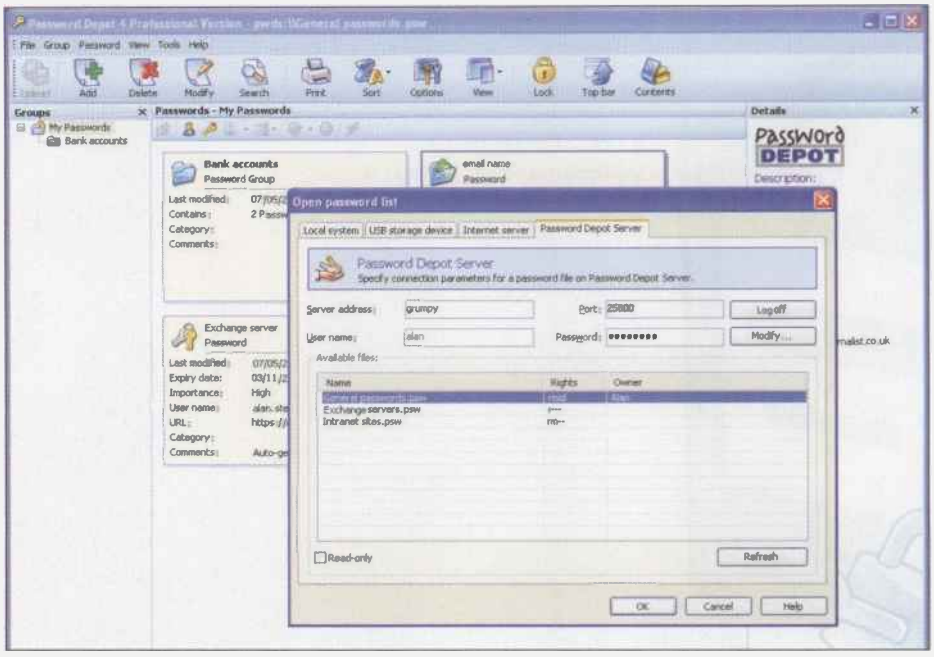
Contact D-Link 020 8955 9000 www.dlink.co.uk

Specifications Four-bay desktop storage enclosure • 500MHz Marvell processor • 128MB Ram • 1 Gigabit Ethernet port • 1 USB port (printer or Uninterruptible Power Supply only) • Organic LED information display • SMB/CIFS file sharing • JBOD, Raid 0,1,5 support • FTP server

PASSWORD SECURITY

Acebit Password Depot 4

Store user names and passwords securely on your PC



An optional server adds support for central storage of password lists that can be shared by Password Depot users

There are lots of ways to keep track of passwords, such as jotting them down on paper or in a spreadsheet or another computer file. However, none of these can be considered properly secure, and finding and using the information when needed can be an issue. If that is the case you might want to consider a custom password organiser, such as Password Depot from Acebit.

Password Depot is designed solely to manage passwords. Now in its fourth release, it lets you store and organise all your account names, passwords and other login information in a set of lists.

The software automatically applies 256-bit AES encryption to protect the data both on disk and in computer memory. It also provides active protection against keyloggers and ensures sensitive user and password information is cleared from both the Windows clipboard and system memory when not needed.

Other benefits of the Acebit software include its ability to rate the strength of your passwords as you type them or it will create them for you using a random password generator.

The latest version also lets you attach files, such as product keys, to passwords and synchronise the contents of multiple password lists. Plus it lets you track password histories, encrypt/decrypt other files on the host PC and store the application and password lists on USB memory keys, enabling you to carry your credentials around and use them on any PC.

Written for use with any version of Windows from 98 onwards, we tested Password Depot in conjunction with the optional Password Deport Server. Available free for up to three users (for six users licences start at £129 ex Vat), this add-on package enables passwords to be centrally stored and shared rather than kept on user PCs.

The Password Depot Server installs as a Windows service on either a server or desktop PC, with a separate control panel for management which can be run on the same host or remotely.

The server does little beyond sharing centrally stored password lists and users interact with the application via the same interface, whether using it standalone or in conjunction with the server program. We found this reasonably easy to follow and there is an option to minimise the GUI to a small toolbar to reduce the amount of on-screen space it needs. However, you are presented with lots of tools beyond simple password management, many of which you may never need and it takes a while to get to grips with what's on offer.

There are wizards to help with some of the more common tasks, such as capturing login information and passwords when you sign on so you don't have to type everything into the program from scratch. Likewise, you can get Password Depot to auto-fill login screens on the fly rather than you having to look up the information and enter it manually.

It all works and a few tutorials are included but we did have a few concerns over the level of training likely to be needed simply to secure user passwords. We would also like to see more supporting documentation beyond the rather basic user guide supplied. Otherwise Password Depot does what it's supposed to and is a huge improvement over jotting down passwords on bits of paper.

Alan Stevens

Verdict

Pros 256-bit AES encryption; files stored with passwords; install to USB key; password generator; optional server for password sharing

Cons Lots of features that may not be used; documentation could be improved

Overall Makes passwords a lot more secure and easy to manage, but takes a while to learn

Features	★★★½☆
Ease of use	★★½☆☆
Value for money	★★★½☆
Overall	★★★½☆

Price Password Depot 4 £27 (£22.61 ex Vat at 19%)

Optional Administration Server (6 users) starts at £129 (£108.38 ex Vat at 19%)

Contact Acebit
+49 (0) 61 51 136 50 0
www.acebit.com

System requirements Windows 98/ME/2000/XP/2003 Server/Vista

COMPETITION

WIN! Four Linksys by Cisco Media Hubs

This month, *PCW* has teamed up with Cisco to offer readers a chance to win one of four LInksys by CIsco Media Hubs, each worth £269.

Designed to simplify access to and interaction with digital content, Media Hub gathers, organises and presents all the digital video, photos and music that users have spread across various devices in the home.

Easily enabled with just a few clicks of a button, remote access allows users to view, upload and download all their media through an easy-to-use interface accessible in the home and throughout the world via **www.ciscomediahub.com**.

Media Hub is the perfect solution for consumers with extensive digital media libraries who are looking to eliminate the complexity of managing their collections. Sharing media on multiple devices within the home is easy with the Media Hub's media and iTunes server and the device automatically searches the network for other media devices to present all available digital media to the user in a single location.

Content accessible to the Media Hub is presented in a browser-based, simple-to-navigate user interface. Music albums are consolidated and presented together with the appropriate album art, regardless of where the tracks reside within the network, eliminating the need to know which device music is stored on. Photos and videos are presented using thumbnail images that are easily organised by date or name.

Automated backup software is also included with the Media Hub to help ensure that all your digital libraries are protected.

Linksys by Cisco Media Hub is available in three versions:

NMH305 – Linksys by Cisco Media Hub (500GB hard drive) MSRP: £269

NMH405 – Linksys by Cisco Media Hub with LCD and 6-in-1 card reader (500GB hard drive) MSRP: £299.99

NMH410 – Linksys by Cisco Media Hub with LCD and 6-in-1 card reader (1TB hard drive) MSRP: £369.99

The Linksys by Cisco Media Hub

For further information please go to **www.linksysbycisco.com**.

For your chance to win one of four Linksys by Cisco Media Hubs worth £269 each, simply answer the question below and enter online at **www.pcw.co.uk/competitions**. The competition opens on 18 June and closes on 24 July 2009.

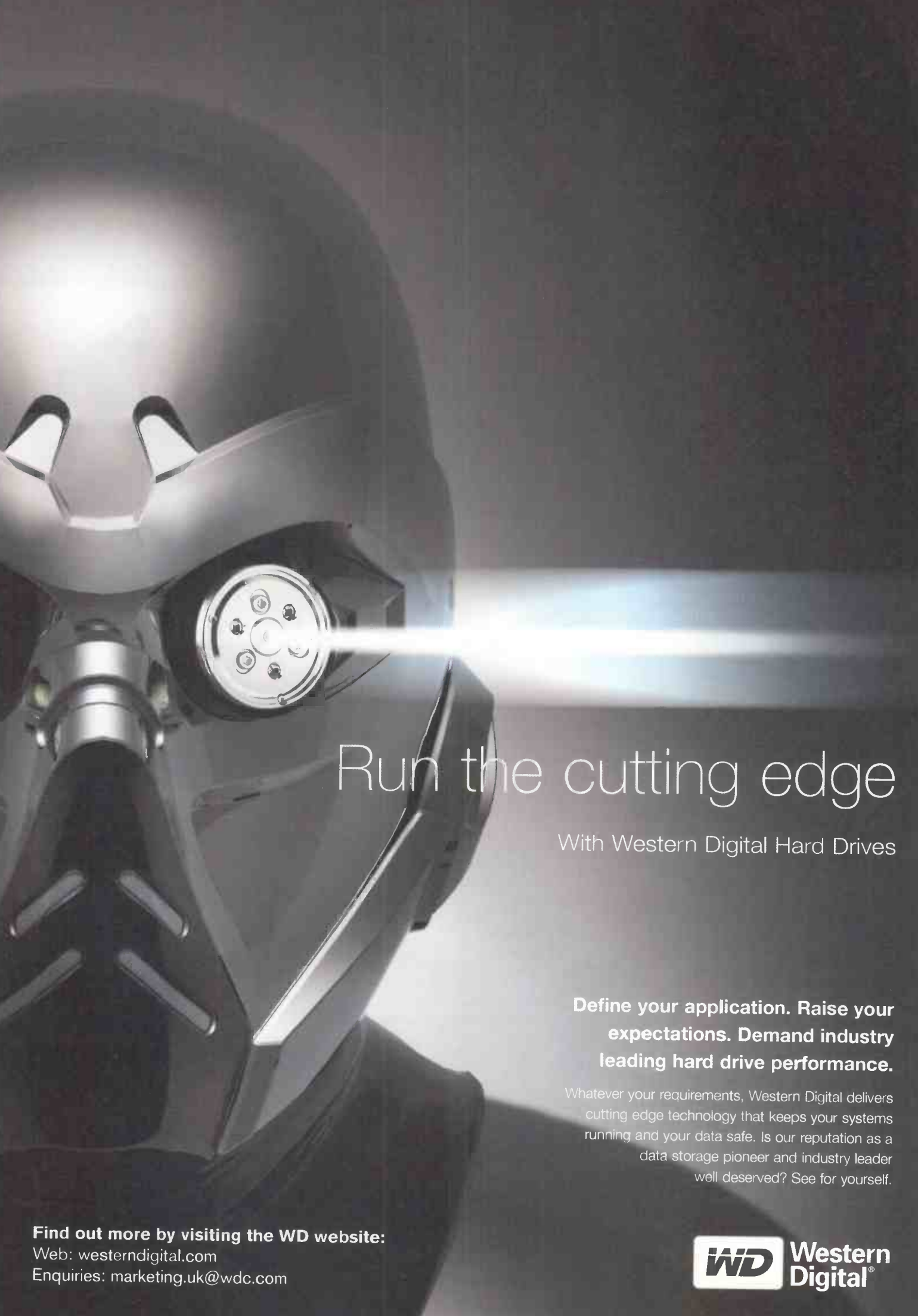
Which feature does the Linksys by Cisco Media Hub include

a) Wireless Camera
b) ITunes Server
c) Wireless Router

This competition is open to readers of *PCW*, except for employees (and their families) of Incisive Media, and Cisco. PCW Is the sole judge of the competition and the Editor's choice is final. Offer applies to residents of the UK and the Irish Republic only. Entrants must be over the age of 18 and only one entry per household will be accepted. Winners will be selected at random from all correct entries received. No cash alternative is available in lieu of prizes. Incisive Media will use all reasonable endeavours to notify the winner(s) within 14 days of the close of the competition. Incisive Media reserves the right to substitute the prize for one of greater or equal value if circumstances make this unavoidable. Prizes will be dispatched by the competition sponsor(s) and the winner(s) name(s) and address(es) will be provided to the competition sponsor(s) for this purpose. No purchase of the magazine is necessary to enter the competition. Incisive Media will use all reasonable efforts to ensure that the prizes are as described on this page. However, Incisive Media cannot accept any liability in respect of any prize, and any queries regarding a prize should be taken up directly with the sponsor of that prize.

The winners of the June 2009 competition are Ann Fitton, Alexander Grant, John Bates and Jane Adair, who each win a Shuttle SN78SH7 Phenom II barebones PC

ENTER ONLINE AT www.pcw.co.uk/competitions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EDITED BY WILL STAPLEY

HANDS ON

JAUNTY ON TRIAL

Thanks to its ease of installation and intuitive interface, Ubuntu is the perfect introduction to Linux. Codenamed Jaunty Jackalope, version 9.04 of Ubuntu has now arrived. A new desktop along with better support for hardware are just two of the new features – head to page 132 to read more.

If you would prefer to get outside and enjoy the sunshine, be sure to check out this month's Digital Imaging, where we show you how to create stunning depth-of-field effects without having to first splash out on a digital SLR camera. And if you are a newcomer to photography, you will be pleased to hear we have also got a quick primer on what the term 'depth of field' actually means.

Finally, with the credit crunch still in full swing, there has never been a better time to get a grip of your finances. In Spreadsheets, we show you how Excel can be used to help keep you afloat during these testing times.

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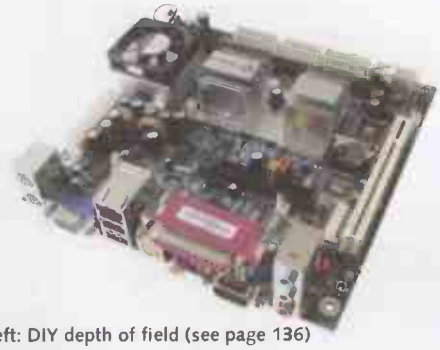


Left: DIY depth of field (see page 136)
Above: Mini-ITX motherboards make for quiet PCs (see page 118)

Advice from our experts

PCW's experts solve all your computing problems

DATABASES

Q I have a form based on my Access 2007 database, each form is A4 size and I would like to put page numbers onto the forms when I print them. It seems quite easy to do and I think I've done it right, but they don't show up on the form. What am I doing wrong?
Pippa Davies

A You've probably done everything right, but the page numbers are not displayed in Form view or Layout view – you have to use Print Preview in order to see them on screen.

Page numbers are indeed easy to add to a form in Design view: click the Page Numbers button in the Controls group and make selections in the Page Numbers dialogue box. You can set the format to be either 'Page 2' or 'Page 2 of 5', place them in the header or footer and choose an alignment. Picking Inside or Outside will alternate printing the numbers on the left or right of the form, depending on whether the pages are odd or even numbers. Inside puts the odds on the left and Outside puts them on the right.

Once you've added page numbers, click the Office button and choose Print, Print Preview and you should see the numbers displayed.

Incidentally, page numbers are allocated to the current batch of paper pages that would roll out of the printer; they have no connection with any record numbering system you might be using in the database. If you filter your records to see, for instance, the four records entered today, or all records where the city is Oxford, the pages (which in Pippa's case equate to records) will be numbered from 1 to 4.

HARDWARE

Q I recently bought a new Acer AL2416WB widescreen monitor thinking it would make Corel Draw 11 easier to use. Unfortunately the reverse is true in that images are now stretched to the new format with circles appearing as ellipses and squares as rectangles. How can I correct this?
Geoff Axford

The majority of large widescreen TFTs have a resolution of 1,920x1,200

A This distortion is happening because the computer thinks it's connected to an older, and squarer, 4:3-shaped screen. It is delivering a resolution designed to fit one of these older screens, such as 1,024x768 or 1,280x1,024 pixels. Since these older screens are narrower than a widescreen monitor, the 4:3 image is being horizontally stretched to fill the new screen, which results in the distortion. Alternatively, some widescreen monitors recognise 4:3 resolutions and display them without stretching, in which case there will be thick black bars running down either side of the image.

To properly exploit the full screen area of a widescreen monitor and avoid distortion, you need to send a widescreen signal from your computer. For the best quality, always drive an LCD monitor at its native resolution, which you can find in the manufacturer's specifications. According to Acer, your AL2416WB has a native resolution of 1,920x1,200 pixels, a common specification for a widescreen monitor.

So open your Windows display control panel and change the desktop area or resolution to 1,920x1,200 pixels; if this mode is not available, you'll need to install a driver for your monitor. Once set to a widescreen resolution, your desktop image will now fill the screen and there will be no distortion. This aspect ratio is actually 16:10, so if you watch a 16:9 DVD or TV show on it, there will be very thin black bars running along the top and bottom of the image.

'Restrictions in hard disk capacities have plagued PCs in the past'

Q I want to install an extra 650GB hard disk to store my CD collection, but I read there was a maximum capacity constraint with Windows, the motherboard or the Bios. Also, the hard disk, a Samsung Spinpoint HD642JJ, is a Sata model, which I have not previously installed; my existing drives being IDE.

Will this disk work with Windows XP Home SP2 and my Asrock P4VT8+ motherboard? Will it work alongside my existing two IDE drives, and if so, do I need to configure it in a Raid mode?
Brian Lawrence

A Restrictions in hard disk capacities have plagued PCs in the past. Most issues were ironed out some time ago, so recent hardware and operating systems should work fine with large disks. Even older PCs can normally accommodate large disks with the aid of a new disk controller on a PCI expansion card.

Your Asrock motherboard has a pair of Sata ports and their controller should handle your proposed disk, although if there's a Bios update available you may want to install it first. If the Sata controller option is not already enabled in your Bios setup pages, you'll need to do that, after

Syncing problems

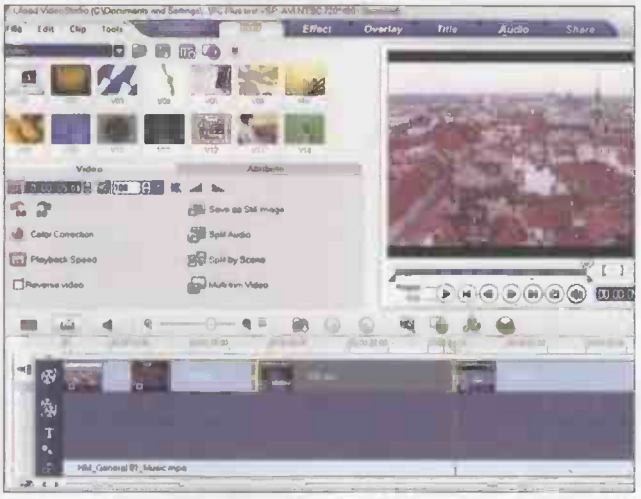
DIGITAL IMAGING

Q I recently retired my old PC for a new super-duper machine with 4GB of memory, quad-core processor and massive hard drive in order to speed up editing home videos. A video that used to take nine hours to render can now be done in about two. However, the final result gradually goes out of sync with the audio and video. I'm using Ulead Videostudio 10 with all the updates.

I've done much research into why a project with only AVI video clips that are in sync in Ulead go out of sync when I try to output it to hard drive video format folders. One of the suggested cures was to make sure that the soundcard was not on the motherboard but freestanding. Is this true? I can't see what the soundcard's role is in rendering but please tell me if I'm wrong and I'll happily buy one.

If I render to MPEG and then convert that to DVD format then the sound stays in sync. If I render it on my old PC it still stays in sync (though as I said takes nine hours), which suggests some problem with my new setup.

Roy Houghton



Ulead Videostudio 10 is able to perform encoding and burning in a single step

A Generally, video and audio sync problems arise because, as part of the MPEG2 encoding process, the video and audio streams in an AVI file need to be separated, or demuxed. There are a number of reasons the two might go out of sync; the question is what can you do about it?

It's unlikely your soundcard is the cause of the problem. It's more likely to be connected to the codecs you are using to capture the original material and encode the MPEG2 video. You don't say what the source material is, but if you plan to edit, try capturing using the DV-AVI codec, then encoding to DVD-compliant MPEG2 prior to burning (Videostudio can combine encoding and burning in one step).

which you may see the option to configure it as IDE, AHCI or Raid.

The AHCI and Raid options will exploit the native Sata features on your disk, but both will need a Windows driver loaded before XP will be able to use it; your motherboard should have come with one, or download one from the Asrock website. There's no need to use Raid unless you're connecting two Sata drives and configuring them as a Raid array. Alternatively, choosing IDE mode may slightly reduce performance, but will allow the drive and controller to work straight away in XP without the need for a driver. Depending on how your motherboard Bios treats disk controllers, your drive letters may be rearranged after installing the new disk.

SPREADSHEETS

Q Our charity booth is open from 7:30am to 4:45pm everyday, except weekends. Is there an Excel formula for calculating how many hours and minutes someone has worked there, allowing for them to be half an hour late on the first day and leaving half an hour early on the last day?

Ali Dhillon

A The NETWORKDAYS function can eliminate the Saturdays and Sundays from the result. A combination of MEDIAN and MOD can help calculate the rest. Format cells C6 and D6 to 'ddd d/m/yyyy h:mm AM/PM'. Format cell E6

How to prevent someone printing your spreadsheet

SCREEN 1

	A	B	C	D	E	F
1		2001	2002	2003	2004	2005	2006
2	Spares	£ 23,456	£ 21,654	£ 20,987	£ 22,345	£ 21,456	£ 22,456
3	Insurance	£ 7,800	£			8,200	£ 8,300
4	Aircraft	£450,876	£4			60,128	£726,140
5							
6							
7							
8							
9							
10							
11							
12							

```
[h]" hrs":mm" mins"
```

The square brackets tell Excel to calculate elapsed time. The result is in hours and minutes. If the person starts half an hour late on the first day, say 30 June this year, enter in cell C6

```
30/6/2009 08:00
```

If they leave half an hour early on 7 July, enter in D6

```
7/7/2009 16:15
```

For the total time worked, in cell E6 enter:

```
=(NETWORKDAYS(C6,D6) ↙
1)*("16:45"
"07:30")+IF(NETWORKDAYS↙
(D6,D6),MEDIAN(MOD(D6,1),↙
"16:45","07:30"),"16:45")
MEDIAN(NETWORKDAYS(C6,C6)↙
*MOD(C6,1),"16:45","07:30")
```

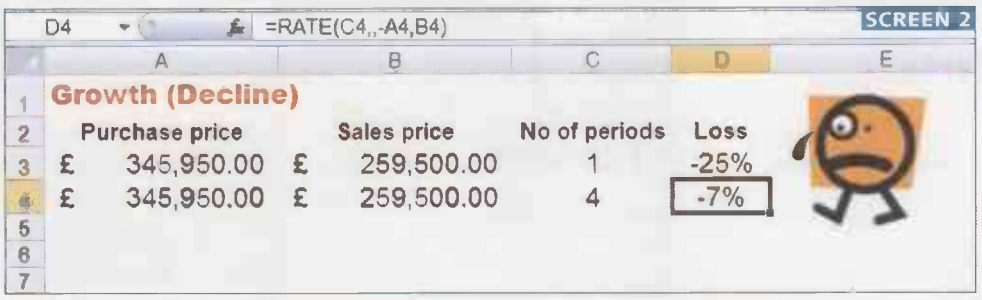
(Key: ↙ code string continues)

The correct answer to this example is 54 hours 30 minutes.

Q I want to be able prevent a user from printing any of the data contained in an Excel workbook. Can you help?

Dave Barber

A You can use a macro to do this. Press Alt & F11 to open the VBA for Excel editor. Double-click on ThisWorkbook in the left-hand panel. In the right-hand panel enter: ↘



Calculating the percentage loss in value of a property

```
Private Sub workbook_
BeforePrint(Cancel As Boolean)
Cancel = True
MsgBox "You cannot print this
workbook", vbInformation
End Sub
```

Close the VBA editor and save the file. The Message Box is optional, but if a message is not displayed when someone tries to print the file they might think there is a problem with their computer. This macro will prevent the print preview being shown with Ctrl & F2. The workbook can't be printed either via the regular menus or the keyboard shortcut Ctrl & P (see screen 1).

This answers your question, but bear in mind there is little total security in Excel. There are many ways users can extract data, formulas or graphics from a spreadsheet.

Q A property that was bought for £345,950 four years ago has just sold for £259,500. How can I calculate in Excel the total percentage loss in value and the average loss each year?
James Wolseley

A If you wish to ignore the thousands frequently claimed by the government, solicitors, and estate agents when buying and selling, enter the purchase price in cell A3 and the sales price in B3. In C3 enter the number of years. In D3 enter `=RATE(C4,,-A4,B4)`

The extra comma is needed because the normal second argument of the RATE function, a mortgage payment, doesn't apply here. In this example, the rounded results are that the property has lost 25 per cent of its value overall representing an average of seven per cent a year (see screen 2).

Q When using Windows XP, I was able to copy a picture from a file and add it to a comment relating to a particular cell on an Excel spreadsheet. I'm now using Windows Vista Basic and would like to be able to do the same. Is this still possible using Vista Basic, and second, if it is possible would you remind me of the procedure?
Dave May

A The version of Windows is irrelevant – it's the version of Excel that matters. The most recent versions allow you to do it. Right-click on a cell and choose insert Comment. Highlight your name, if it appears, and press Delete. Hover on the edge of the Comment box until a double-headed arrow appears. Right-click and choose Format Comment. Click the Colors and Lines Tab. Click the down arrow near the Fill Color: box. Choose Fill Effects and then the Picture tab. Click the Select Picture button, which takes you to your My Pictures folder. From there, navigate to the picture of your choice and select it and click Insert and OK twice. Chances are the picture will be distorted so correct this by dragging out the sides of the Comment box (see screen 3).

LINUX

Q I would like to install a new version of Ubuntu. I have backed up my documents, but I want to keep my Firefox cookies, passwords and so on.
Peter Bird

A All Firefox settings are stored under '.mozilla' in your home folder. However, files and directories that begin with a dot are traditionally treated as hidden in Unix systems, and so Nautilus will not usually display them. You can override this by selecting 'Show Hidden Files' from the 'View' menu (or pressing Ctrl & H).

First, ensure you have quit Firefox completely. Now drag the .mozilla folder to your backup. In your new installation, once again display hidden files in Nautilus and delete any existing .mozilla folder, and then just drag your original folder back in place.

WORD PROCESSING

Q Every time I load Microsoft Works the font defaults to Times New Roman size 10. How can I change this setting?
Joan MacDonald

'I want to use superscripted numbers in a Word document'

A You need to create a template for your documents. Start a new blank document in Works, then set the font and size you want to use as the default. Then, on the File menu, click 'Save As...' and then click 'Template'. Type a name for the template, click in the 'Use this template for new Word Processor documents' check box, and then click OK. All your subsequent documents should then use the chosen font settings.

Q I am working on a translation of some French poems into English. As the lines are fairly short, I would like to

Using a picture as a Comment

Delay dilemma

WINDOWS

Q When I go to open files in Excel or Word, I get a long delay with a message stating that it is 'Initializing the root folders to display'. Eventually the folders show, but there can then be additional delays in displaying other folders. What is causing this behaviour and how can I cure it? I'm using Windows XP Pro, with all current updates, and Office 2003.
JL Walton

A The usual cause of this is Windows trying to find a mapped network drive that isn't currently available. The cure is to right-click on the desktop icon for 'My Computer', then choose 'Disconnect Network Drive...' This will open a dialogue box in which you can pick a mapped drive and disconnect it.

Alternatively you can open My Computer and you should see any mapped drives – and their current status. You can then right-click on a mapped drive – even if it is shown as already 'disconnected' and disconnect it. Either method should clear the problem.

Disconnected network drives can cause delays

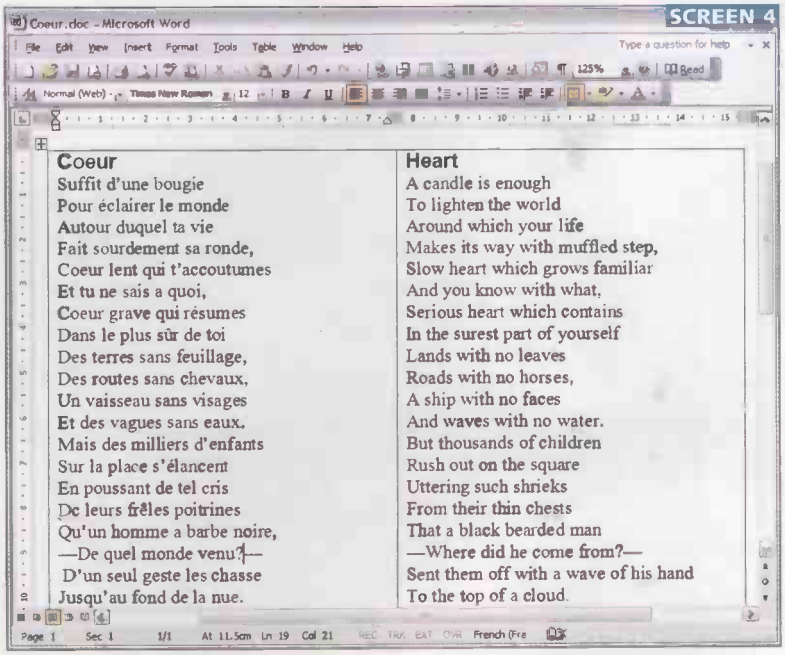
have the verses side by side on the same page. I thought Word's column feature would be the ideal way to achieve this, but I find the two texts get mixed up when I reach the bottom of the column. Am I missing something, or is there a better way?
Gerard Delbos

A As you have found, columns are intended for continuous flowing text – as you see on the pages of *PCW*. For a side-by-side approach, you would be better off using a two-column table. You could either have each whole poem in a single cell (ie a two-column single-row table) or split it up to show each verse in a separate row (see screen 4).

Q **I want to use superscripted numbers in a Word document. I've noticed that although most fonts include these as separate characters, Word 2003 seems to do this by using an ordinary numeral, raised and made smaller. I only need 2 and 3, which I can see from the Windows Character map are present in the font (Times New Roman). Is there a way of getting Word to use these, rather than the 'botched' version?**
Ken Pearson

A It seems a shame Word doesn't use the glyphs kindly provided by the font designer, but there are ways round this. One is to use the Ansi codes for the symbols. With Numlock on, hold down the Alt key and type 0178 or 0179 on the numeric keypad. This should work in any text-entering situation. For a more elegant solution, go to Insert, Symbol. Find and select the proper superscript 2 and click on the Shortcut Key button. In the 'Press new shortcut key' box type a suitable combination – Control & Shift & 2 should be available. Next, click the Assign button, then the Close button. Repeat the process for the true superscripted 3 and you will have the two symbols permanently assigned to the chosen shortcut keys.

SCREEN 4



For side-by-side translation use tables, not columns

LET US HELP YOU

All our experts welcome your queries. Please respond to the appropriate address below

Databases database@pcw.co.uk
Digital imaging & video digitalImaging@pcw.co.uk
Hardware hardware@pcw.co.uk
Linux linux@pcw.co.uk
Networks networks@pcw.co.uk
Performance performance@pcw.co.uk
Sound sound@pcw.co.uk
Spreadsheets spreadsheets@pcw.co.uk
Visual programming visual@pcw.co.uk
Web development webdev@pcw.co.uk
Windows win@pcw.co.uk
Word processing wp@pcw.co.uk

Gordon Laing has been a hardware enthusiast since his first Sinclair ZX80 and as a former editor of PCW and contributor for over 10 years, what he doesn't know about technology isn't worth knowing.

→ Comments welcome on the Hardware column.
Email hardware@pcw.co.uk
Please do not send unsolicited file attachments.

Mini marvel

How to build the perfect compact hi-fi PC

Benchmark's DAC1 PRE is arguably the ultimate means for getting top-quality audio from your PC. But in a hi-fi system, you will want that PC to be small and quiet

In this month's column I'm building a mini PC designed as a source for high-quality audio. It will be small, quiet, consume minimal power, and, crucially, be controlled without the need for an external monitor, keyboard or mouse.

PCs make great audio jukeboxes. They have greater capacities than portables, the opportunity to choose from a wealth of encoding formats, and the potential for better sound quality, thanks to superior software and hardware options.

It's this flexibility that keeps drawing me back to using a PC as both the storage and source for audio in my hi-fi system. Sound quality has become a paramount concern of mine and, despite positive experiences with various streaming appliances, my best results to date have been with a PC.

For playback, I recently switched from a modified Logitech Squeezebox back to a normal PC, albeit one that's connected to the best quality external soundcard I've ever heard: Benchmark's DAC1 PRE. The DAC1 PRE is actually a pre-amplifier with a digital to analogue converter and headphone amplifier, but one of its digital inputs is a USB port, allowing it to act as an external soundcard. The results are fantastic. Costing from £1,400 from online dealers, it isn't cheap as a soundcard alone, but considering everything else it does and the quality delivered, it represents a bargain in serious hi-fi terms; see www.benchmarkmedia.com and check out the latest HDR version, which now includes a remote control.

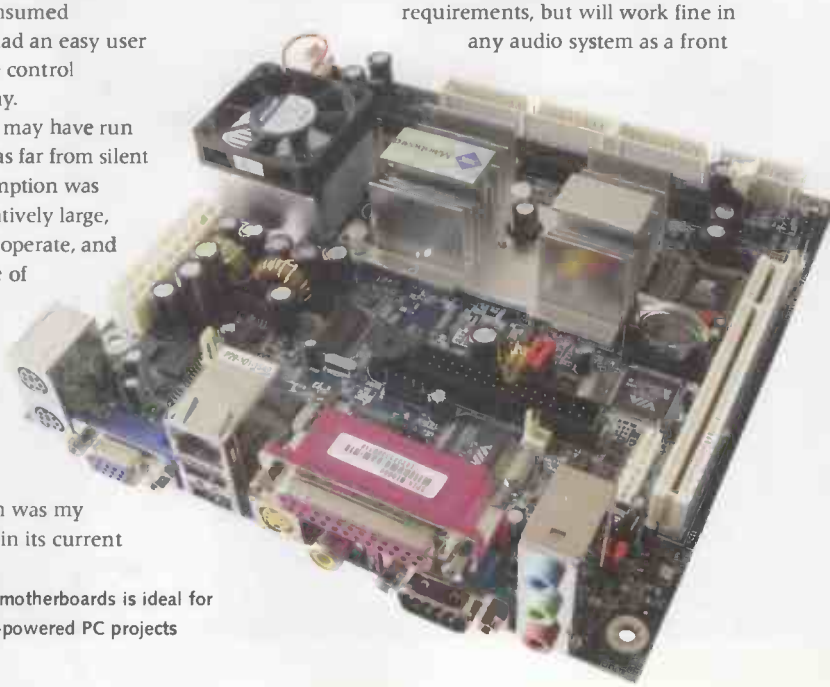
Back in the June 2009 issue, I tested the DAC1 PRE and commented with relief that my journey to hi-fi nirvana was complete. But there was just one problem: I had brought a conventional PC back into my audio system. Previously, I had been using a Logitech Squeezebox that looked great, ran silently, consumed minimal power and had an easy user interface with remote control and fluorescent display.

In contrast, the PC may have run fairly quietly, but it was far from silent and the power consumption was higher. It was also relatively large, required a monitor to operate, and didn't look like a piece of consumer electronics. In short, my audio quality may have finally become everything I wanted, but the PC hardware behind it wasn't.

The PC in question was my media system, which in its current guise isn't particularly attractive, quiet or low-powered, but sits hidden in a cupboard. It's perfect for playing video on a TV, but wasn't ideal for this particular audio task. What I wanted was something small, low-powered, very quiet (ideally silent), and that had both remote-control operation and a built-in display that would allow selection of music without needing a separate monitor.

Ironically, my existing Logitech Squeezebox already met all these requirements bar one: the device also needed to be a full PC running either Windows XP or Vista in order to use the Benchmark DAC1 PRE as an external USB soundcard.

So that's why I'm assembling a quiet mini PC designed for audio playback and operation without an external monitor. To make it interesting, I'm determined not to buy any new parts where at all possible, and instead recycle spare components from old projects. This new build may be driven by my own specific requirements, but will work fine in any audio system as a front



Via's range of Mini-ITX motherboards is ideal for compact, quiet and low-powered PC projects

end, whether you intend to use an external soundcard or the PC's own audio outputs.

Mini motherboard

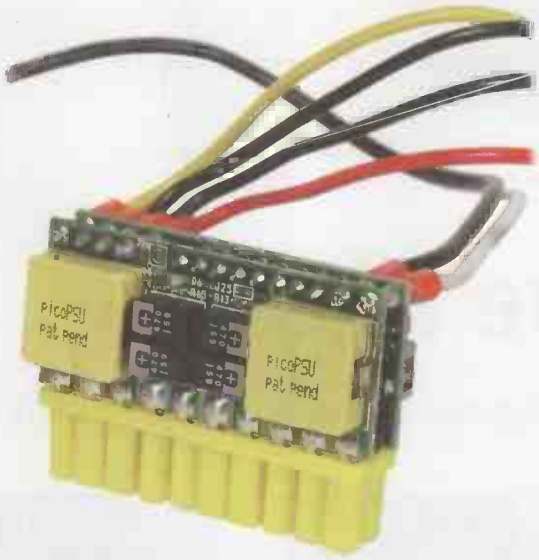
Several years ago I became quite enamoured with Via's range of Epia Mini-ITX motherboards or, more strictly speaking, platforms as they included an integrated processor and graphics chipset. They were small, economical to run and some even had passive heatsinks on their CPUs for silent operation. Via and the small form factor industry has since gone on to offer even smaller boards including the latest Pico-ITX models which measure from just 10x7.2cm.

The original Mini-ITX boards at 17x17cm seem relatively large in comparison, but remain much smaller than a traditional ATX or even Micro-ATX board while still offering a full-size Dimm and PCI slot. Crucially, for my recycled project I also had one spare: an old Via M10000 model circa-2003 with a quietly cooled 1GHz C3 processor and integrated graphics.

There are, of course, newer models available; if you're interested in these or smaller solutions check out the **www.mini-itx.com** website. For my requirements, though, the old M10000 would more than suffice and I fitted it with a 1GB stick of DDR memory, going spare following migrations to DDR-2 and DDR-3 platforms.

For storage, I originally hoped for a budget solid-state solution, such as booting from a Compact Flash card. This would have been small, silent and low-powered, but one of the requirements for this particular project was a full installation of XP or Vista for compatibility with the Benchmark DAC1 PRE. Sadly, the constant disk-hammering of both operating systems isn't particularly friendly to Flash memory cards, and using a modern SSD would have blown the budget and broken my recycling rule.

I'm planning to experiment with a Compact Flash-based Linux installation in the future, but for now it had to be Windows XP running from a hard disk. Not just any old hard disk though: I still had a 12GB 2.5in drive going spare after swapping it out for a 40GB model during a laptop upgrade in 2003. This drive would not only be small and quiet, but sufficiently low-powered to allow a neat power supply – and as for its limited capacity, I would access the bulk of my music collection over a network.



The Pico-PSU is the world's smallest DC-DC power supply, with its circuitry built on top of a standard motherboard power plug

Mini power supply

In May 2006, I tested the Pico-PSU, the world's smallest snap-in DC-DC ATX PC power supply. No bigger than a pair of AA batteries, the Pico-PSU slots into the motherboard's power supply connector. Leads emerge to power various drives, along with one that connects to an external AC adapter brick.

Then I found the Pico-PSU was happy to power a Via Epia board, a full-sized 3.5in hard disk and a laptop-style slimline optical drive, although anything hungrier could push it too far. Since my new system only used a 2.5in laptop hard disk though, with a slimline optical drive temporarily fitted for the initial Windows installation, it was well within the specification.

Pico-PSUs and matching AC adapters are available from £35 and £19 respectively from **www.mini-itx.com**, with the latest models supporting Sata drives and four-pin supplemental connectors – but again be careful about choosing a supply and AC adapter to meet your requirements.

Display and remote

One of the requirements of this project was for it to be entirely operated by remote control. The first step to achieve this was having a built-in display. I found a Matrix Orbital MX630 USB model, tested in November 2005's column. This 20x2 character display uses Polymer Light Emitting Diode (PLED) technology, which delivers similar-looking output to a VFD but with much lower power consumption and wide viewing angles.

Matrix Orbital supplies its displays with the LCDC utility to drive them from Windows, and this includes a plug-in to support Winamp; the existing WA2 plug-in also works with the latest 5.x versions of Winamp. You can browse Matrix Orbital's latest screens at **www.matrixorbital.com**.

Winamp can be configured to work with almost any remote control using a vast array of plug-ins. I'm evaluating a variety from an old serial IR-Man to a more recent USB Windows MCE remote; if you've had particular success – or lack of – with certain models, we would love to hear from you.

End of story?

As I iron out the bugs, there's only one major aspect remaining: the case. The prime candidate is an existing Morex Cubid with a modified front panel to accommodate the Matrix Orbital screen, but this is one area where I may buy a new case – the Mini-ITX store (**www.mini-itx.com/store**) has several from around £40.

While not quite totally complete, this system has been one of my most satisfying projects to date due to its entire construction (so far) from old spare parts. While writing this column I was surprised to find many of them were up to six years old and it feels great to give them another outing. If you have been building and upgrading PCs for some time, you'll almost certainly have a collection of old parts that could be recycled for a system like this. Drop us a line if you're undertaking or have completed a similar project. PCW

In order to navigate a music collection on a PC without a monitor connected, you will need another kind of display, such as a Matrix Orbital MX630

Gordon Laing has been a hardware enthusiast since his first Sinclair ZX80 and as a former editor of PCW and contributor for over 10 years, what he doesn't know about technology isn't worth knowing.

→ Comments welcome on the Performance column.
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Alternative hacking

Discover how consumer electronics devices can be boosted by hacks

Hardware enthusiasts are rarely satisfied by the performance of components straight out of the box any more. Most of us have tried modifications that result in either faster speed or greater features, which in turn encourages a search for various tweaks early in the life of a new part – or to deliberately buy one that has a good reputation for this kind of thing.

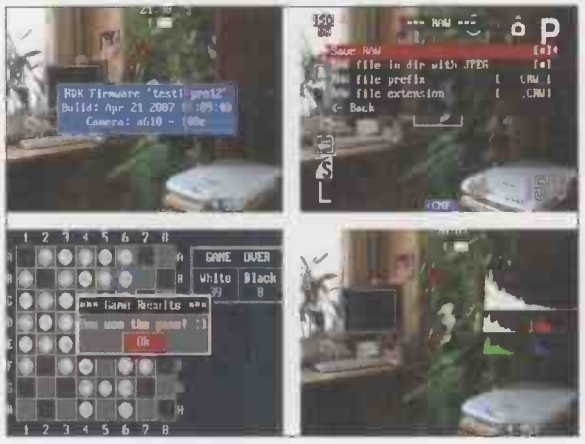
While overclocking processors is the most visible and widespread form of performance hacking, the projects that most interest me are those involving consumer electronics – devices that, from the outside, look like closed systems with as much chance of tweaking as a domestic fridge.

Over the years, my favourite 'upgrades' have included equipping a Tivo PVR (personal video recorder) with networking facilities, hacking an Xbox to boot Linux and run other programs, and swapping the hard disk on a Sky+ box to achieve longer recording times. If you're interested in the Sky+ hack, go to www.morlocks.co.uk/sky.htm.

The reason all these things are possible without a degree in electronics, is because most use standard PC parts and recognisable software. All these devices have a processor that might be persuaded to run modified code to expand the feature-set. One of the more intriguing hacks of recent times does just this with a range of Canon Ixus and Powershot digital cameras to include options normally reserved for much pricier models.

CHDK it out

The Canon Hacker's Development Kit, or CHDK for short, can equip many basic Ixus and Powershots with Raw recording and live histogram facilities, long exposures and a variety of bracketing features, not to mention options to fine-tune the bit rate of video modes or remote control the camera over a USB connection. Many of these features, especially Raw support, were previously reasons to go for pricier models instead, but if your camera is compatible with CHDK you may be able to enjoy them for free.



The Canon Hacker's Development Kit software can add various features to Canon's Powershot and Ixus digital cameras, such as remote control over USB (top left); Raw image support (top right); basic games (above left); and live histograms (above right)

As with all modifications and tweaks, you run CHDK at your own risk. Compared to many hacks, CHDK is remarkably discreet and, technically, shouldn't invalidate your warranty.

Software is copied onto an SD card and executed by first starting the camera in Play mode, then choosing Firm Update from the Menu if nothing further happens. The camera will then reboot with new menus and features. At no point does it change any code within the camera so that once you remove the card, or switch off the camera, CHDK effectively disappears without a trace. Most cards will need to be write-protected for CHDK to work, and since it also only works on Fat 16 file systems, large cards will need a small Fat 16 partition created for it.

Head over to the wiki page at http://chdk.wikia.com/wiki/CHDK for a list of supported models, the code and how to get it working, but check the firmware version of your camera, too, as some revisions aren't supported.

If you want to find out the firmware version of an Ixus or Powershot, but there's no menu option to display it, first create an empty text file using Notepad and save it in the root of your memory card with the name 'ver.req', ensuring there's no .txt file extension. Then, with the card inserted in the camera, start it up in Play mode, hold down the Function/Set button, then press the Disp button. The firmware version should be revealed.

At the time of writing, CHDK mostly supported older Canon models running Digic 2 or Digic 3 image processors, including popular models such as the A620, A640, A720 IS and G9. Towards the end of 2008 though, Canon began releasing models that used its latest Digic 4 processor, including the Powershot SX10 IS, which has already become a big seller.

The SX10 IS launched alongside the higher-end SX1 IS, which recently enjoyed an official firmware update to equip it with Raw recording facilities; good for SX1 IS owners, but frustrating for those who bought the SX10 IS.

Thankfully the SX10 IS has become the first Digic 4 model to get a CHDK port, which unlocks Raw recording capabilities, among other features. At the time of writing though, it was a limited beta version that only worked on models running firmware version 1.01a. My test camera reported version 1.00c, so sadly I can't yet report on its effectiveness, but those with compatible firmware are reporting some success.

CHDK is one of the most exciting and useful hacks around, and proves you don't always have to upgrade to a pricier model to enjoy certain features. We hope Canon takes notice of CHDK's popularity and considers equipping more than just its top models with official support for Raw and live histograms. If you're using CHDK, we'd love to hear from you. PCW

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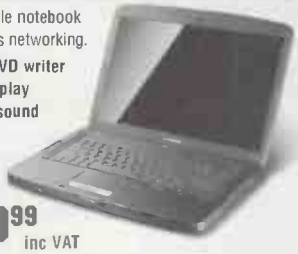

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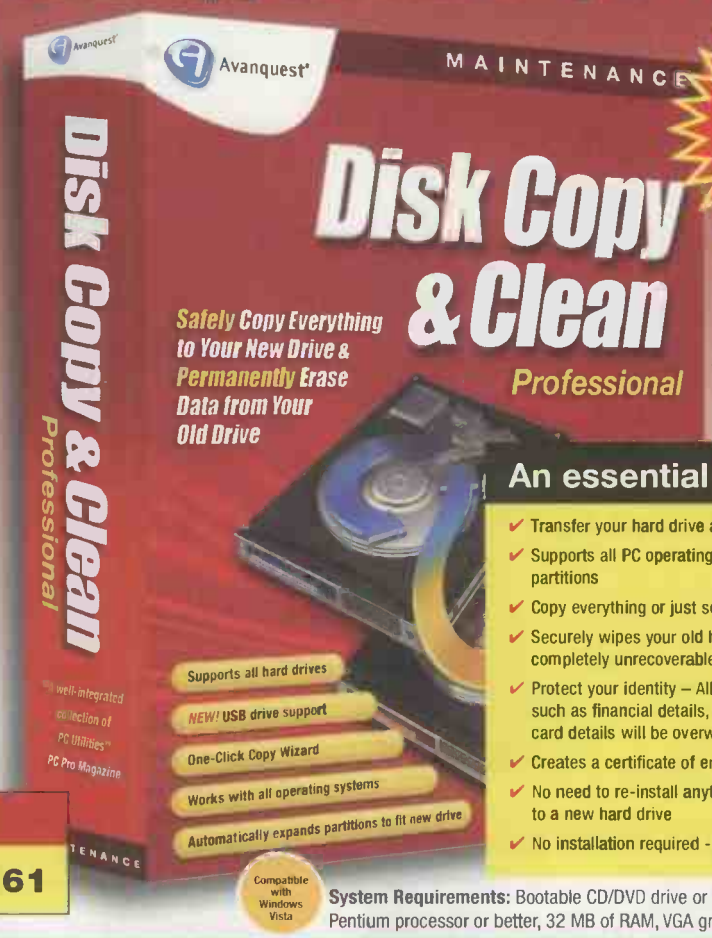

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Paragon Disk Wiper 8.5*

Safeguard personal data by erasing your drive

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Winamp 5.552
Windows 7 Upgrade Advisor
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Xmarks for Internet Explorer 1.0.10

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Microsoft Debugging Tools for Windows 6.11
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TweetDeck 0.25
twhirl 0.9.2
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6 SHAREWARE

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USING THE COVER DISC

The PCW cover disc uses a web browser-style interface. To get full functionality, you'll need to use Microsoft Internet Explorer (version 5.5 or later). Unfortunately, Netscape doesn't properly support this software. However, we have also provided links to the featured programs, so you can still copy them to your hard disk or install them manually (the standard download dialogue box will appear). Programs can be found in the \software\folder on the disc.

STARTING THE DISC

The CD-Rom (or DVD) should auto-start. If it fails to do so, double-click the CD-Rom/DVD icon in My Computer or open the terms.htm file on the root of the disc.

PROBLEMS?

We cannot give support on programs on this disc. If you have problems running the disc, follow these guidelines:

PROBLEMS INSTALLING/RUNNING THE SOFTWARE

Check the support page on the disc or check the manufacturer's site.

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For details on cover disc support and frequently asked questions about the discs go to **www.pcw.co.uk/disc-support** For faulty or damaged CDs/DVDs please email disc_support@pcw.co.uk for a replacement, giving the details requested on the website. If you have no internet access, call 020 7316 9706 between 10am and 6pm Monday to Friday. Please note that PCW cannot give technical help/support.

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Paragon Disk Wiper 8.5 SE

Securely erase hard drives and keep your data safe from snoopers

INFORMATION

System requirements Windows 2000/XP (32/64-bit), Vista (32/64-bit), 40MB hard drive space

Contact Paragon Software www.paragon-software.com

Registration Follow the instructions during installation

When you accidentally delete a file, Windows doesn't immediately remove the data from your hard drive. Launch a suitable undelete tool and your document should quickly be restored.

When you intentionally delete files containing sensitive information, however, this isn't such good news. You can delete its files and folders, erase the whole partition, even format the drive, but the data is still accessible to the drive's next owner. User names, passwords, business information, financial records could all be uncovered.

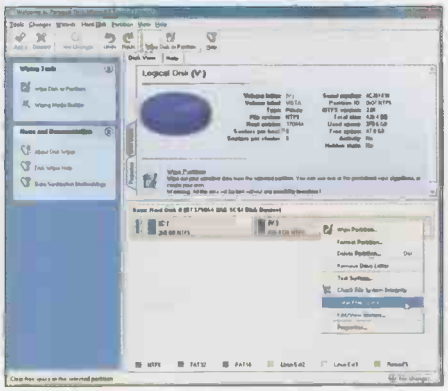
Fortunately, Paragon Disk Wiper 8.5 has a solution to this problem: it overwrites your data. Just doing this once is enough to defeat undelete utilities. But you can also overwrite the drive multiple times, putting your data beyond the reach of even specialist data recovery hardware.

At the simplest you can use this technology to wipe free drive space, ensuring that nothing on your drive can be undeleted. The next step up is to wipe a complete partition or drive, perhaps before passing it on to someone else.

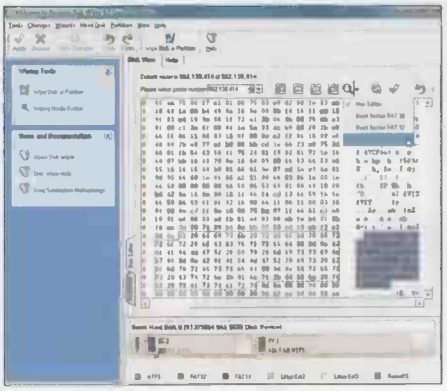
And you're even able to build a bootable CD with a standalone version of the program, which can then be used to quickly wipe the system partition on PCs with a single hard drive.

This isn't a program to be used lightly: point it at the wrong drive and you'll lose everything. But well-designed wizards, graphical displays of what you're doing and requests for confirmation protect your PC and ensure the wipe process delivers the results you need.

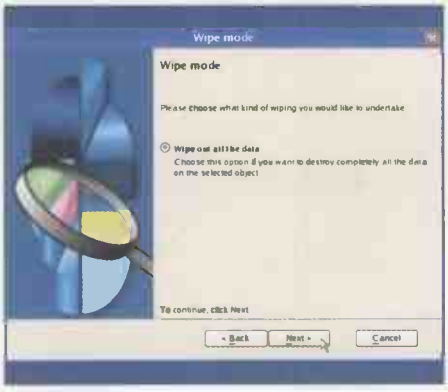
Three reasons you need Paragon Disk Wiper



1 Paragon Disk Wiper isn't just for those rare occasions when you're selling a PC or hard drive. You can also use it to wipe only free hard drive space, so erasing any confidential files you've deleted recently. It's very easy to use – just a few clicks and your documents will be lost forever.



2 Maybe you have other programs that will do similar things. But will they also let you inspect your drive at the sector level to confirm that everything is gone? You can even use this to edit individual sectors, fixing low-level drive problems, if you know what you're doing.



3 Paragon Disk Wiper can't delete the drive where it's installed, but the authors have thought of that, too. Click Tools > Wiping Media Builder to build a bootable CD, DVD or floppy with its standalone version of the program. Then boot your PC from that disc and use it to erase any drive you like.

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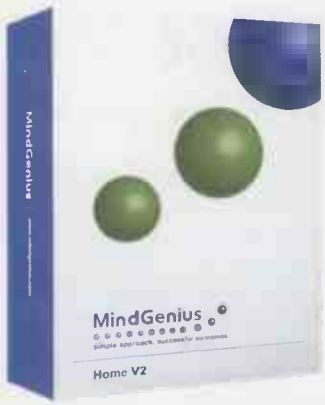
Paragon's Hard Disk Manager takes the Disk Wiper features, then adds all the tools you need to create, move, resize and otherwise manage hard drive partitions. There's also hard drive cloning, backup and restore (file level and image-based), a defrag option, and excellent disaster recovery tools that could get a broken PC booting again. The suite includes just about every hard drive tool you'll ever need, yet still costs only around £35. Find out more at www.**paragon-software.com**.



MindGenius Home 2

Brainstorm more effectively with this powerful productivity tool

INFORMATION

System requirements Windows XP (32/64-bit)/Vista (32/64-bit), 100MB hard drive space
Contact MindGenius www.mindgenius.com
Registration Launch the program, select Activate Product and use licence code YG20TM-67050 and security code 476337688 to register your free copy

When you take on a complicated project – perhaps organising a wedding, starting a new business or just writing a report – the first step is almost always the most difficult. It's just you, a blank page, and a single question: where do I start?

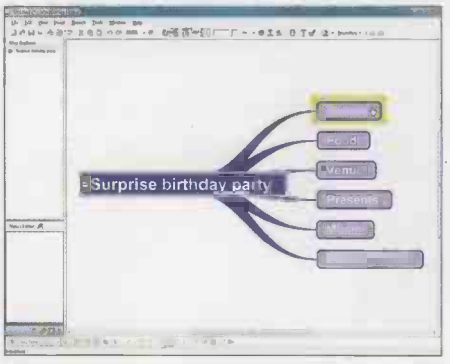
You could struggle on with a piece of paper, start making text notes and see what happens, but the chances are you'll get much better results by installing MindGenius Home 2. This graphical tool makes it quick and easy to create mind maps (intuitive diagrams that visualise and organise your ideas), and is the ideal companion for any brainstorming session.

When you're working through an initial list of ideas, for instance, the program doesn't get in your way. If you're planning a holiday with friends, perhaps, then you don't have to interrupt your discussions to browse menus or search the toolbar. Just type in any ideas that come to mind (destination, who's coming, cost, transport to the airport and so on) and an attractive mind map will be generated.

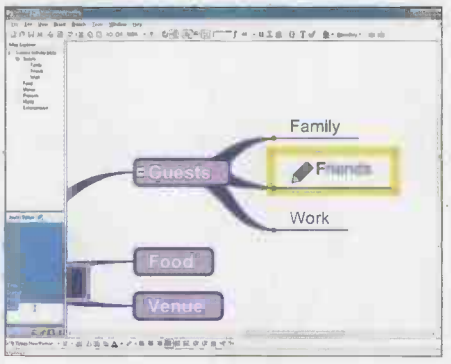
Some of these items will then inspire other thoughts, perhaps including your own ideas on the holiday destination. So click the Destination branch, type in your preferred options, and they'll automatically be added to the diagram. Each new idea will help you think of others, and you'll soon have a clear and detailed mind map that breaks down your project into more manageable steps.

Finally, you can export this as an RTF file and email it to anyone else involved in the project.

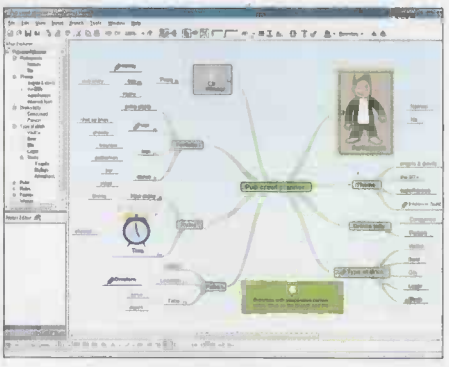
Quickly generate, organise and share your ideas



1 Click File > New and enter a name for your project, 'Surprise birthday party' for our example. Then think of an idea that represents a task you'll need to sort out, such as who's coming, type Guests and press Enter. Repeat the process with other ideas, such as food, venue, presents, music and entertainment.



2 Start to expand the branches with more ideas. Who's coming to the party, for instance? Click the Guests branch, type Family and press Enter, then add Friends and Work branches. Click each of these in turn, make notes of who you want to invite in the Notes Editor, and they'll be easily accessible later.



3 If you are not happy with the default font or colour, double-click a step and format it to suit your needs. Would an image help bring your mind map to life? Right-click a step and select Add/Edit Picture. The results can be impressive – click Help > Sample Maps to get a feel for exactly what's possible.

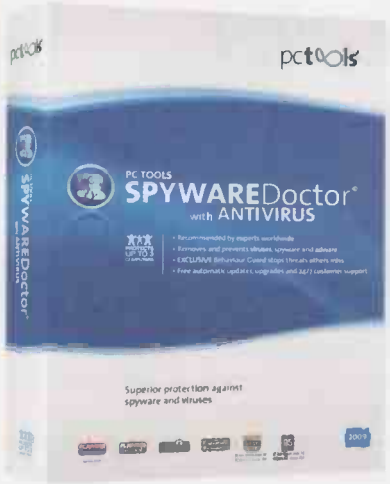
UPGRADE OFFER

NEW FEATURES

More images, icons, backgrounds
Hyperlink to web/files
Microsoft Office integration
Zip up maps with linked files
PDF Export
Save as web page

MINDGENIUS BUSINESS 2

MindGenius Business 2 takes the core Home features and adds a library of professional images, icons and backgrounds to spice up your maps. Individual maps or branches can be linked to any website, map or file. Integration with Office means you can import contacts from Outlook, and export the finished map to Powerpoint. And you can now also share your maps by exporting them as PDF files or web pages. Best of all, we're offering 10 per cent off the regular prices (£66 for MindGenius Education, £169 for MindGenius Business) as long as you order before the end of August 2009. Just enter the discount code MGPCCA at the checkout.



PC Tools Spyware Doctor with AntiVirus 6 Starter Edition

Complete malware protection that never expires

If you have an anti-virus tool then installing another probably won't be a high priority. But there are plenty of reasons you need to give Spyware Doctor with AntiVirus a try.

The program comes from PC Tools, which has years of experience in malware detection and this current version combines spyware and anti-virus engines to detect and remove more than 1.6 million threats.

It comes with a scanning engine that's fast, accurate and highly configurable. In just a few clicks you can optimise scans for blistering speed, extreme thoroughness, and all points in between. Once you've got it working as you like, the scheduler will automatically run unattended scans without further attention. And in between those scans a real-time detection system called IntelliGuard monitors the files you access, and prevents malicious programs from being launched.

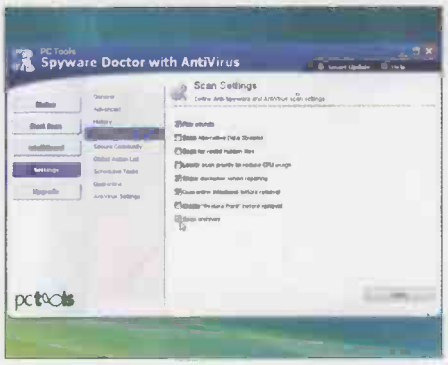
If you're not ready to ditch your existing anti-virus tool, turn off IntelliGuard and Spyware Doctor with AntiVirus should co-exist with other security software. You can then run your current package as normal, and turn to Spyware Doctor with AntiVirus as required for a second opinion.

Best of all, the program isn't going to expire.

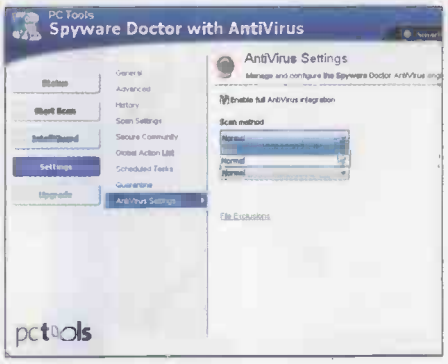
INFORMATION

System requirements Windows Vista (64/32-bit)/XP/2000, 91MB hard drive space
Contact PC Tools www.pctools.com
Registration Not required

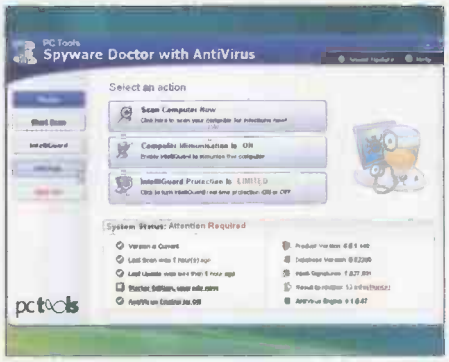
Handy Spyware Doctor tweaks that deliver the best possible protection



1 The default Spyware Doctor settings are good. But with a little tweaking they can be even better. If you're looking for more security, click Settings > Scan Settings, check 'Scan Archives', and the program will check your ZIP files for threats. And checking 'scan for rootkit hidden files' will help find rootkits, but may also double scan times.



2 If you're more interested in performance, clear the 'Lower scan priority to reduce CPU usage' box. Scans will be faster, but use more system resources. Or click AntiVirus Settings and set Scan Method to Fast for a real speed boost. The program will now miss malware that requires a lot of resources to detect, though, so you'll be less secure.



3 Click IntelliGuard > File Guard to configure real-time protection, and choose 'Processes and Scripts' to block malicious scripts. Click Settings > Scheduled Tasks and set up the program to automatically run scans every day, week, month – whatever suits your needs. Then sit back and leave the program to get on with protecting your PC.

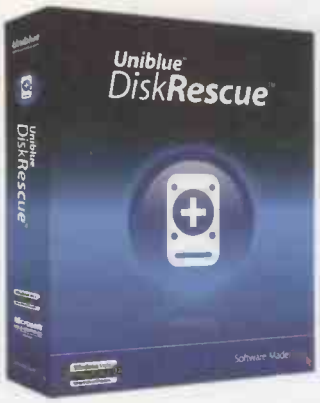
UPGRADE OFFER

NEW FEATURES

Block browser hijackers
Protect your Windows Hosts file
Remove tracking cookies
Block malicious hidden processes
Protect your network settings
Monitor Windows Startup programs

PC TOOLS SPYWARE DOCTOR WITH ANTIVIRUS 6

Move to the regular edition of PC Tools Spyware Doctor with AntiVirus and you'll discover many more real-time protection features. Browser Guard, for example, stops browser hijackers from tinkering with your toolbars, add-ons, favourites, and more. Network Guard prevents malicious changes to your network settings, while Keylogger Guard detects spy programs that record your keystrokes and personal information. Just £39.95 gets you a licence to run the program on up to three PCs for a year, and you can order by clicking Upgrade > Upgrade Now.



Uniblue DiskRescue 2009

Keep your hard drive running at top speed with this defragger

INFORMATION

System requirements Windows XP (32-bit)/ Vista (32-bit), 100MB free hard drive space
Contact Uniblue www.uniblue.com
Registration Point a browser at http://ca.uniblue.com to get your free code
Need to know You need at least 10 per cent of hard drive space free for the scan to work

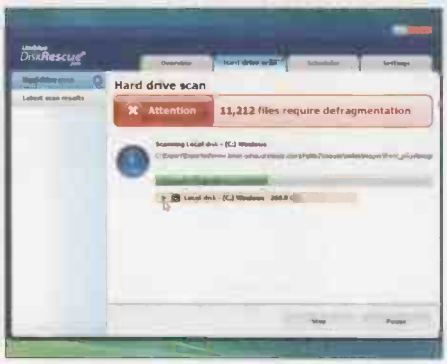
Defragmenting your hard drive occasionally is a simple, effective way to keep your system running at peak performance. You could leave Windows' own defrag tool to handle the job, but it's slow and far from the best solution. The Windows Vista defrag utility won't give you an estimate of how defragmented a drive might be (unless you use the command-line version) and it's less convenient to use than the XP version.

Fortunately, Uniblue DiskRescue 2009 takes a different approach. Launch the program, click Start Scan and it will run a quick analysis of your hard drive (just a couple of minutes to scan 200GB of data on our test PC). You'll then get a detailed report on your file system, including the number of fragmented files and the largest contiguous block of free space, so it's easy to work out if a defrag session is needed.

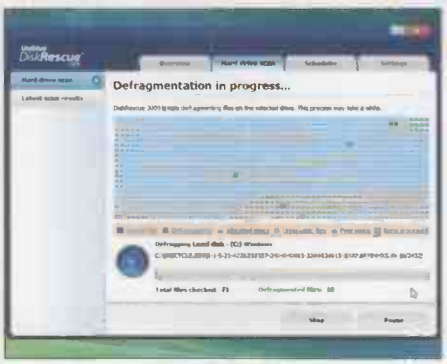
If you decide to defrag the drive, click one button and Uniblue DiskRescue 2009 will start optimising your file layout. It's a speedy process and so the best approach is just to leave your system alone for a while, let the program do its work, and it will soon have your system running at full speed again.

The manual process only requires two clicks, but you can always set up the scheduler to run defrags automatically. There are two options available. Choose the ongoing defragmentation and the program will kick in once your PC has been idle for five minutes. Or you can schedule the Uniblue DiskRescue 2009 to run on a particular time and day, even if you're not around.

Speed up your hard drive in three easy steps



1 Launch Uniblue DiskRescue 2009, specify the hard drive you'd like to defragment, and click Start Scan. Then wait as the program crawls over your file system looking for fragmented files and checking your free hard drive space. Don't worry, despite all the work going on this only takes a couple of minutes.



2 Once the scan is complete you'll probably find that your hard drive has an alarming number of fragmented files. In which case you should click the Defrag button and let Uniblue DiskRescue 2009 rectify this unfortunate situation immediately. Leave the program to it for the best possible defrag speeds.

3 You've set up your hard drive to deliver its best possible performance. But do you keep it that way? Just click Scheduler, check 'Ongoing Defragmentation' and click Apply. Uniblue DiskRescue 2009 will now start defragging whenever your PC is idle for five minutes, ensuring the hard drive is always optimised.

READER OFFER

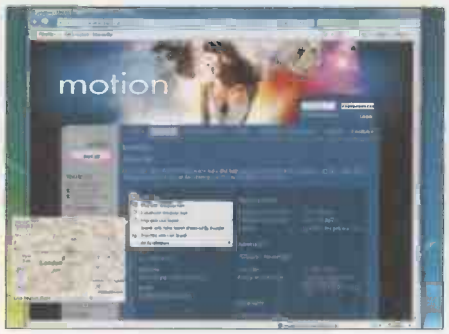
NEW FEATURES

Faster startup and shutdown
Improve stability and security
Customise Windows appearance
Easily navigate Windows settings
Enhance IE and other applications
Explore up to 1,000 PC tweaks

BUY A UNIBLUE PRODUCT AND GET SYSTEM TWEAKER FOR FREE

Uniblue System Tweaker provides easy access to 1,000 different Windows tweaks covering all kinds of areas: simplifying and speeding up your PC startup and shutdown, making your system more stable and secure, customising Windows' appearance to suit your needs, providing easy access to Windows and system settings, and enhancing IE and other key applications. And you can get it free by purchasing just one Uniblue tool from our Registration page. Find out more at **www.uniblue.com**.

Microsoft Internet Explorer 8



INFORMATION

System requirements Windows XP (32/64-bit), Vista (32/64-bit)
Contact www.microsoft.com/windows/products/winfamily/ie
Registration Not required

The new IE8 accelerator will map the most highlighted addresses in a couple of clicks

The latest version of Internet Explorer may not break much new ground in the browser world, but it's still packed with essential improvements.

There's the performance, for instance. IE now loads more quickly, and the Javascript engine is much faster than before. Browser reliability gets a much-needed overhaul and a range of small tweaks reduce the chance of IE crashing and it now remembers which tabs you were viewing and offers to open them again when you restart.

Security enhancements start with the SmartScreen Filter, a tool designed to stop you from accessing dangerous sites or downloading malware. There's a new filter to protect you from cross-site scripting exploits, one of the most common hacking techniques. And Data Execution Prevention (DEP) is now on by default, which provides further protection against buffer overrun exploits.

You'll also find the new accelerators, which deliver handy productivity features. Highlight an address on a web page, say, then click the Accelerator button and select Map with Live Maps to find out exactly where it is. You can also translate pages and find goods on Ebay.

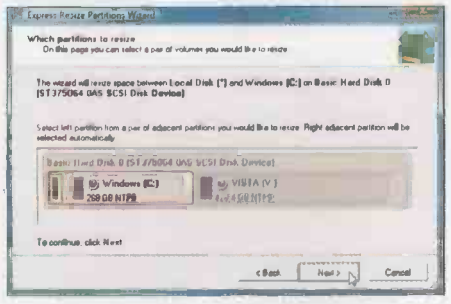
There's also a smarter address bar, improved text finding, better favourites and history management and more.

UPGRADE OFFER EXTENDING IE8

Once you've discovered the standard IE8 features it's worth looking at the extras that are available. Web Slices, for instance, let you access web content directly from your Favourites bar. In a couple of clicks you can be exploring the most popular videos on Twitter, watching Ebay auctions, learning about the latest StumbleUpon sites or Digg stories, and more. Visit **www.ieaddons.com/en/accelerators** to get started.

Paragon Partition Manager 10 Express

ON OUR COVER DVD



INFORMATION

System requirements Windows XP/ Vista, 100MB hard drive space
Contact Paragon Software www.paragon-software.com
Registration Click 'Get free serial' during installation to get your free product key and serial number

Simple wizards walk you through the partitioning process

Partitioning your hard drive can help organise your data, reduce file fragmentation and make more efficient use of the available space, but Windows doesn't make it easy to create the drive layout you need.

The built-in Windows XP partitioning tool will erase your drive while it works, for instance. And while the Vista equivalent won't destroy your data, it's awkward to use.

Paragon Partition Manager 10 Express offers just two core tasks: to create or resize partitions. Choosing either option will launch a wizard to walk you through the process.

This is surprisingly smart, so for example if you're creating a partition then the default 'smart mode' will automatically choose a suitable partition size according to your drive space.

Perhaps the real bonus here is the program's rescue disc, a disaster recovery toolkit that could get a broken PC booting again. Find a blank CD and click Tools > Burn Rescue Kit to create the disc, then keep it safe. If your PC won't start and Windows' own repair tools are no use, then boot from the rescue disc and try the Boot Corrector tool, fixing most startup problems in Windows XP, Vista or 7.

UPGRADE OFFER PARTITION MANAGER 10 PERSONAL

Move to Paragon Partition Manager 10 Personal and you'll be able to create and resize partitions, format, delete or undelete them, redistribute space between partitions, merge two partitions into one, and more. Bonus tools include a simple backup wizard, a hard drive defragger and an Install New OS Wizard to help set up multiple operating systems on the same drive. It costs around £22 and you can order by clicking Upgrade Now on the Paragon Partition Manager 10 Express launch menu.

Tim Nott is a full-time freelance journalist. When he's not writing about Windows and word processing, he tackles many other diverse subjects. He currently lives in France with his wife and family.

→ Comments welcome on the Windows column.
Email windows@pcw.co.uk
Please do not send unsolicited file attachments.

Dealing with XS baggage

Tips to help you manage the resource-hogging WinSxS folder

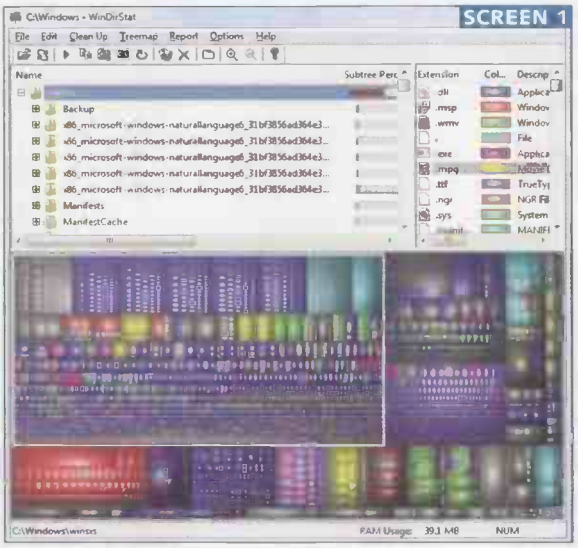
A colleague was surprised to find that the WinSxS folder on his Vista PC was occupying over 7GB of disk space. Intrigued, I looked on my own PCs. Windows XP had a WinSxS folder with a modest 36.5MB, Windows 7 beta totalled 3.8GB, but Vista easily topped the bill with an impressive 8.22GB, comprising 41,644 files in 11,070 folders. There have been reports of this increasing to over 30GB. And in normal circumstances the folder can easily constitute over half of the Windows footprint, as the report from WinDirStat shows (see screen 1).

So, can some of this space be reclaimed and, if so, how? The WinSxS folder is where every operating system file is stored, in what is known as the 'component store'. You'll find everything in here from executables to video files. You will also find different versions of the same file – I had six versions of Explorer.exe on my PC.

One of the biggest changes from XP to Vista was the move from an INF-described operating system to a component basis. INF files for drivers are text files that contain the name, location, version and Registry information, whereas components each consist of one or more binaries (such as .exe or .dll files), a catalogue file and an XML file that tells the system how files should be installed.

The advantages are that if any application needs a particular version of a DLL, then that version will be available – as we see, new versions are accumulated alongside the old, rather than replacing them. Also, if you decide to add a Windows component, you will get the latest version rather than the original released to manufacturing (RTM) version.

You may also notice that many files in the WinSxS subfolders are duplicated elsewhere, typically in the System32 folder. But Microsoft says these duplicates are 'hard-linked' and there is only one copy of each file on the system. Joseph Conway, senior support escalation engineer at Microsoft Enterprise Platforms Support said in a Technet blog: "There is only one instance (or full data copy) of each file in the OS, and that instance is located in the WinSxS folder." However, in another blog, Michael Beck, a program manager in the Microsoft core OS deployment feature team, said: "...nearly every file in the WinSxS directory is a hard link to the physical files elsewhere on the system – meaning that the files are not actually in this directory."



WinSxS can easily take up half of the Windows footprint

Clear as mud

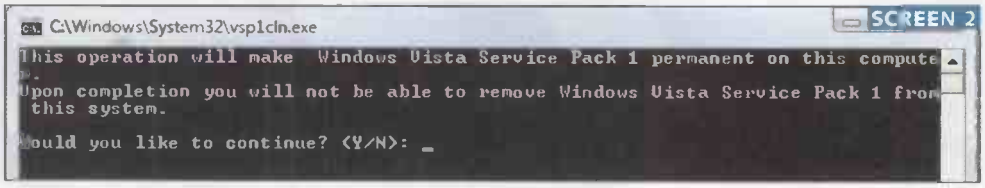
So it seems Microsoft has no consistent view as to where the files really are. Unfortunately, neither Windows Explorer nor the Command Prompt 'Dir' command can tell the difference between real files and hard links. This is a failure on Microsoft's part because the OS can't return accurate information about its own file and folder system. Beck admits: "The fact we make it tricky for you to know how much space is consumed in a directory is definitely a fair point."

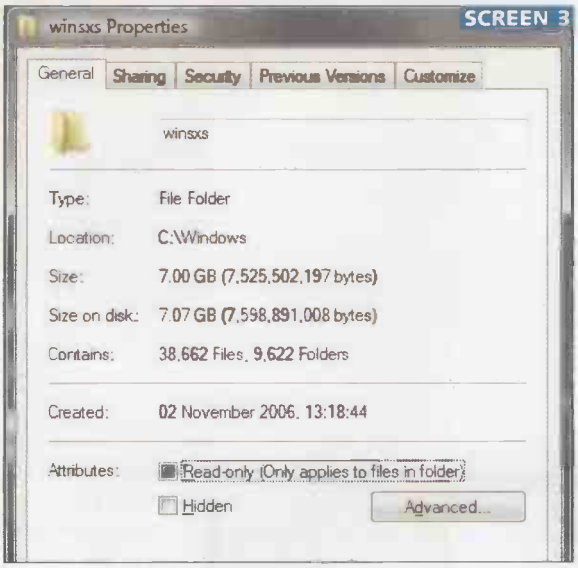
There is a third-party tool designed to differentiate between files and hard links. It's called Sizesxs (available at www.msftmvp.com). Alas, we couldn't get it to work with Vista as it produced a 'not a valid Win32 application' message, but it did work with the Windows 7 beta.

So, what can you do about this folder's appetite for disk space? The answer is very little. You can't move it to another partition because, as Beck said, "Windows Vista only supports the WinSxS directory on the physical drive in its originally installed location." Some websites may encourage you to delete files and folders from WinSxS, or offer tools to help. Personally, I wouldn't. You might get away with it – but you could find that certain applications are dependent on particular versions of a DLL and stop working. And you could break Windows Update or Installer. Vista does (or so Microsoft claims) remove files that are no longer needed when you uninstall programs, but this may not happen immediately.

If you have installed Vista Service Pack 1, then you can run the clean-up utility. This makes SP1 permanent, so

Clean up after Vista SP...





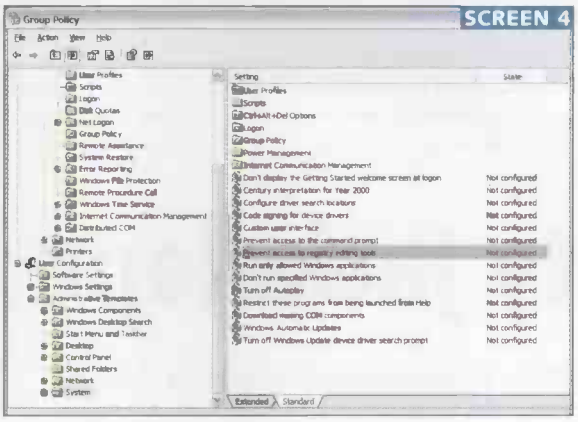
... and claw back 1.2GB

you will no longer be able to remove it. However, it will remove all files that were replaced by SP1 versions. You'll find the utility at Windows\System32\Vsp1cln.exe, or you can just type the name of the executable into the Vista search box. This will open a command prompt asking you to confirm that you want to make SP1 permanent – type 'Y' and the clean-up will commence (see screen 2). On my Vista PC this shrunk the reported size of the WinSxS folder by about 1.2GB, removing some 3,000 files and 1,400 folders (see screen 3).

Oh no, it's a virus

This month I got a virus that came from infected media – in this case a DVD. In a moment of imbecility I double-clicked on an EXE file, and the damage was done. Following a reboot AVG anti-virus sounded the alert, but couldn't eradicate it. System Restore wouldn't work, MSconfig wouldn't run and neither would Regedit or the Task Manager. Spybot Search and Destroy got rid of some more, and reported that Registry editing had been disabled. However, it failed to reinstate the latter. Microsoft Windows Defender seemed blissfully unaware that anything was happening.

Eventually, I identified the villain as Regsvr.exe. Despite the plausible name, this is not a Microsoft Windows file – though Regsvr32.exe is. Another clue is that although the file is an executable, it has a folder icon, which is another reason to turn off 'Hide extensions...' from Folder Options, View. After deleting several copies of Regsvr.exe and disabling its start-up entry, I thought I'd fixed the problem.



The trick is to enable the entry and then disable it

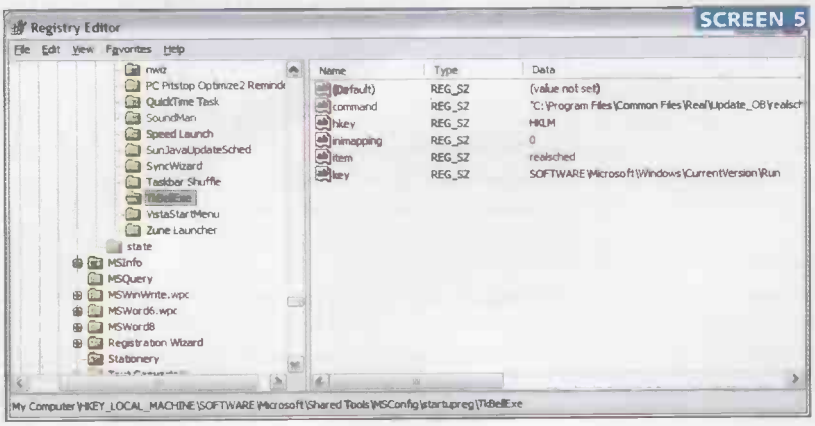
But two issues remained. First, although MSconfig and the Task Manager were back, I still couldn't run Regedit. Registry editing tools had been 'disabled by my administrator'. A trip to the Group Policy Editor revealed that under User Configuration, Administrative Templates, System, the 'Disable Registry editing tools' entry was set to 'Not configured' (see screen 4). This is as it should be, but Regedit was still disabled. The trick is to enable the entry, then disable it again (or reset it to 'Not configured'). This round-tripping corrected the problem and access to Regedit was restored.

The other problem was that when XP started it complained that it couldn't find Regsvr.exe. This is because it had been deleted. But if you disable a Startup item from MSconfig, it still tries to find it and complains if it can't. Disabled start-up items are still stored on the PC, otherwise you would not be able to re-enable them. The answer is to run Regedit and go to HKEY_LOCAL_MACHINE\Software\Microsoft\Shared Tools\MSConfig\startupreg. Each disabled item will have its own sub-key here, and deleting this will remove the reference and get rid of the annoying message (see screen 5).

Whoops

Further to the mention of Windows Defender and Software Explorer in the June 2009 issue, several readers were puzzled by the absence of this in XP. Eddie Hill, Allan McKendrick and John Lewcock all said that. despite being up to date with Windows Updates, there was no trace of either on their XP PCs. I assumed that Windows Defender was delivered as part of XP's update schedule, but it isn't – you need to download it from http://tinyurl.com/5q36co. As well as managing start-up programs better with Software Explorer, Defender also claims to provide real-time protection against spyware, pop-ups and 'other unwanted software'.

Further confusion was caused by comments on the Task Manager in the May 2009 issue. I said that pressing Ctrl, Alt & Del in XP takes you straight there. In fact it only does this if you have the Welcome screen enabled – if not it takes you to the Windows Security dialogue where another button starts the Task Manager. My thanks to Derek Souter for helping to clarify this and for pointing out that Ctrl, Shift & Esc always takes you straight to the Task Manger, as does right-clicking on the Taskbar and choosing Task Manager. PCW



Where Windows stores disabled start-up entries

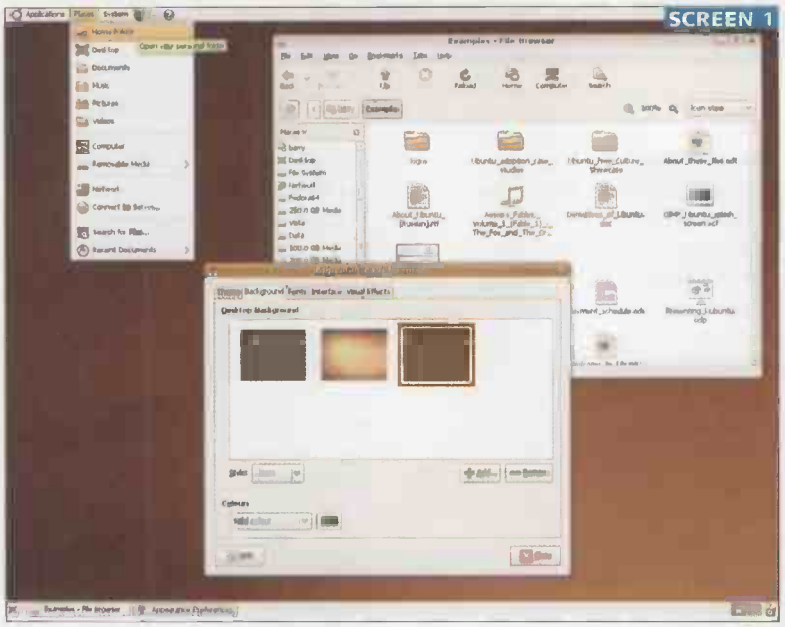
Barry Shilliday has worked with computers for almost two decades. By day, he is a Linux and Unix consultant, but in his free time he prefers to travel the world – and snap it with his camera.

→ Comments welcome on the Linux/Unix column.
Email linux@pcw.co.uk
Please do not send unsolicited file attachments.

Jaunty Jackalope

Take a close look at the latest Ubuntu release

Towards the end of April Canonical released the latest update to Ubuntu, version 9.04, which is also known by its codename Jaunty Jackalope (see screen 1). As usual, this release comes at a six-month interval and follows the release of 8.10 (Intrepid Ibex) in October. Also in common with its predecessor, Jaunty (as it is colloquially known) is not a 'long-term support' release, but a regular release with security updates for 18 months. As a result, if you are running Intrepid, you will most likely want to upgrade to Jaunty, and will have the option to do so through the standard update utility.



The standard Ubuntu 9.04 desktop on a fresh installation

New features

So what is new with Jaunty? A six-month release schedule may be criticised for not allowing enough time for major changes, and that seems to have been the case with the past few releases of Ubuntu. Jaunty comes as another fairly incremental release, predominantly bringing a new kernel (2.6.28) and a new version of the Gnome desktop (2.26). The new kernel will mean better support for newer (and in some cases older) hardware, as well as possible performance increases overall. One significant addition is the support of the new ext4 filesystem, which has recently become marked as stable by kernel developers. This is not enabled by default in Jaunty – it is considered too new by the Ubuntu developers – but can be selected at installation time for those who want to try it out.

Email improvements

The new Gnome release, not unlike Jaunty itself, provides a general update. One change that may interest business users is that Evolution now has better support for interacting with Microsoft Exchange. Outlook backup files (.pst) can be imported directly, and Evolution can use Microsoft Exchange's Mapi protocol. There are other enhancements to the desktop, including the handling of multiple displays and new support for authentication through fingerprint readers. The Brasero CD/DVD burning utility has been fully integrated into the official desktop; previously this was an add-on tool that Ubuntu provided. The audio and video player, Totem, now includes UPnP support, which will allow it to work with many media player appliances. There are also several small updates, such as a warning if you have the caps-lock key pressed while entering passwords, and an appealing cross-fade effect when changing the desktop background. Outside of the Gnome project, Canonical has developed a new notification system that integrates well into the new release. Users of Growl on Mac OSX may be familiar with its style. A small transparent and unobtrusive window appears to relay messages that do not contain any critical information, such as an automatic network connection being established. Since these do not need to be acknowledged, there is no need to dismiss the messages, and they appear only for a short time, causing minimal distraction.

'Jaunty comes in a version that is especially suited for netbooks and their smaller displays'

Quick boot

Developers for many distributions have been working on start-up times recently, and Ubuntu is no exception. Start-up times have improved quite noticeably in Jaunty. This may be especially attractive to netbook users, who will also be pleased to learn that Jaunty comes in a version that is especially suited for netbooks and their

smaller displays. The updates to the kernel will also help with having all hardware up and working immediately upon installation on these machines.

Overall then, there are no enormous changes from Intrepid to Jaunty. The theme, perhaps the most visible side of an operating system to an average user, is little changed once again, though an improvement nonetheless. The general updates to applications, however, are an incentive to upgrade Intrepid. One major criticism I had of this earlier release was that Openoffice was still at 2.4; in Jaunty it is at the latest 3.0 series. Intrepid offered few benefits over the 8.04.1 LTS release for most users, something Jaunty in contrast just manages to do. Although the new release may disappoint some people with its lack of major changes, there is unlikely to be any drawback in upgrading to the new version, especially from 8.10.

Upgrading

Both Intrepid (8.10) and Hardy (8.04.1) can be upgraded. Hardy users will have to set the Update tab in the Software Sources utility to include 'Normal releases'. For new installations, head over to www.ubuntu.com to download the installation CD image. Those using Windows can burn this CD in most CD writing applications, including the free Infra Recorder (www.infrarecorder.org). Linux and OSX users can write the CD with their standard desktop tools.

After a fresh installation, regular readers will probably know exactly what to do next: install the Ubuntu Restricted Extras package. This can be found in the Add/Remove Applications tool by changing the search type to include all software. The package includes support for many essential extras, including Adobe Flash 10, most audio and video playback formats (including MP3 and Xvid), some Microsoft fonts and Sun Java. You should also consider installing any hardware drivers that are available. These considerations are not necessary with upgrades; the packages will automatically be upgraded along with the rest of the system.

PC-BSD

In the early years of Linux there was a fair amount of competition between it and the BSD variants. These are similar Unix-based operating systems,

The graphical installation for PC-BSD 7.1

the most popular of which became FreeBSD (www.freebsd.org). In recent years, FreeBSD has been left behind somewhat, especially on the desktop, with Linux gathering momentum with developers and users, and more widespread adoption.

PC-BSD, a relatively recent system, is sometimes seen as the 'Ubuntu of FreeBSD'. It aims to make the installation and management of FreeBSD on the desktop simpler, providing a graphical installation program and a selection of desktop applications. A new version, PC-BSD 7.1, was released in April and has been receiving some praise in a number of blogs (see screen 2).

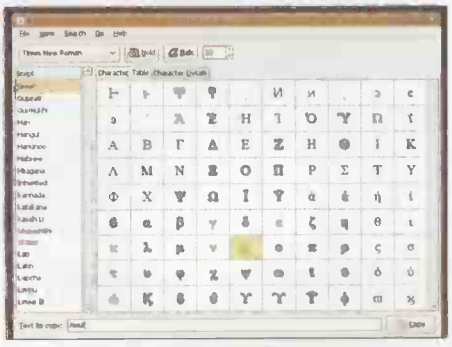
To most people, PC-BSD will likely be mistaken for Linux. It uses the same desktop software available for Linux (KDE 4.2) and the same applications (such as Firefox), but the low-level operating system (ie the kernel, the command line tools and associated software libraries) is from FreeBSD. Some might therefore ask if there is much point, yet PC-BSD does offer another free and secure alternative to Linux with a different method of obtaining software; many who have used Unix since the early 1990s, or before, will also have a fondness for BSD-based operating systems. One major difference between Linux and FreeBSD is that Linux distributions are put together as the distributor pleases, using different versions of system libraries and applications, while FreeBSD is a complete operating system with fixed versions of software. In that way it is comparable to a single release of a particular Linux distribution. Some potentially significant drawbacks, however, include limited hardware support compared to Linux, and no official Adobe Flash support (though Flash 9 can be configured to work).

PC-BSD is available at www.pcbsd.org as a bootable installation DVD for 32- and 64-bit Intel systems. PCW

An easy way to add accents to text

Reader Mark Brummitt often finds himself wanting to write Italian and French text and wonders how to go about entering accented characters easily. Currently he uses the Character Map application, which he finds more difficult than the Windows method of using the Alt key followed by various numeric codes.

The character map application is useful for entering unusual letters and symbols, but there is a much simpler method in Linux for the more common accents. Instead of having to remember three-digit codes for every accented character, you just have to remember a certain key combination for a certain type of accent.



A useful application for entering some unusual Unicode characters

TABLE 1

Accent	Dead key	Example
Acute	;	éó
Circumflex	'	êô
Grave	#	èò
Diaeresis	[	ëö
Caron	@	ěǒ
Macron	}	ēō
Cedilla	=	ç̧

For example, Alt-gr & ; are used to enter an acute accent. First press the necessary key combination, then the letter you want to have the accent. So to enter an 'é', first press Alt-gr & ; then release the two keys and press the E key next. There are many of these key combinations, known as dead keys, and in the table I have listed a few of the most common. You will notice that the dead keys are all conveniently collected together on the right-hand side of the keyboard.

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Ken McMahon is a freelance journalist and graphic designer. His involvement with digital cameras began with a Commodore 64. He graduated to Macs and now works mostly with PCs.

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Losing focus

How to digitally create your own depth of field with realistic results

Looking at camera hardware and image-editing software, you might think we're all obsessed with image sharpness. Camera manufacturers spend millions developing pin-sharp optics and reducing the effects of camera movement with image stabilisation technology. And then we use software tools to squeeze the last ounce of sharpness from our photos.

But now everybody's attention seems to be concentrated on the blurry bits of a photo and what can be done to enhance them.

At the moment software developers and photographers want to turn sharp areas of photos blurry.

This is nothing new. Photographers have used depth of field to focus attention on the subject and throw everything else into blurry diffusion for a long time, but software tools used to simulate shallow depth of field are now so sophisticated that it's getting harder to tell the difference between 'real' and simulated depth of field.

Depth of field is the bit of your scene that's in focus. When you focus on an object the in-focus area extends in front of and behind what you've focused on. Depth of field is the distance between the nearest and furthest in-focus elements.

The biggest determinant of depth of field is the size of your aperture. Large apertures (small numbers such as f1.8) produce narrow depth of field, small apertures produce larger depth of field. Other factors that influence depth of field include the lens focal length and distance from the subject.

But why do we need software tools to recreate it? The answer is that conditions and equipment often make it difficult or impossible to create shallow depth of field. With ultra-wide-angle lenses even the maximum aperture may not throw the background out of focus. Longer lenses, the distance from camera to subject (long) and subject to background (short) can all make life difficult.

Bokeh is great for simulated depth of field effects

If you want to know more I'd recommend a good basic photography book *Basic Photography* by the late Michael Langford (Focal Press ISBN 978-0-24-052035-3).

Artificial depth of field

The simplest way to digitally produce a shallow depth of field effect is to blur the background using a blur filter, but this isn't that realistic. The problem is that out-of-focus elements produced by light passing through a lens are more complex and textured than those produced by a software filter.

Image highlights – lights, reflections on water, leaves on trees – can take on the shape of the aperture diaphragm, producing circular, star-shaped, or polygonal blurred highlights. Blur quality is rarely uniform; it increases with distance from the in-focus zone and varies in quality depending on the nature of the subject. Lastly, the lens can affect the quality of out-of-focus zones and certain lenses are known for producing good results.

The Japanese have a word that describes all these characteristics – Bokeh. Alien Skin software (www.alienskin.com) has chosen this as the name for its Photoshop plug-in that simulates limited depth of field effects by selective blurring. The Bokeh plug-in, which works with Photoshop Elements and other applications that support Photoshop-compatible plug-ins, has gained plaudits and respect for its realistic effects.

Screen 1 shows the Bokeh interface. To the left of the large preview window are three tabs, one of which is for saving and applying presets and one for applying vignette effects. The middle 'Bokeh' tab is the business end and provides settings for controlling the extent and quality of the out-of-focus area.

The region and blur controls offer three options: none, radial and planar. For most purposes the radial button, which allows you to define an elliptical sharp region, is the one to go

Photoshop's Lens Blur filter does a good job of simulating narrow depth of field

for. Two circles appear on the preview; the inner is untouched by the filter and remains sharp and the outer circle becomes less sharp toward its edge. Beyond the outer circle everything is blurred to the same degree. The amount of blur is set using the Bokeh Amount slider.

Better Bokeh

But it's the next set of controls that give Bokeh its edge. The first of these allow you to define the aperture diaphragm shape. This is a crucial element of Bokeh that ordinary blur filters mostly ignore. Lens aperture diaphragms are constructed from overlapping metal leaves that interleave to form an adjustable hole in the centre. This hole can be circular or polygonal in shape, and is often adopted by out-of-focus elements.

Bokeh provides several polygonal apertures as well as a circular and a heart shape, which is likely to prove very popular with wedding and portrait photographers. Polygonal shapes allow you to rotate the aperture shape and make it rounder or more star-shaped.

The next slider is called creamy. At one end of the scale (100) it produces very diffuse blobs with no visible detail; at the other end (-100) elements are blurred, but retain some of their detail. Adjusting the creaminess is key to producing bokeh that emulates the behaviours of out-of-focus light patterns produced by some lenses. The final section, highlight, provides some additional tweaking for highlights.

Bokeh is unmatched in its ability to reproduce out-of-focus lens effects, but its selection tools are basic. In-focus subject areas rarely fit neatly within an oval and a simple lasso tool would make it possible to achieve a more finished look within the plug-in.

Fortunately, Bokeh can combine its selection tools with a pre-existing Photoshop selection, so you can make a selection in Photoshop and then use the Radial or Planar selection tool in Bokeh to refine the effect.

For some subjects, all that's required to improve the end result is a quick once around with the lasso tool. To benefit from more accurate selections and for ultimate control you could use an alpha channel to control not only the sharp and out-of-focus regions, but also the transition between the two by means of greyscale gradients.

Bokeh is priced $199 (around £135) but if you don't have a professional budget there are cheaper alternatives. If you have Photoshop, check out the Lens Blur filter (head to the Filter menu, Blur, Lens Blur) which is as close to Bokeh as you will get without spending £135. Lens Blur uses either layer transparency or a layer mask to select the in-focus zone and has many features in common with Bokeh including iris (aperture diaphragm) shapes, blade curvature and rotation and specular highlight control (see screen 2).

Paint Shop Pro Photo X2

Paint Shop Pro Photo X2's Depth of Field filter (found in the Adjust menu) isn't as sophisticated as Photoshop's Lens Blur. However, it does provide rectangular marquee and lasso selection tools. There are two iris shapes to choose from (circular and hexagonal) and you can feather the selection edge and adjust the focus range (see screen 3).

DIY DoF

If your photo-editing application lacks an automated depth of field effect, you can still create fairly realistic out-of-focus areas using whatever blur filter you have to hand.

The key with this technique is to get the selections right. Bokeh that doesn't quite make the grade isn't a deal breaker, only keen photographers are likely to spot the difference. What gives the game away is unrealistic focus – large flat areas of the image that are equally blurred. There are two ways around this. If your image editor supports alpha channels, use them to create a graduated selection that radiates away from the in-focus subject. The channel needs to mask what's in focus, so that part of it should be solid black gradually fading to white – everything that's solid white will get the full effect of the blur filter.

If you lack alpha channel support you will need to create several (three is usually sufficient) zones around the subject using whatever selection tools are at your disposal. The first zone, tight in around the subject is sharp and has no blur applied, the next one has a slight degree of blurring, followed by more blur in the outer zone.

With the exception of the in-focus inner zone, you will need to feather the selection edges to make for a smooth blur transition. It also helps if you copy and paste each zone to a new layer with the sharp zone topmost progressing downwards in order of bluriness. PCW

Paint Shop Pro Photo X2's Depth of field effect is rudimentary, but effective

Tim Nott is a full-time freelance journalist. When he's not writing about Windows and word processing, he tackles many other diverse subjects. He currently lives in France with his wife and family.

→ Comments welcome on the Word processing column.
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The urge to merge

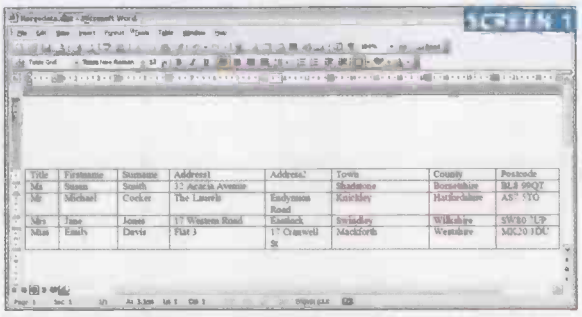
Get to grips with one of Word's most feared features

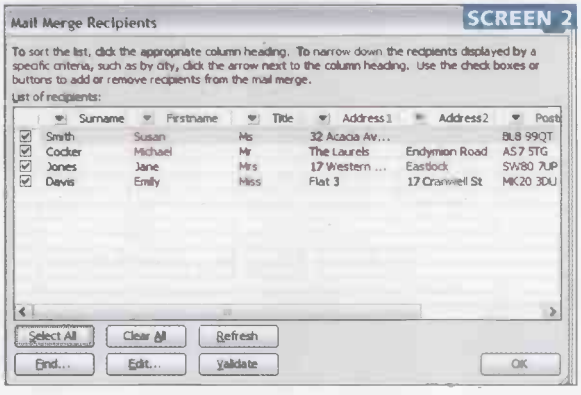
One of the phrases that can strike terror into the hearts of mere mortals is 'mail merge', along with the closely related 'database'. The idea is that you send out a standard letter, personalised with individual names, addresses and possibly other items.

The Word mail-merge wizard does make it fairly simple, but it still exudes an air of mystery. Word offers you a bewildering array of list formats to import from, including Access Databases, Outlook Address books, Excel spreadsheets or Word tables. You can also create a new list on the fly – this will be in Access (.mdb) format. The disadvantage of this is that it is US-based in the address format. The other great fear with mail merging is that you can not only get something wrong, but you can get it wrong over and over again in every letter.

Keep it simple

This month we're going to demystify mail merge, just using Word. First, before you go near the Mail Merge command, create your addresses using a Word table. Across the top of the table list the fields you want available for each entry – such as Title, First Name, Surname, Address 1, Address 2, Town, County and Postcode. You don't have to stick with these names, and you can have more or fewer fields and they can be in any order, though it makes life easier to arrange them in the order they will appear in the address. Next, enter the data as per our sample. The Tab key will take you from field to field and, when you reach the end of a row, a further Tab will start a new row. Take care not to include spaces at the start or end of a field as this may mess up the formatting of the letters, but don't worry if a field wraps more than one line in a cell – this won't happen in the merged letters.





In the example (see screen 1), no resemblance is intended to any real person, place or postcode. Save your table with the name you want in a convenient folder, then close it.

Next you create your letter. Don't worry about the fields or a greeting line at this stage – just leave blanks. When you're ready, and the urge to merge becomes irresistible, save the letter then go to Tools, Letters and Mailings, Mail Merge (Word 2003) or Mailings, Start Mail Merge (2007).

Taking Word 2003, this action will open the Mail Merge task pane. First choose a document type – in this example we are producing letters. Then choose the document – again we're using the current document. The next stage is to select recipients. Using the default, we are going to use an existing list, and browse to the document containing the table of names and addresses we made earlier. This will open in a Word dialogue, rather than a document, and we can then select some or all of the names on the list.

Left: First assemble your names and addresses

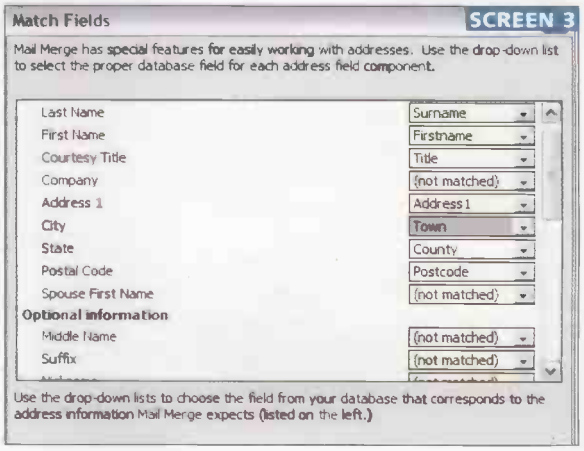
Below left: Choose who gets the letter

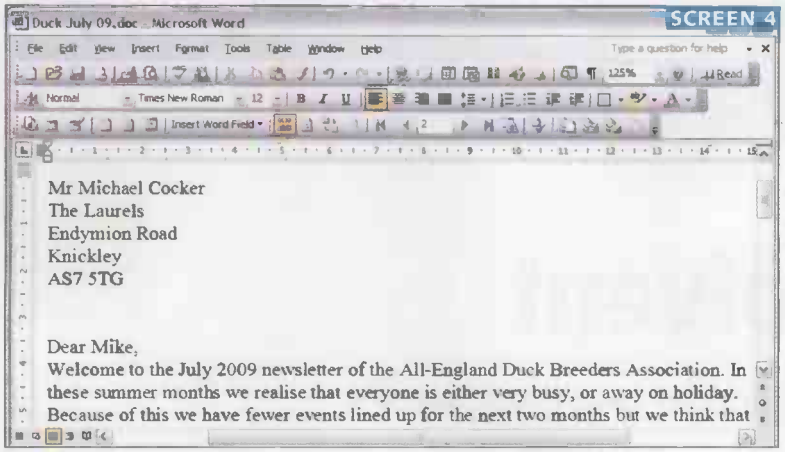
Having done this and clicked OK, the next stage is to insert the fields corresponding to the names and addresses (see screen 2). Although you can do this from the task pane, you may find it more flexible and convenient to do this from the toolbar. So close the former and open the Mail Merge toolbar – from View, Toolbars or Tools, Letters and Mailings.

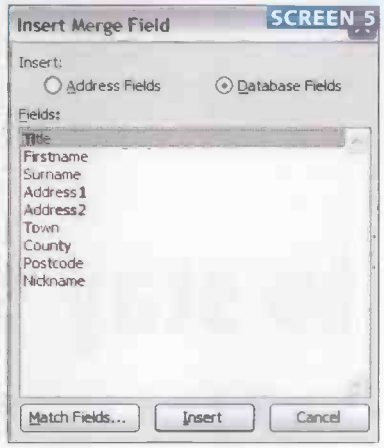
The first thing to do is insert an address block – this is the fourth button along. When the dialogue opens, click the 'Match fields' button. Some of the fields will already be matched – others you will have to choose from the droplists on the right.

The address format is US based, so you need to match Word's 'City' and 'State' to UK Town and County (see screen 3). Having done this, you'll see <<Address Block>> appear in the document. Switching field codes on (Alt & F9) will show the detailed field

Matching Word's default field names to your own







Far left: Viewing individual letters

Left: Adding address fields individually

codes. To see the actual names and addresses you need to 'View Merged Data' – the eighth button along (see screen 4). You'll then find you can use the arrow buttons to page through each recipient's letter.

Formatting

You can format address blocks as you wish. If you're dealing internationally, you may want to include the country. You'll also find that different countries have different address formats. If you're feeling brave enough, you can edit the address block field accordingly, but it's probably quicker to construct your own by adding the required fields one at a time. The smart way to do this is to click the 'Insert Merge Field' button, make sure 'Database Fields' is selected then double-click (or select, then click Insert) in the order you want them (see screen 5).

The dialogue is modal (you can't edit the text while it's open) so you'll get everything in one line without spaces between – 'MrJohnSmith10 High St' etc. To tidy this up, close the dialogue and make sure that 'View Merged Data' is turned off. You should then see something like <<Title>><<Firstname>><<Surname>> <<Address1>> and so on. Move the insertion point to where the chevrons between Title and Firstname meet, and type a space, repeat for Firstname>><<Surname, and where you want a new line press Enter. If this causes a blank line between the address lines this will be because of the paragraph spacing settings. Using Shift & Return instead will produce normal single spacing.

The greeting line can also be automated – fifth button along. You can type anything you want in place of the default 'Dear', and choose your level of formality – 'Dear Mr Smith' or 'Dear John'. If you have included a nickname in your address table you can use this – select 'Josh' from the samples in the dialogue top centre box (see screen 6).

Having created the letter with all the fields in place, and checked through, the next step is to make sure that results, rather than field codes, are showing. You then have the choice of merging to a new document or directly to the printer. The former may create a large document if you have a lot of recipients, but it does provide an additional opportunity to spot errors.

In Word 2007, it is – for once – easier, as everything you need is not only on the Mailings ribbon but clearly labelled. Having drafted your letter, the 'Start Mail Merge' section lets you select the data file and, if required, individual recipients. The 'Write and Insert Fields' section lets you match and insert individual fields as well as address blocks and greetings lines. The Preview Results section lets you see each letter and have the choice of printing directly or creating a document containing all the letters. As with Word 2003, you can also check for errors by simulating a merge.

Astute readers will notice that our letters at this stage are missing something, namely envelopes. One solution is to use window envelopes, making sure that the address block is correctly positioned (hint: use a text box anchored to the page) but if you'd rather your mailing looked less like a utility bill, then next month we will look at how to print individually addressed envelopes for each recipient.

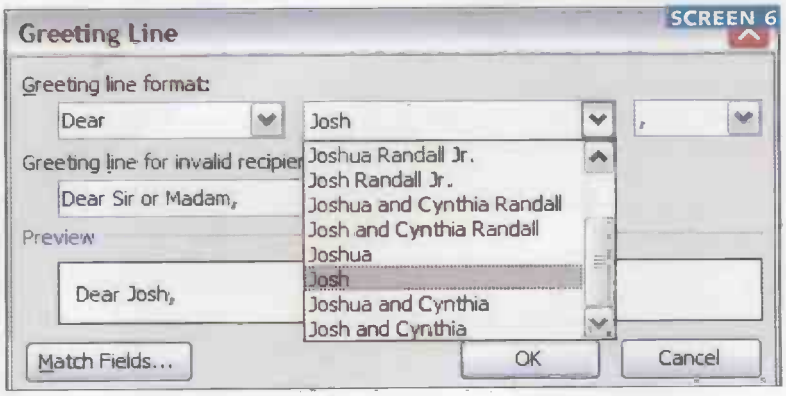
Ask nicely

Further to April's piece on Word's Ask and Ref field codes, our regular correspondent Vivian Dunn came up with a useful tip. He found that his was just what he needed to help insert a name in several places in a standard document that he uses. He wanted the Ask box to automatically appear when he opened the document – but this didn't seem to be possible. After some diligent web searching he came up with a solution. All he needed was an AutoOpen macro for the document in question, with the line:

```
ActiveDocument.Fields.Update
```

On the table

Finally, here's another trick with Word tables. With one or more cells selected, the Delete Key clears the contents (equivalent to Word 2003 Edit, Clear, Contents). If you hit the Backspace key, however, this deletes the cells as well – the equivalent of Table, Delete, Cells. As with the menu command you get a message asking how you want the surrounding cells moved. PCW



Choose your level of formality

Stephen Wells is a freelance journalist and a regular contributor to computer magazines. He's been writing PCW's Spreadsheets column for over 10 years.

→ Comments welcome on the Spreadsheets column.
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How to stay solvent

Find out how Excel can help you keep a track of your finances

One thing everyone needs in the current economic climate is a way to manage spending. The Microsoft Office website offers four budgeting templates (see screen 1), but the chances are that none fit your needs. It's better to use Excel to tailor your own bookkeeping system.

Since bills come in monthly, quarterly, or annually, you will need to devote one workbook to a year's records.

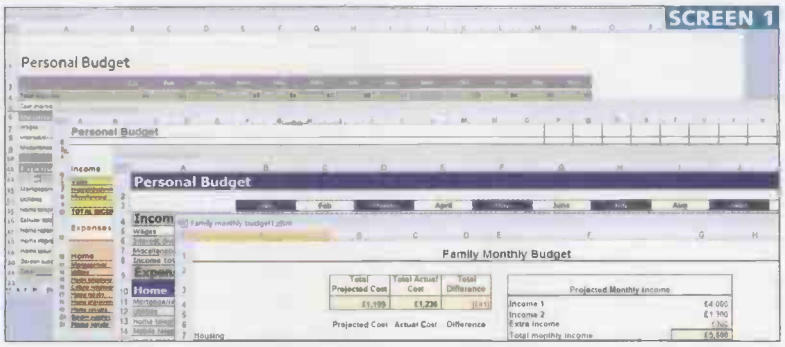
To recreate the example here you will need eight worksheets. To add a worksheet press Shift & Alt & F1 or right-click on a worksheet tab and select Insert, Worksheet and click OK. Group six of the sheets by holding down Shift and clicking on the first and sixth sheet. Label cells A1:H1 Date, Out, In, To, From, For, Detail, and Balance. The only formula on these six sheets is entered in cell H3 and is `=H2+C3-B3`.

Drag this down the column as needed. To ungroup the sheets, right-click on any tab within the group and choose Ungroup Sheets.

Double-click the first tab and name it Cash. Name the other seven sheets Current, ESavings, Premium_Bonds, Credit_card, Store_card, Expenses and Assets. Tabs with two-word names need an underscore. You can change these names to suit your needs.

In cell H2 of any of the first six sheets, enter the current balance in hand. In the example the starting Current (account) balance is £123.45. The ESavings account has £1,400. The Credit_card and Store_card accounts have been paid up to date so currently have zero balances.

Screen 2 shows the Current worksheet with some entries. The date of each transaction is entered in column A. The amount payment made is entered in column B, under Out.



Excel has four budgeting templates

Income, which might be salary or interest, and so on, is entered in column C. Who money was given to is listed in column D. Who money is received from is entered in column E. Columns D and E are not particularly significant in this bookkeeping system but you may wish later to run a filter and see all the entries pertaining to a particular supplier. The entries in column F are critical. It's imperative that the names of expenses and income used here are identical to those used on the Expenses and Assets worksheets. Column G, headed Detail, is simply a convenience for making a note about a particular purchase or income source.

Click on the Expenses sheet tab. Across the columns, use headings that list the sources of payment. These must be the same as the names on the first six worksheet tabs. Although you may use plastic just for convenience, and pay it off every month, you need to be able to keep track of the balances owed in credit or store card accounts.

The penultimate column records a running total for each account throughout the year. The final column can optionally calculate a monthly average for each expense.

List in column A all the categories on which you are likely to spend. They can be as detailed or as generalised as you like. Rent, mortgage interest, home insurance and utilitiy bills may all be considered large enough to keep separate but they can be subtotalled under Home. Ideally, though, you won't have vague account names.

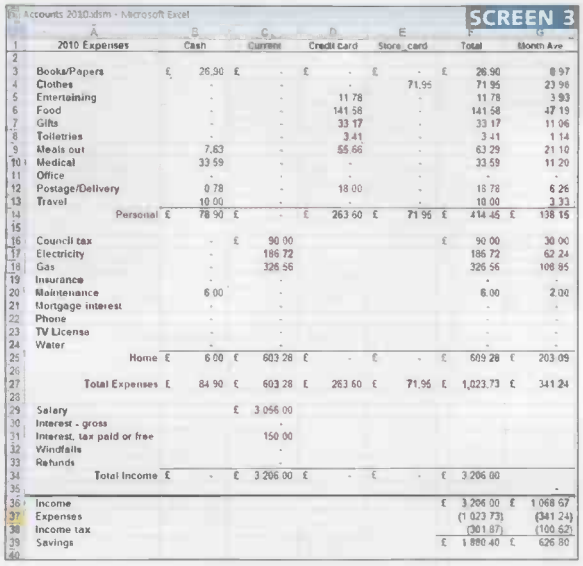
Screen 3 shows subtotals for Personal and Home expenses. You may eventually have groupings for Car, Hobbies, or other expenses.

SCREEN 2

The entry sheet for current account transactions

	A	B	C	D	E	F	G	H
1	Date	Out	In	To	From	For	Detail	Balance
2							B/f	123.45
3	Jan 4		1,528.00		Black & Co	Salary		1,651.45
4	Jan 5	326.56		British Gas		Gas		1,324.89
5	Jan 5	90.00		Wiley District Council		Council tax		1,234.89
6	Jan 8		50.00		Premium Bonds	Interest, tax paid or free		1,284.89
7	Jan 9	186.72		E-On		Electricity		1,098.17
8	Jan 13	50.00		Cash				1,048.17
9	Jan 15	100.00		ESavings				948.17
10	Jan 16	100.00		Cash				848.17
11	Jan 17	301.87		HMR&C		Income tax		546.30
12	Jan 20	86.81		Credit card				459.49
13	Jan 29	52.00		Store card				407.49
14	Mar 18		1,528.00		Black & Co	Salary		1,935.49
15	Mar 18	121.13		Credit card				1,814.36
16	Mar 31	1,000.00		Premium Bonds				814.36
17	Apr 10		100.00			Interest, tax paid or free		914.36
18	Apr 15	500.00		Premium Bonds				414.36

SCREEN 3



	2010 Expenses	Cash	Current	Credit Card	Store_card	Total	Month Ave
3	Books/Papers	£ 26.90	£ -	£ -	£ -	£ 26.90	8.97
4	Clothes	-	-	-	71.95	71.95	23.98
5	Entertaining	-	-	11.78	-	11.78	3.93
6	Food	-	-	141.58	-	141.58	47.19
7	Gifts	-	-	33.17	-	33.17	11.06
8	Toiletries	-	-	3.41	-	3.41	1.14
9	Meals out	7.63	-	55.66	-	63.29	21.10
10	Medical	33.59	-	-	-	33.59	11.20
11	Office	-	-	-	-	-	-
12	Postage/Delivery	0.78	-	18.00	-	18.78	6.26
13	Travel	10.00	-	-	-	10.00	3.33
14	Personal	£ 78.90	£ -	£ 263.60	£ 71.95	£ 414.45	£ 138.15
15							
16	Council tax	-	£ 90.00			£ 90.00	30.00
17	Electricity	-	186.72			186.72	62.24
18	Gas	-	326.56			326.56	108.85
19	Insurance	-	-			-	-
20	Maintenance	6.00	-			6.00	2.00
21	Mortgage interest	-	-			-	-
22	Phone	-	-			-	-
23	TV License	-	-			-	-
24	Water	-	-			-	-
25	Home	£ 6.00	£ 603.28	£ -	£ -	£ 609.28	£ 203.09
26							
27	Total Expenses	£ 84.90	£ 603.28	£ 263.60	£ 71.95	£ 1,023.73	£ 341.24
28							
29	Salary		£ 3,056.00				
30	Interest - gross		-				
31	Interest, tax paid or free		150.00				
32	Windfalls		-				
33	Refunds		-				
34	Total Income	£ -	£ 3,206.00	£ -	£ -	£ 3,206.00	
35							
36	Income					£ 3,206.00	£ 1,068.67
37	Expenses					(1,023.73)	(341.24)
38	Income tax					(301.87)	(100.62)
39	Savings					£ 1,880.40	£ 626.80
40							

This worksheet summarises a year's expenses and income

Further down, add together the subtotals in each column to show the totals for each source account.

Income

Below the Total Expenses row, list in column A your sources of income. This might be Salary, Interest paid gross, and net, or parental grants or pension.

Below that, in column A, enter summary labels for Income, Expenses, Income tax, and Savings. In cell B3, here the Cash outlays for Books/Papers expenses, enter the formula:

```
=SUMIF(Cash!$F$3:$F$128,$A3,↙
Cash!$B$3:$B$128)
```

(Key: ↙ code string continues)

The 128 is arbitrary and assumes that within a year there will be no more than 128 entries on the entry worksheets. Make it more if you think you will need them. The formula looks for Books/Papers entries in column F of the Cash worksheet and totals the outlays entered in that sheet's column B. Drag this formula down to row 13. Cell C3 has the similar formula:

```
=SUMIF(Current!$F$3:$F$128,↙
$A3,Current!$B$3:$B$128)
```

the only difference being it looks for outlays on the Current worksheet.

Create similar formulas for columns D and E. Cell F3 has the totalling formula for the row

```
=SUM(B3:E3)
```

Cell G3 has

```
=F3/MONTH(TODAY())
```

to give a current monthly average as the year progresses.

The totalling rows, 14, 25, and 34 are self-explanatory. Cell F37 has

```
=-F27
```

F38 has,

```
=-SUMIF(Current!$F$3:↙
$F$128,A38,Current!$B$3:$B$128)
```

and F39 has

```
=ROUND(SUM(F36:F38),2)
```

The ROUND function drops any stray decimal points and helps this cell agree with cell F9 on the Assets sheet.

Open the Assets worksheet. Down column A list the names on the worksheet tabs Cash, Current, ESavings, and Premium_Bonds (see screen 4).

The purpose of this worksheet is to show how each money-source account has grown or been depleted in a year. It keeps track of money as it moves from one account to another.

In B2, enter `=Cash!M2`. In D2 enter `=Cash!H2`, and in F2 enter `=B2-D2`.

In other words, calculate the difference between the starting amount in the Cash account and the current balance. Columns C and E are dividers.

For each of these four accounts enter comparable formulas. Below a subtotal of these balances in row 6, enter in column A Less Credit_card and Less Store_card. Logically, cell B7 has `=Credit_card!M2`.

You can complete this block as for the accounts above and total them.

Cell B9 has `=SUM(B6:B8)`, deducting the negative balances in your credit card accounts from the total of your cash and bank accounts. Cell F9 has `=ROUND(B9-D9,2)` and uses the Round function again to ignore any extraneous decimal points.

The formula in cell F10, `=IF(F9=Expenses!F39,↙ "Agrees","Disagrees")`, checks the total of these Current Assets accounts agrees with the totals of the Expenses.

To simplify the formulas that pick up the balances from each money-source account, the formulas refer to cell M2 on each of those worksheets. A macro regularly copies the current balance to the cell M2.

Press Alt & F11 to open the VBA for Excel editor. Click on ThisWorkbook in the left-hand panel. On the VBA Insert menu, choose Module and in the right-hand panel enter:

```
Sub LastCell()
ActiveSheet.Range("H1").↙
End(xlDown).Copy
ActiveSheet.Range("M2").↙
PasteSpecial Paste:=xlValues
Application.CutCopyMode = ↙
False
ActiveSheet.Range("H1").↙
End(xlDown).Select
End Sub
```

Press Alt & F11 again to return to a worksheet and press Alt & F8. Click the Options button and create a keyboard shortcut, such as Ctrl & Shift & L, to run the macro.

After making any entry for income, expense, or a transfer between accounts you can run this macro to keep your Assets worksheet up to date.

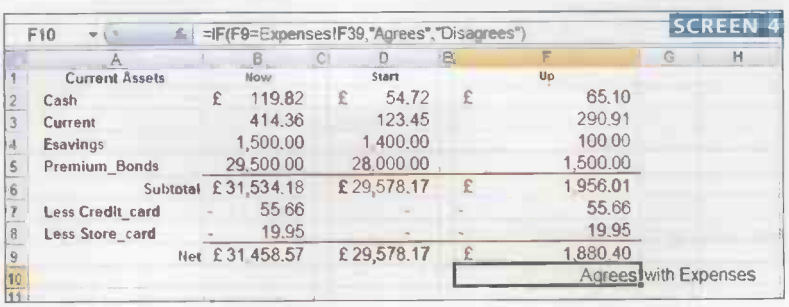
If you prefer to run the updates for all the sheets at once, you can insert the following macro in the same Module before the Sub LastCell() macro listing

```
Sub Update()
Application.ScreenUpdating ↙
= False
    Sheets("Cash").Select
    Application.Run "LastCell"
    Sheets("Current").Select
    Application.Run "LastCell"
    Sheets("ESavings").Select
    Application.Run "LastCell"

Sheets("Premium_Bonds").Select
    Application.Run "LastCell"

Sheets("Credit_card").Select
    Application.Run "LastCell"
    Sheets("Store_card").Select
    Application.Run "LastCell"
    Sheets("Assets").Select

ActiveSheet.Range("A12").Select
Application.ScreenUpdating = ↙
True
End Sub
```

When you make an entry to pay off a credit card from your current account, or get cash from a bank account, don't forget to enter balance entries in both affected accounts.

If you are using Excel 2007, save the file with an .xlsm extension as the default format – .xlsx doesn't allow macros. Under Excel Options, Trust Centre Settings check, Trust access to the VBA project object model. PCW

SCREEN 4



F10 =IF(F9=Expenses!F39,"Agrees","Disagrees")

	Current Assets	Now	Start	Up	
2	Cash	£ 119.82	£ 54.72	£ 65.10	
3	Current	414.36	123.45	290.91	
4	Esavings	1,500.00	1,400.00	100.00	
5	Premium_Bonds	29,500.00	28,000.00	1,500.00	
6	Subtotal	£ 31,534.18	£ 29,578.17	£ 1,956.01	
7	Less Credit_card	- 55.66	-	- 55.66	
8	Less Store_card	- 19.95	-	- 19.95	
9	Net	£ 31,458.57	£ 29,578.17	£ 1,880.40	
10				Agrees with Expenses	

The Current Assets sheet cross-checks the balances in each account

Nigel Whitfield edited computer magazines before going freelance in 1995. A specialist in internet and consumer issues, he has a degree in Computing Science from Imperial College.

→ Comments welcome on the Web development column. It returns in the October issue. Email webdev@pcw.co.uk *Please do not send unsolicited file attachments.*

Where in the world?

How to add geographic information to your websites

Google Maps is one of the most useful websites to appear in recent years. If you want to show someone on a map where your office is, or the location of a party, it's a great tool.

You can add a link to a map very easily by clicking the buttons on **http://maps.google.co.uk** to get the code. But there is more to Google Maps than that.

If your site can determine the location of a user, geolocation can be used to customise the information displayed automatically. So there is no need for people to enter their postcode, for example, to find the nearest branches of a business.

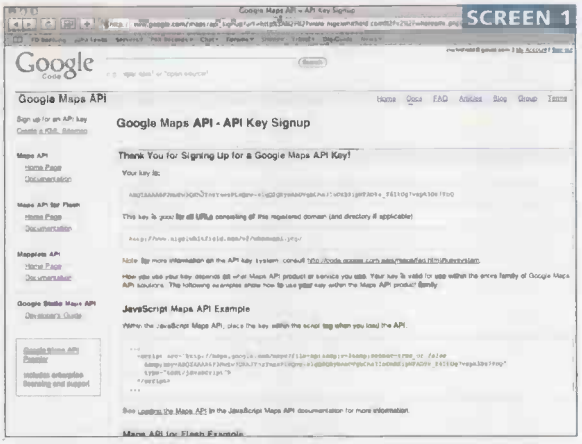
But how do you do it? Well, the web standards organisation W3C has developed a geolocation API, designed to allow you to determine someone's location in Javascript.

Javascript provides a way for your web pages to identify where a user is. You could draw a map, or send the location back to the server via a web form, but first you need to find the location, so how is that done?

Not many web browsers support W3C geolocation, but the idea is that it's extensible. Rather than relying on a single method, there are several ways of finding out where someone is. The least accurate is by a geographic look-up of an IP address. Next, there are services such as Skyhook (from **www.loki.com**) which map the locations of Wifi access points, and then there is GPS. Some of the example services use Skyhook, which can be quite accurate. I'm going to show how to add Google maps to your site, including one that is based on the location of the visitor.

Unfolding the maps

Before you can use Google's Maps API, which will allow you to request a map



Top: To begin, you will need to sign up for a Google Maps API key

Bottom: It's very simple to add a map for a specific location to your site, with a few lines of Javascript

for any co-ordinates, you will need to register on the website at **http://code.google.com/apis/maps**. To do that, you need a Google account, and you'll receive an API key that looks like a random string of letters (see screen 1).

Next, there are a few things to add to your web page. First, include the Google Maps Javascript, like this

```
<script src="http://maps.↙
google.com/maps?file=↙
api&amp;v=2&amp;key=↙
abcdefg&sensor=false" ↙
type="text/javascript">↙
</script>
```

(Key: ↙ code string continues)

replacing the key with your actual API key. You'll also need a region on your page where you want the map to appear; a DIV is the simplest way to do this:

```
<div class="body" id=↙
"firstmap" style=↙
"width:400px; ↙
height:400px"></div>
```

Now, I'll create a map showing the location where a photograph was taken; you just need to add this as a script in the HEAD of the page:

```
function init_maps() {
  if (GBrowserIsCompatible()) {
    var firstmap = new ↙
GMap2(document.getElement↙
ById("firstmap"));
    firstmap.setCenter(new ↙
GLatLng(51.4564, -2.6269), 15);
    firstmap.setUIToDefault() ;
  }
}
```

And then, in the BODY tag, add

```
onload="init_maps()"
onunload="GUnload()"
```

That is as simple as it gets, in terms of embedding a Google Map in your page (see screen 2). The options to the setCentre method are the latitude and longitude, followed by the zoom level; it's worth experimenting with that to get the result you want. When you declare the new map, the name of the document element has to match the ID you gave to the part of the page where you want the map to appear.

You can add markers just as easily, or text boxes in the floating balloon style that you will have seen on other maps, and set options such as the map view. The API documentation explains how it's done – it's all incredibly easy:

```
var origin = new ↙
GLatLng(51.4564, -2.6269) ;
firstmap.addOverlay(new ↙
GMarker(origin)) ;
```

will add a marker at the centre of our existing map.

FIG 1

Geolocation code

```
<script type="text/javascript">
function init_maps() {
   if (GBrowserIs↙
Compatible()) {
      var firstmap = ↙
new GMap2(document.↙
getElementById("firstmap"));
      var origin = ↙
new GLatLng(51.4564, -2.6269) ;

firstmap.setCenter(origin, 15);
firstmap.setMapType(G_HYBRID_MAP);
firstmap.setUIToDefault() ;
firstmap.addOverlay(new ↙
GMarker(origin)) ;
   }

   if (navigator.geolocation) {
      navigator.geolocation.↙
getCurrentPosition↙
(visitor_map, location_error);
   } else {
      errorLocation = document.↙
getElementById("latlong") ;
      errorLocation.innerHTML = ↙
'Sorry, your browser does not ↙
support W3C geolocation.' ;
   }
}

function visitor_map(position) {

   userLocation = document.↙
getElementById("latlong") ;
   userLocation.innerHTML = ↙
"Latitude " + position.latitude + ↙
", longitude " + position.longitude ;

   if (GBrowserIsCompatible()) {
      var visitormap = new GMap2↙
(document.getElementById↙
("secondmap"));
      visitormap.setCenter(new ↙
GLatLng(position.latitude, ↙
position.longitude), 15);
      visitormap.setUIToDefault() ;
      visitormap.openInfoWindow↙
(visitormap.getCenter(), ↙
document.createTextNode("You're ↙
probably somewhere near here")) ;
   }
}

function location_error(error) {
   userLocation = document.↙
getElementById("latlong") ;
   userLocation.innerHTML = ↙
"There was an error determining ↙
your location, so the map cannot ↙
be shown: " + error.message ;
}
</script>
```

(Key: ↙ code string continues)

Where are you?

W3C geolocation is experimental. So much so that the test page at www.nigelwhitfield.com/v2/whereami.html (see screen 2) doesn't agree with the documentation. But if you visit that page with the Mozilla browser and the Geode plug-in is enabled you should see a second map appear, which will attempt to show your own position. If your browser doesn't support the service you will see a polite message.

Opera has released a test build to work with W3C geolocation and the Skyhook positioning service, but I have not persuaded it to return useful information and the documentation only offers a vague 'You need to register your site on Loki.com' comment. Loki provides a geolocation API of its own, as does Google's Gears, so you can use either of those. But the W3C implementation is simple and should become more widespread.

All you have to do in a script on your own site is something like this:

```
navigator.geolocation.↙
getCurrentPosition↙
(visitor_map, location_error);
```

The two parameters are functions that will be called when the location of the browser has been worked out; the first is called with a position as its parameter, if a location can be found, and the second – which is optional – if the location can't be found.

The first parameter, which provides the information you can use to find your nearest branch, for example, differed from the documentation. Most of that states that among the attributes of a position object are co-ordinates, which themselves have latitude and longitude attributes, so if you have a paragraph on your page where you want the user's position to appear, with the id 'latlong', you'd update it with something like this:

```
userLocation = document.↙
getElementById("latlong") ;
userLocation.innerHTML = ↙
"Latitude " +
position.coords.latitude + ↙
", longitude " +
position.coords.longitude ;
```

In fact, using the Geode plug-in for Firefox, I had to refer to simply position.latitude, and position.longitude. From the Google maps example above, it should be easy to take those elements and create a new map further down the page.

The full code is in figure 1. All that is missing is the code to load the Google Maps API for drawing the maps, and a few hooks in the HTML – there's a second DIV with the name secondmap, and a paragraph with the id latlong:

```
<p class="body" id="latlong">↙
Your latitude and longitude ↙
should replace this text.</p>
```

and that really is the basics of it.

Sites such as Loki and Google both provide 'geocoding' and 'reverse geocoding' which are used to map from addresses to latitude and longitude or in the opposite direction, respectively. So, you could even alarm visitors to your site with a pop-up message telling them the name of the street you think they're on – or amuse them, depending on the level of accuracy. As you can see in screen 3, the Geode plug-in allows users to set how much information they want to pass to a website; the W3C specification includes information to tell the site how accurate the positioning information is. There is also information about altitude, heading and speed, plus a 'watch' function that allows for the page to update each time the computer moves – you can read more at www.w3.org/TR/geolocation-API. PCW

The Firefox Geode plug-in allows you to set what level of accuracy should be used to report your location

SCREEN 3

All you need to add a map like that is to sign up for the Google Maps API, and get a key, which you

Alan Stevens has implemented and supported networks for over 25 years, working for IT vendors, system integrators and customers. He now mostly researches and writes about networking matters.

→ Comments welcome on the Networks column.
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Imap and sharing calendars

Smooth out some bumps in your home email server setup

This month's column is email related and prompted by some queries sent in by reader James Rimell, who writes: "Thank you for your recent article on home email servers. Following the article I installed hMailServer and, since I tamed the firewall and DNS records, I've been very happy with the system. I just have a few questions.

"I log on to several computers at home and so have switched from a Pop3 download to my Outlook clients to an Imap synchronisation, which works much better for my purposes. I use both Outlook 2003 and 2007. On the 2007 version when I first sent a message, it wanted me to confirm where to save sent messages, which enabled me to point to the sent folder on the Imap area. However, Outlook 2003 keeps saving the messages in the Personal Folders, which aren't synched. If I go to Tools, Options, Preferences, E-mail Options, there's only a tick box to save sent messages and not to choose which folder. A similar problem occurs with saving draft emails."

As James has discovered, Outlook 2003 doesn't have a built-in option to choose where to save copies of sent items. Unless you're connected to an Exchange server, Outlook will always save sent items in a pre-set folder in the local Personal Folders (.pst) file. One way around this is to upgrade to Outlook 2007, which does have the option of redirecting sent items to a different folder. Another is to try the following workaround. It isn't perfect but is a reasonable compromise.

The first thing to do is tell Outlook not to save sent messages at all. By going to the Tools menu, then selecting Options, Preferences, then E-mail Options (see screen 1).

Next you need to make sure there's a Sent Items folder on the Imap server that you can use. The hMailServer doesn't create one automatically so you'll need to do it yourself, just as you would a folder in Personal Folders. Other servers may create a Sent Items folder for you, in which case you have to make sure you've subscribed to it by going to the Tools menu, selecting Imap Folders and clicking Query to list all the available folders you can access and subscribe to.

Stop Outlook 2003 saving sent mail in your Personal Folders

Now you can create an automatic message processing rule to save a copy of every message sent in the Sent Items folder on the Imap server.

From the Tools menu select Rules and Alerts, click New Rule and take the option to 'Start from a blank rule'. Click 'Check Messages after sending' then hit Next. On the next screen tick the box marked 'through the specified account' then, in the lower box (marked Step 2) click 'specified' (underlined), which will display a list of available email accounts. Choose your Imap account and click OK.

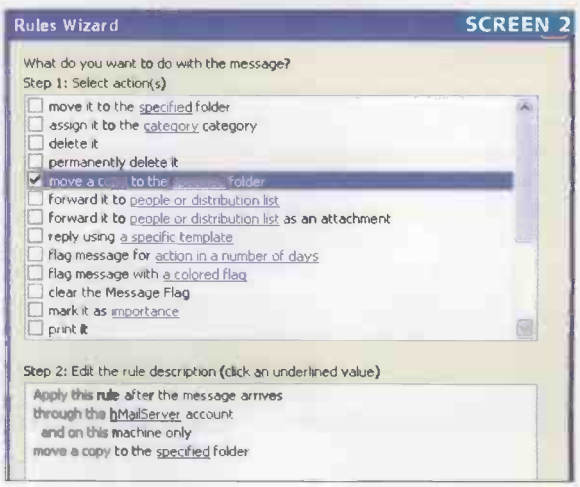
You're then asked what you want to do with the message. Here you should tick the box marked 'move it to the specified folder' then, in the lower box again, click on the underlined word 'specified', as in screen 2.

This time, however, browse to your Sent Items folder on the Imap server. Click Finish and you're done; a copy will be made of any message you send via your Imap account and saved in the Sent Items folder on the server (see screen 3).

There are a couple of things to bear in mind. Messages saved in an Imap Sent Items folder won't be marked as read, which is what happens when you use the built-in option. Plus the folder itself won't have the Sent Items icon, but otherwise it does the trick.

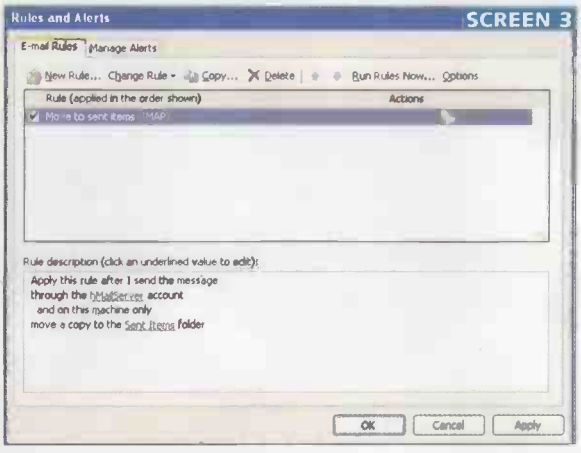
Unfortunately, it doesn't look as if you can do anything similar for draft messages. Rules can't help and, although it's possible to redirect unsent messages to a folder other than Drafts, the only options are the Inbox, Outbox or Sent Items folder in the Personal Folders file.

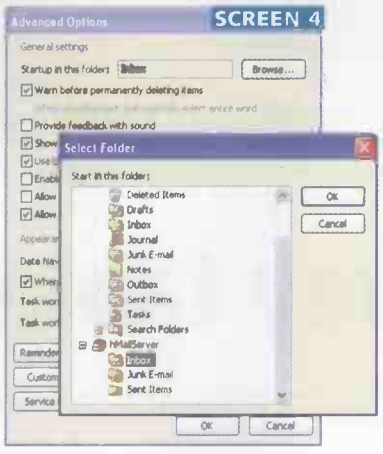
Use an Outlook rule to move a copy of sent messages to your Sent Items folder on the server



Getting rid of Personal Folders

James also writes: "As hMailServer downloads external accounts as well as my domain, both my email clients only have Imap folders set up. I don't





seem to be able to remove the Personal Folders area, or specifically remove Inbox etc from there."

Here it's important to understand that the Imap protocol can only handle email messages, not contacts, calendars journals, notes or tasks. Get rid of your Personal Folders file and Outlook would have nowhere to store such items so it's not allowed. Nor can you delete the Inbox from within Personal Folders.

Some mail server vendors do offer Outlook plug-ins that enable non-mail items to be stored on an Imap server and, in some cases, do away with the need for the separate Personal Folders, just as in Exchange. Unfortunately, these plug-ins can't be used with servers from other vendors and there isn't one for use with hMailServer.

However, you can tell Outlook to go to your Imap inbox when it starts up, rather than the one in Personal Folders. If you're using Outlook 2003 or 2007, go to the Tools menu, choose Options and click the Other tab. Click on Advanced Options and, at the top of the display, you'll see an entry marked 'Startup in this Folder'. By default, this will be set to the Inbox in Personal Folders, but if you click the Browse button you can choose another folder instead including an Imap inbox (see screen 4).

Calendar sharing

James' final question is: "Something I would like to implement is a way to synchronise and share my calendars. Have you already, or are you planning on looking at sharing calendars, especially a system that works with Outlook as the client?"

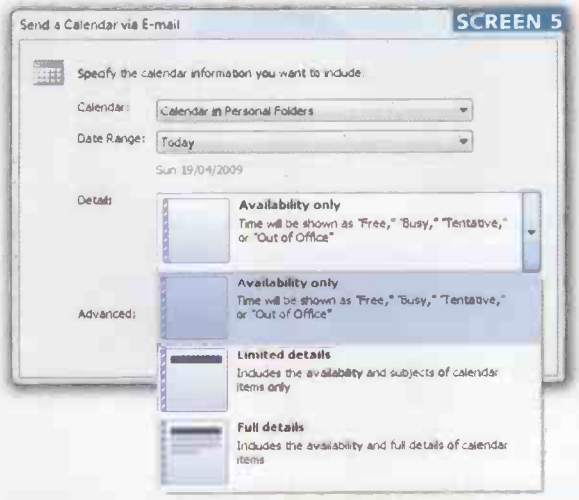
Unfortunately, just as with email, Outlook is really designed to share calendars via Exchange Server, which isn't necessarily something most home users want to get involved with. There are a number of ways to get around this, but all have their issues. One solution is to deploy an Exchange Server alternative such as MDaemon or Kerio Mail Server. These let you share calendars both using Webmail and, using a plug-in, from the Outlook client. Such products, however, cost money and I have yet to find a free email server that has calendar sharing facilities. The hMailServer product, for example, doesn't have this option. That said, if anyone knows of a shareware or open-source solution, please let me know and I'll take a look.

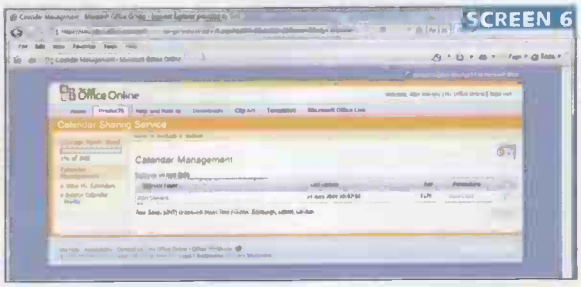
There are a few dedicated calendar sharing tools around, and I'll see if I can get hold of a couple and report back. In the meantime, there has been a recent development from Microsoft, called Internet Calendars which, as the name implies, lets you share Outlook calendars over the internet.

Above left: The finished rule. I've renamed it to make it obvious what it does

Above right: Set up Outlook to open your Imap Inbox rather than the one in Personal Folders when it starts

Below: Calendar snapshots can be sent by email with controls over the detail included





Outlook calendars can also be published to a Webdav website or Office Online, for others to share

Internet Calendars

To use Internet Calendars you need Outlook 2007, which has enhanced support for the iCalendar format used plus specific tools to take advantage of what this has to offer. Outlook 2003 can import iCalendar files produced using the later software, but that's about it.

Calendars can be shared in two ways with Internet Calendars, the first being to email a static snapshot of a calendar to another user (see screen 5). You're asked to specify the calendar you want to use, the date range and level of detail to include.

The calendar will be added to a new email both as text in the body of the message and as an iCalendar file attachment. No synchronisation is possible but by clicking the attachment an Outlook recipient can open the calendar, see what you're doing and drag and drop entries onto their own and other calendars.

Another way of sharing a calendar from Outlook 2007 is to publish it to a website (see screen 6). Other users can then subscribe to the calendar and use it within Outlook or other compatible client. Any changes made to the source calendar will be replicated on the website.

To share calendars via a website you need a web server that supports Webdav (the Web Distributed Authoring and Versioning protocol). This can be an in-house server or you can use Microsoft Office Online, which hosts a free calendar-sharing service for just such a purpose. Signing up for Office Online costs nothing and is quick and easy, you just need a Windows Live ID account which, similarly, is free of charge. Just go to **https://login.live.com** to sign up.

As when sending a snapshot via email, you can choose the calendar to be published, the date range to include and the level of detail. You can also limit access to your calendar to specific users (by email address) or allow anyone to subscribe to it. A valid Live ID account is required to subscribe to a published calendar which can then be viewed on the web using Office Online or added to Outlook just like a snapshot sent via email.

More about Internet Calendars next month, and thanks to James for his email. PCW

Mark Whitehorn is one of those lost souls who actually likes databases. He splits his time between consultancy, writing, working for two universities and tinkering with old cars.

→ Comments welcome on the Databases column.
Email database@pcw.co.uk
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Music to my tables

Import data into Access and create a normalised database of your music

Last month we started looking at how to create a normalised database of music – the artists, titles and tracks held in Windows Media Player. This task splits into three parts. How to:

1. Generate a text file of the data that Media Player holds;
2. Import that file into Access; and
3. Create a normalised set of tables from the data.

It is worth splitting the process into steps because importing data and/or normalising it are common operations and apply to more than this example.

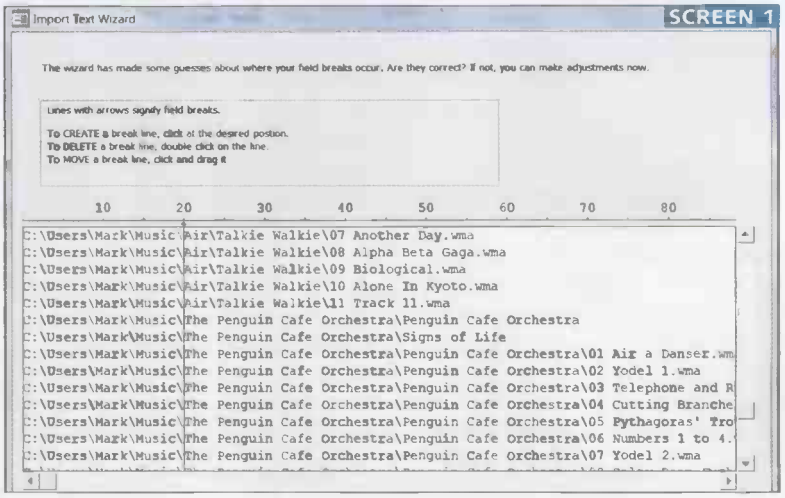
Importing data

To recap last month, the solution is based on the fact Media Player allocates one folder for each artist (for example, Air). Within each artist folder there is a folder for each album (Talkie Walkie); within the album folders are the appropriate tracks (Venus, Cherry Blossom Girl).

We can use the Dos command 'Dir' (see last month's issue) to dump the entire folder structure to a text file. This generates a line in the text file for every folder and sub-folder. In this exercise we will only use the lines that define the tracks, for example: **C:\Users\Mark\Music\Air\Talkie Walkie\01 Venus.wma** or **C:\Users\Mark\Music\Air\Talkie Walkie\02 Cherry Blossom Girl.wma**, but we'll import the whole lot into Access because it is easier to do that than to remove the ones we don't want. Later you'll see that we use a WHERE clause in a query to ignore those rows not defining the tracks.

The sample database on the cover disc (DBCAug09.mdb) has all the queries you are going to need already written. I have also supplied a tiny example of the text file (penguin.txt) generated by the Dir command.

In Access 2007, you import the data from the text file by selecting External Data, Text File, choose to import the source data into a new table, browse to the file and then click OK. In Access 2003 it's slightly different – you start from File, Get External Data, Import.



The vertical line placed 20 characters in from the left indicates a break where data is split

In the next screen select Fixed Width and click Next. In this screen we can insert breaks that split the incoming data into separate fields. Depending on the set of data you use, Access may already have inserted one or more breaks. Remove these (by double-clicking on them). Then inset one as shown in screen 1, just at the point where the artist names begin.

Click on Next. In this screen, mark the first field as 'Do not import field (Skip)' – this saves us from creating a field that always contains 'C:\Users\Mark\Music\'. Rename the second field as RawData, then click on the Advanced button and set the width of the RawData field to 255 characters and click OK. Click Next, allow Access to add a primary key and click Next once more. Name the table Penguin and click Finish. We now have a table that contains the data. I have supplied a tiny sample table; just replace it with your own data.

Converting flat-file data

Now we need to split the data into a set of normalised tables, where each table is about one entity. The entities will be Artist; Album; and Track. It is easy to extract the names of the artists, albums and tracks using GROUP BY queries. The trick is to do this while retaining the information that a particular track is on a particular album performed by a given artist. For this we have to assign a primary key to each table and ensure we also insert the appropriate foreign keys in the other tables that point to those primary keys. Our starting point is the string we have in RawData about each track, for example: Air\Talkie Walkie\02 Cherry Blossom Girl.wma.

The good news is that this string always has two delimiters (backslashes) separating the artist, album and track. So we can write a query that finds the positions of those delimiters. This query relies on a function called InStr (short for In String). It is specific to Access but all databases engines have a similar function. The query is called SplitString:

```
SELECT Penguin.ID, ↙
Penguin.RawData,
InStr(1,[RawData],"\") AS ↙
PosSlash1,
```

```
InStr([PosSlash1]+1,↙
[RawData],"\") AS PosSlash2
FROM Penguin;
```

(Key: ↙ code string continues)

It creates two fields (PosSlash1 and PosSlash2), which record the position of each backslash in the string. If there is no appropriate backslash, the field contains a zero (see screen 2).

We can write a second query (DissectedData) that runs against the SplitString answer table and dissects the string into its components, including the track number:

```
SELECT Left([RawData],↙
[Posslash1]-1) AS Artist,
Mid([RawData],[Posslash1]↙
+1,[posslash2]-[Posslash1]↙
-1) AS Album,
Mid([RawData],[Posslash2]↙
+1,2) AS TrackNo,
Mid([RawData],[Posslash2]↙
+4,255) AS Track
FROM SplitString
WHERE SplitString.PosSlash2>0;
```

Note that the WHERE clause:

```
WHERE SplitString.PosSlash2>0;
```

ensures we are only running this on those rows that have a second backslash – in other words, those rows that define tracks. All you have to do is to open this query to see it working (see screen 3).

To create the Artist table we can run a Group By query (MakeArtist) that uses the DissectedData answer table and groups on the field called Artist. If we also make this a 'Make Table' query, we can get it to generate a new table called Artist. The SQL is:

```
SELECT Artist INTO Artist
FROM DissectedData
GROUP BY Artist
ORDER BY Artist;
```

The ORDER BY clause isn't vital but it does make the tables neater. Open this new table (Artist), check the contents and add an AutoNumber field called ArtistID and make it the primary key.

To produce the Album table we need to extract the name of the album from DissectedData and tie it to the right artist in the Artist table. We need to add the foreign key to the Album table. The query is called MakeAlbum and it generates a table called Album.

```
SELECT Album, Int([ArtistID]) ↙
AS ArtistIDs,
Artist.Artist INTO Album
FROM DissectedData INNER JOIN ↙
Artist
ON DissectedData.Artist = ↙
Artist.Artist
GROUP BY Album, ↙
Int([ArtistID]), Artist.Artist
ORDER BY Int([ArtistID]);
```

SCREEN 2

SplitString

ID	RawData	PosSlash1	PosSlash2
1	Air	0	0
2	The Penguin Cafe Orchestra	0	0
3	Air\Talkie Walkie	4	0
4	Air\Talkie Walkie\01 Venus.wma	4	18
5	Air\Talkie Walkie\02 Cherry Blossom Girl.wma	4	18
6	Air\Talkie Walkie\03 Run.wma	4	18
7	Air\Talkie Walkie\04 Universal Traveler.wma	4	18
8	Air\Talkie Walkie\05 Mike Mills.wma	4	18
9	Air\Talkie Walkie\06 Surfing On A Rocker.wma	4	18
10	Air\Talkie Walkie\07 Another Day.wma	4	18

Record: 11 of 42 | No Filter | Search

The query SplitString in operation. The rows without track information have a zero in PosSlash2

We are using the Int() function to change the AutoNumber field called ArtistID into an integer. I have also included the name of the artist (the Artist.Artist field) because we will need it in a moment.

Run the query and then edit the newly created Album table, adding an AutoNumber field called AlbumID and making it the primary key. Change the field name ArtistIDs to ArtistID. This also isn't vital, but it is tidier.

Finally, we need to make the Track table. We have to be careful here because we could have albums and/or tracks with the same name. To ensure each track is uniquely identified, in the query we join the DissectedData table back to Album on two fields – Artist and Album. This query is called MakeTrack:

```
SELECT Int([AlbumID]) AS ↙
AlbumIDs,
TrackNo, Track INTO Track
FROM DissectedData
INNER JOIN Album
ON (DissectedData.Album = ↙
Album.Album)
AND (DissectedData.Artist = ↙
Album.Artist)
GROUP BY Int([AlbumID]), ↙
TrackNo, Track
ORDER BY Int([AlbumID]), ↙
TrackNo;
```

This generates a table called Track. Edit it and add a primary key called TrackID of type AutoNumber. Edit the name of the field called AlbumIDs to AlbumID. Remove the Artist field from the Albums table. You should now be able to set up referential integrity.

That's it. We started from a flat data file and have not only split it into three tables but have added the primary and foreign keys that keep them logically linked. I've left the .wma extension on the end of the track names, but you can remove it using the query CleanTracks.

I've done some testing on this database and it appears to work, but don't expect it to be commercial grade. It also occurs to me the sample database could be modified to do all these operations automatically and create a database of the music held in Media Player complete with elegant forms, queries and reports. If anyone wishes to take up the challenge I am happy to publish the best in a future issue. Go on, you know you love a challenge...

More of the same

Mark has been writing the database column for a long time now. The best bits have been collected into book – *Essential Database Stuff*. More details from www.penguinsoft.co.uk. PCW

SCREEN 3

DissectedData

Artist	Album	TrackNo	Track
Air	Talkie Walkie	01	Venus.wma
Air	Talkie Walkie	02	Cherry Blossom Girl.wma
Air	Talkie Walkie	03	Run.wma
Air	Talkie Walkie	04	Universal Traveler.wma
Air	Talkie Walkie	05	Mike Mills.wma
Air	Talkie Walkie	06	Surfing On A Rocker.wma
Air	Talkie Walkie	07	Another Day.wma
Air	Talkie Walkie	08	Alpha Beta Gaga.wma
Air	Talkie Walkie	09	Biological.wma
Air	Talkie Walkie	10	Alone In Kyoto.wma

Record: 12 of 37 | No Filter | Search

The query DissectedData shown, well, dissecting the data

Tim Anderson is an IT journalist and software developer, and began writing for PCW in 1993. Since his first Commodore Pet, he has acquired expertise in Rad programming, Windows and the Internet.

→ Comments welcome on the Visual programming column.
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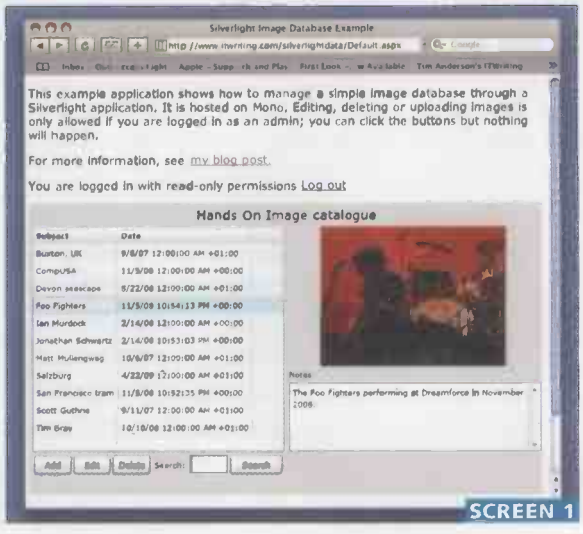
Silverlight revisited

Delve deeper into coding using Microsoft's web framework

Last year's two-part feature (December and Christmas 2008 issues) on coding a Silverlight 2.0 application (see screen 1) has attracted numerous comments and queries. The feature showed how a desktop database application could become a cross-platform web application using Silverlight, but there was not room to show all the code or discuss all the issues. This follow-up fills some of those gaps, and all the code is available for download.

The example application is an image database. Users can browse through a list of images, view them, search for an image, and add or amend existing records. The earlier article covered how to create a Silverlight application together with an ASP.Net web service, and call the web service from Silverlight to populate a DataGrid. The web service queries an SQL Server database and images are not actually stored in the database, but instead there is a link to each image on the web server.

The challenge of applications such as this is that they are distributed applications. Many Windows Forms applications either work entirely locally or communicate with a server only through a database connection. In a classic web application, most of the code runs on the server, with the web browser simply displaying the output. Rich Internet Applications such as those built with Silverlight, Flash or Javascript are different because there is significant coding to do both on the client and on the server. If it is on the internet, the whole world can have a crack at your application, so security is critical. It is no use implementing security checks in the Silverlight application itself, since this code is untrusted. Somebody might decompile your application and modify it, or work out what web service calls it is making and duplicate them in some other application.



SCREEN 1

Visual Studio 2008

Visual Studio 2008 is a decent environment for developing with Silverlight (see screen 2), but has a few foibles. One is the lack of a visual designer, which will be fixed in the next version, Visual Studio 2010. Another problem is that your Silverlight solution typically has two projects; one for the Silverlight client and another for the web application. The IDE is mostly smart about linking these together, but can get confused about which port the built-in web server is running on. The consequence is that the web service breaks. You can fix this by looking at the properties of the web application in the property inspector (not the right-click property pages). Set 'Use dynamic ports' to False to fix it. You can usually leave the port number at whatever random port Visual Studio has assigned.

One of the primary reasons for interest in Silverlight is that it runs on Mac as well as Windows

'It is no use implementing security checks in the Silverlight application itself, since this code is untrusted'

Authentication and security

There are not many database applications where you do not care who can update the data, and sometimes you also want to restrict who can read it. How do you secure your Silverlight web services? Microsoft's answer is based on ASP.Net security. For example, this application has a web service method called SavePhotoItem, which looks like this:

```
<WebMethod()> _
Public Function ↙
SavePhotoItem(ByVal pi As ↙
photoitem) As Integer
'returns ID of saved item
If
datamanager.SavePhotoItem(pi) ↙
> -1 Then
 Return pi.ID
 Else
 Return -1
 End If
End Function
```

(Key: ↙ code string continues)

The datamanager class has shared methods that read or update the database. So how do you prevent unauthorised calls to this method? The first answer is that you can require authentication for the web service just as you can for a web page. If you set the authorisation to:

```
<deny users="?"/>
```

in web.config, then only authenticated users will be able to call the service. The authentication method is set by the authentication mode of the web application, which can be Windows, Forms or Passport. Of these, Windows is the most convenient but only works within a Windows domain. Forms authentication is the most flexible, since you can control it entirely within your application. In the simplest case, you define a user in web.config like this:

```
<credentials ↙
passwordFormat="Clear">
```

```
<user name="pcw" ↙
password="secret"/>
</credentials>
```

Then create a login.aspx in the normal way. When a user requests the page containing your Silverlight application, they will be redirected to login.aspx. Once logged in, you can retrieve information about their identity in your web service:

```
If HttpContext.Current.↙
User.Identity.IsAuthenticated ↙
Then
'proceed
Else
'quit
End If
```

You can also check the name of the user, or use the ASP.Net membership API to check their role, to set access levels. There are really two techniques here; one controlling access to the entire web service, and one checking authentication within the service.

A snag with forms authentication is that it is not designed for web services. For example, if the session times out and your Silverlight application calls a secured method, ASP.Net will try to redirect the user to login.aspx, but that will not work, because it is not the web browser making the call. There are workarounds, but this simple approach is enough to get started.

If you secure your web service like this, VB will not be able to update the service reference for Silverlight. The solution is to remove the restriction, or not to secure it at all until deployment.

Creating an edit form

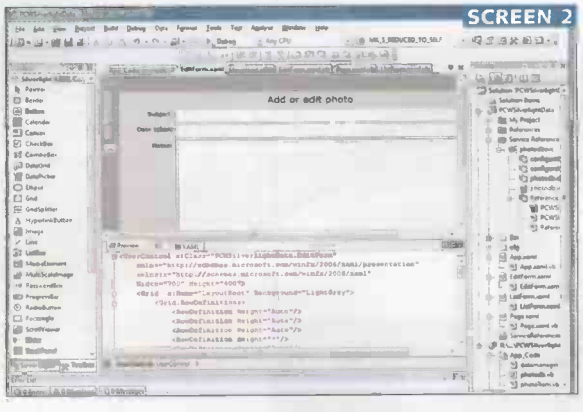
Once you have secured the data access, how do you create an edit form in Silverlight? Each Silverlight application is a single page, but you can simulate multiple pages. One approach is to use the default Page.xaml as a master page. The content is usually in a UserControl element. Leave Page.xaml empty, but add a SwitchPage method like this:

```
Public Sub SwitchPage(ByVal ↙
newPage As UserControl)
LayoutRoot.Children.Clear()
 If Not (newPage Is Nothing) ↙
Then
 Me.Height = newPage.Height
 Me.Width = newPage.Width
 LayoutRoot.Children.Add↙
(newPage)
 End If
End Sub
```

Now add new UserControls to the application. The example has two: ListForm.xaml and EditForm.xaml. The edit form is for editing a single record. The application uses a custom type, photoitem, defined in the web service. The DataGrid is bound to an array of photoitems. To edit an item, you get the selected item from the grid and pass it to the edit form:

```
Dim pi As photodbsvc.↙
photoitem = CType(grdPhotos.↙
SelectedItem, ↙
photodbsvc.photoitem)
Dim p As Page = ↙
CType(App.Current.RootVisual, ↙
Page)
p.SwitchPage(New EditForm(pi))
```

The EditForm has controls which are bound to its photoitem, and a button to save the current item which calls a web method. Straightforward so far, but how about uploading an image?



Using Visual Studio to edit a Silverlight project

Uploading an image

Image upload is done in several parts. Use Silverlight's OpenFileDialog to request a file from the user. This returns a FileInfo object. Call OpenRead to get a FileStream object, and use WebClient to write the stream to an ASP.Net handler. Add this to your web application. The Handler service has the job of writing the file to the web server, using normal .Net FileStream operations.

Uploading files is a security risk. For example, a hacker might upload an .aspx script to your web server and then execute it. There are several ways to lower the risk, including authentication, restricting the upload folder to one that will only serve images, and ensuring what you are writing is an image type with a known image extension. PCW

Resources

This application is online at www.itwriting.com/silverlightdata, where you can also download the code. Silverlight is at www.silverlight.net.

What's new in Silverlight 3.0

Silverlight 3.0 is in beta, and promised before the end of the year. It is a substantial update. On the multimedia side, there's support for the popular H.264 video and AAC audio formats, and on the design side there's 3D graphic effects and the ability to write pixels to bitmaps, enabling freedom to create any kind of effect in code.

Sharing a Sketchflow design for collaboration via the browser-hosted player

There are also changes aimed at developers, which is where Silverlight is attracting the most interest. There are now over 60 controls, including a much-requested File Save dialogue. A new Data Form control with validation controls is supported by a server-side library for ASP.Net, called .Net RIA Services, which will simplify authentication, security, and data operations.

In Silverlight 2.0, data crosses the network as XML, which is inefficient. Binary XML in Silverlight 3.0 compresses the data and should speed performance.

Another big feature is the ability to drag a Silverlight application out of the browser and onto the desktop. You can then run it from a desktop shortcut without opening the browser at all. An out-of-browser Silverlight application can read and write data to a local area of isolated storage, and detect whether or not it is online. The idea is that you can cache data for offline use. Sloob (Silverlight out of the Browser) looks good, though developers are struggling with its security limitations, which forbid almost all interaction with local resources, and restrictions on cross-domain web calls that prevent use of popular services such as Twitter.

A surprise hit when Silverlight 3.0 was presented at the Mix conference in Las Vegas was the new Expression Blend, which supports the new features. Highlights include much improved import capabilities from Adobe Photoshop and Illustrator, preserving layers, and a new tool called Sketchflow for creating user interface mock-ups and circulating them for discussion and feedback.

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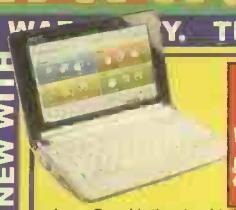

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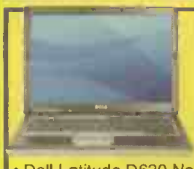

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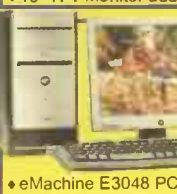

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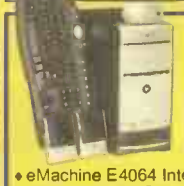

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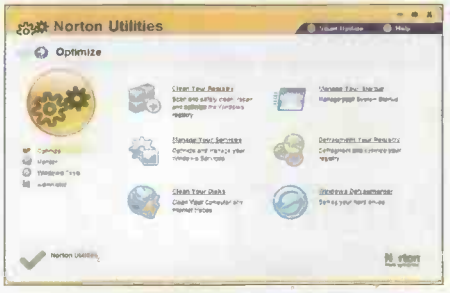
Space-saver PCs

PCs can now be squeezed into the smallest spaces and hardware companies are coming up with plenty of new designs to grace your living rooom or study. From all-in-one models with built-in monitors, to cool and quiet 'net-tops' that can play games, media, and run all your office software, we've a great selection of stylish desktop space savers for you.

System utility suites

If your PC is straining under the weight of long-term use, with a bloated Registry, fragmented disk and a lengthy boot time, a PC tweaking utility suite could breathe new life into it. There are plenty on the market and we've picked out a selection to see whether they live up to their claims.



Fix Windows errors

Fed up with the same error messages appearing in Windows? We've compiled a back-to-basics guide to the inner meaning of the most annoying ones. This handy guide should save you lots of wasted time.

A wallet in your phone

It's been promised for years, but has the idea of using your mobile phone as an electronic wallet finally come to fruition? In this special report we take a tour around the latest technological developments in mobile banking.

There's lots more in September's PCW DON'T MISS IT...

How PCW greeted the machine that outclassed the Mac and challenged Windows, plus we go back in time and take a look at two issues from 15 and 25 years ago

1985: COMMODORE AMIGA

PCW managed to get a Commodore Amiga six months before it launched in Europe and reviewer Guy Kewney declared it to be "the micro I have been waiting two years for the world to produce".

He said: "The Amiga is a multi-tasking micro (it can run several programs at once). It runs them very, very fast. It has graphics animation in colour, not just [still] pictures. It has sound capabilities the match of most synthesisers."

One top of which it had a mouse-and-icon interface like the vaunted Mac but ran at 10 times the speed and cost half as much.

The Amiga used Motorola 68000 processor like the Mac but much of its speed came from three support chips called Daphne, Agnus and Portia; the first two dealt with graphics and Portia coped with tasks such as interrupt handling and disk control.

The Amiga was the first machine to use a full-featured Blitter, a name derived from Block Image Transfer, which relieved the central processor of the task of moving around sets of image data (such as a character in a game).

The Commodore Amiga could run several programs "very, very fast," according to Guy Kewney

Guy highlighted the business potential of the Amiga (Spanish for girlfriend) but the brand became most famous for games machines.

He warned that Apple – not expected to offer multi-tasking for another 18 months – should watch its back. "The Amiga has a price advantage. It is an open architecture machine, onto which anyone can attach anything. All system calls will be published."

And he wondered if Microsoft Windows would be able to face the challenge of the Amiga.

We know now Windows would not take off until version 3.0, five years later. In retrospect it's clear the world needed a standard open hardware platform, which the PC became by default and, until the advent of faster processors, the speed of text-based programs would be more important to businesses than graphics.

All this meant the Amiga remained a niche product. Commodore went bust in 1994 though the brand has lived on under various owners. A company called Amiga (**www.amiga.com**) owns the technology and sells machines in the UK through Amigakit (**www.amigakit.com**).

Read Guy Kewney's full review in PDF format on your cover disc

AUGUST 1984

PCW's cover featured the Osbourne Encore, described as a fully portable, fully IBM-compatible machine. For 'fully portable' read relatively portable. It weighed nigh on 5kg. Reviewer Dick Pountain said "most buyers will probably use it as a mains-powered desktop machine but take it home every evening and on business trips, too."

But the Encore did have a built-in modem, a luxury in those pre-web days even if it did support a data rate of only 300baud.

A reader pointed out in a letter that the 'imminent' Integrated Services Digital Network (ISDN) would be able to push 80Kbits/sec down the existing two-wire copper links to exchanges.

Software piracy was already a problem, and so were futile attempts to stop it. Newsprint reported some software vendors had threatened to withdraw advertising if *PCW* carried ads for disk and tape copiers.

And Taiwan was making its presence felt on computing. The Einstein from Tatung, was the first in its class to have built-in disk drive but no tape drive. It cost £500, without a monitor, and ran a CP/M-like operating system called XtakDos.

AUGUST 1994

This edition caught the PC world in transition from DX4 chips (486 processors) to Pentiums. The Pentium had been out for months, but the first versions were slower than their top-of-range predecessors – partly due to a slower clock rate and software that wasn't optimised.

PCW was caught on the hop, doing a group test of DX4 machines only to find there was a shortage of DX4 chips. Editor Ben Tisdall complained that Intel has not been honest about its plans to push manufacturers to the Pentium. To make matter worse there was a shortage of the faster 90MHz and 100MHz Pentiums. The chips were needed to ensure machines could cope with Windows 95.

Newsprint reported that some of the researchers behind the Mosaic graphical browser were being headhunted by commercial companies, to the disgust of purists who did not want the web to be sullied by business. But Marc Andreessen, who went to Netscape, said government funds used to develop Mosaic were at "least partially intended to become an incubation method for technologies that then become commercially distributed."

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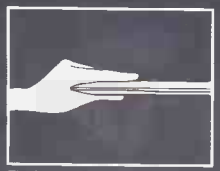
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