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April 2003

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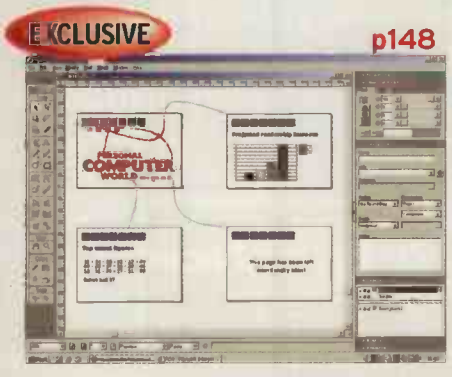

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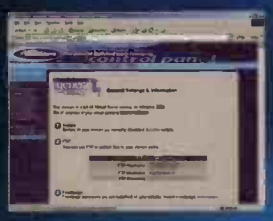

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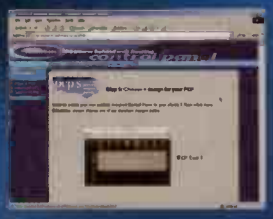

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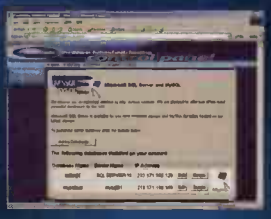

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To celebrate our silver anniversary we've made *PCW* even better, says Dylan Armbrust

Reviews
Our new improved product reviews section – see page 102

Hands on
Advice, hints and tips from our experts – see page 25

Welcome to the 25th anniversary collectors' edition of *PCW*. It's fair to say that few UK computer magazines can claim to be 10 years old, but none can boast being 25 – besides ourselves. And to mark our silver anniversary, we've put together what we think is an extraordinary issue. Read our cover feature '25 years of computing' for an in-depth look at the last quarter century of IT development as covered by *PCW*, and a look forward at what's to come. I'm confident you'll find it a fascinating and entertaining read. And for those of you who have fond memories of early personal computers, don't forget our bonus CD which carries some of the earliest games and emulators.

We've also taken this occasion to refresh the magazine with a new, more contemporary design, as well as adding new elements and updating some of the old ones. Based on feedback from you, our readers, you'll find changes in the way we signpost and sectionalise the magazine to make it easier for you to navigate around each issue and to find the pages, products, reviews and features most important to you.

The first change you'll notice is the return of Guy Kewney to the front pages in our Columns section. Guy contributed to the very first issue of *PCW* back in 1978 and, with over 30 years of experience covering the IT industry, has become one of the UK's leading gurus of technology. You'll also see that we've increased the number of News pages to cover more products and technology developments, as well as providing insightful analysis of the IT issues at large.

In addition, we've expanded our reviews coverage, providing you with more pages dedicated to objective information to tell you what's available and how we rate it. In every issue you'll find group tests dedicated to PCs, software, and peripherals for both the home and business environment, as well as a monthly mini-round-up of leading-edge products. To complement these changes, we've also updated some of our labs tests and our approach to reviewing particular items. Read Mark Walsh's update on page 102 for more information.

For those of you who are looking to keep up with the latest in practical advice, check out our revised Hands on section starting on page 225. You'll find an easier-to-read, cleaner design to help you find and follow some of the best 'how to' advice around. We've added a new Mobile computing column, too, that will cover how you can make the most of your mobile computing devices, ranging from your laptop to PDA, whether for the home or business. Go to page 253 to introduce yourself to this fascinating world. We've also taken this opportunity to expand the old Hands on Graphics & DTP column to include digital photography and video-editing techniques. It's now called 'Digital imaging and video' and can be found on page 250.

And at the back of the magazine we've introduced a new column, called The last word, by industry and technology expert Ed Henning. If there's any new development, Ed will know about it and will give you the straight goods about what it is, what he thinks of it and how it could affect you.

As always, please let me know what you think of the changes and how we can improve *PCW* further for you. We hope you enjoy our 25th anniversary issue and the changes that have come with it, but most importantly we'd like to thank all our readers who have supported us over the years. Long may we continue. ■

'Based on your feedback, we've made it easier to find the pages most important to you'

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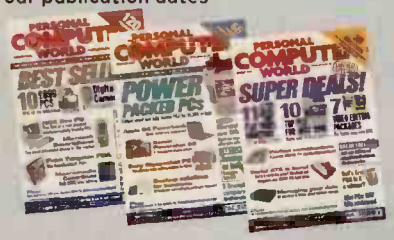

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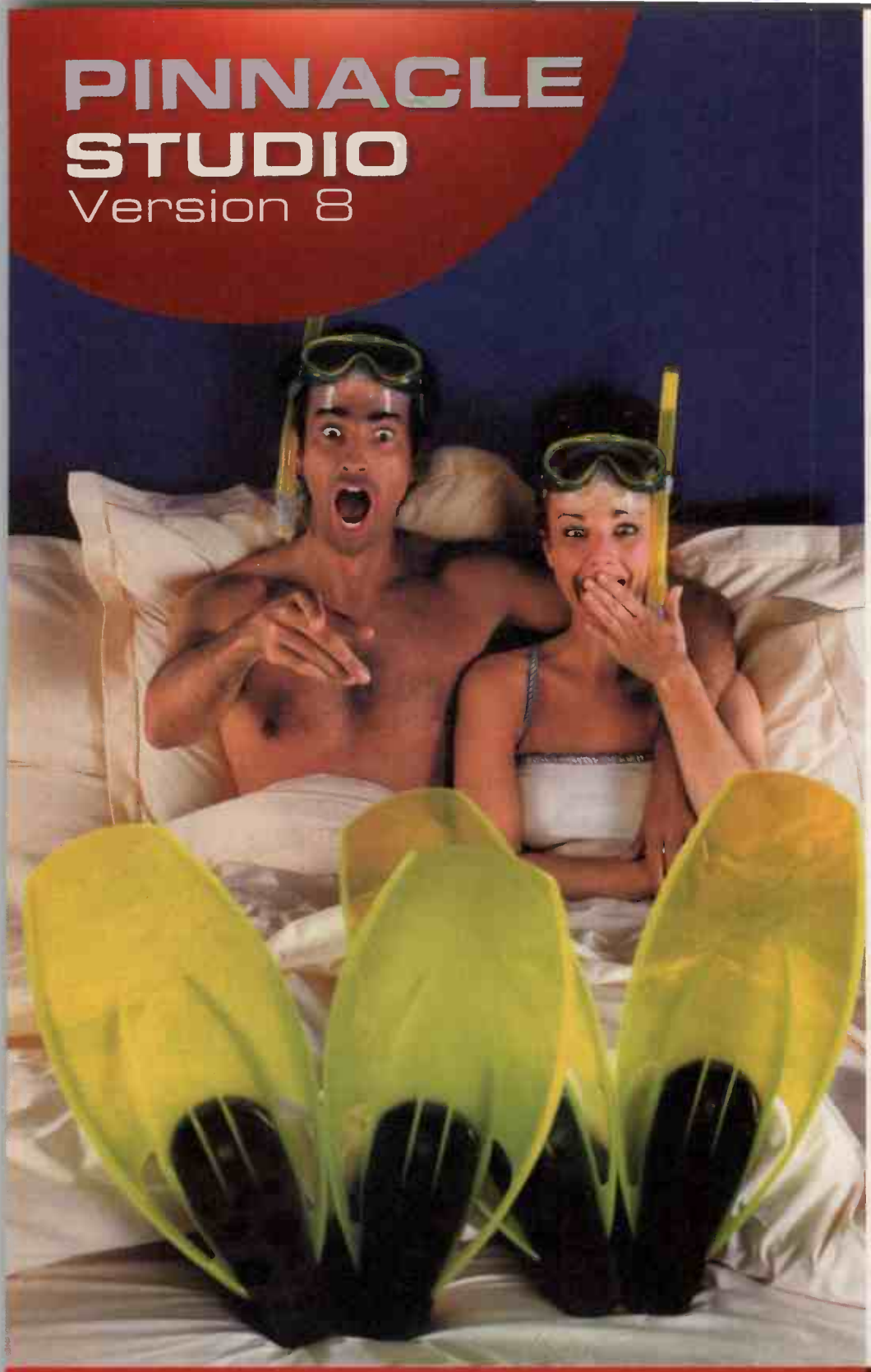

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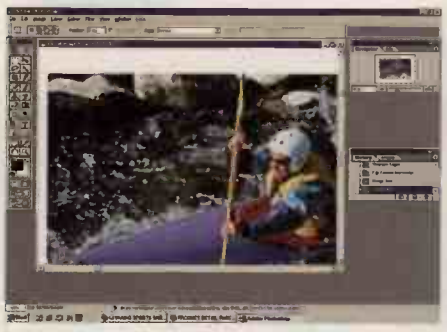
PINNACLE SYSTEMS

Results explained

Below is a list of the benchmarks we use in our reviews and group tests to test products



Adobe Photoshop 6.01 is part of Sysmark 2002

3Dmark 2001 tests DirectX performance

Unreal Tournament 2003 is used to test OpenGL

Sysmark 2002

Sysmark 2002 is an application-based benchmark made up of 14 applications. These are divided into two categories: office productivity and Internet content creation. A predefined script, with data, is run on each application at an execution speed that includes one-second pauses between operations to simulate human activity. Applications are also run concurrently to reflect the way most people use PCs today.

The time taken for each application to complete an operation is recorded. Sysmark calculates the geometric mean of the application times for each category, and converts these into a score for each category.

These scores are based on a comparison between the test system and a reference PC featuring a 1GHz Pentium III processor, an Intel 815EEA chipset motherboard, 256MB of PC133 SD-Ram, a 64MB Creative Geforce Annihilator 2 graphics card, a 30GB UltraDMA100 IBM hard disk and Windows XP. A score of 100 indicates that the test system has a performance equal to the reference PC, 200 indicates twice the performance and so on. An overall Sysmark score, the weighted geometric mean of the two category scores, is then calculated.

We run the benchmark at a resolution of 1,024 x 768 in 16bit colour. It is run three times, rebooting between each category. The applications are as follows:

Office productivity

Microsoft Word 2002, Microsoft Excel 2002, Microsoft Powerpoint 2002, Microsoft Outlook 2002, Microsoft Access 2002, Netscape Communicator 6.0, Dragon Naturallyspeaking Preferred v.5,Winzip 8.0, McAfee Virus Scan 5.13.

Internet content creation

Adobe Photoshop 6.01, Adobe Premiere 6.0 Microsoft Windows Media Encoder 7.1, Macromedia Dreamweaver 4, Macromedia Flash 5.

Sysmark 2002 is a commercial benchmark, available from Bapco at around £130 (www.bapco.com).

3Dmark 2001

This algorithmic DirectX test runs three specially coded games, based on the Max Payne engine, at low and high detail. A fourth test only runs on cards that are fully compliant with DirectX 8. This results in higher scores being achieved by these cards than others.

The benchmark is run at its default settings of 1,024 x 768 in 32bit colour. When testing graphics cards, it is also run with Full Scene Anti-Aliasing (FSAA) and at 1,280 x 1,024, both in 32bit colour and textures, set to loop three times.

The result is calculated through a combination of the average frame rates for the first three games in both high and low detail, with greater emphasis put in the high detail. The result of the fourth test is the added to this – it has less of a bearing on the overall score.

The scores in the box below, provided as a reference, should give you an idea how two different graphics chips perform under this test.

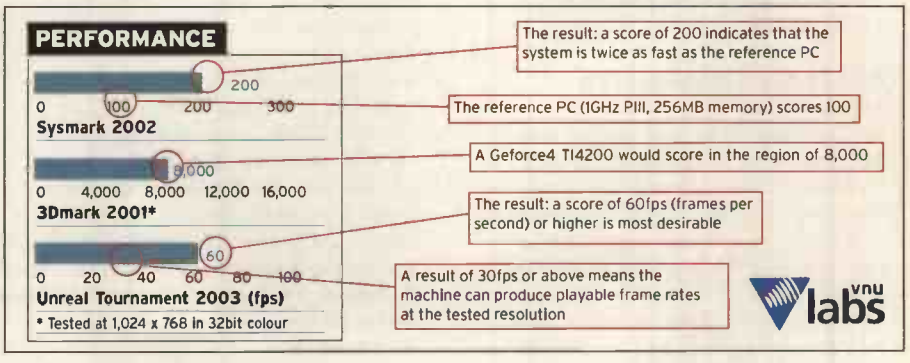
Unreal Tournament 2003

We test OpenGL performance of PCs, graphics chips and motherboards with the Unreal Tournament 2003 benchmark. The benchmark is featured in the Demo version of the game (available for download at www.unrealtournament.com), but not in the full version. Once the demo is installed, the benchmark can be found in the System folder of the UT2003 Demo file.

The test is run with all the default settings and at 1,024 x 768 resolution. Once the benchmark has run, two results appear: a flyby and a botmatch result. We use the botmatch figure, as it is a better representation of frames that will be achieved when playing the game

Battery test

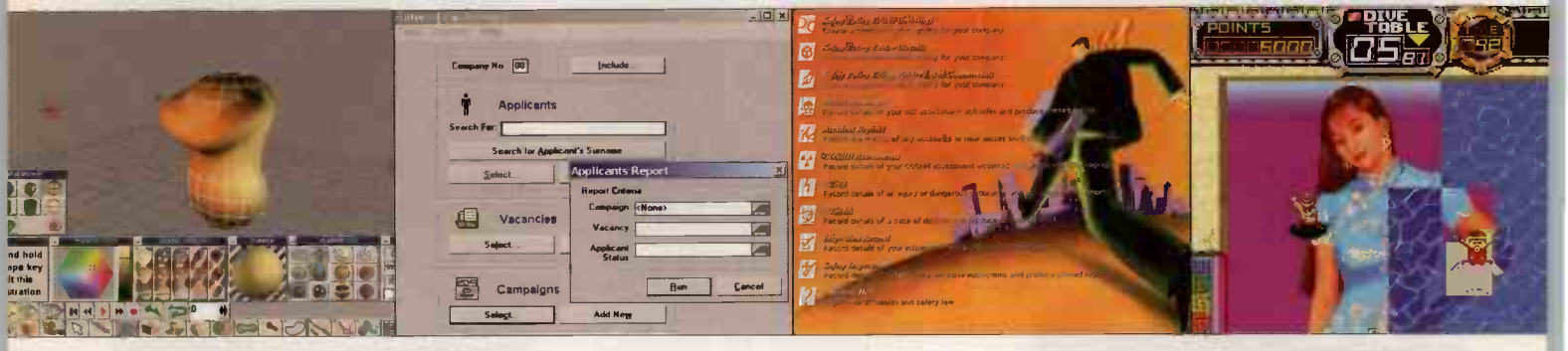
To get a feeling for the length of time a notebook battery will last, we run a specific test. Based on a looping Excel Visual Basic application, the test opens worksheets, generates random numbers and pivot tables, then zooms, and adjusts the brightness and contrast of an image. The application also includes 2D animation and periodically halts to simulate natural human pauses. The running time is then recorded to disk every 30 seconds until the battery power finally diminishes.



April Cover Disc

Turn to page 348 for more details >>

Three full programs worth £468 including Truespace and a PlanIT duo



Featured software

Truespace 3.2

www.caligari.com

Caligari's 3D modelling and animation software is renowned for its ease of use and power. At the time of its release, Truespace 3.2 was priced at $595 (£363), but now it's yours for free with no time limits.

Truespace 3 gives you a true 3D interface; automatic physics calculations; inverse-kinematics for animating; metaballs for creating organic objects; 3D paint for texturing; the ability to output to any medium, including paper, film, video, avi, HTML, or VRML without the need for translation filters. You also get spot, local, and global lights; point editing and sweeps for modelling; and the ability to use Adobe-compatible plug-ins for post-processing. Overall, it's an all-encompassing modelling, animating and rendering package.

Be sure to try out the Truespace 6.0 demo (also included on the CD), to see how far Truespace has evolved since 3.2. At the time of going to press, Truespace 6.5 was undergoing final development, however you'll be able to upgrade from your copy of Truespace 3.2 to the latest Truespace 6.5 for only £249 ex VAT and shipping – **see page 276 for upgrade offer details.**

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PlanIT Staff Manager Pro

www.planit.co.uk

Staff Manager Pro provides all you need to help you recruit and manage your staff. It's broken down into three main modules: Employer's Resource Kit, Staff Recruiter and Staff Appraiser. With the Resource Kit you can create a staff manual in minutes by editing the template provided. Areas covered are rules of the workplace; policies for business expenses, equal opportunities, health and safety and maternity policy; plus disciplinary and grievance procedures. The Resource Kit also provides you with expert advice on how to create a wide range of employment documents.

PlanIT Staff Recruiter guides you step by step through the process of finding and employing new staff, whether you're in charge of recruitment for a small company or several multi-branch organisations.

PlanIT Staff Appraiser's Intellitext technology automatically creates fully formatted, fully personalised staff appraisals for you, potentially saving you hours of laborious preparation and paperwork, and creating a more constructive employee evaluation.

Turn to p348>

PlanIT Health & Safety 3 Pro

www.planit.co.uk

If you run a small company, this software will help you to understand the current health and safety legislation for your business, create accident report forms, implement a risk assessment procedure, and establish a workable health and safety policy.

A 'virtual consultation' takes only 10 minutes to complete and will result in a health and safety plan to cover your business and staff as well as yourself. Reporting procedures provide for all eventualities and requirements, including health and safety standards COSHH, F2508 (injury or dangerous occurrences) and F2508a (report of a case of a disease), as well as covering safety inspections and inspection reporting. The program also automatically downloads any software amendments concerning the latest legislation. **Please read the installation notes on page 348.**

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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 4 or later). Unfortunately, Netscape doesn't properly support this software. However, we have also provided links to the featured programs so that 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 doesn't, double-click the CD-Rom/DVD icon in My Computer, or run pcw.exe on the root of the disc.

Problems?

Please note that we cannot give support on individual programs contained on this disc. If you have problems running the disc or any of its content, please note these guidelines:

FAULTY DISC > If the disc is physically damaged and will not load, return it to this address for a replacement:
PCW April 2003 cover disc
ABT, 306 St Mary's Lane,
Upminster, Essex RM14 3HL
quoting reference '*PCW* Vol 26 No 4'.

PROBLEMS INSTALLING/RUNNING THE SOFTWARE > Check the support page on the disc, or check the manufacturer's site.

GENERAL DIFFICULTIES > Call 08700 885 995 (9.30am to 5pm Mon, Tues, Thurs & Fri; open until 8pm on Wed and 10am to 2pm Sat).
Or email us at pcw@vnusupport.co.uk.

April Bonus CD

Our 25th anniversary bonus disc harks back to the golden age of computing

Full versions

Edsac Simulator
http://edsac.net

This Warwick University simulator is a faithful emulation of the Edsac for Windows. All the controls and displays of the original machine are here, together with a library of original programs, sub-routines, debugging software, and program documentation.

Among the programs on the disc is possibly the first-ever computer game. Read more about the machine that changed the world on page 32.

Mame version 0.63
www.mame.net

Mame stands for 'Multiple Arcade Machine Emulator' and, as its name suggests it emulates those legendary machines on which thousands of arcade games used to run. In fact the current version supports 2,131 unique games.

CCS64 Commodore 64 emulator
www.computerbrains.com/ccs64

For those who remember the early 1980s, this shareware program emulates all aspects of the famous C64 and is claimed to run perfectly with all games or demos, even those that used the original C64 1541 disk drive.

Sinclair ZX81 emulator (freeware)
http://users.aol.com/autismuk/sinclair.htm

Sir Clive's second Z80-based wedge-shaped home computer is brought to life in this emulator from Paul Robson.

Spectrum emulator (shareware)
www.worldofspectrum.org/emulators.html

The popular Z80 emulation of the ZX Spectrum 48 and 128 comes with support for keyboard, cursor and Sinclair joysticks; Currah micro-speech, Disciple, microdrive, ZX Printer, RS232, Multiface 128 and Specdrum. All unofficial opcodes are supported, plus realtime loading and saving from tape, sample file, tap or tzx file. It also loads sna and Z80 snapshot files.

Retro games collection
Here's a selection of oldies but goodies that should keep you amused:
Astro Fire • Brainwave 2 • Ploing 2 • Strayfire • Jumpstar • Crosscraze • Terrafire • Invaders 78.

Nvidia & ATI graphics card drivers
www.ati.com and www.nvidia.com

You'll find a selection of drivers for these cards in the \software\nvidia_and_ati_drivers\ folder on this month's disc. If you have one of these cards you can copy the installers individually to your PC, or install them directly by clicking the appropriate button in the CD user interface.

Trial versions

Paint Shop Pro 7
www.digitalworkshop.com

This 'Annlversary Edition' of the popular photo-editing suite includes: Paint Shop Pro 7.04, Media Center Plus 3.1, Animation Shop 3.04, special effects filters from Alien Skin Eye Candy, Virtual Painter, and Flaming Pear Essentials, a brand new Product Tour, bonus hands-on tutorials, 30 new picture tubes, picture frames, shapes and more.

Utilities

Winzip 8.1 (shareware)
www.winzip.com

Winzip is the world's most popular file compression utility. Its optlonal wizard interface makes zipping and unzipping easy for novices too. Winzip features built-in support for cab files and for popular Internet file formats such as tar, gzip, uuencode, binhex, and mime. Arj, lzh, and arc files are supported via external programs.

Winamp 3 (full version)
Now updated to include a movie player Winamp is now on a par with much of its competition. However, its core values remain the managing and playing of audio.

Utility selection
Here's another collection of useful programs and add-ins for Windows: Shockwave Player 8 • Laplink FTP • ID3-TagIT • Ad-Aware • Download Accelerator Plus • 123 Free Solitaire • Popup Stopper • Celestia.

Note

Due to a programming error, clicking the 'Featured' button on the bonus disc will display the wrong programs in the main window. The program list to the left of this window is correct, however, and clicking on any of these will display the correct contents in the main window.

On the DVD-Rom

Age of Terror: In The Name of God

In addition to the complete contents of both CD-Roms, we have a fascinating DVD documentary; *Age of Terror: In The Name of God*, from The Discovery Channel. Whether in the skies above the US or in the jungles of Colombia, terrorism is a global menace.

This hour-long episode of *Age of Terror* examines the history of modern terrorism, from its birth in the chaos following World War II to the horrific threat that it presents today.

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News

EDITED BY CLIVE AKASS

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Focus on

'Progress was very fast in those first 15 years. In the last 15 years it has been as fast or faster. People said the computer field would settle down... but it hasn't. It has retained its excitement'

Sir Maurice Wilkes, who built the world's first modern working computer, interviewed in our retro special on pages 32-33

Analysis

24 £1b education IT bonanza

PCW numbers

Throughout the News section you'll see references in stories to PCW numbers.

To find out more on the stories go to www.pcw.co.uk and put the number in the box pictured here.

Microsoft .Nets the world

Microsoft is to launch two crucial products in April aimed at securing its dominance in web services, commerce and infrastructure. Windows Server 2003 and Visual Studio .Net 2003 face a tricky commercial environment even discounting war and downturns.

They are sure to gain wide acceptance, but they enter a world looking for alternatives and reluctant to give leverage to a company recently convicted of monopoly abuse.

Unilever and merchant bank Morgan Stanley are two of the latest companies to announce a switch to Linux, after licence changes that mean they lease rather than own Microsoft code.

The changes are part of a bid to maintain revenues by selling software as a service rather than as a product. Microsoft also wants to sell web services and the tools to host and create them, which is the point of the .Net suite of which the two new products are part. The company has trumpeted new commerce-friendly security features in Server 2003, originally called .Net Server, which comes in Standard, Web, Enterprise and Datacentre editions.

But its image was not helped last month when the Slammer worm jammed the web. This exploited a known flaw in Microsoft SQL Server for which a patch was available – but some of the company's own servers had not been updated and were hit.

Visual Studio .Net is a toolbox for developers to create services hosted by Server 2003. It is an impressive product but raises questions about the ways users can be locked into Microsoft code.

Developers have a choice of high-level languages, including the new C#, Visual Basic.Net, and J#, a Java lookalike, all of which compile to the same intermediate code. J# allows Java developers to migrate easily to .Net, but the apps they create will not run on a Java machine.

Microsoft has claimed these apps will be cross-platform like Java, and indeed the code will run on a variety of mobile devices. But only those with Microsoft's Compact Framework, roughly the equivalent of a Java Virtual Machine, will be able to run 'rich applications'. Other devices will be limited to Wap and HTML-style services.

So, initially at least, any device intended to take full advantage of what may be the dominant web server software will need a Microsoft platform (see below).

Product manager Ivo Salmre said other platforms, such as Symbian or Linux, may be supported in future if there is a 'compelling commercial case'. But the Framework specs had been posted to the ECMA standards body so that in theory any device maker can write their own .Net environment.

He said the .Net suite avoided the 'fragmentation' that had happened with Java. Which is a little rich, when Microsoft has been ordered to bundle 'official' Java with Windows – rather than lumbering users with its own 'fragmentation'. **Clive Akass**

Quick facts on new code

Visual Studio .Net will support Pocket PC 2000 and 2002, and Windows CE 4.1 – but not, at first, the Smartphone. The platforms pass .Net code through a Just In Time compiler known as a Jitter. Presumably flaws will be called Jitterbugs.

The Enterprise and Datacentre editions of Server 2003 have been compiled for Intel's 64bit Itanium, which has its own instruction set, and not yet for AMD's x86-compatible 64bit Opteron, which launches in April. AMD's Richard Baker said this was expected and that the OS versions did not cover the Opteron's target market.

Confused about the meaning of .Net? Then you may be pleased to know that Visual Studio .Net has a module known as the Obfuscator – and it is not the PR department. Its aim is to protect the intellectual property of developers by preventing the reverse engineering of apps.

An add-on for Server 2003,set to launch this summer will let users take full advantage of Office 11 collaboration facilities.

Borland will shortly release a new integrated development environment incorporating Microsoft's .Net Framework software development kit. But it 'remains committed' to Delphi, for which a .Net component library layer has been developed. A further update is promised soon but Delphi will not access .Net Framework tools.

This Internet radio from PDT is likely to be sold as part of a BT broadband bundle. It links to a PC via the USB port. Philips has a similar device called the MC-i250. Both were on show at the Consumer Electronics Show in Las Vegas. For more on the show turn to page 22.

17in Apple Powerbook

Digicam owners will love this – see p36 & p106

School tablets

Vendors target teachers in £1b bonanza – page 24

Digicams get an eyeful

A new sensor that allows digital cameras to 'see' more like we do has been developed by Fujifilm. Our visual systems (which of course extend beyond the eye into the brain) cope automatically with light and shade in a scene. But novice photographers who expect cameras to do so can be shocked to find that darker areas of their pictures are too dark or highlights are too white.

Film has scored over digital CCD sensors to date in having a higher dynamic range – that is, it can capture detail over a broader range of light and shade, allowing a balanced image to be teased out if necessary in the darkroom.

If you set your CCD camera to capture the darker areas of a scene, the highlights can be 'burned out' and no amount of manipulation in an image editor can recover the detail.

Fujifilm has got round the problem with what is in effect a twin-sensor pixel (see picture above right): one sensor has low sensitivity for the highlights; the other captures the darker areas. The combined image has four times the dynamic range of conventional modules, Fujifilm says.

If you'll take the high lights... twin photo-diodes in a single pixel set in the honeycomb structure of the Super CCD SR module. The smaller diode captures highlight details that would burn out on the larger one

The eye, too, has sensors of different sensitivity called rods and cones, though their roles are rather more complex than those of their equivalents in what Fujifilm calls its Super CCD SR module.

The third-generation Super CCD on which it is based was also inspired by the human eye, according to Fujifilm. It uses hexagonal sensors that, like the eye, capture information best along the horizontal and vertical axes; the shape also allows the sensors to be packed and accessed more efficiently.

Fujifilm has yet to ship any Super CCD SR products, but it has launched two Super CCD High Resolution (HR) modules that it describes as the first of its 4G products.

One is a 9.4mm 3.1megapixel module boasting 50 per cent more pixels than a 3G one of the same size; the other is a 14.9mm 6megapixel module. Fujifilm claims both have an 'output resolution' of around twice their pixel count thanks to their hexagonal geometry.

No launch date has been set for the SR devices. There's a good interactive demo at www.fujifilm.co.uk/supercd.

500GB holo-drive 'two years away'

Holographic drives taking 500GB discs could be on sale within two or three years, according to Cambridge University spinoff Polight Technologies. It claims to have made a breakthrough with a material called Holonide, eliminating wasteful light scatter and boosting data density.

Chief executive Michael Ledzion claims the technology is an order of magnitude better than one under development by Inphase, a spin-off from storage media giant Imation.

Ledzion said his media can use green or cheap red lasers and many elements of low-cost DVD burners. First products are likely to be for professional use but the technology is likely to migrate to to the consumer market 'within the decade'.

www.polight.com

Palm gives a Jot

Palm is dropping Graffiti handwriting recognition after a court ruling that it infringed Xerox patents. It is appealing but will use CIC's Jot system instead.

Polaroid snaps up digital

You may have wondered what happened to Polaroid, the company that made a fortune on cameras that delivered near-instant prints from self-developing films.

Even in the age of one-hour printshops and digital photography, it still sells some of this core technology. But you will soon see the name on a range of consumer digital cameras called Cool-icam, most of which can double as webcams.

The point-and-shoot £249 PDC 3350 and £149 PDC 2350 have 16MB of Ram, an SD (Secure Digital) card slot, and 3.3 and 2.1megapixel sensors respectively. Two models can also be used under water: the 2.1megapixel Aqua 2100, pictured above, costs £199; the 1.3megapixel Aqua 1300 is £79.

The cameras are not made by Polaroid but use the brand after a deal with World Wide Licences. All prices are inc VAT.

www.cool-icam.com

Swat a lot of bother as armed police home in on PC rage man

Police feared the worst when tenants at an apartment block in Boulder, Colorado, reported a neighbour waving a gun, shouting that he 'wanted to kill the bitch'.

An armed police Special Weapons and Tactics (SWAT) team evacuated the building and diverted cars from the scene, where a large crowd gathered.

But police quickly left after establishing that the man had simply been suffering a bad case of PC rage, threatening his PC with a plastic pellet pistol.

'It was alarming and concerning and expensive for us, but the man's conduct didn't warrant any criminal charges,' deputy police chief Dave Hayes told local reporters.

'He's asking if anyone knows how to undelete a file'

>> Art of CDs

This is another one from the department of odd ideas. A company called Discarray reckons the artwork on CDs goes to waste so it is selling disc holders that double as display cases. Prices start at £24.99 for a choice of designs.
www.discarray.com

>> US web watch

A web monitoring centre to detect and respond to attacks on information systems and key ecommerce sites has been set up by the US government.

The Global Early Warning Information System (Gewis, pronounced 'gee-whiz') has been in development for 15 months. The pilot is expected to go live within weeks.
PCW number 1138402

>> IBM thinks fast

IBM has unveiled a new range of Thinkpad laptops with both 802.11b Wifi networking and faster 11a. The R40 range is targeted at corporates.

>> ...so does CTX

CTX has launched its largest-ever LCD screen, the £556 ex VAT 19in P922E, with speakers, DVI and analogue ports and a USB2 link that allows you to link other devices at a rate 480Mbits/sec.
www.ctxintl.com

Mesh box aids web sharing

A Linux box from a British start-up will allow a community to share a broadband connection using mesh technology that automatically sets up links in a population of Wifi access points.

The £250 ex VAT Locustworld Meshbox uses software from text-message pioneer Jon Anderson to configure a group of wireless access points into what used to be called a parasitic network and is now more aptly described as symbiotic because nodes provide mutual assistance.

According to *PCW* writer Guy Kewney, who highlights the Meshbox on his site at www.newswireless.net, the most impressive aspect is its ability to combine several broadband feeds. This means that, say, 20 houses could share four links, though this does add 10 per cent to the wireless load.

Locustworld founder Richard Lander has also set up what he calls the Wireless Internet Assigned Numbers Authority (Wiana) to prevent address conflicts when meshes overlap.

The Meshbox packs a 802.11b Wifi access point with a 500MHz fanless processor, 128MB of Ram and a 32MB Compact Flash drive. It can be used as a Linux workstation.

But all is not good news about mesh networks. BT Wholesale has ended a three-month trial in Pontypridd in Wales, saying that it failed to fit its broadband needs. A spokesman said this was because of the 'expense, customer experiences and limitations' of the Meshwork wireless technology from Radiant Networks.

He added: 'We will still look at mesh wireless technologies and will plan other pilots.' BT tested the system for delivering video at up to 5Mbits/sec.

Geoff Butcher, Radiant's chief executive officer, said the company never intended to deploy the system in its current form commercially. 'The trial was simply to prove that the technology could deliver video on demand at 5Mbits/sec and we did this, and still have happy punters to prove it,' he said.
http://locustworld.com
www.radiantnetworks.com

Shredder war on the bin raiders

We've seen a lot of things pass through the portals of *PCW* Towers but nothing quite like this. It's a device for shredding CDs and paper, aimed at beating bin raiders who sift rubbish for sellable information or credit card details. The Fellowes PS70-2CD costs £265 from major suppliers.
www.fellowes.com

Imminent Banias dubbed Centrino

Intel's imminent Wifi-equipped mobile platform, codenamed Banias, is to be called Centrino. Designed from scratch to cut battery drain, it will eventually supersede the mobile P4.

The first versions will clock between 1.4GHz and 1.6GHz, but are expected to outperform a 2GHz P4. They will have a 1MB on-chip cache. A second version supporting both 11b and faster 11a Wifi will ship later this year.

Euro law will test HP's eco-friendliness

HP is anxious to prove its green credentials by persuading you not to throw away your old inkjet and toner cartridges. It launched a web page last year dedicated to recycling (www.hp.com/recycle) as the latest step in its mission to stop us drowning in waste.

Kevin Hoban, HP's programme manager for recovering spent consumables in Europe, says that more than 50 million toner cartridges weighing 62,000 tons – equivalent to nearly 400 Boeing 707s – have been collected and recycled since the scheme started in 1993.

Now the issue has become complicated by the European Parliament, which has voted for a new law to minimise what it calls electroscrap. The problem is that items such as inkjet cartridges often end up in municipal waste systems that are not equipped to cope with the materials used in chips that monitor ink usage. These chips can discourage the refilling of cartridges, because the printer may refuse to print when the cartridge is registered as empty. Printer vendors make most of their money from consumables.

But we can expect companies like Canon, Epson, Lexmark and HP to be ordered not to use the chips, because they break the electroscrap rules. The new law may allow cartridges to be refilled in the future, but it is also possible that manufacturers will raise prices to cover the lost revenue. That will be a true test of how green HP really is.

● Lexmark has invoked the controversial Digital Millennium Copyright Act in a bid to prevent Static Control Components cloning one of its ink-cartridge chips. Many lobby groups have predicted that the law would be used beyond its original aim of preventing digital piracy.

Leo Waldock

Digital paper saves power

Don't be fooled by the murkiness of the image (right) – you're looking at what could be a major rival to the organic (Oled) screens, which are expected to supersede standard liquid-crystal displays (LCDs) over the next five years.

The pictured prototype comes from Zenithal Bistable Displays (ZBD), a spin-off from Britain's Defence Evaluation and Research Agency (now Qinetic).

It's an LCD, but differs in that it is bistable: a special grating causes the liquid crystals to flip-flop into one of two orientations and stay there without being sustained by an electric current. So the device goes some way towards combining the advantages of a dynamic display and paper.

A ZBD screen on a handheld ebook could be used for five hours a day for a year on four AAA batteries, according to ZBD chief executive Henri-Luc Martin. He also claims the contrast on a reflective screen is four to five times better than that of a Palm black-and-white screen.

Time for a change?... a ZBD display

The power saving is greatest on devices like ebooks where the image is fairly static. Watches are another target market, but even on moving images, only pixels that change draw power. First products are likely to be transflective, that is, they can be backlit in poor ambient light. Oled screens are emissive, saving power by lighting only the pixels used, but still draw more than ZBD displays.

Sample screens ZBD showed to *PCW* look rather better than the one pictured left, but had obvious defects. Martin said this is because they were made in a laboratory rather than by an LCD plant. However, response times on the samples subjectively appeared to be good.

One advantage of ZBD displays is that they can be made by LCD manufacturers. Another, said Martin, is that they can be driven by a passive matrix rather than an expensive thin-film transistor (TFT) layer.

Singapore-based Varitronix has signed a deal to develop and manufacture ZBD displays – the first products could be available within six months. During that time period ZBD also expects to demonstrate a colour screen. 'It is a question of getting the greyscale right,' said Martin. 'Once we have that we can use standard LCD techniques for colour.'

He believes ZBD and Oled screens will coexist when the technology matures.

www.zbddisplays.com

Closer view from the top

Getmapping has increased the resolution of the aerial views it offers of major cities so detail as small as 10cm can be seen, for example road markings and garden paths.

You can already get views of any part of Britain at the lower resolution of 25cm. The first phase of the new high-res survey has just been completed, taking in 30 cities, including London, and Edinburgh. The images, adjusted to fit the Ordnance Survey's digital maps, are available on CD from www.getmapping.com.

Getmapping's view of Parliament Square

>> Fast memory

Kingston has launched its new HyperX DDR fast memory modules for bus speeds of up to 370MHz and 434MHz in capacities of 256MB and 512MB. Prices start at £51 for a 370MHz 256MB module.

www.kingston.com

>> Disk peril

Companies are discarding hard drives filled with sensitive data, according to a study by MIT students. They recovered files on 69 of 158 second-hand drives; 49 contained love letters, personal information and credit card details. One had a year's transactions, including account numbers, from a cash machine.

Tests by our former sister title *Network News* found destroying a disk was more reliable in avoiding this problem than data-wiping software.

PCW number 1138062

>> Safe Crusoes

Transmeta is packing new security features into its Crusoe chips to protect data on notebooks used on wireless networks.

Features include secure hidden storage, encryption acceleration, and an architecture that can be extended to support new features and standards such as the Advanced Encryption Standard.

PCW number 1138059

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intel inside pentium 4

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>> Look... no keys!

Keybowl's Orbitouch wins the award for strangest product of the show – it's a keyboard without any keys. Instead of punching keys, you slide two domes into one of eight different positions. As you do so, it creates key presses.

The orbs also double as a mouse. The company reckons that its device will be tremendously useful to those who suffer from aches and pains while typing.

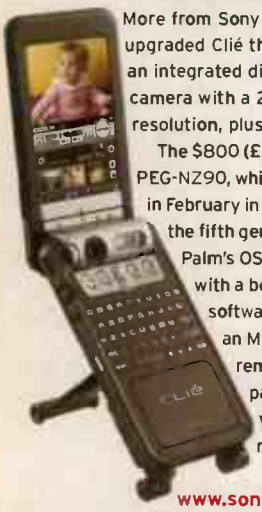
www.keybowl.com

>> All-in-one fun

This futuristic gadget from Panasonic is its latest attempt to create a handheld device that can play digital music and mpeg-4 video clips, act as a Dictaphone and take low-resolution digital stills. Files are stored on SD (Secure Digital) memory cards, with a 64MB version in the box, and there's a docking station to connect it to a TV. It will cost $400 (£266) in April.

www.panasonic.com

>> Clié with eye



More from Sony – an upgraded Clié that features an integrated digital camera with a 2megapixel resolution, plus flash.

The $800 (£530) PEG-NZ90, which launches in February in the US, runs the fifth generation of Palm's OS and comes with a bevy of software, including an MP3 player, a remote control package and a voice recorder.

www.sony.com

PC stakes out living room

This year's CES in Las Vegas was packed with products that promise to place the PC at the centre of the living room. Sony and Philips both talked about products that make modern, multimedia PCs much more useful. Most exciting was Sony's network media receiver PCNA-MR10, which transforms Vaio computers into multimedia servers for the home.

The $200 Roomlink, available in February in the US, sends audio and video from PCs to home cinema equipment via Ethernet cables, or wirelessly using the 55Mbits/sec 802.11a standard. Sony's idea is that you use the Vaio PC to store digital audio, and record TV programmes using Gigapocket software. Watching and listening to what you've stored is a simple case of pressing a few buttons on the remote control.

Philips also signified its intention to sell a similar product at some point – it referred to its invention as a wireless digital media receiver.

Not every company bought into this vision of the PC as a home entertainment server, however. Pioneer announced that its $1,200 (£800) Digitalibrary DL-1000-S will be available in May. This is a dedicated server for the home – it multitasks as a music jukebox, video player, image viewer and Internet gateway. The Digitalibrary streams DVD-quality video downloaded from broadband Internet connections to receivers located around the house, and contains an 80GB hard drive on which to store files.

Roomlink... joins PCs to your home-cinema kit

Pioneer DL-1000... jukebox, image viewer, video player and net gateway

Unlike November's dismal Comdex, this year's CES was a storming success – 116,687 visitors from 128 countries came to see 2,283 exhibitors. The show floor was packed with cracking gadgets – the products on these pages are just a small sample. Most will turn up in the UK, but for the moment, pricing and availability is only relevant in the US.

Microsoft to go for new handheld media players

RCA caused a stir with this portable video player (right), which will ship in the summer for $400 (£266). The Lyra RD2780 has a 3.5in colour TFT screen and a 20GB hard disk, which can hold up to 80 hours of video. It was one of several such devices to use the fast USB2 port (see story opposite) rather than Firewire to connect to a PC for transferring prerecorded video so that you can you can watch it on the move. The player can also cope with MP3 and Windows media files, plus it doubles as a portable hard disk.

Microsoft announced that it is developing a Windows CE version, codenamed Media2go, to give such devices the multimedia capabilities of Windows XP. Intel showed reference designs (right) based on the platform and intended to be the basis for real products by other manufacturers. The pocketable devices use low-drain ARM-based XScale processors and again connect to PCs via a USB2 port.

Expect manufacturers such as Sonicblue and Samsung to have models in the shops this year.

Microsoft's new Media Centre edition of Windows XP was on show in the laptops from Toshiba and Alienware and a range of home PCs from Viewsonic, which has been broadening its product range beyond displays. The software offers new features for watching TV or DVDs, and managing music collections.

Above: RCA's Lyra 3.5in video player. Left: Reference designs from Intel for a similar device using Microsoft's new Media2go platform

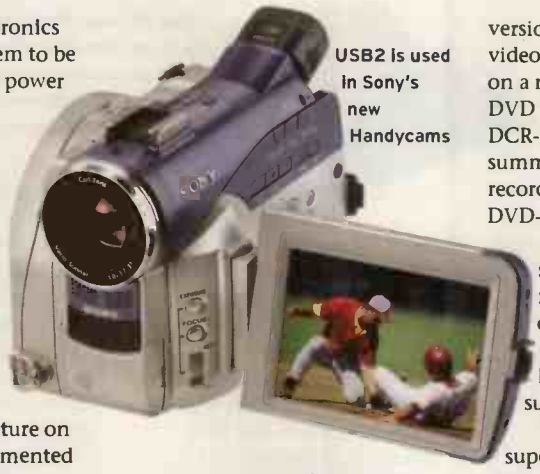
www.rca.com, www.intel.com

USB2 takes on Firewire

Consumer electronics companies seem to be bowing to the power of the PC market by including the new 480Mbits/sec USB2 links in many of their devices rather than Firewire – even though the latter is now pushing 800Mbits/sec.

Firewire, which began life as an Apple product, has never become a standard feature on PCs though it is implemented on some motherboards. The new fast version is built into the latest Apple Powerbook (see page 36 and review page 106), which is designed to appeal to video and digital camera owners.

By contrast USB2, rated at 40 times the speed of USB1, is implemented on almost all the latest PCs



USB2 is used in Sony's new Handycams

Samsung included a USB2 port on a new type of camcorder it showed at CES – one that records mpeg-4 video onto a 1.5GB hard drive. The $500 ITCAM-7, which ships in the US this year, can also be used to play mpeg-4 video and MP3 audio files on the move.

Sony has been long been a Firewire stalwart, using a version it calls I-Link for its video cameras. But it uses USB2 on a new range of what it calls DVD Handycams. The top-end DCR-DVD300, out in the summer for less than $2,000, records to 3in DVD-R and DVD-RW discs.

This also represents a swing to the DVD-RW format – Sony was officially a member of the +RW alliance but has launched drives supporting both formats.

Firewire is not about to be superseded by USB2. It will almost certainly be used in high-end video cameras and, unlike USB2, can support peer-to-peer operation: Firewire devices can interoperate without the mediation of a computer.

But the fact that there are two rival fast serial links is likely to confuse vendors and users.

www.samsung.com
www.sony.com

GPS Palm

This Palm-based Garmin Ique 3600 PDA from Garmin boasts an integrated GPS unit with software that provides turn-by-turn directions for drivers. The $590 devices, packing an ARM processor, 32MB of Ram and an SD (Secure Digital) slot, is expected to ship this summer in the US.

www.garmin.com

Big screens

Samsung unveiled a 54in LCD TV – upstaging Philips, which showed a 52in one. The Samsung product can double as a monitor using a DVI-I port.

www.samsung.com
www.philips.com

>> To be frank...

You could be buying electronic stamps on the web this year if Royal Mail trials prove to be successful. Tests are due to start in the next three months. Information systems director Paul Kelsall said companies will be able to put their logo or a picture next to a stamp they print out themselves.

The technology comes from Lockheed Martin, which supplies the Royal Mail's sorting machines. Encrypted information on the stamps will be read and the cost deducted from a customer's account.

PCW number 1138377

>> Rambus wins

A US appeal court has rejected a fraud allegation against memory specialist Rambus. The claim was made by chip giant Infineon after Rambus sued it, together with Micron Technology and Hynix, for non-payment of royalties.

Rambus was accused of amending secret patent applications to take into account future memory standards agreed at meetings it attended. Rambus argued that its intellectual property had been infringed by industry standards. Its shares rose sharply when the verdict was announced.

PCW number 1138378

>> Which scheme?

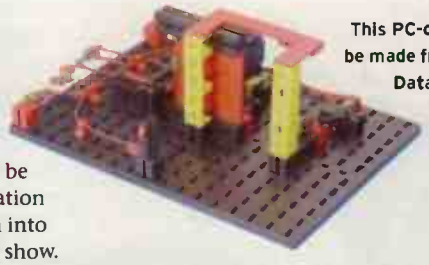
The Consumers' Association has dropped its Which? Webtrader kitemark scheme to save 'significant' running costs. Paul Kitchen, head of online at the Association, said: 'It is now up to business and government to set up an alternative scheme.'

PCW number 1137847

>> Spam spate

Four in 10 emails sent last year contained spam compared with fewer than one in 10 a year previously, according to the filter firm Brightmail. Spam traffic increased seven per cent on November's total.

£1b IT bonanza in schools



This PC-controlled model of a garage door can be made from Fischertechnik kits sold by the Data-Harvest Group. Similar Flowgo kits include modules for primary school kids. www.data-harvest.co.uk

The government is pouring an extra £762m into technology for schools, making it very big business indeed. This may be why the annual Bett education techfest has quietly grown into Britain's biggest computer show.

Education Minister Charles Clarke announced the cash at the start of Bett in London's Olympia. But a nearly simultaneous announcement by Culture Secretary Tessa Jowell proved more controversial.

She approved a BBC plan to divert £150m of licence fees for setting up Digital Curriculum, a project to provide free online course material for schools. The move, which with the £762m puts more than £1b into schools IT, had been opposed by educational software vendors as providing unfair competition.

But the BBC undertook to use £90m hiring private firms to work on the scheme. It had hoped the project would go live in September, but days after being given the go-ahead, two leading executives resigned for breaking BBC Charter agreements by spending on the scheme during the approval period.

There were fears this would delay the project, but Ray Barker, of the British Education Software Association (Besa), said it would still go ahead. 'We are resigned to it and will work within it,' he said. 'We believe our members can beat the BBC on quality.'

Bett was awash with soft and hard teaching aids, including packages to help with classroom paperwork. Much of the software comes from teachers, or ex-teachers. The cash injection comes at a time when the role of computers in education is being challenged, notably by an Israeli study that purports to show that they make little difference to a child's progress.

Teachers point out that this is difficult to assess, because the benefits vary with the software, the teacher, the age of pupils and the subject. And of course arguing against computers is like arguing against books: they are components of literacy, as well as tools for promoting it.

The government says some £280m of the new cash is for online resources and software, representing £100m a year for the next three years with existing funding. Teachers get £195m over three years to equip themselves with laptops (see below), and £287m will go on giving schools broadband links.

However, there is still a problem with technophobic teachers: many complain that they don't have time to learn IT even if they want to. But Barker said: 'Things have moved on enormously in the past five years.' Certainly, if the teachers at Bett are anything to go by, there is no shortage of enthusiasm. **Clive Akass**

Tablets hold seed of future literacy

Several vendors configure PCs and laptops specially for the schools market. Some firms also recognise that certain schools only have a range of outdated models. Akhter was selling systems to allow these to be used as Windows-based terminals for software running on servers.

Fujitsu-Siemens and Apple were among companies selling low-cost notebooks targeted at teachers. Akhter, Research Machines and Time all offer relatively low-cost tablet PCs. This was the most interesting trend, as it is surely from this format that the future human-machine interface will evolve. So the pupils who use and develop the tablet today could be defining the literacy of tomorrow.

● Time sells the 933MHz Crusoe-powered Fic-made Tablet PC above for £899 ex VAT complete with 256MB of DDR Ram, 56K modem and built-in Wifi.

UBL lets world speak same language

A proposed standard for allowing businesses to easily exchange orders and invoices when etrading has been released by the Organisation for the Advancement of Structured Information Standards (Oasis).

The draft Universal Business Language (UBL) is a library of seven basic XML-based etrading documents designed to get round the fact that each company can devise its own XML dialect to conduct business – which causes problems when they communicate with each other.

Some analysts doubt whether any single machine-readable XML dialect can cope with the diversity of global business, and believe computers simply have to get smarter to deal with it.

Sun and Microsoft have rival languages purporting to describe the entire business process. The first draft of UBL, which is royalty-free, can be found at oasis-open.org/committees/ubl/lcsc/0p70.

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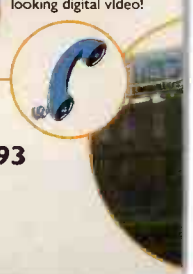

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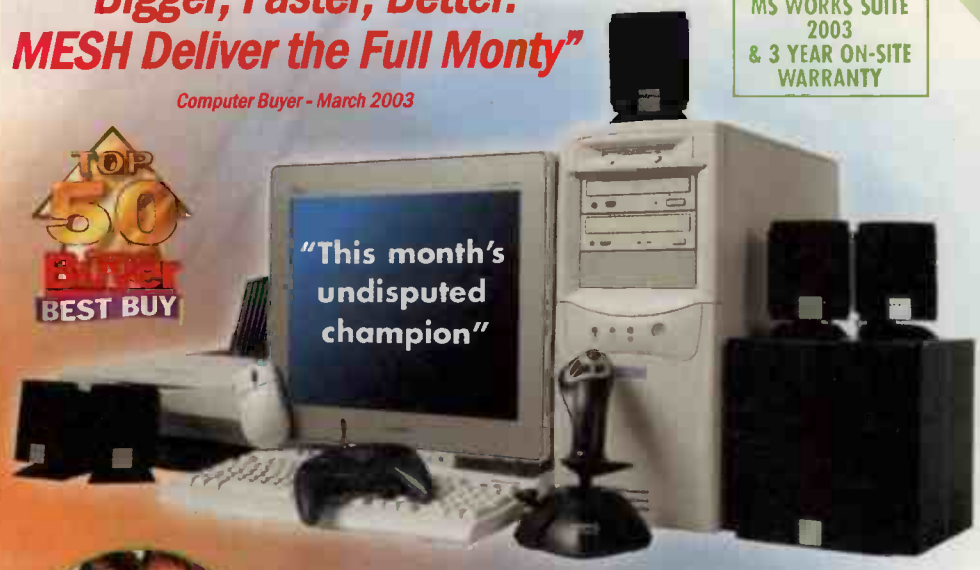

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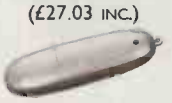

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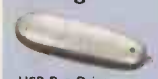

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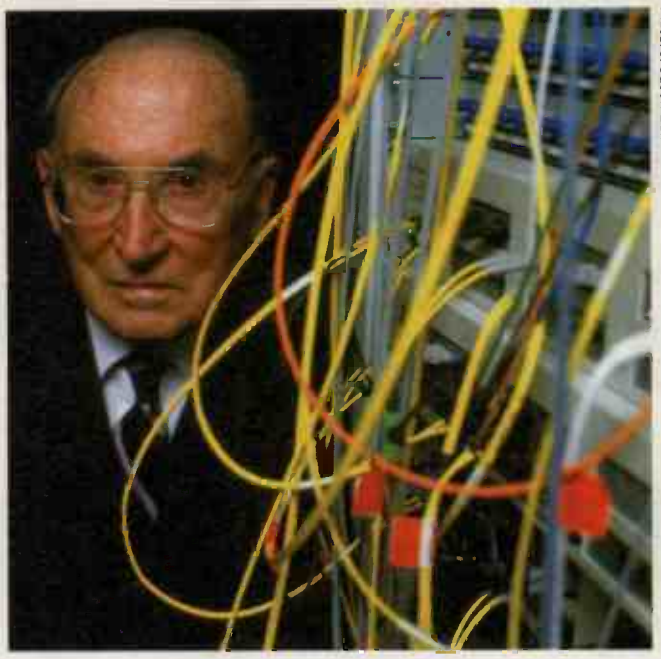
Machine that changed the world

The world's first operational programmable computer went live at Cambridge in 1949. Clive Akass talks to Sir Maurice Wilkes, the former wartime boffin who built it

Even today, if you have a sense of history, you can get a shiver down your spine running the first code of the world's first operational general-purpose computer (see box below). Any novice programmer knows the thrill of getting code to run for the first time. The team who built the Electronic Delay Storage Automatic Calculator (Edsac) at Cambridge University had been doing nothing so simple as tweaking a few lines of code: they had spent more than three years building the computer and learning to program it from scratch. Suddenly, after months of debugging, it worked: a teleprinter began printing out a table of squares. It was 6 May 1949, and you could see it as the beginning of the modern world.

The Edsac kept going for nearly 10 years, but the man responsible for it is still going, rather more strongly than you would expect at the age of 89. Sir Maurice Wilkes drives daily to the Cambridge Computer Laboratory, where he has an office as emeritus professor, and his mind is as agile as ever.

There are of course other people and other times with a claim to having given birth to computing. There was the Victorian engineer Charles Babbage, who described and tried to build programmable computing machines a century before the technology had matured enough to make them practical.



Picture: Jason Bell

Sir Maurice Wilkes ... still going strong at Cambridge Computer Laboratory

But his work had been largely forgotten by 1937, when young Wilkes began work at the Computer Lab, then known as the Mathematical Lab, under Sir John Lennard-Jones, a structural chemist who was interested in using machines to solve differential equations.

A year earlier, Alan Turing had published his classic paper, *On Computable Numbers*, outlining a universal computing machine. But Wilkes recalls: 'It was purely theoretical. There is no hint in that paper of there being any practical applications. No hint whatsoever. I think he [Turing] made that connection afterwards.'

Computing at the lab involved mechanical desk calculators and analogue computers that solved mathematical problems by modelling them mechanically – just as an analogue clock 'computes' the time by modelling the rotation of the earth. There was nothing that is generally thought of as a computer today. 'No-one had thought of digital computers. That was all in the future,' said Wilkes.

So, as it turned out, was his work on computing. Wilkes, who had done his doctorate on radio waves in 1934, became a wartime boffin, pulled from the lab to work on radar even before hostilities started. When he returned to Cambridge after the Second World War, he found himself in charge of the laboratory.

'It was wonderful. I'd had six full years involved in radar and I got away as soon as I could and said to myself: "Let's do something constructive." There was a wonderful feeling of reconstruction in the world. Everyone felt this excitement of establishing peacetime values.'

Considerable steps had been made in computing during the war. A team under mathematician Max Newman built a proto-computer called Colossus at Bletchley in 1943 to help decrypt signals; Turing, of course, also worked there. Colossus could perform logical operations but no arithmetic, and the fact that Britain insisted on keeping it secret for 30 years limited its influence.

Much more important to Wilkes was the 18,000-valve Electronic Numerical Integrator and Automatic Computer (Eniac) completed in 1945 in the US by a team led by Presper Eckert and John Mauchly, initially to perform artillery calculations. It was decimal rather than binary, it was very cumbersome to program, and the processor was not separated from the memory. But a lot of lessons were learned building it.

Out of the blue in 1946 Wilkes got an invitation to attend a series of lectures at Philadelphia's Moore School involving the Eniac team leaders. 'It was very difficult to cross the Atlantic at the time. Shipping was very scarce. But I did get there for the latter part of the course and I got the whole story – all these new

How you can replay IT history

Programs with the Edsac emulator on this month's cover disc show how fast computing developed even in its early days. Note the folder to which it unpacks from the disc and be sure to switch on your sound to catch the buzz of the teleprinter.

Start the emulator and click the Edsac menu to ensure 'Initial Orders 1' is selected. Go to the File menu and open Squares.txt from the Demonstration Programs subfolder in the Edsac folder.

A text box will appear giving the program listing. Press the Start button and the squares will appear.

OXO.txt, which we believe to be the world's first computer game, is in the same folder. It dates from 1952 – so within the space of three years the interface had become interactive and the computer could beat humans at their own game.

There's a lot more about Edsac in the folder – all comes courtesy of Dr Martin Cambell-Kelly of Warwick University. His site is at www.dcs.warwick.ac.uk/people/academic/Martin.Campbell-Kelly.

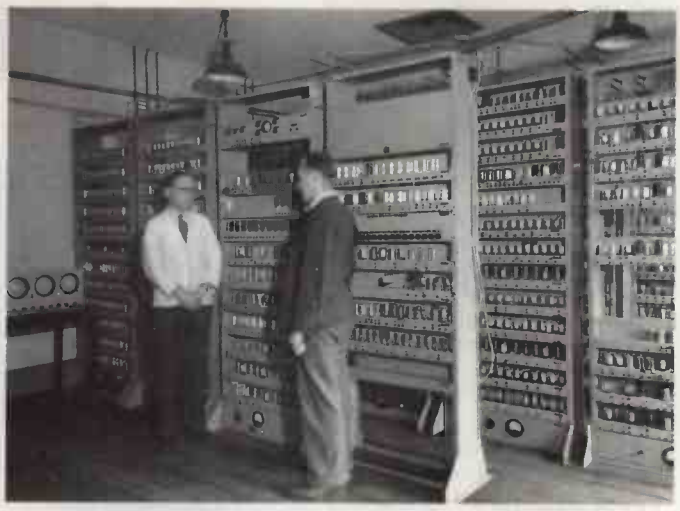
ideas. As far as I am concerned that is where they all came from,' Wilkes said.

'They were quite revolutionary. The idea that everything could be contained in memory: numbers, any mathematical tables that you needed, and indeed the program itself. All contained in one big memory. No setting up the machine. You walked up to it, you fed your program in, and then you were in business. You didn't have to set a lot of switches, or knobs, or things of that sort. In fact it was the idea of the modern computer.'

In contrast to the secrecy surrounding Colossus there was a 'very free exchange of information'. Wilkes recalled: 'I came back from that course feeling that I knew everything there was to know. Some of the people on the course, and some others, set about building computers. The Edsac was one of these [projects].'

A major technical problem was how to implement fast memory. At Manchester University, FC Williams and Tom Kilburn solved the problem by using a cathode ray tube (see Kilburn interview on our website). Their 'Baby' was working before Edsac but it was a short-lived pilot project; Wilkes had to build a computer that could be used in earnest. At Eckert's suggestion he used magnetic delay lines as memory (see box below).

Building a computer was a 'very large-scale engineering problem' requiring unprecedented build and component quality. 'There was a period of some months when all the hardware was there and we were making it work. We had to make modifications where we had not matched up to these high standards. You see in a computing machine the numbers change very rapidly and when a change takes place you mustn't lose any pulses and you can't have any intrusive pulses.'



Wilkes (left) with the Edsac. Its three monitors are visible on the left

How did he feel when it finally worked? 'We all made a beeline for the pub and celebrated.'

Success for Wilkes meant moving to a second phase. 'The Edsac project was two things. It was to build a computer that was workmanlike – not necessarily the best that might with more time be done with the technology of the day – so that we could get on with running some problems and getting experience of its use... we began to turn our attention to the development of what is now calling programming methodology.'

Wilkes is self-effacing about the fact that his team beat the Americans in building the first stored-program computer to go into service. There was not a race, he said. Or if there was, it was one in which the competitors each had a different winning post. 'Eckert and Mauchly, the Eniac engineers, set up a company to produce a computer they could sell for business purposes. Clearly, they had to achieve a higher degree of technical perfection than ours. We cut a lot of corners to get things going.'

There was a sense among all people working in the field at the time that computing would have 'very, very wide applications'. But, with early machines breaking down several times a day, what was not foreseen was that computers would get reliable, Wilkes said. Valves 'weren't particularly unreliable' but resistors tended to drift in value and soldered joints would give a lot of trouble.

'Of all the advantages of integrated circuits – low cost, high speed and all that – the most important thing it seems to me is reliability. The idea that you can have a computer of your own and that it will work for months or years without going wrong.'

The press got hold of the Edsac story and had a field day, with much talk of a 'mechanical brain' – which was curious, considering that mechanical computers were precisely what electronic ones were superseding. Also curious was the fact that Alan Turing, the only UK computer pioneer of the time to be famous today, was unknown outside academic circles. Wilkes, who was the same age as Turing and went up to Cambridge with him in the same year, recalled: 'I liked him. He was a quiet man who kept himself to himself.'

But he said Turing's post-war work at the National Physical Laboratory, and later at Manchester University, met little success in practical terms. 'He wasn't a man of action. He didn't know how to get a project going. I don't think he was very interested in the user side of a computer. He was more interested in ideas... His record of achievement is really very slight.'

The old way... Wilkes (right) and colleagues in the 1930s with a mechanical analogue computer that was designed to solve differential equations. Analogue computers can also be electrical and may still be used for some purposes

Wilkes headed the Computer Lab until 1980, and the spent five and a half years with Digital Equipment in Massachusetts before returning to Cambridge.

'The extraordinary thing is that progress was enormously fast in those first 10 to 15 years and in the last 15 years it has been as fast or even faster. People were always saying that the computer field will settle down and it will become like the motor car industry or something. But it hasn't. It has retained its excitement.'

● Sir Maurice Wilkes' 1985 book *Memoirs of a Computer Pioneer* (MIT Press ISBN 0-262231-22-0) is still in print and costs £23.50 from John Wiley distribution (01243 779 777).

Mercurial memory down the tube

Sir Maurice Wilkes in Edsac days with a bank of mercury delay lines. These consisted of a tube of mercury with a quartz crystal at either end; one crystal sent a pulse that was picked up a millisecond later by the other one, which translated it back into an electrical pulse.

This was amplified, cleaned up, and looped back. A train of 500 to 600 pulses could be kept circulating indefinitely, and they could be counted off and read when required.

Each tube was called a tank, to avoid confusion with 'vacuum tubes', and the Edsac had 32, giving a total of some 2KB of memory.

Spring deals for new sign-ups

Several broadband suppliers are offering spring deals to tempt you into signing up.

Demon (www.demon.net) is waiving its £250 business install fee until March, BT Openworld (www.btopenworld.com) is waiving the £260 install fee for its Business Plus service until 31 March, and those buying its Business 500 Plug-and-Go deal will get free activation, modem and micro-filters.

Pipex (www.pipex.net), which has one of the lowest monthly charges at £23.44 inc VAT, is giving a modem and microfilters to new sign-ups, or you can get a free month, and free installation, if you have your own modem.

Similarly-priced Freedom2surf (www.freedom2surf.net) has halved its self-install activation fee to £35.24 inc VAT. AOL (www.aol.co.uk) is offering a free month for new sign-ups until April.

Telewest (www.telewest.com) is offering digital TV users a £12.50 self install option.

DSL rivals get in the loop

Options for ADSL users are mushrooming as the so-called 'unbundling of the local loop' takes effect. Most ADSL links are still provided by BT, but are sold through other companies that buy bandwidth in bulk. But watchdog Oftel ordered BT to allow rivals to install ADSL equipment at local exchanges and offer fast services on the 'local loop' to customer premises.

Bulldog Communications (www.bulldogcommunications.com) has done so in 40 London exchanges, linking them with its own backbone. It offers a more options than BT, including Symmetrical DSL, which has the same speed up and downstream.

Partners like DG-Technologies repackage and resell Bulldog capacity and, unlike some BT resellers, will undertake the entire installation at company sites.

All DG-T packages include a 400Kbits/sec upstream data rate, with a choice of contention ratios (a measure of line sharing). Prices are competitive with BT's.

DG-T quotes £70 a month for an entry-level 512K line, with a 20:1 contention ratio – equivalent to the basic BT business offering, though this offers only 256K upstream. The same with 5:1 contention costs £118, and a 1:1, equivalent to a leased line costs £210 a month. A 5:1 4Mbit link costs £360.

All links come with a 99.85 per cent service-level guarantee; charges will be waived if it is not met. Other prices, including those for SDSL are available at www.getbetterbroadband.co.uk.

For places fast lines do not reach

A satellite service launching in March will offer fast web links to areas not served by ADSL or cable. It uses Eutelsat's new Eurobird 2 satellite (above) which is positioned to enable web and digital TV services to be delivered via the same aerial. Previous services of this type have required a separate aerial. www.everybroadband.com

*£28 a month standard. Free connection offer ends 31/03/03. Standard price £60. Standard equipment costs £80. Subject to availability & survey. BT line required. Minimum 12 month term from connection. Other conditions apply.

£1,000 projectors in view

Digital micromirror projectors that have long been an expensive tax-deductible executive perk are heading for mass-market prices that could transform computer-based home entertainment systems.

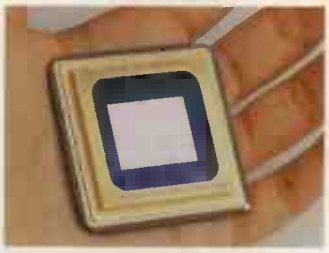
Projectors, used officially for business presentations, and unofficially for watching videos at home, have fallen in price from £5,000 or more five years ago, to below £2,000 for entry-level models.

They are already getting significant sales for home-entertainment systems – and prices are likely to drop to below £1,000, according to Ian MacMurray, of Texas Instruments Digital Imaging division which is responsible for the Digital Light Processing (DLP) chips that power most projectors sold (see above).

Home movie player... The Piano HE-3200

He was speaking at the launch of two new DLP projectors from Plus: the Piano HE-3200, which is optimised for home cinema use and the U4 series, which is designed for dual use.

The 2kg Piano uses TI's widescreen DLP chipset for a 16:9 image and has a 700:1 contrast ratio, with a recommended price of £2,300 inc VAT. The 1.5kg U4 series is said to be the world's brightest for its weight – 1,500 Ansi lumens for the top of the range. It also has a contrast ratio of 1,500:1, and one version has a short-focus lens for use in small rooms. It has an expected street price of around £1,760 ex VAT.

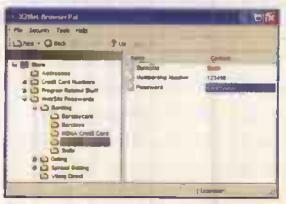


TI's SVGA DLP chip. Light shines through a spinning three-colour filter onto the matrix of tiny mirrors, which are turned on or off in sync to reflect the image through a projection lens

Plus sales director Brian Wood says the UK market for digital projectors is expected to grow 21 per cent this year to 156,000 units sold. This is partly due to the increase in people using a 'mobile office'.

Plans also include shipping wireless-enabled projectors so that you could screen a DVD in one room from a PC in another.

www.plus-vision.com



>> Password aid

Last month we highlighted the problems caused by multiple passwords. X2Net claims to have an answer, with its £10 ex VAT Browser Pal plug-in for Internet Explorer. It lets you encrypt and store passwords, and it can also fill in web forms for you. www.x2net.com

>> Cad to pdf

Plot2pdf converts Autocad drawings into pdf for viewing by clients. It costs £114 inc VAT and a trial version is available from www.softcover.com.

>> Junk filter

The £19.95 Eureka Email client includes a junk mail filter. Go to www.eureka-email.com for a trial version.

With BT Broadband, your kids will actually enjoy doing their homework.

(We're still working on the Brussels sprouts thing.)

■ From virtual tours of museums to finding reference material in an instant, learning has never been so much (shock horror) fun. BT Broadband uses your existing BT line. And unlimited use costs just £27 a month with Direct Debit*, which is included on your telephone bill. And if you sign up before March 31st, connection is free of charge and you'll get £30 off your Broadband modem.

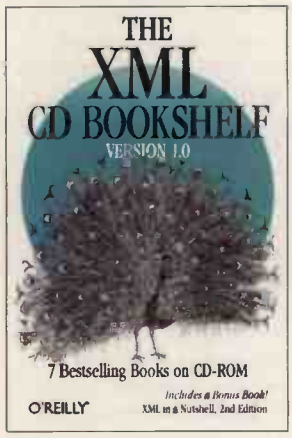
BT

Bringing your kids and clever stuff together.

bt.com/btbroadband 0800 800 060

>> Clean surfing

The latest version 2.1 of Internet Cleanup claims to delete traces on your PC of sites you have visited on the Internet. The lite version costs $24 (£14.90) from www.pcmesh.com; the Pro version, which includes viewer for the index.dat file holding your surfing records, costs $29 (£18.02). Also available at the same site is the latest version of Defrag for Windows, which costs $19 (£11.80).



>>XML bundle

O'Reilly has packed seven XML books into a single £85 ex VAT searchable library called XML CD bookshop. The titles, which would cost £191.85 if purchased separately, are: *XML in a Nutshell, Second Edition*; *XSLT*; *XML Schema*; *SAX2*; *Java & XML Second Edition*; *Java & XSLT*; and *Perl & XML*. www.oreilly.co.uk

>> Dazzle suite

Dazzle has launched DVC 150, a home video-editing suite for analogue and digital camcorders that comes with a USB2 interface. It costs £199 from selected Dixons or PC World stores.

>> Stylemaster

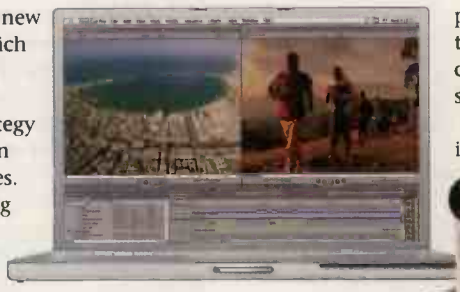
Westciv says its Style Master 3 is a major upgrade to its cascading stylesheet editor. New features include a set of hand-coding tools. www.westciv.com

>> XML first

Atomik Roundtrip 1.0 is said to be the first tool to offer two-way XML support for Quark XPress, enabling a single XML source to be used for print and web. Mac and PC demo versions are posted at www.easypress.com.

Apple tempts PC users

Apple's two smart new Powerbooks, which are reviewed on pages 106 and 108, were launched as part of a strategy of trying to beat Wintel on style and advanced features. Both offer 54Mbit 802.11g wireless networking in addition to Bluetooth for short-range links.



Videocam users are one target market Apple sees for the 17in Apple Powerbook

The company believes it can also woo PC users by bundling high-quality video and music utilities. And the Unix kernel underlying the new MacOS X has made 'a huge difference' in the corporate market, the company says. It claims that there are now more than 2000 native MacOS apps.

The new 1GHz PowerPC G4-based 17in Powerbook boasts a widescreen 1,440 x 900-pixel display and a keyboard that is backlit automatically by optical fibre in dark conditions. It weighs in at 3.1kg which barely counts as portable. But Apple UK chief Mark Rogers said it was aimed at desktop users who occasionally had to take their work machine home. He enthused: 'It is a very cool piece of technology.'

Apple continues to ignore the fast USB2 link and has instead packed the latest 800Mbits/sec version of Firewire for fast links to digital video cameras and standalone storage. 'Most of the peripherals that users will want to connect, like digital video cameras, will support Firewire,' said Rogers.

In fact many of the latest imaging devices are using USB2 (see page 23).

A free browser called Safari, based on the popular open-source KHTML, was also launched at the Macworld Expo in San Francisco. It is claimed to be 'significantly faster' than Internet Explorer.

A beta of Safari, which can only be used with Mac OS X, is available for download. Apple also launched Keynote, a £79 ex VAT presentation package, which will ship in May.

Apple has also released an 11g version of its Airport Extreme base station, with support for up to 50 users. It costs £149 inc VAT. www.apple.com/uk

Kaleidoscopic approach to web page design

Organic Software has taken a novel approach to creating web graphics and pages with a £39.95 utility called Kaleidoscope Designer. As its name implies this creates kaleidoscope designs from your chosen colours

Your designs, or any pictures you import, can be incorporated into backgrounds, buttons and borders for web pages. Borders are scalable and can be wrapped round text or graphics.

The package can also generate linked page templates to provide a uniform style across a site. Your designs can be imported into other web-design packages.

Organic (www.organicsw.com) also sells a £314 Master Toolbox of plug-ins for Adobe Acrobat, with features like batch processing and the ability to split or combine pdf files.

Meanwhile Xara has launched a free upgrade to its Webstyle package, offering a new auto-enhancement option providing one-click optimisation of the contrast, brightness, sharpness and colour saturation of images.

Webstyle 3.1 (£43 ex VAT) also offers template-based web graphics creation, from button bars with DHTML menus to animated banner ads. A free trial version is available at www.xara.com.

Websiteit.com has launched a range of packages its says will enable small and medium-sized companies to set-up etrading sites in a few hours. It charges £30 a month for hosting. www.websiteit.com.

Mouse nestles into your working hand

Fellowes says its £11.99 Ergo Tech mouse is moulded to fit your hand and has a scroll wheel designed to see you through long working days. A cordless version costs £21.99.

Fellowes has also launched an Opti Gel mouse with a gel insert that fits into you hand. Its optical sensor means you can use it with no mat. It costs £24.99 or £39.99 cordless. The mice are available to buy online from www.viking.co.uk or www.jungle.com.

Modem on mains

Maplin Electronics is cutting £20 from the price of its £99.99 One-For-All mains modem link during March. The kit allows you to link a PC to a dial-up modem via a power socket. www.maplin.co.uk

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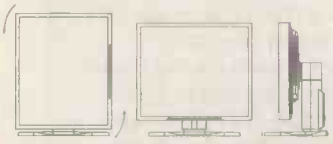

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Letters

Times they are a changin'>

I have been a regular reader of your magazine since the first issue. I know that in itself is not exceptional, but I still have copies of the first and second issues, from 1978.

The issues feature the Nascom computer, which I managed to build and use to do simple programs in Z80 machine code. How things have changed!

Best wishes.

John Corkett

Pet projects >

I bought the first issue of *PCW* all those years back. I knew nothing about computers, but being an electronics and short-wave enthusiast I started buying your magazine to learn more.

I cut out all the program listings; in those days it was common to have several pages listing a program written in Basic which you could type in and try (cover discs had not been invented).

I saved up and went to my local Tandy store to buy a TRS 80 with 4KB of memory. The salesman asked me what I wanted it for, and I explained I was keen on short-wave and wanted to use it to decode Morse Code (I had seen a program advertised that did this). Then he said: 'Oh you know more about it than me,' and walked off. That was my first experience of ever seeing a computer and I was left standing alone in the store, so I went elsewhere and ordered a Commodore Pet. It duly arrived; sadly I could not afford the optional cassette drive, but instead splashed out on the model with a real keyboard (Pet users will know what I mean).

I unpacked the unit, plugged it in, and dug out my treasured program listings to type in. About two hours later – you must remember that I had never seen a computer or any programming language before – I typed the magic word 'Run' and sat back to see the magic happen.

'Syntax error line 101' appeared on the screen, and I was at once totally lost. What was a syntax error and how did I get line 101 on the screen? I had no idea, and so all I could do was switch it off and try again as I had no way of saving the data, without the cassette drive. Needless to say I quickly learned Microsoft Basic.

How times change, now you don't need to type in your programs, you don't even need to know anything about writing them.

I wrote a communications program in only 128bytes of machine code and used the Commodore Pet to replace my very noisy Creed teleprinter. My latest creation, written in Visual C++, is a communications program and takes up nearly a megabyte of disk space. What's more, my modern Pentium 4, with all its fans is now as loud as the old mechanical Creed machine. The times have changed, but the fun in IT certainly hasn't.

Ken Williams

WIN!

Each month we are giving away a Canon Powershot A40 to the author of the Letter of the Month.

Winner of the *PCW* best digital camera award for 2002, this 2megapixel beauty is an entry-level camera but certainly hasn't got basic features. Worth £250, the A40 captures enough detail to make great-looking 8 x 6in inkjet prints. Among the features you'd normally have to pay a lot more for, is manual exposure control and a variety of flash modes, not to mention a 3x optical zoom, equivalent to 35-105mm on a 35mm camera. In our tests it proved to be one of the sharpest cameras around.

For more information on Canon cameras, go to www.canon.co.uk/digitalcameras or call 0800 616 417.

Prints charming >

In commemoration of *PCW*'s quarter century I'd like to mention my all-time

Letter of the month

The future state of storage>

After reading Gordon Laing's article *The Write Stuff*, (February 2003), I find myself wondering why we are talking about DVD and hard drives as future storage media? Surely, in this age of technology we should be thinking about a new form of storage that would be much faster, quieter, more reliable, more compatible and capable of storing Terabytes (1,000GB) or maybe even Petabytes (1,000TB) of information.

Just think how many films you could save on a device with a capacity of 10TB. This new form of storage, in my opinion, is possible. I'm talking about solid-state, removable chips capable of huge storage and lightning-fast read and write speeds. There isn't a DVD or hard drive on the market that could match the read and write speeds of solid state. Surely we have the technology to make this a reality. In my opinion, solid-state storage is the only true way forward.

D Goring

Gordon Laing replies > You're right in saying solid-state storage has much faster access times than current optical or magnetic disc technologies, but you don't actually need it for the television recording discussed in the article. Today's hard disks are sufficiently fast to record and timeshift even high-definition television programmes, while anyone who's used a PVR knows their access times feel virtually instant. We agree Terabytes or even Petabytes of storage would be nice, but no technologies are closer to delivering these capacities with a decent price/performance ratio than hard disks or optical discs.

Hard disk reliability is also good enough for TV recording and with careful mounting can run quieter than many VCRs. Crucially though, the arguments against solid-state storage for most applications are capacity and price: today 1GB of Flash memory is considered huge, and costs £400 to £800 depending on the supplier. Sadly, not the ideal primary storage technology for a PVR, let alone a PC.

favourite article. This came from 1978 or 1979 and was entitled 'The poor man's printer'. In those days even the most basic dot-matrix printer cost more than many people could afford.

PCW's solution to this problem was to publish an article about how to modify an old 5bit Baudot code teleprinter to respond to Ascii input. Inspired by this and in the hope of being able to obtain hard copy output from my brother's Compukit UK101 I bought a Creed 7B teleprinter from a government surplus shop for £25 and set about powering it up it on my parents' living room floor.

I remember running its 230v DC motor by the potentially lethal expedient of wiring a bridge rectifier across the back of a mains plug! I also managed to obtain a 90v transformer to drive the solenoid used to select the letters for printing.

But that was as far as it went – I never did get the thing interfaced to a processor, and the old Creed was eventually sold. I wonder if anyone out there ever got one up and running?

Richard Barns

Amiga versus IBM >

In the March edition of the *PCW* magazine, Geoff Lane wrote of how he thought IBM's introduction of the PC marked the end of innovation. When I first read this, I could see where he was coming from and agreed with some of what he said. Winding the clock back 12 years, I was an ardent Commodore Amiga fan (and I still have fond memories of my floppy disk-based machine outperforming, in certain ways, hard drive-based IBM machines of the time, with superior sound and graphics).

It is still frustrating that on the odd occasion I have to format a floppy disk on a modern PC, it can still reduce the responsiveness of a Celeron 667 machine (with over 300MB of Ram) to a level similar to that of a hibernating tortoise when, 12 years ago it was possible to format two floppy disks simultaneously on a 7.5MHz Amiga while listening to unbroken four-channel stereo (sampled or synthesised) music. So what sort of machines would we have now if the Amiga had 'won the PC war' and more of us were using Amiga-based machines that had been developed to the same degree as the PC?

For me, one of the things that 'made the PC great' was 'application integration' – being able to copy and paste information between the various office applications. You couldn't really do this very well on the Amiga and so possibilities were more limited. Of course, application integration on the Macintosh was arguably even better than the PC at the time, but the Macintosh wasn't really an 'open system'. So in some ways, it could be argued the Mac platform did not allow much innovation either.

But for all its faults, the PC has opened up so many avenues that were not even thought of 10 years ago and now provides an affordable 'portal' to many areas of the digital world in which we now live.

Like everyone else, I get very frustrated with the blue screen crashes in the 'more robust and reliable' Windows XP and curse when I lose an hour's work because my USB webcam driver conflicts with my digital radio driver or something. But I can forgive this when I can use my PC to produce a digital photo album for my family, containing about 500 photographs from the last 90 years (as well as more recent videos). I can produce 20 copies of it in little over two hours, for a material cost of around £5. All my family, from my 85-year-old father to my two-year-old son can view the album simply by inserting the CD into their PC. I can tell my sister in Australia I have just sent her a copy and, via a webcam link, we talk for over an hour, for a total call cost of about 25p. Then I switch tasks and carry on playing my favourite Amiga game which has been 'paused' in an emulator Window in the background.

Andrew Johnson

Dylan Armbrust replies > Thanks to John, Andrew, Ken and Richard for sharing your experiences and thoughts about *PCW*, and computing in general, over the past 25 years. There were many more letters of congratulations we'd have loved to include but there just wasn't enough space. But to all those who wrote in, as well as those who have supported us during our 25 years of existence, we thank you.

Protecting online privacy >

I found your feature regarding online privacy (*On your guard*, February 2003) a very good and informative article. I am, however, concerned that the section regarding the Electoral Register may mislead fellow readers. The article states, correctly, that the register was always available for public inspection. However, it then goes on to say that there are now two versions, one of which is restricted as a register of those registered to vote and accessible only to certain agencies. It does not stress that this register is still available for public viewing.

As a doctor in General Practice I am concerned about the availability of my address to disgruntled or psychiatrically ill patients. I therefore initially refused to register but was then threatened with fines, etc. The solution recommended by my council, which may be of interest to other readers, was to register under a fake name. I would then be able to vote as long as when I turn up at the ballot box I state that I am whomever I have registered as. I have therefore maintained the ability to vote and my anonymity.

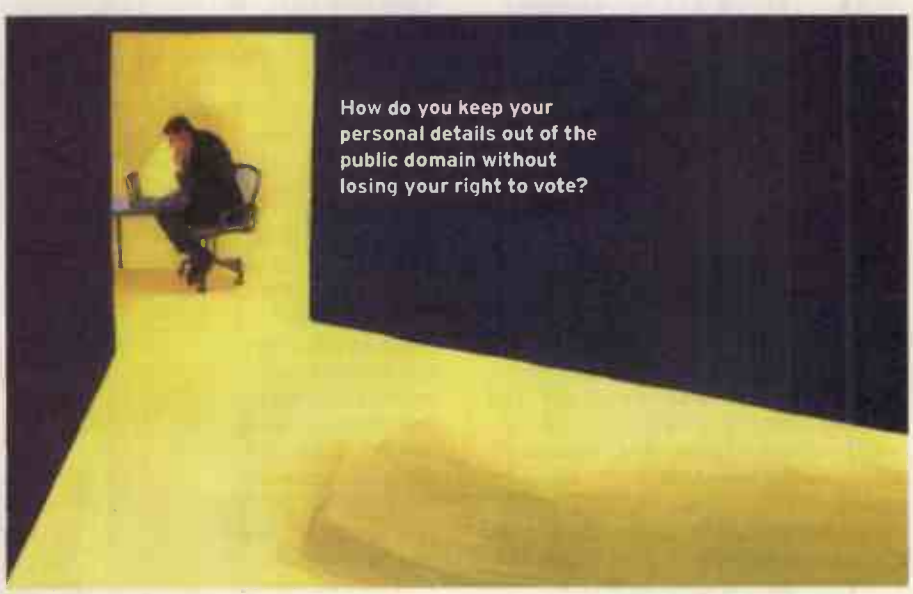
Name withheld

Nigel Whitfield replies > Yes, the doctor is quite right – the register of voters remains available for public scrutiny as it always has been. The recent changes relate more to the commercial sale of the register, and its subsequent electronic processing. It's that electronic processing that leads to many of the additional ways of breaching your privacy, as we detailed in our feature. For complete privacy you can, of course, register to vote under an assumed name or simply avoid registration – but *PCW* believes that it's important for everyone eligible to ensure that they don't lose their right to vote.

Bandwidth postponed? >

I read with fascination your 'guru' Guy Kewney's assertion (February 2003) that we will all be having to cope with Internet download speeds of 100Mbits/sec within a decade. To which I say: Ho, ho, ho. In fact I'd goes as far as putting money on him being wrong.

Technologically it will doubtless be possible, but we live in the land of telecoms



profiteering and regulatory indifference. While we are told that we are among the cheapest broadband countries in Europe, it is hard to see where it might be more expensive. Take Germany, a country that only allowed telecoms competition about a decade later than Britain. Now there are more Internet sites comparing telecoms rates than there are telecoms providers in this country. With about 150 companies jostling for business, you can imagine what that has done for the cost of a phone call.

But let's stick with Internet connections. Here the main provider, BT offers a derisory 512Mbits/sec connection for home users at £28 per month, while the next two biggest service providers compete with lower cost offers of only £27.99. Meanwhile in Germany you can buy 1.5Mbits (10 times as fast as BT's newest wheeze, for those not keeping up) for €50 (about £30). If you can restrict your downloads to 5GB per month, you can get the same 1.5MB speed for a mere €16.90 per month. That's only about a tenner in our money. It's a different world out there.

The point is that we have always enjoyed second or third-rate service for premium prices, and I see no sign of it ever changing. We might get 100Mbits/sec connections offered in a decade (to those who can afford the extraordinary British prices), but only if the rest of world is already on 100Gbits/sec at half the cost.

Mike Robinson

Guy Kewney replies > Your gloomy portrait of the future makes an assumption – which I think is worth examining – that BT and the other big carriers will still be around.

They may be. But it isn't necessarily so; already, they are watching their assets being stripped to the backbone fibre. Check out companies like Exponential-e – there are a dozen already, providing fast-fibre Ethernet. Read up on World Wide Packets, a company that is allowing users to bypass the normal comms infrastructure.

The personal computer revolution gave people their own way to get things done; the wireless revolution is going to give people independence from the big carriers. And long before another 10 years are up, too!

Bandwidth denied >

It was with some amusement that I read your news article entitled *Megabits for the masses* in the January 2003 issue.

When I moved to my current house in Aylesbury, I made enquiries about high-speed Internet access, and specifically ADSL, with the BT engineer installing my phone line. I was somewhat shocked to discover that I couldn't have ADSL – not, you understand, because of being too far from the exchange, but because the estate where I live is fairly recent and all the phone cabling in the area is fibre optic. The best I can hope for is ISDN, which seems very poor value at the price when compared to the higher speeds offered by ADSL.

I find this quite laughable. It seems terribly shortsighted to me that we are installing new, high-capacity telephone systems in parts of this country but aren't providing any means to use them. To think I'm denied high-speed Internet access because I don't have the old copper wiring!

It seems to me that we need a rethink if we really are to achieve the goal of providing high-speed data access in this country. Solutions such as ADSL are good and should be promoted for older phone systems; but laying a high-capacity foundation for the future and then ignoring it for end-user rapid data access seems to be missing the point.

A more consistent strategy is required. In the meantime, I guess I'm stuck with narrowband technologies – that or moving to Stockholm.

James Corrin

Inventing/discovering >

In last month's flat-panel monitor group test you stated that 'Karl Ferdinand Braun discovered the cathode-ray tube'.

Where did he discover it? Behind the potting shed? Lurking under the stairs? In a handbag at Victoria station? You can only discover something that already exists. The CRT was 'invented'. Please give inventors their due.

As it happens, Braun's was not the first CRT, although it was the first with a really useful electron beam.

Richard Pickvance

Bayliss not batteries >

Guy Kewney wants a laptop that he can constantly use between London and LA (News, March 2003). Trevor Bayliss could have the answer for him. 'Who's Trevor Bayliss?'; he invented the clockwork radio!

Daniel Barraclough

Break free >

I read with great interest Nigel Whitfield's *Breaking free* comparison of Linux and Windows solutions (*PCW* March 2003). However, the £650 cost difference is a worst-case scenario. Star Office, of course, can run under Windows. Irfanview or any of the full graphics packages you have put on your cover discs over the past year make for fine and free products. AVG Antivirus is a perfectly good free Windows virus checker, and Zonealarm is of course an excellent free firewall.

This brings the price difference down to a little over a £100. Which many would consider worth it for the ability to run the latest games and have far less driver and USB hassle.

Simon Thornber

Dylan Armbrust replies > While everything you say is true, it's worth pointing out that the feature was meant to highlight the incredible strides made in Microsoft alternatives, most of which can be had for free today. Open-source software is, in our opinion, slowly revolutionising the industry and consumers' approach to software. Admittedly, there is a way to go, such as in the games arena, but we're certain major developments aren't that far off.

Progress without risk? >

I've just read your interesting editorial on UK industry's lack of entrepreneurial spirit. Good, thought provoking stuff, but while the report (*Chips for everything*) correctly identifies a problem, it misses the target when seeking a solution.

This is not surprising, as the root cause of UK industry's poor record is government itself. UK industry is as good as any in the world and better than most, but the business environment in the UK positively discourages risk taking.

Successive governments have imposed increasing layers of employment law, health and safety restrictions, and financial regulation. They continue to do so. Company profits (vital to sustain R&D budgets) are being soaked up in increasing compliance and insurance costs. Any bold commercial initiative is likely to represent an unacceptable risk!

The EU is a popular scapegoat, but is only partly to blame. The UK Government seizes EU regulatory initiatives zealously, and after refining and enhancing them, imposes them on a groaning UK industry.

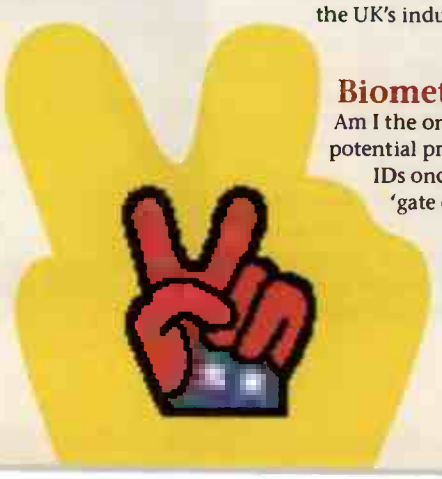
A thriving entrepreneurial environment has to accept the possibility of failure. But failure in the UK is unacceptable – the company executives involved will be publicly pilloried by press and government.

It is hardly surprising therefore that the boards of most UK companies are risk averse, and that their aversion is reflected in the UK's industrial performance.

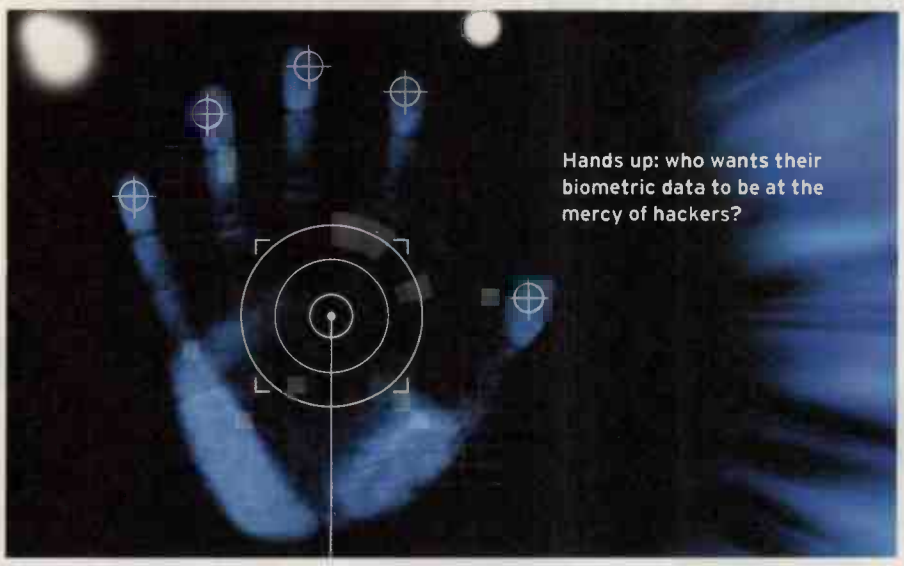
Mike Gray

Biometrics hex >

Am I the only person that can see a potential problem with biometric IDs once they progress beyond 'gate entry' devices?



I don't have a problem with a standalone gate controller that scans



Hands up: who wants their biometric data to be at the mercy of hackers?

my iris, fingerprint, or whatever, but the instant you place biometric requirements on 'connected' devices there is the possibility that hackers can gain access.

Correct me if I'm wrong, but at some point in the chain, a group of hex codes created by your body interacting with the biometric sensor is compared with a known, secure, digital 'signature' stored on the system. Pretty much the same as a normal password situation, but with one crucial difference.

If your password is compromised you can change it, but if your biometric data is compromised then you are really stuffed because you can't change it. All a hacker needs to do is present that data to the system via devious means and your whole electronic 'life' is forfeit.

The convenience of not having to remember passwords is being traded against the possible doomsday scenario of a one-off hack.

David Reynolds

CLARIFICATIONS

- In last month's review of small-form factor PCs the website address for Kustom PCs should have been www.kustompcs.co.uk. Check out this month's Hardware column in our Hands on section for more information on Kustom PCs.

- In the same review a slip of the finger resulted in us erroneously saying in the caption for the Shuttle Spacewalker SN41G2 that it was not a high-performance system. In fact it is one of the best Athlon platforms around.

- The wrong scores were printed in the review for the Packard Bell Igo 3491 on page 53 of the March 2003 issue. The correct scores are 123 overall in Sysmark 2002, 1,472 in 3Dmark 2001 and a battery life of one hour 21 minutes.

- The MSI K7N2 motherboard (p75 March) will not be sold with the Bluetooth attachment as stated. It now costs £132.78 (£113 ex VAT). Apologies for any confusion caused.

Unless otherwise stated, letters sent to the editor, *PCW* team or contributors will be considered for publication. Letters may be edited for clarity or length. Views expressed are those of the author and not necessarily those of the editorial team. If you wish your letter to be considered for the monthly prize, please include a full postal address for delivery. An email address alone is not sufficient.

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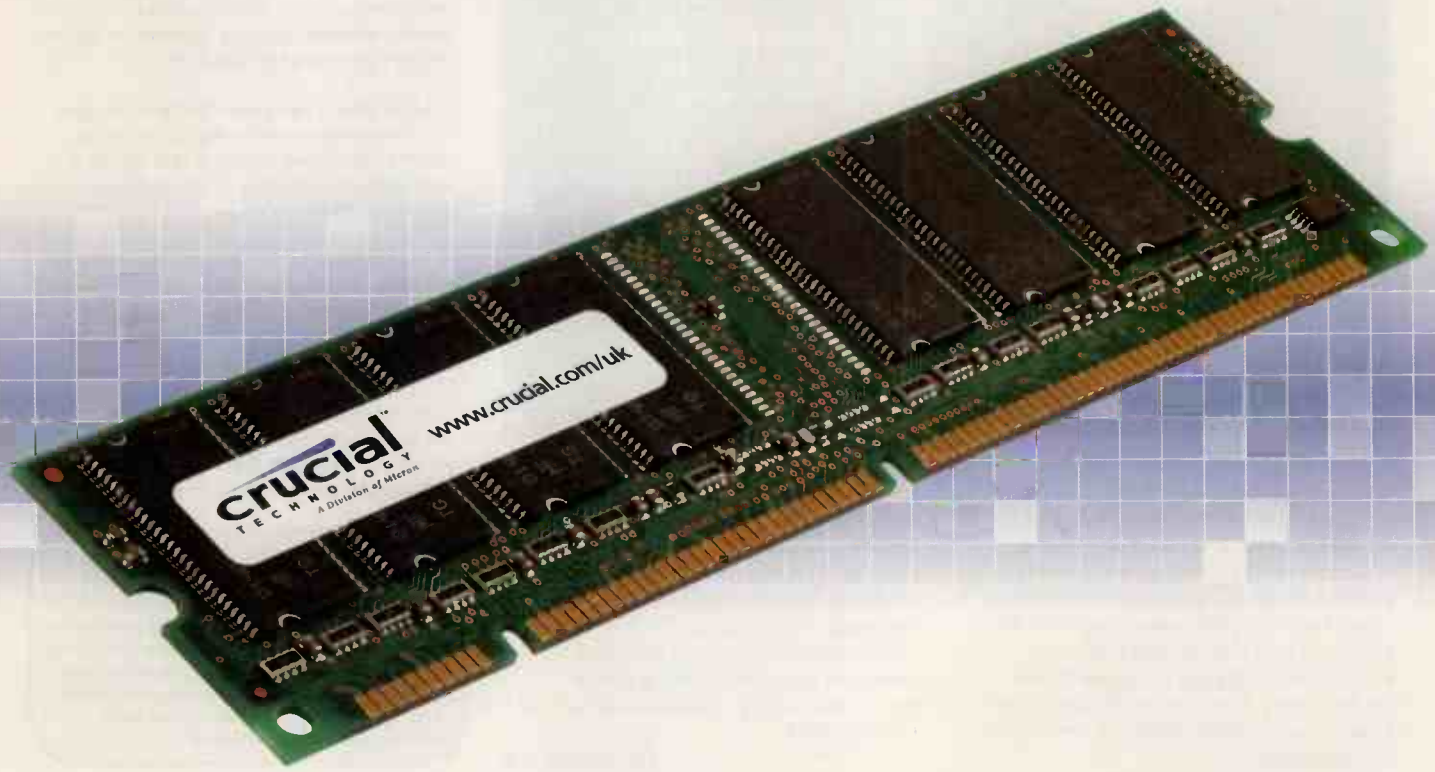

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A good idea... 'tis a pity it was phoney

The workgroup idea was revolutionary, but far too complex for mere mortals, says Guy Kewney

Did you know that Microsoft was a revolutionary once? Truly, it had new and exciting ideas, and was trying to turn the world upside down.

Take the idea of the 'workgroup'. When I set up my home network, it had a domain controller. Actually, a friend set it up – I wouldn't let myself loose on a domain any more than I'd defuse a bomb; something like that requires a professional. So there it was, an NT4 server set up.

The original network was a thing of marvels: a set of Intel-built network interface cards (Nics), and Microsoft's new Windows for Workgroups 3.11.

At the time, Microsoft explained that this was networking 'for the rest of us' because the only alternative that ordinary mortals could configure was Appletalk.

In those days, a serious network used Novell Netware as the network operating system. It wasn't very good; if the network software crashed, every computer connected to it would die, too. Also it was a pig to set up, and it crashed quite often.

Microsoft's idea was revolutionary. Most people, it pointed out, live in small communities of between three and 20 people. They didn't need a big server with huge files and complex operating software: all they wanted was a way to share files with each other and send messages. And if Windows for Workgroups fell over quite often, well, it wasn't much more often than a Netware server would. The added bonus was that you could set it up yourself, at home, if you had two or more PCs.

Today, in theory, you can still work in a workgroup. You don't have to have a domain controller: just plug four PCs together, all running Windows 9x, 2000 and XP, give them all the same workgroup name, and you have a sophisticated networking setup.

It will even, if you aren't careful, set itself up to share a broadband Internet connection; so all the PCs can access the web at the same time.

Exactly how it happened that someone set up Internet Connection Sharing (ICS) on my network is a mystery. What's certain is that you can find experts who are able to set up domains – for a fee, naturally – but if you ask them about a workgroup without a domain, they'll all look blank. You'll have to become your own expert by trawling newsgroups and asking for advice.

'Nobody today uses workgroups. The support was so bad we switched to domains,' confessed one particularly expert network guru. 'It's OK if you switch it on and leave it on; but of course people don't. Then you end up with nightmares of browse masters, out-of-date directories and invisible machines. And if something goes wrong, usually it costs a fortune on research to find out what [the problem is]. As to fixing it, the usual advice is to reinstall Windows.'

Of course, someone who knows what they're doing can master it. If everybody has the same user name on their machine as the login details on other machines, then read-only access is pretty straightforward.

But of course, the point of avoiding a domain is that in a small group, there is a real chance that most people in it don't really know what they are doing. And when you're in that sort of market, a lot of users don't know what their login name is. Add in 'simple file sharing' to make life more interesting; plus incompatibilities between the way you share Windows 9x and NT (or 2000 or XP) files, where it's possible to share the whole of drive C, and you still find that your documents and settings are 'access denied'.

Then the shared printers suddenly stop working. Funnily enough the error message won't say that the password has expired on the machine that drives the printer; you have to know that. You'll find this out if you try to log on to that machine, but it may not be set up for another user at start-up.

'The experts never use it, so have no need to turn it off, and they honestly don't know how'

And if you accidentally turn ICS on, you will search for some time before you find someone who really knows how to turn it off. The experts never use it; they set up a proper domain, and it acts as the Lan server and gateway. Since they never turn it on, they have no need to turn it off, and they honestly don't know (without going back to their text books) how to do it. 'You'll have to work it out for yourself, or just reinstall Windows. Or, if you're using XP, just roll it back to before you ran the network wizard that installed ICS,' said several of these experts.

The software works, well enough. It's just that it's pathetically obvious Microsoft really doesn't care if it's easy to make it work. Microsoft, once the revolutionary firebrand that said: 'Enough of these outdated large Lans, let's introduce workgroups!' would now far rather you bought an extra machine and set it up as a server.

I wonder if the next major edition of Windows will make workgroup networking really usable – as Microsoft undoubtedly could make it – or whether Redmond will try to leave non-domain sharing right out of the equation? ■

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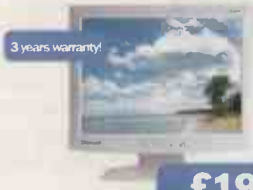

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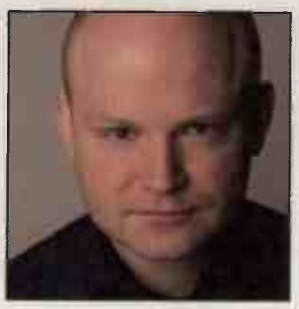

Cameras focus on moving images

Gordon Laing investigates whether we really need to use a camcorder to produce video clips

gordonl@pcw.co.uk

As a photographic enthusiast and self-confessed gadget fetishist, it continues to surprise me that I don't own a camcorder. Sure, I adore playing with them, but just don't have any personal use that can justify buying one. That's why when a friend recently asked if I could help him transfer his holiday footage onto a DVD, I jumped at the chance – at last, a real application and an opportunity to play.

An enjoyable hour or two later, we'd captured the video from his MiniDV camcorder, cropped the scenes then output it onto a DVD, all using Pinnacle's Studio 8 (around £55). Afterwards I continued to play with the clips, knocking them into a montage and compressing it for email. Once, in one of those 'ah ha' moments, I'd seen the clips in a lower resolution, something occurred to me: perhaps I didn't need a camcorder after all.

Video clips may traditionally come into your PC via a camcorder, but most editing software is quite happy to work with other sources. Indeed, the reduced-quality montage I'd prepared for emailing reminded me of the movie clips you get from still digital cameras. This got me thinking: if you only ever intended to email or stream your movie, could you knock one up with digital camera clips instead?

The more I thought about it, the more it made sense. While the movie modes of digital cameras still look ropey compared to camcorders, they're normally much better than the quality used for online video. Better still, there's no capturing or converting required to get the clips into the editing software – just copy them straight from the memory card into your PC using the supplied USB cable.

So that's why during a recent and rather pleasant weekend in Cornwall, I shunned stills and recorded video with my digital camera instead. Sadly it wasn't long before two potential flaws in my plan became painfully apparent. Best-quality video modes of digital cameras may only require around one-tenth the data of MiniDV or Digital-8, but you're still looking at around 5MB for a 15-second clip – average memory cards ain't gonna last long at that rate. Second, they don't call them clips for nothing. The latest digital cameras may keep recording until you run out of memory, but most are still limited to capturing 15 seconds at a time.

Seeing the glass as half-full though, I decided to embrace these limitations. Short clips can be a godsend when you've endured overly long camcorder footage – indeed if you study TV shows or movies you'll see each scene rarely lasts more than a few seconds anyway. I also freed up precious memory by deleting useless clips and shortening others using my camera's cropping facilities.

Back at home, I copied the clips onto my hard disk, and continuing my budget aspirations, edited the footage with free software. I opted for Microsoft's Moviemaker 2, free via Windows update, but sadly only for Windows XP users (see **www.microsoft.com/windowsxp/moviemaker**).

Moviemaker 2 supports mpeg-1 and avi formats, but not mov Quicktime files. This does, however, cover most digital camera movie modes, and all the basic editing features are offered. Admittedly, nothing you can't do with Apple's Imovie (free on all Macs), but at least Windows has caught up.

But what of the quality of my movie? Well one of the most satisfying aspects of the whole process surprisingly involved the audio. The 8bit mono sound captured by digital cameras may not be a patch on the 16bit stereo of MiniDV and Digital-8 models, but in reality this didn't matter. Infuriatingly, the audio delivered by built-in microphones on even decent camcorders can leave much to be desired, often making gentle breezes sound like tropical storms.

'I'm not suggesting that digital cameras can replace camcorders for video'

This had been a problem with my friend's holiday footage, so we simply replaced all the original audio with high-quality music captured from CDs. The great thing was I could do exactly the same thing with my digital camera project. Better still, this neatly solves the problem of what to do with cameras that can't capture sound.

My end movie was looking good and sounding great and, once compressed into a form suitable for emailing, looked not much different to footage born of a MiniDV camcorder. Indeed I even turned my movie into a semi-respectable VideoCD, although this standard was sadly beyond the capabilities of Moviemaker.

Now don't get me wrong – I'm not suggesting for one minute that digital cameras can replace camcorders for video. While both are gradually converging into single products, we're still some time off a camera which can capture both excellent video and stills. So if you want decent video today, buy a camcorder.

In the meantime, though, anyone who doesn't have a camcorder shouldn't miss out on the enjoyment of video editing. If you've got a digital camera, try taking a few clips and knocking them together with something like Moviemaker. It's fun, free and, surprisingly, might deliver the result you were after. ■

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Movie makers read from wrong script

Hollywood is trying to stop DVD cloning but it really needs to get its facts straight, says Barry Fox

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The Hollywood movie studios are up in arms. They want US company 321 to stop selling two software packages, DVD Copy Plus and DVD X Copy, and hand over all profits. MGM, Columbia, Warner, Universal and Disney also want the District Court in California to rule that 321 is violating the US' Digital Millennium Copyright Act. The people running the company then risk five years in jail and a $250,000 fine.

Both packages let a PC make a digital clone of a DVD movie disc. As the DVD system uses CSS (Content Scrambling System) to stop cloning, it looks as if 321 is banged to rights. But there is a lot more to this story.

Hollywood accuses 321 of using DECSS, the hack posted on the Internet a couple of years ago (see also Hands on Linux/Unix page 244). But 321 flatly denies this. Instead, the cloning software works by caching the mpeg-2 code from the DVD after it has been legitimately unscrambled by an ordinary DVD-Rom drive. Copy Plus then converts mpeg-2 to mpeg-1 and records the reduced bit rate code on blank CDs; X Copy leaves the mpeg-2 data stream intact and burns it to blank DVD.

So the case will hang on whether it is illegal to divert the data stream after it has been legitimately unscrambled.

In practice it probably does not matter. Although X Copy needs an activation code, which costs $100, hackers will find a way of making unauthorised copies of X Copy. 321's remedy would then be to sue under the DMCA, which seems pretty unlikely, so the software will probably end up in the public domain.

> 'Is it illegal to divert the data stream after it has been legitimately scrambled?'

In practice it is often more convenient to make an analogue copy of a DVD movie. The original DVD is often a dual-layer 9GB disc, so a clone needs to span two 4.7GB blanks. Making an analogue dub, by using a consumer DVD recorder to recode the analogue output of a consumer DVD player, squeezes at least one full movie on a single side. At VHS quality the single side can hold six hours and three movies. The menus and extras are lost, but a lot of people never bother with them anyway.

The DVD system was designed to prevent this kind of dubbing, even without the use of Macrovision copy protection on the disc. A DVD recorder should throw up the message 'Copy protect' and refuse to record from a copyright movie disc. In practice this often doesn't happen.

A high-street recorder will copy a DVD movie to a blank DVD from a high-street DVD player. I know because when Columbia and Warner defended their decision not to use Macrovision on DVDs such as *Spiderman* and *Harry Potter*, they patted me on the head and told me that the discs were protected anyway. Only a few simple tests show they are not.

The studios are relying on a system called CGMS-A (Copy Generation Management System – Analogue). Under two-bit code instruction from a trigger on the DVD movie disc, the player inserts digital flags into unused lines of the TV picture. These flags are like European Teletext. By informal industry agreement, a DVD recorder looks for these flags and shuts down. The disc, player and recorder must all be working from the same hymn sheet.

The hymn sheet is the 44-page Procedural Specifications (Version 1.1) of the CSS licence, drafted by 4C Entity (Panasonic, Toshiba, Intel and IBM) and administered by the DVD Copy Control Association and LMI (Licence Management International). All the drafting was done in the US and Japan, which are NTSC countries. So the spec is good and clear for NTSC discs and players.

Section 6.2.1(1)(a)(i) says that NTSC players should put the CGMS-A flags in lines 20 and 21 of the analogue output signal, along with flags denoting the use of Macrovision. So there is no doubt where NTSC discs and players should put the copy-control flags and where DVD recorders should look for them.

Unfortunately Section 6.2.1.1 (a)(ii) is less clear on where Pal/Secam players should put the flags. Instead of clearly defining the lines, the standard just shunts to a different standard ETSI 300294. This 20-page document turns out to be a Wide Screen Signalling standard for broadcasters (to control wide-screen picture display) with subsections on subtitling and analogue copy control – all in Line 23.

As a result some discs are telling players to put the flags in the wrong place, some players are not putting flags in the right place and DVD recorders are looking for flags that are not where they can be found. Some people in the industry know there is a problem and do not want to admit it; others do not know and don't want to.

Panasonic, mainly responsible for DVD copy protection, tries to duck the issue. 'There is a non-disclosure agreement within the industry,' it wriggles. Rubbish! Anyone can see the sloppy standard document provided by the licensing body which represents Panasonic.

Nothing can be done to modify the who-knows-how-many players and discs that are copy-capable. An unclear standard cannot be enforced. So if Hollywood wants to make sure future players and discs are not easily copied, the studios first have to admit they got it wrong. And they will not find that an easy pill to swallow. ■

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The hidden cost of creativity

Nik Rawlinson aims to maintain rights over his online work, but some copyright lines are beginning to blur

Have you ever read this column and thought you could have done better? Well, I dare say you could – I'm not too proud to admit my faults. Trouble is, you can't just take my words and rework them into something more entertaining, more authoritative or easier to read, because you don't own them. Come to that even I don't own them. The contents of this page belong to VNU, the publishers of *PCW*.

That's fine by me. After all, I get paid for my ideas and words, but is that fair on you?

If you said 'yes' then perhaps you've not heard of Creative Commons, so here's a story from its website (**www.creativecommons.org**) that might change your mind. The White Stripes, a Detroit-based rock band, is famous for not having a bass player. That's part of its so-called 'unique' sound – kind of like the way a machine gun doesn't have a silencer and sounds all the better for it. Steve McDonald, a bass player from another band, Red Cross, liked their music but couldn't help but feel it would be a whole lot better if they did have a bassist on staff. So, he bought their album, copied the tracks, added a bass line and uploaded the results to the web as MP3 tracks for all and sundry to download.

Now, far from being outraged, Jack White, the White Stripes lead guitarist, had no objections, and on meeting McDonald by chance one day gave him the nod to continue as he was. If you check out the Stripes site today (**www.whitestripes.com**) you'll find a whole raft of similarly 'improved' fans' tracks in the Tabs section, and a link to the now legendary punk kittens (**www.rathergood.com/punk_kittens**) produced by Joel Veich.

The White Stripes could easily have got quite nasty about this apparent infringement of their rights, but by giving it the nod they have effectively contributed to the creation of something far more entertaining and diverse.

Now an online movement running along these lines is rapidly gaining pace. Called the Creative Commons Deed, it redefines how we think about copyright and the ownership of published works.

Having read about the Creative Commons ethos – the online hippy revolution – many bloggers, authors and online publishers are replacing that all too familiar copyright glyph with two Cs in a circle, and linking it to one of the various licences available at the site. You see, as the originator of the work, it's up to you to decide how and by whom it can be used, and even what subsequent users can do with any derivative works.

A cursory glance at some of the various sites making the switch would indicate Attribution-Noncommercial-Sharealike 1.0 to be the most popular licence, allowing any user to reproduce the work free of charge, on the condition that the original author is credited, and the same sharing and attribution conditions are tied to any subsequent derivative uses.

That's the shorthand. The full text of this, and every other licence option, is a knot of legalese designed to stand up in court, while the front end is a consumer-friendly summary that will help, rather than frighten the user.

The rate at which Creative Commons is gaining widespread acceptance could see it overtake traditional copyright restrictions in just a few years, as far as non-professional online work is concerned. Suddenly everything online will become half-finished; a work in progress that one creator has finished tweaking and passed on to the whole world to read, enjoy, or work on some more. The implication is a potentially massive explosion of creativity the likes of which we've not seen since Enid Blyton learnt to write.

> **'With no control over the way your derived work is used, it can appear in ways you don't like'**

This can only be for the better, but I see a flaw. With no control over the way your derived work is used, it can appear in ways you don't like. Remember the Tony Blair 'Demon Eyes' poster a couple of elections ago?

Pro-Tory billboard posters showing the PM's face appeared to have had a strip torn from the middle, revealing a pair of demonic red eyes peering out from behind. Had you taken the original Blair photo, or were a Labour supporter and had released the image under the Collective Commons licence, then you might not have been pleased to see it used in this way.

You could, of course, have specified that no derivative copies can be made – that is, the photo must be used in its original unadulterated state – but that rather misses the point. Creative Commons is nothing but a means of earning your work a larger audience if it can't be used as a springboard for further creativity.

Until a new clause – perhaps Attribution-Noncommercial-Approvedderivative 1.0 – is introduced, then I'll be hanging onto my little circle-C logo and the the rights it affords me. I dare say this magazine, and all others, will be hanging onto it a whole while longer. ■

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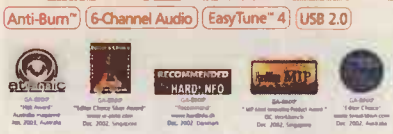

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WORDS: THE PCW TEAM & CHRIS CAIN

25 years and still going strong

We're 25 years old and to celebrate this, and a quarter-century of personal computing, we've gone back in time to rediscover the highs and lows of what is still a fascinating and fast-changing industry

Along with Louise Brown Garfield – the world's first test-tube baby – and the arcade game Space Invaders, *PCW* celebrates its 25th birthday this year. It's amazing when you think that's a quarter of a century. In dog years, we'd be dead!

The first dedicated personal computer magazine in the UK, *PCW* was the brainchild of journalist Angelo Zgorelec – our founder's name still appears on the magazine credits page today. The first issue arrived in February 1978 to coincide with the launch of Britain's first microcomputer, the Nascom 1 – several years before the original IBM PC. Since then, we've never looked back. Our readers' enthusiasm for computing combined with an expanding industry and our sheer nosiness have given us plenty to report on over the years.

To mark this anniversary we've trawled through the archives to look back at the major events and people that have shaped both the personal computer industry and the magazine. It's amazing just how far we've all come.

In our fifth issue we reviewed Commodore's Pet, an advanced machine for its time with a 1MHz 6502 processor, built-in 9in monochrome screen and anywhere between 8KB and 32KB of Ram. It cost £700. Today the same money would no doubt get you a Pentium 4 running at over 2GHz with 256MB of memory, and a 17in full-colour monitor. You'd also get a 40GB hard drive and CD writer thrown in, plus a copy of Microsoft Works. You could even download a Pet emulator to run on it.

It's not all about speed and power, though. Advances in personal computer technology over the years have improved our lives tremendously, from the humble word processor and spreadsheet through to communications (hands up all those who couldn't live without email or the Internet), entertainment and many other areas.

It's not all about looking back; just what can we expect in the future? With increasing developments in sectors such as mobile computing, screen technology and wireless networks, what amazing new gizmos and gadgets will we see? We take a peek into our crystal ball on page 94 to predict what kind of things we can expect.

All that's left to say is Happy Birthday to us and thanks to you.

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1978

Birth of the micro and PCW

A quarter of a century ago desktop computers were called micros to distinguish them from larger minicomputers.

As 1978 dawned they were still far too expensive for most people in the UK, unless they could build one. There was no Microsoft OS; most computers used Digital Research's CP/M.

In May, the first issue of *Personal Computer World* featured the £240 Nascom 1 (see cover above), which you had to solder together yourself.

In June Intel launched the 16bit 8086 processor, first of the dynasty that was to power the PC. Around the same time, Microsoft began an 8086 version of 8asic.

PCW reviewed the £700 6502-based Commodore Pet, which had a 9in monitor and between 8KB and 32KB of Ram.

In September *PCW* looked at the TRS-80 which was £200 cheaper. It had 4KB of Ram and for storage you plugged in a tape.

In December Atari launched its 400 and 800 in the US. And Epson shipped its groundbreaking MX-80 dot-matrix printer.

The biggest change of the year was in mindsets. No fewer than 30,000 people bought *PCW*'s sellout first issue: people were coming to realise that computers, long considered the realm of boffins and big business, were within reach of their pockets and brains. The IT revolution had begun.

Apple II impresses with colour graphics at core

The Apple II was one of those landmark machines that changed the early days of computing. It was originally debuted at the first West Coast Computer Fair in San Francisco in 1977 and *PCW* reviewed it in our fourth issue. We cited the reasons to buy it as: 'Its colour graphics, its extra high-resolution graphics package, its extreme portability and its high-quality construction.'

In retrospect, however, it was the colour graphics alone that won the day. It could show 16 colours at a resolution of 280 x 160 pixels, which at the time was remarkable for a machine in its price bracket. When we reviewed it in the August 1978 issue it cost £1,250 ex VAT for the 16KB version, although you would also need to buy a colour TV to get the most out of those graphics.

It was based around the MOS 6502 processor and had Basic in Rom and just 4KB of Ram. At the end of 1978 the Apple II got a boost in the form of a Ram jump to 48KB, but the big advance was the introduction of a low-cost 5.25in floppy drive. Until then the Apple II had used an audio cassette drive for storage, mainly because floppy drives, which had been around since 1971, were so expensive. However, the Apple II floppy drive was a low-cost alternative and most existing Apple II users bought it. And a year later when the first version of Visicalc was launched with the Apple II as its only platform, Apple's future was secure, at least for a short while.

Thousands take a Pet home

Home brew was very much in when *PCW* first launched. The first machine we benchmarked in the first issue was the Nascom 1, which you had to solder together yourself.

This was not everyone's idea of fun so the Nascom was not one of those machines to stand the test of time, unlike the Commodore Pet 2001 (pictured below) reviewed in the second issue. We were bullish about its likely success: 'It is a successful attempt at placing computing within the reach of thousands and there seems little doubt that thousands worldwide will buy it.' As it happens, we were not far wrong.

Intel's first 16bit chip in the spotlight

In the very first issue of *PCW* we took a look at the new 8086 processor from Intel. Based on the 8080 which, in 1974, had powered the influential Altair 8800, the 8086 was created by two engineers in just three weeks. The major difference between the 8080 and the 8086 was that the latter was the first of Intel's 16bit processors. Work on the processor began when Intel realised the i432 project was in deep water.

This processor's direct descendant, the 8088, released in 1979, was chosen by IBM for its first PC, which in turn shot Intel into the Fortune 500 list where it has been firmly entrenched ever since.

Remember when...

The $360 4.7MHz 8086 processed 0.33million instructions per second (mips) > An Altair system with twin floppies, 64KB of Ram and printer cost from £6,781 > £1,500 ex VAT got you an Apple II and a Sony TV to show its colour display > Microsoft revenues first topped $1m at $1.36m > Intel made $44m on an income of $399m > IBM made $3b on revenues of $22.8b

1979

Pacman mania hits the UK

The Space Invaders games console arrived in 1979 and kids across the country became hooked on Pacman.

Hayes, whose command set still runs modems, shipped its $380 Micro modem running at 300baud.

In May Software Arts launched the Visicalc spreadsheet, invented from scratch by Don Bricklin and Bob Frankston.

Intel launched the 8088 chip in June. This was similar internally to the 16bit 8086 launched in 1978 but with an 8bit external bus. It was to power the first IBM PC.

Micropro chose a July release for Wordstar, the model for all early word processors.

August saw the launch of the Vulcan database which Ashton Tate was to turn into the world-beating Dbase II.

In September the 16bit 68000 from Motorola arrived. It was to be to Macs what the x86 dynasty was to PCs.

Most computing still ran on 8bits, as did the Sharp MZ80K, which was part of the first wave of Japanese micros and was reviewed in *PCW*'s October issue. In the same month Atari shipped its 400 and 800 models.

In December Xerox took 1,000 Apple shares worth $1m in return for giving the company access to projects at its Palo Alto research centre. It has been kicking itself ever since. In effect, it had given away the mouse-driven graphical user interface which was to become synonymous with the Macs and the future of computing.

Visicalc makes the PC a serious business tool

Visicalc was the first of the killer applications. From the time it first appeared, personal computers could stop being regarded as pointless toys for nerds and became serious business tools.

Visicalc was essentially a spreadsheet package on which you could do your accounts. The revelation came when you altered one figure and saw straight away it could affect the rest of your budget. This allowed small companies make the kind of sophisticated financial projections that were previously available to only large companies that had mainframe or mini-computers

The program was developed in 1978 by Dan Bricklin and Bob Frankston, working on a computer on a timeshare basis. Bricklin developed the functional design and documentation, at the same time as studying for an MBA, while Frankston programmed at night when computer time was cheaper. When the product first went on sale it was just 25KB long and cost $100.

Visicalc proved to be not only the making of Bricklin and Frankston, but also had a significant impact on the success of Apple, as the first version of Visicalc was produced for the Apple II.

Versions for numerous other platforms were produced and the software lasted well into 1984, when a little application known as Lotus 1-2-3 stole its crown.

A1 (L) ACCOUNT B C1

	A	B	C	D
1	ACCOUNT BALANCES SUMMARY			
2				GBP EQUIV
3	HSBC HK	HK$	17246.54	1437.21
4				
5	MIDL LON	GBP	243.87	243.87
6				
7	BBME DUB	AED	438.15	62.59
8				
9	BBME BEI	LBP	3257.04	271.42
10				
11	HSBC SING	SG$	12.13	3.89
12				
13	CITI NY	US$	14231.04	8371.20
14				
15	MIDL PAR	FRF	0.00	0.00
16				
17				10390.18
18	17/01/83			
19				
20				

Users could see how each altered figure impacted the bottom line

Word processing begins to emerge

In our January 1979 issue we reported on a letter-editing system being developed by ICL Dataskil.

Later that year Micropro released Wordstar and Apple released Applewrite I for the Apple II. Wordstar was not the first word processor, but it did exploit the market potential and held many users captive until the release of Word at the tail end of 1983.

There was also much excitement about using word processors to create page layout for magazines and newspapers. In that year *The Times* had to close its doors due to action by journalists and the print unions, fearful of changes around the corner for the print industry.

Sharp shooter sets sights on Pet

The Japanese invasion was upon us and *PCW* was quick to milk the imagery to the full (see this year's cover, above left). However, not everyone was overly pleased by this turn of events: 'Because of the Japanese reputation in other fields, their arrival is being awaited with some anticipation – or trepidation, depending on your viewpoint.'

Gunning for the leading machine of the day, Commodore's Pet, Sharp launched the MZ-80K. Founded around the Z80 processor and with between 20KB and 48KB of Ram, of which Basic took up 14KB, the MZ-80K was a solid workhorse. But Sharp made a mistake in trying to corner the market by locking users into a proprietary technology: it eschewed Ascii for its own character codes.

Remember when...

The $360 Intel 8088 processed 0.66mips at 5MHz or 0.75mips at 8MHz > A 4MHz Z80-based Horizon PC with dual 380KB floppies, 24KB of Ram and 32cps (characters per second) printer cost £3,616 > £1,500 got you 23 per cent of a 10MB hard disk > Microsoft had revenues of $2,390,145 > Intel made $78m on an income of $661m > IBM made $3.3b on revenues of $21b

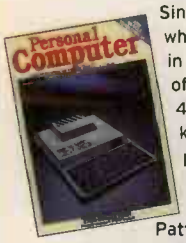
1980

Microsoft OS in big league

In 1980 computing became available to all but the very poor. The impetus was home grown, from a certain Clive Sinclair.

In March, SSI shipped Word-perfect 1.0 for Data General minicomputers.

PCW looked at the Acorn Atom, predecessor to the BBC Micro in April. But the sensation was Sinclair's ZX80 (left) which cost just £79.95 in kit form. It had 1KB of Ram and Basic in 4KB of Rom, and it got kids across the UK programming.



Meanwhile, virtually unnoticed, Tom Patterson of Seattle Computer Products began writing a disc operating system (Dos) for an 8086-based machine.

In May Apple shipped the disastrous 2MHz Apple III, with a 5.25in floppy drive and a price of between $4,300 and $8,000.

Seagate announced the first 5.25in Winchester hard drive in June. And in July the wife of CP/M developer and DR founder Gary Kildall turned IBM away from the door when they requested a new OS for a project called Chess. IBM turned to Microsoft.

In October Patterson sold Microsoft the rights to his Dos for $100,000.

In November Microsoft was contracted to provide software, including a rejig of this Dos, for the IBM project. It was, of course, the PC. It would sweep the world, and shake IBM to the core.

Clive Sinclair achieves impossible with ZX80

In 1980 Clive Sinclair did what everyone said was impossible. With the Sinclair ZX80 he was the first person to make a computer that broke the psychological barrier of £100, finally making computing affordable for anyone who wanted to give it a go.

If you were brave you could buy it in kit form for £79.95 and solder it together yourself, or you could save yourself £20 worth of heartache and get it ready-built for £99.95. It was based around an NEC Z80 processor running at 3.25MHz, had 1KB of Ram (expandable to 16KB), 4KB of Rom and used a TV and cassette drive to display and store programs. You could expand the memory to 16KB, but to buy the full amount would cost you £300.

It ran a form of Basic that our first reviewer was a little scathing about: 'The software of the ZX80 comprises the Basic interpreter, the Editor and whatever else it is that does the rest of the work (operating system seems too grand a title),' although he did go on to admit it was almost impossible to crash the system.

The sub-£100 Sinclair ZX80 had 1KB of Ram expandable to 16KB – but that would set you back £300

Ataris set standard for home PC

Hailed in *PCW* as 'the first of a new generation of home/personal computers', the Atari 400 and 800 set the mould for anything you would do with your home PC – play games, sort out your finances, run home education packages or maybe a small business.

But it was as consoles that these machines made their mark. They were among the first to have player missile graphics and they had sound which could be played back through the TV's speakers. Designer, Jay Miner, went on to bigger and better things, including the Commodore Amiga.

The rotten Apple

After the success of the Apple II, the two Steves, Jobs and Wozniak, proudly marched ahead with the Apple III. Announced in the July issue, it had 128KB of Ram, a 4KB Rom, a built-in 5.25in disk drive and graphics on the motherboard. It could run most Apple II programs in emulation and came with a new operating system.

The Apple III sold initially for between $4,300 and $8,000 but it was riddled with problems and bombed, nearly taking Apple with it. Some things never change. Apple crawled back into the running by bringing out a modified version later that year, with a better operating system and more Ram and Rom, and it was one of the first computers to have a 5MB external hard drive.

Remember when...

A 10MHz Intel 8086 processed 0.75mips > £1,500 bought you Pascal (£200), Wordstar (£250) Pet Comaccounts, Company and Comstock (£950) and a choice of utilities > Support for the above software cost £2,387 a year > Microsoft had revenues of $7.5m > Intel made $97m on an income of $855m > IBM made $3.5b on revenues of $26b

1981

BBC Micro and IBM PC launch

This may be remembered as the year of the IBM PC but, despite the exposure on *PCW*'s cover, few saw it so at the time.

Other launches seemed just as exciting. In January Commodore launched the colour VIC 20, with a 6502 processor and 3.5KB of Ram for £190 (minus cassette). Sony announced the 3.5in 437.5KB floppy disk.

In March Clive Sinclair shipped his new, improved ZX81. Around this time Quantum was formed to make 8in and 14in Winchester drives. We predicted that as production rose, a 6MB drive may retail for as little as $1,500.

In April Adam Osbourne shipped a Z80-based desk machine with twin 100KB floppies, 64KB of Ram and a modem for $1,785, bundling a software suite theoretically worth $1,500.

Visicalc, running on Apple II and Pet, topped the UK software sales list. Ex-*PCW* editor David Tebbutt said later, without hyperbole: 'No-one, before or since, has created anything quite so revolutionary.'

The first true adventure game, Zork, moved from minis to be squeezed into 32KB Apple IIs and TRS-80s. A typical command: 'Attack troll with mace'.

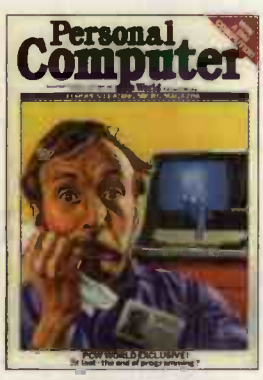
The IBM PC was launched in November. And in December Acorn shipped the much better BBC Micro which, with an associated TV programme, helped make Britain one of the most computer-literate nations in the world.

Another year and another ZX

Uncle Clive Sinclair cunningly re-used the idea of naming his products after the year of release, and offered us the ZX81. It may have shared its predecessor's doorstop wedge styling, but since it cost £70 ready-built or £50 in kit form, you couldn't really argue and thousands of people didn't.

It featured a 3.5MHz Z80A processor, 1KB of Ram and an 'everything-proof' membrane keyboard. A thermal printer and unstable 16KB Ram Pak (responsible for most hair loss in terms of frustrated pullings-out) were options.

The ZX81 had a 3.5MHz processor and an 'everything-proof' keyboard



The last program you'll ever need!

February 1981 saw the arrival of what could have been 'the last program you will ever need to buy'. Named 'The Last One' from Somerset-based David James and Scotty Bambury, it removed the need for pesky programmers and their complex languages. 'We didn't know that we'd done anything clever until *PCW* told us,' exclaimed Scotty. Unfortunately, in this instance, we wouldn't have known a clever thing if it had come along and hit us.

IBM changes the world with first PC

November 1981 saw the 'Jolly Giant deliver the goods'. In a *PCW* world exclusive we flew to Florida and tested the very first IBM Personal Computer.

IBM listed the main system unit (Intel 8088 at 4.77MHz) with 16KB of Ram and keyboard for $1,265, a mono display at $345 and a matrix printer for the bargain price of $755; an additional 64KB of Ram came in at $540 and you had the choice of running CP/M or the unproven fledgling Microsoft Dos.

The last word goes to then editor David Tebbutt: 'The only thing missing at the moment is a wide selection of packages, but I rather feel that the whole world and its grandmother will be frantically trying to fill that particular gap.' Things would never be the same again.

Auntie Beeb plants little Acorns

The year ended with a rave review of the BBC Micro, a machine originally commissioned by 'Auntie Beeb' to accompany a series of TV programmes aimed at increasing the public's awareness of computers.

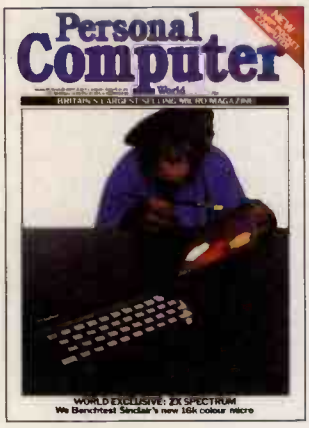
The 'Making the most of the micro' campaign helped make Britain one of the most computer-literate countries in the world. Indeed, at one time there were more computers per head in the UK than anywhere else in the world. To be fair, much of the UK penetration was due to Sinclair, a company widely predicted to get the BBC contract.

In the end, the deal went to Acorn, whose latest development, the Proton, needed little modification to meet the BBC's specification. £235 got you a 6502 processor, 16KB of Ram, a great keyboard and eight rather impressive graphics modes. Production delays didn't see the BBC Micro really take off until the following summer, when we blessed it with a further 10-page benchtest.

Remember when...

A Superbrain QD CP/M machine with 700KB of storage and an NEC Spinwriter printer set you back £3,745 › £1,500 bought you half an Apple II, with 48KB of Ram and twin floppies › Microsoft had $16m revenue, and its staff numbers had grown from 25 to 128 in two years › Intel made $27m on an income of $789m › IBM made $3.3b on revenues of $29b

1982



Software joins growing throng

The PC came to rule not because it was better than its rivals (it wasn't) but because software houses could not write for multiple platforms.

The industry needed a focus and IBM was a natural candidate. The range of PC applications soon became unbeatable.

But rivals prospered for a while. January saw the launch of the best-selling $595 Commodore 64.

In February came the Sirius and the founding of both Compaq and Sun. Intel launched the 6MHz 80286 which could access 16MB of Ram (most of it invisible to Dos).

There was a flurry in the UK with the April launch of Sinclair's ZX Spectrum.

In June Columbia Data Products launched the first PC clone, seeding a new-world industry. Epson shipped its 3lb HX-20 notebook.

Wales-based Dragon Data bravely launched the £199 Dragon 32 in August.

In November six-month-old Lotus launched its 1-2-3 spreadsheet package and Compaq introduced a portable PC after spending $1m developing a Bios that didn't breach IBM's copyright.

Apple was riding high, becoming the first personal computer company to top $1b in sales, and the Mac was yet to come.

Oh, and TCP/IP was named the protocol suite for the collection of linked nets, including Europe's new EUnet, that was coming to be known as the Internet.

Revolutionary Spectrum enhances game playing

Colour, sound and high-resolution graphics for £125? It could only be the new Sinclair ZX Spectrum, a home computer so revolutionary that the expected name, ZX82, was simply not good enough.

The Spectrum measured 233 x 144 x 30mm, weighed 520g and, unlike its predecessors, actually boasted keys that pressed down – well, squidged down, anyway. It may resemble a desk calculator today, but at the time we described it as 'extremely elegant', or at the least, truly rubbery.

The earlier ZX81 could be expanded to 16KB of Ram, but the £125 Spectrum came with it as standard. Another £50 got you the vast 48KB model, but both at the time of release were mail order only.

Unfortunately most of us had to go through two or three models before we got one that worked, but the British public couldn't get enough.

The graphics, at 176 x 256 pixels, were fairly high resolution at the time, but you could only assign colour to them in considerably lower resolution blocks of 24 x 32 characters. Sneaky. The sound facility was aptly named Beep, as that was about all it did as well as cunningly freezing the processor while it was at it.

Most people remember the inspired keyboard-entry system (first seen on the ZX80 and ZX81) where a single press would pop up entire words: most keys had up to five such words or symbols.

Programming the 3.5MHz Z80A processor had never been so much fun. Programs were loaded by cassette, with the fabled Microdrive tape system scheduled to arrive later at around £50 each and the same again for the interface. A thermal printer was also available.

The ZX Spectrum really took off as a games machine, spawning an enormous market which flourishes to this day. Most of its owners were closet programmers too, which helped place the UK as the highly computer-literate country it is today.

Sirius competitor to the IBM PC

Chuck Peddle, designer of the 6502 processor and the Commodore Pet which first housed it, is widely regarded as the man who started the personal computer industry. Chuck ended up leaving Commodore to set up his own company, Sirius, which in early 1982 released its first product and, indeed, the first serious competitor to the IBM PC. He described his Sirius 1 as a third-generation computer, based around a 16bit processor (the Intel 8088 running at 5MHz) and plenty of memory (128KB of Ram) . It also boasted a pair of 5.25in floppy disk drives, each capable of cramming an impressive 600KB on one side of a disk. The basic system cost £2,395, or £3,890 with 512KB of Ram.

Above all, Peddle says, they should be designed for the end user rather than the programmer, and be regarded not so much as a computer but a piece of business equipment. The Sirius came with CP/M-86, the 8086 version of the CP/M operating system, Microsoft Basic-86 and an early Wordstar; MS-Dos was available later that year.

Not too far from the truth? You decide. This was *PCW*'s vision of an office of the future in 1982

Remember when...

A 6MHz Intel 8286 processed 0.9mips ■ A Sharp MZ80-A with an Epson MX80 printer and custom interface cost £787 ex VAT ■ £1,500 bought a 6KB Osborne 'portable' and £100 worth of software ■ Microsoft had revenues of $24m and 220 staff ■ Intel made $30m on an income of $899m ■ IBM made $4.4b on revenues of $34b

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Personal Computer World has and is blessed with some of the most brilliant journalists, designers, contributors and production staff in UK technology publishing, and we couldn't have done it without them, or without the work of a great support team and the suppliers who help us to produce it each month. We would also like to thank the current roster of companies we work with for their continued support.

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1983

Windows on the GUI future

Apple seemed to be making all the running in January when it unveiled the 5MHz 68000-based Lisa, its first attempt at a mouse-driven graphical user interface. Lotus spent $1m launching 1-2-3, which needed an unprecedented 256KB of Ram.

In March IBM launched the $5,000 XT with 128KB of Ram, a 10MB drive and a 360KB floppy: a configuration the new MS-Dos 2.0 was designed to support.

In April Microsoft showed versions of Word and Windows. In May Fujitsu announced a new 256Kbit Ram chip and Sony showed a 3.5in double-sided double-density floppy. Osborne filed for Chapter 11 bankruptcy protection and Novell launched Netware for PCs.

In October IBM introduced the $9,000 8088-based XT Model 370 with 768KB of Ram and a 10MB drive. And in Britain, Apricot offered its 5MHz 8086-based ACT.

In November SSI shipped Wordperfect 3.0 and IBM launched its buggy PCjr, starting at $700.

Microsoft released Word 1.0 but failed to interest IBM with its yet-to-be-launched Windows. IBM was working on a Dos multitasker called Topview. In the event, Digital Research beat both to the market with Gem.

In truth, an effective GUI needed more power than was available, but it was clearly going to come. Philips and Sony backed their faith by beginning development of the CD-Rom.

Lisa points the way with its new graphics mouse

Most agree that Xerox's advanced research labs in the late 1970s and early 1980s were responsible for the first GUI, but it never carried it through into a viable commercial product: a fully equipped Xerox Parc Star system came in at around $50,000. For more reasonably priced products you'd have to travel to January 1983, when *PCW* was invited to review two new products based on 'the graphics mouse... the vehicle that (will) smoothly usher in the next generation of computer users – keyboard-phobic executives'.

One product was Vision from Visicorp (business partner of Dan Bricklin's Software Arts which developed the ground-breaking Visicalc). The other was the Apple Lisa, boasting a much-vaunted 300 man years of development. Compare that with the Apple II's two man years and the Apple III's 25 man years. Lisa stood for quite a mouthful (Locally Integrated Software Architecture) but the whole point was to produce a computer which was easier to use than ever before.

Looking back, the Lisa's operating system clearly shows early inspiration for the forthcoming Mac, with the menu bar at the top, nested folders with draggable contents in windows that could be moved about, and of course the arrow-headed mouse-driven pointer. The Lisa featured a 720 x 364 pixel 12in mono display built into the main unit, a Motorola 68000 processor and 1MB of Ram, but would set you back around £7,000 including a printer. It's easy to say that Apple's Mac started the mass acceptance of the GUI in 1984, but technologically the Lisa was there a year earlier.

Sid in tune with Commodore 64

'Home computer or small business system?' was the question we asked of the Commodore 64. Costing £344.95, the 64 was pitted against the likes of the BBC Micro, leaving the ZX Spectrum for entry-level computing.

Under the lid of the 64 beat the heart of a 6510A (a 6502 development) processor, plus 64KB of Ram and a spectacular sound chip named Sid. It may have had business aspirations, but with the Sid chip driven by superb musicians such as Rob Hubbard, and sprite graphics capability, the 64 became the games computer to own. The 64 became one of the best-selling home computers in the world.

Gandalf works his magic as gamesters revel in latest fad

Computer games were big in 1983. May's *PCW* alone covered the superb action of Imagine's Arcadia and Melbourne House's Penetrator for the ZX Spectrum. The madness of Automata's Pimania written by Christian Penfold and Mel Croucher baffled UK gamesters searching for the hidden gold and diamond sundial prize allegedly worth £6,000. And those home computer users jealous of Zork on higher-end systems could revel in Melbourne House's The Hobbit, where Bilbo, Thorin and Gandalf explored Tolkien's world, getting frustrated by carefully timed floating barrels and Gollum's invisible-ring antics.

Remember when...

A 10MHz Intel 8286 processed 1.5mips › £1,500 got you 30 ZX81s › Compaq took a record $329m in its second year › An ACT Apricot with floppy drive, 256KB of Ram and Epson RX80 printer cost £1,800 inc VAT › Microsoft had revenues of $50m and 476 staff › Intel made $116m on an income of $1.2b › IBM made $5,4b on revenues of $40b

1984

UK at leading edge of market

In January the Apple Mac introduced itself, and a new phase of computing, with the words: 'I'm glad to be out of that bag'.

Also released was the souped-up Lisa 2, the Commodore 264, a $2,900 portable from IBM, and NEC's 8MHz V20 and V30, clones of the Intel 8088 and 8086.

In March *PCW* reviewed the Spectravideo, first to be built to the MSX games-PC spec, backed by Microsoft and top Japanese companies. MSX went the way of many such moves, fragmenting into nothingness.

Another approach came in April with the Adam, which turned the Colecovision games module into a personal computer.

In May Amstrad made its debut in the computer market with the CPC464.

Sinclair launched the multi-tasking 16/32bit QL, with two microdrives in June. It was novel and well received but failed to take off.

The UK was still at the leading edge, though. This was the year of the first handheld Psion Organiser, with a single-line display.

In August IBM launched the PC AT, true precursor of the modern PC, plus its Topview multitasker and the Enhanced Graphics Adaptor card and monitor, supporting up to 640 x 350 resolution in 16 colours.

In October the Internet clocked its one-thousanth host. The race was already on for bandwidth: 2,400baud modems were the rage at Comdex in December.

Mac eschews conformity

If Apple's advertising campaign of 1984 was anything to go by, the Orwellian nightmare was the conformity of Big Blue's IBM PC. There was an alternative. Many considered Apple's future to be on the brink after the Apple III and Lisa, but the Mac – a computer for the rest of us – turned the company around.

The original Mac, reviewed in March 1984, was described as using Lisa 32bit technology. This referred to its relatively quick Motorola 68000 processor running at a fairly nifty 8MHz; this ran in 32bit internally and 16bit externally. Compare that to 1983's Lisa running its 32bit 68000 at around 4MHz, and IBM's Personal Computer employing an Intel 8088 (16bit internal/8bit external) running at 4.77MHz.

The original Mac came in an upright 20lb box with a mono 9in 512 x 342 pixel display, 128KB of Ram and Sony's then revolutionary 3.5in 400KB floppy drive which was incompatible with Lisa's 5.25in floppies.

A basic machine started at $1,995, or around $3,500 fully kitted up, which was still considerably cheaper than the Lisa.

Lisa's Desktop Manager had been refined into the Mac's proprietary Finder Operating System that still forms the basis of modern-day Macs. The 'biggest surprise [was] that the Macintosh [was] totally incompatible with the IBM Personal Computer. Moreover, it [didn't] even run stripped-down, revised or enhanced versions of Microsoft's MS-Dos Operating System'. According to Apple however, over 100 independent software developers were working on products for the Mac.

The original system did, nonetheless, come with the Macwrite word processor and Macpaint, arguably one of the first bitmapped paint packages.

Despite Apple announcing Lisa 2, it also began to develop software to allow the Lisa to emulate the Mac. The fate of Mac's big sister was sealed, being discontinued a year later.

Apple founder and head Steve Jobs described his Mac as: 'The fastest and most powerful computer ever placed in the hands of a large number of people'. We concluded: 'Apple [was] one of the few companies that could take on the IBM/MS-Dos de facto standard with any chance of winning, and the Mac [was] a terrific weapon with which to enter the battle.' We did, however, argue that some of the graphical-interface features were a little trivial, asking: 'How many times can you look at a whimsical icon before you tire of it?'

IBM AT sets hardware standards

In August 1984, IBM announced its PC AT system, with a 6MHz Intel 80286 processor (the first in a product line still supported today), 1.2MB 5.25in floppy drive and 256KB of Ram: yours for around $4,000, but that didn't include a hard disk or monitor. A more complete system with a 20MB hard disk, colour graphics card and monitor weighed in at around $6,700. The AT signalled the long-term future of PC hardware, the basics of which still exist for compatibility on even the latest systems.

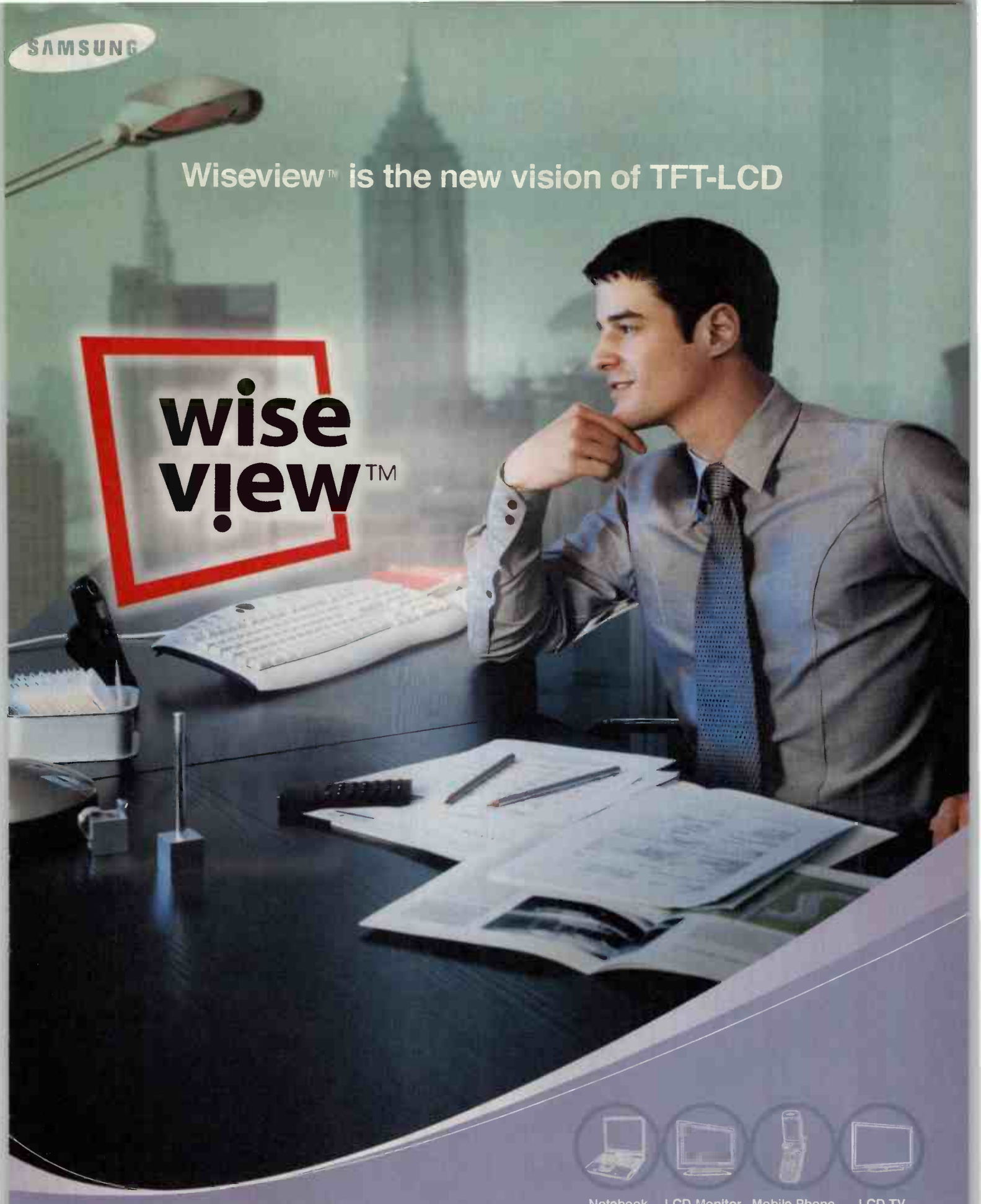
In the same month, IBM announced the Enhanced Graphics Adaptor (EGA), offering up to 640 x 350 pixels in 16 colours. You had to add a 64KB memory pack to the standard card however, bringing the total cost of this graphics card to over $700.

Microsoft released MS-Dos 3.0 for PCs, supporting 1.2MB floppy drives and hard disks larger than 10MB: ideal for the IBM AT computer.

The Hubot shows that the whole point of having a household robot is to watch TV!

Remember when...

£1,500 bought you three 2,400baud modems > A twin-floppy Apricot with monitor and daisy-wheel printer cost £2,384 > An 8088-based IBM PC XT with 768MB of Ram, 360KB floppy and 10MB drive cost $9,000 in the US > Microsoft had revenues of $97m and 608 staff > Intel made $198m on an income of $1.6b > IBM made $6.5b on revenues of $45.9b



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1985

Apple drops Jobs and Lisa

The market was hardly wide open but Intel and Microsoft had yet to corner it. There were many other players. In January Atari launched the 520ST, with 512KB of Ram, 192KB of Rom, colour and Midi. It became a favourite with musicians.

In February *PCW* gave a rave review to Digital Research's Gem GUI. Microsoft released Word 2.0 for Dos.

IBM abandoned the IBM PCjr in March and Apple dropped the Lisa. In May Apple sacked Steve Jobs, who went on to found Next.

In July Aldus released Pagemaker for the Mac, Quarterdeck shipped Desqview 1.0 for task switching within the PC's Ram, still hovering at 512KB.

Unlikely IT catalyst Alan Sugar, at Amstrad, shipped the PCW 'Joyce', first of two seminal launches. It ran CP/M on an old Z80 but was packaged as a word processor complete with printer, all for £399. It attracted many non-techie users.

In August Guy Kewney welcomed the Amiga 1000 as giving a 'new price level to business computing'.

IBM launched Token Ring and Intel introduced the 80386 in October. Not to be outdone, Britain's Advanced Risc Machines (ARM) shipped its first 32bit Risc chip which debuted in an Acorn accelerator card.

November saw Microsoft ship Windows 1.0, two years after its announcement. It made little impact. And Nintendo introduced its games module.

Jackintosh 'Mac-beater' let out of the box by Atari

Former founder and boss of Commodore, Jack Tramiel, left to head up Atari at the beginning of 1984. The fruits of his labours arrived in mid-1985 with the Atari ST, complete with Tramiel's catchy slogan 'Power without the price'. At £749 for a 68000-based machine with 512KB of Ram, a 3.5in floppy drive, high-resolution graphics and the Gem graphical user interface, the ST was dubbed a Mac-beater, or the Jackintosh. Proud of his new toy, Jack shamelessly gave his name to the ST's Tramiel Operating System, resulting in a rather unfortunate acronym.

Nonetheless, the ST was a huge success, bought in droves as much by the Mac as the Amiga wannabes. It beat both in one respect beyond price, however: the inspired fitting of a pair of Midi ports made the ST the music-studio computer of choice for many years, and pretty much launched sequencing outside of dedicated boxes. For most though, the ST was a much-loved games machine.

Power without the price: the Atari ST cost £749 and became a favourite with musicians

A month after our review of the Atari ST came the long-anticipated Commodore Amiga, one very excited Guy Kewney and a nine-page review: 'It does multitasking. It has colour. It uses a mouse and icons. It's fast, has plenty of memory and uses cheap, large-capacity disks.' He was 'sure this really [was] the micro [he'd] been waiting two years for the world to produce'.

Apple corners DTP

Computers thrive on killer applications and the Mac needed only to wait one year before its holy grail arrived: desktop publishing (DTP). The Mac's friendly GUI, coupled with Aldus Pagemaker and the first affordable Postscript laser printer, heralded the DTP revolution. Indeed, we can thank president and founder of Aldus, Paul Brainerd, for coining the term 'desktop publishing'.

It was years before you could perform serious DTP on a Windows-based PC, by which time the Apple Mac dominated the business. Even today the majority of UK publishers, including those of *PCW*, are still putting their pages together on Macs.

Paula, Daphne and Agnus chip in

At $1,500 the Amiga was at first considered to be more a business machine than one for the home. You got an 8MHz Motorola 68000 processor, 256KB of Ram and three fabulous custom hardware chips (called Paula, Daphne and Agnus) which raced through graphics and sound leaving the main CPU to better things. It featured a colour GUI two years before Apple and could multitask from day one, but with all those cool graphics and audio capabilities and a pair of joystick ports thrown in, what fate befell the Amiga?

Yes, you guessed it: despite carving a slight niche in some aspects of video post-production, the Amiga fast became the aspirational games machine. Its price never dropped as low as the Atari ST, but the two battled for supremacy in the entertainment market for years.

Remember when...

The new 16MHz 80386 was 10 times faster than the first 8086 and at $299, 11 times cheaper per mips ▸ A mono Atari 520 ST and Epson LX-80 printer cost £1,054 ex VAT ▸ £1,500 got you half a Canon Laser-beam printer ▸ Microsoft had revenues of $140m and 910 staff ▸ Intel made $1.5m on an income of $1.6b ▸ IBM made $3.5b on revenues of $26b

1986

Dos PCs begin their ascent

Here began the heyday of Dos PCs, which were finally getting the Ram and power for sophisticated, albeit text-based, software.

Memory-resident (TSR) utilities, such as Sidekick, provided Windows-like pop-up services; must-haves were Norton Utilities (for its Undelete) and Traveling Software's Laplink for swapping files between PCs.

In January PC-cloner Compaq announced record $503.9m revenues and Apple launched the 8MHz Macintosh Plus and the Laserwriter Plus. IBM announced the shortlived IBM RT, one of the first 32bit Risc computers.

Microsoft released Dos 3.2 with support for 3.5in 720KB floppies. In March Microsoft sold its first shares at $21 per share.

In August Intel shipped the 32bit 80386, ramping up the mips (millions of instructions per second) for the coming graphics revolution. Almost immediately, Compaq shipped 386 PCs.

In October *PCW* enthused over Amstrad's second seminal product, the PC 1512, starting at £399 ex VAT. It opened the UK home market to PCs but at the expense of innovative British companies such as Acorn and Apricot.

This was the year Inmos UK pioneered parallel processing with the T800 transputer, NEC launched the multisnyc monitor, Gateway 2000 shipped its first PC, and the Small Computer System Interface (SCSI-1) standard was finalised.

Compaq leads 386 brigade

Towards the end of 1986 Intel officially announced its true 32bit 80386 processor and, hot on its heels was Compaq's Deskpro 386: our first official 386 review was written by Peter Jackson in November's issue. 'As the leader in the IBM-compatible market, it was obvious Compaq would build a 386 machine, but at the same time Compaq does not have the muscle to impose brand new standards on the business micro world.' The problem was the 'absence of any 32bit product line or statement from IBM', forcing Compaq to 'tread a narrow path'.

'On the one hand, sticking to the old (IBM/Microsoft PC-Dos 1981) standard at the expense of performance would waste the potential of the chip. On the other, unleashing the full power of the 32bit processor would mean a proprietary machine with no software available, and no guarantee that IBM would decide to become Compaq-compatible when it launched its own range of 32bit systems.'

The design of the Deskpro 386 was the result of walking such a tightrope, and indeed ended up setting the standard for PCs for years to come.

For example, the Deskpro's powerful 16MHz 32bit 80386 processor acted like an 80286 when first started up.

'First the 80386 mimics the 80286 protected mode features, including the protection itself and the 16bit instruction set. On top of that sit the specific 80386 features that give the chip its real power,' such as direct addressing of 4GB of Ram, memory paging and the full 32bit instruction set. 'Most important for the future, though, is [what] the 80386 called virtual mode', allowing real mode programs written for the 80286 to be run in separated protected areas of memory. We eagerly awaited a 'protected mode' operating system to arrive, exploiting the chip's potential – it was hoped that Microsoft's long-awaited MS-Dos 5 would do the trick.

The Deskpro's 80386 mimicked the 80286 protected mode features

Jackson summed up the Deskpro's architecture and, in hindsight, described many PCs to come: 'The Deskpro 386 [was] split into two functionally separate parts. On one side of an invisible divide is the 16MHz processor and its 32bit slotted Ram; on the other is an 8MHz AT clone.' He concluded: 'If it gets a real operating system and drops all this 640KB Ram barrier, the Deskpro 386 should give any new IBM PC a run for its money.' Sadly, we'd have to wait a few years.

Described as 'aggressively priced', a standard Deskpro 386 with 16MHz 80386 processor, 1MB of Ram, one 1.2MB floppy and a 40MB Winchester hard disk cost £5,399 minus monitor. Just over £2,000 extra got you a 130MB hard disk, while a 4MB to 8MB Ram expansion came in at £2,695. £695 got you an intelligent 40MB tape streamer.

Sugar's 1512 keeps users sweet

In October 1986, Guy Kewney described Amstrad's PC 1512 as 'probably the most important British micro to appear this year'. The PC 1512 was codenamed Airo, an acronym invented by Amstrad boss Alan Sugar himself, meaning Amstrad IBM Rip-Off.

The 1512's big problem was an inability to use high-resolution EGA-enhanced graphics adaptor cards. This may have been a problem for some, but most important was the price: £399 ex VAT meant that 'many people who always wanted a PC [could] now afford a very nice one'.

Your money got you an Intel 8086 processor running at 8MHz (switchable to 4.77MHz), 512KB of Ram and a 5.25in 360KB floppy drive; MS-Dos 3.2 was included, as was a monitor and keyboard. Strangely, the monitor powered the system, and the keyboard used a non-standard plug. This limited expansion possibilities, but at £399 for a basic PC clone, we said: 'What more could you want?'

Remember when...

£1,500 bought you 2.75MB of Ram in the form of 256KB chips > A colour Amstrad 1512 with 10MB disk and Epson NLQ LX86 dot-matrix cost £1,236 inc VAT > Microsoft had revenues of $197m and 1,153 staff > Intel lost $178m on a $1.26b income after demand slumped as expensive new fabs opened > IBM made $4.7b on revenues of $51b

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1987

IBM loses grip in vintage year

A vintage year for products, and one in which IBM found it had lost control of the PC.

In March US Robotics unveiled the 9.6Kbits/sec Courier HST modem. And Sinclair's Cambridge Computing launched his final classic – the £200 Z88.

In April *PCW* tested the 68020 Mac II, the first with colour, a separate monitor and slots for PC-style add-on cards... and plug-and-play, which Windows would not get until 95.

IBM launched the PS/2 range with two important innovations: VGA, giving 16 colours at 640 x 480; and Micro Channel Architecture, a sensible but doomed attempt to upgrade the PC.

Microsoft announced Windows 2.0 and IBM shipped Topview, only to drop it within weeks. Apple created Claris to sell some software.

In August came the second UK classic of the year: Acorn's Archimedes, driven by an ARM Risc chip and doomed like many non-PCs to be squeezed into a niche.

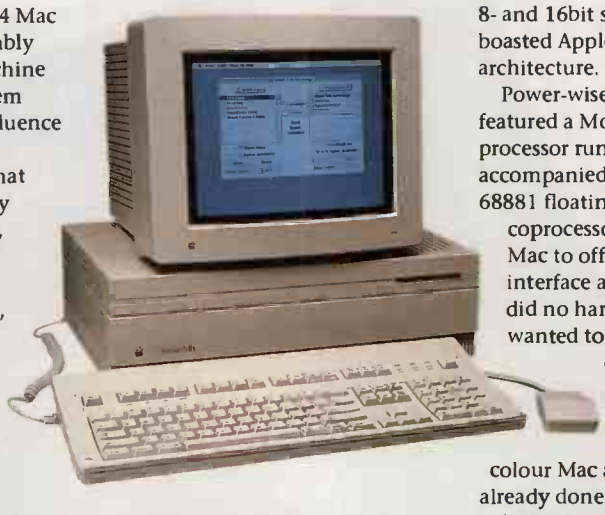
We reported the battle of the Sega Master, the Nintendo and Atari 65XE games consoles in our October issue.

In November Borland shipped its Quattro spreadsheet, whose 1-2-3 emulation resulted in a nine-year legal battle with Lotus.

The millionth copy of Windows was sold in December, despite a lack of applications. And Microsoft and IBM both shipped OS/2.

Mac gets taken seriously

The original 1984 Mac was an undeniably impressive machine with an operating system which continues to influence developers to this day. The only trouble was that it wasn't taken seriously as a business computer, not like an IBM or compatible system.



Apple's Macintosh II, reviewed in April 1987's *PCW*, changed all that. It was the first Mac to break away from the all-in-one design, instead favouring the separate monitor and main system box of, how shall we say, more serious computers. This gave Apple a great opportunity for expansion, sensibly fitting six slots into the Mac II. While the IBM AT design was struggling with 8- and 16bit slots, the Mac II boasted Apple's 32bit Nubus architecture.

Power-wise, the Mac II featured a Motorola 68020 processor running at 15.6MHz, accompanied by a Motorola 68881 floating point coprocessor. It was the first Mac to offer a built-in SCSI interface as standard, which did no harm when you wanted to fit additional drives, scanners and the like.

The Mac II was also the first colour Mac and Apple had already done its homework, offering a small but perfectly formed rebadged 13in Sony Trinitron monitor, driven at a considerably less flickery 66.7Hz than the average 60Hz of the competition.

The Mac operating system at 640 x 480 pixels in 256 colours had never looked so good. 1MB of Ram came standard, expandable to 8MB, and you had the choice of a 20, 40 or 80MB SCSI hard disk. The 40MB version came in at around £5,500.

PCW said in our review the Mac II 'marks Apple's entry into the realm of serious computing', and concluded that 'you can disagree with any number of individual design details on the Mac II, but you can't call it a toy'.

Archimedes makes a big splash

Is this the world's fastest micro? we asked of the new Acorn Archimedes in August 1987. Our reviewer, Dick Pountain, was smitten: 'The A500 felt like the fastest computer [I've] ever used by a considerable margin; just about everything you [did] happen[ed] instantaneously.' This power came from Acorn's ARM (Advanced Risc Machines) technology which produced a 32bit Reduced Instruction Set Computer (Risc) chip, resulting in 4mips from a relatively modest 4MHz clock speed.

The Archimedes, or A series, came in two flavours: the A300 series were replacements for the BBC Micro and Master, indeed wearing the BBC badge, while the A400 series, badged by Acorn, was more upmarket, featuring hard disks, memory and greater expansion capabilities.

The basic A305 with 512KB of Ram cost £799, while an A440 with 4MB of Ram and 20MB hard disk would set you back £2,299. A colour monitor cost £200. You'd want colour, as the Archie raced through graphics and was demonstrated drawing swift mandelbrot sets or playing the excellent 3D Lander game.

Colour was a must on the Archimedes, but a monitor would cost you £200

DTP gains ground

1987 was a great year for DTP, with the first releases of Ventura and Quark Xpress, and Pagemaker becoming increasingly mature. The Atari ST joined in too, with a DTP bundle consisting of one of the first cheap laser printers driven by the new Mega ST models. Atari was also one of the first to launch a CD drive, the CD-001 costing £399. The McEmulator, said to turn your ST into a Mac clone for £150, while being great fun didn't fare so well.

Remember when...

A 20MHz 80386 processed 7mips > £1,500 bought four 20MB Winchester hard drives > Digitask sold 386-based systems priced from £2,600 > Compaq posted $1.2b sales: the fastest growth ever from start-up > Microsoft had revenues of $346m and 1,816 staff > Intel made $248m on an income of $1.9b > IBM made $5.2b on revenues of $54.2b

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1988

Dos still rules the PC roost

Four years after the Mac demonstrated the power of the GUI, PCs were still predominantly running under text-based Dos (to be fair, it was far easier for Apple to innovate within its narrower base of users and hardware).

In March it sued Microsoft and Hewlett-Packard, claiming their GUIs (HP had one called New Wave) infringed its copyright: cheeky, considering Apple copied the Mac's from Xerox.

The PC meanwhile was creeping up to the price-performance needed for a mass Windows market. In June Intel launched the SX, a 386 with a 16bit data bus to fit cheaper motherboards.

In September IBM launched a new PS/2 using the AT (to become known as the ISA) bus rather than its new MCA bus, while 61 companies backed the rival Extended Industry Standard Architecture (EISA).

Compaq introduced its first VGA laptop, using a 12MHz 286 and a 10in greyscale display.

In October Ashton-Tate released Dbase IV for Dos and Steve Jobs unveiled the sensation of year, the Next computer, a stylish black cube running the remarkable Nextstep OS.

In November came the Ami word processor for Windows, and Aldus was reported to have scrapped a similar project after being given a preview of Microsoft Word for Windows.

And Spectrum Holobyte sold Tetris – the first game to be imported from Russia.

Jobs goes cubist with the Next thing in computing

December 1988's *PCW* said: 'When Steve Jobs left Apple three years ago and announced he was going to build the Next thing in computers, he wasn't given much chance to succeed. But the (Unix-based) Next computer system is finally here. However, it took so long to arrive that several other companies, notably Sun and Apollo (the latter taken over by HP in mid-1989) got well ahead in the field.'

Steve Jobs took Nextstep to Apple when he returned

The Next was a striking computer in every respect. On the outside, the one-foot magnesium cube housing the system, the 17in 1,120 x 832 pixel display, the keyboard, mouse and even optional 400dpi laser printer were all finished in a very stylish black.

The inside of the cube was equally impressive. At its heart beat three Motorola processors clocked at 25MHz: the main 68030 backed up by a 68882 numerical coprocessor and an impressive 56001 Digital Signal Processor (DSP). Much of the Next's blistering performance was due to a custom Integrated Channel Processor chip featuring no fewer than 12 Direct Memory Access (DMA) channels used to move data without interrupting the main 68030 processor. Compare that to five DMA channels on a 1990s PC.

Another custom chip looked after a then-revolutionary 256MB rewritable optical drive, a Canon device which used 5in disks fitted into cartridges; an optional 330MB or 660MB Winchester hard disk could be fitted. 8MB of Ram was standard, expandable to 16MB.

The software was even more impressive than the hardware, based on the Mach operating system, a variety of Unix developed at the University of California, Berkeley. On top of the basic OS lay the Nextstep system software. One impressive aspect of Nextstep was its use of display Postscript, developed in conjunction with Adobe, and boasting a 'lightning-fast and very powerful graphical user interface'. It also allowed the laser printer to be a very simple device.

When we first looked at the Next, it could only be purchased by US academic institutions. Significant quantities didn't arrive until around six months after its first launch, and the UK had to wait a further 12 months before we got a go. The Next's official UK launch came in February 1990, and a version of the OS for Intel processors came shortly afterwards. Jobs returned to Apple in the mid-1990s along with his Nextstep OS.

OS/2 born but giants sever links

IBM and Microsoft shipped OS/2 1.1 with the Presentation Manager GUI in November 1988. Bill Gates said: 'During the next 10 years, millions of programmers and users will utilise this system.'

In January 1983 Microsoft began work on a multitasking Dos which led to OS/2. IBM had a project led by Ed Lacobucci who later developed the Citrix technology upon which Microsoft Windows Terminal Server (Hydra) was based. In 1985 IBM and Microsoft pooled their efforts but it was a team in name only. Microsoft wanted the GUI to be Windows, IBM wanted the Presentation Manager from Hursley, UK. Nathan Mhyrvold, Microsoft's chief technology officer, originally joined Microsoft to resolve this battle.

OS/2 was announced in April 1987. It shipped late, in December 1987, without the GUI and with limited printer support. Relations between IBM and Microsoft didn't improve. Microsoft's involvement ceased in 1990 with OS/2 1.3, still the leanest, fastest NOS kernel today. MS spurned OS/2 for Windows NT in 1990 but the break wasn't concluded until 1992 after IBM shipped OS/2 2.0. Gates said he would support OS/2 2.0 if it sold a million copies. It did. He didn't.

Remember when...

A 16MHz 386SX cost $40 less at $165 than the 386 but nearly twice as much in cost per mips > £1,500 ex VAT got you a 286-based Brother BC-20 PC and an HP Deskjet > A 16MHz portable mono Mac cost £4,500 > Microsoft had revenues of $591m and 2,783 staff > Intel made $453m on an income of $2.87b > IBM made $5.8b on revenues of $60b

1989

Portable PCs show their hand

This was the year of the portable, and not only because it saw the start of the PC Memory Card International Association (PCMCIA) to develop what would become the PC Card notebook slot.

In January Microsoft released Quick Pascal, to vie with Borland's excellent Turbo Pascal. Apple launched its most powerful Macs yet, the SE range.

April saw Intel launch the chip that was to be the making of Windows: the 486, which was essentially a 386 with a built-in maths coprocessor.

In June Apricot scooped the world with the first 486 PC, costing $18,000. The next month *PCW* reviewed IBM's 'portable', the P70, which weighed 20lb.

August saw the advent of one of the first useful palmtops, the Dos-based Dip (sold by Atari as the Portfolio). Apple showed its portable Mac in October.

In November Psion launched its MC range, a radical attempt at true mobiles (light and easy for both input and access of data). They lacked good screens and cost too much. Worse, they turned Psion against the format.

In November at Comdex Microsoft endorsed OS/2 and IBM backed Windows, a sure sign they were parting ways. Wordperfect was at the peak of its success at version 5.1. Microsoft shipped Word for Windows 1.0.

In December Lotus shipped Notes and *PCW* reviewed Atari's new Stacy 'portable'. It weighed 9kg.

Sun sets out to lure PC users with Sparcstation

In June 1989 we commented that 'as the high-end PC world tends more and more to have the flavour of workstations, so workstation manufacturers are styling their "low-end" machines to tempt the top of the PC and Mac markets'. One such workstation manufacturer was Sun, which promised a 'welcome to the new world' in the publicity for the launch of its Sparcstation 1.

The Sparcstation departed from traditional workstation design, instead borrowing much from PCs at the time in terms of slimline case styling and mass-production manufacture. The whole point was to produce true workstation performance at prices competitive with high-end PCs and Macs. The Sparcstation was designed to run Unix with a graphical interface. While this was incompatible with MS-Dos, we argued that the jump to Unix (in order to gain higher performance, multitasking and better hardware support) was no bigger a jump than that to OS/2, itself then lacking significant market penetration.

The Sparcstation 1 was built around an LSI-built Sparc Risc processor running at 20MHz, accompanied by a customised Weitek 3167 coprocessor, 8MB of Ram (then expandable to 16MB), a single 3.5in 1.44MB floppy drive and the choice of one or two 104MB SCSI-II hard drives. The display ran at 1,152 x 900 pixels in 256 colours or shades of grey, with the option of 16, 17 or 19in monitors. Ethernet, SCSI-II and audio were standard.

The Sparcstation 1 found a home in scientific arenas

A system without a hard disk with 17in greyscale monitor cost £7,400, while one with 104MB hard drive, a 16in colour display and GX graphics accelerator weighed in at £16,400. The Sparcstation 1 and other workstations never took over the mass market but, like Silicon Graphics machines, made friends in scientific and post-production special-effects facilities.

The 386 is dead, long live the 486

IBM was the first manufacturer to produce a machine fired by Intel's brand-new 80486 processor, which Peter Jackson took apart in September 1989's *PCW*.

'The 80486 [comprised] more than one million transistors, linked together to form on-chip functional equivalents for three previously discrete chips: the 80386 basic processor, the 80387 match coprocessor, and the 82385 cache controller with 8KB of mixed data and instruction cache memory.

'In other words, add some main memory and some input and output hardware, and the 80486 on its own can form the heart of a system with all the features of today's top 80386-based PCs.' We concluded: 'The 80486 [was] not revolutionary. It [was] simply evolution in action; the 80386 has had its day and is on its way down, while a superior version that can do more has just arrived and can only become cheaper and more prevalent. The old chip is dead but just doesn't know it yet.' The 386 would know it soon enough however, with its exit to be hastened by the power-hungry Windows 3.0 just around the corner.

In the meantime, IBM's Model 70-A21 Power Platform with the first 25MHz 80486, 8MB of Ram, 120MB ESDI hard disk, VGA graphics and monitor, and ill-fated MCA expansion slots, cost around £3,000.

Remember when...

A 25MHz 486 cost $950 at launch: five times as much as a 386, but about the same cost per mips › £1,500 ex VAT got you three 2MB Ram cards › An Amstrad PPC 640S portable PC with 2,400baud modem cost £524 › Microsoft had revenues of $804m and 4,037 staff › Intel made $391m on an income of £3.1b › IBM made $3.76b on revenues of $63b

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1990

Graphical front end a reality

The PC was at last ready for a graphical interface, with entry-level systems (just about) able to run one.

Rising PC power had hit the lucrative mainframe business, forcing mighty IBM to retrench with many layoffs. Unix vendors pushed vainly downmarket.

In a Cern particle-physics lab, a British coder called Tim Berners-Lee drew up the first spec for the World Wide Web.

In January we pitted the new EISA bus against IBM's MCA (see 1987). But the real contest was one of market strength between IBM and the cloners. IBM lost.

In April *PCW* put IBM's RS/6000 mid-range box on the cover. Its success did not stop the march of the PC.

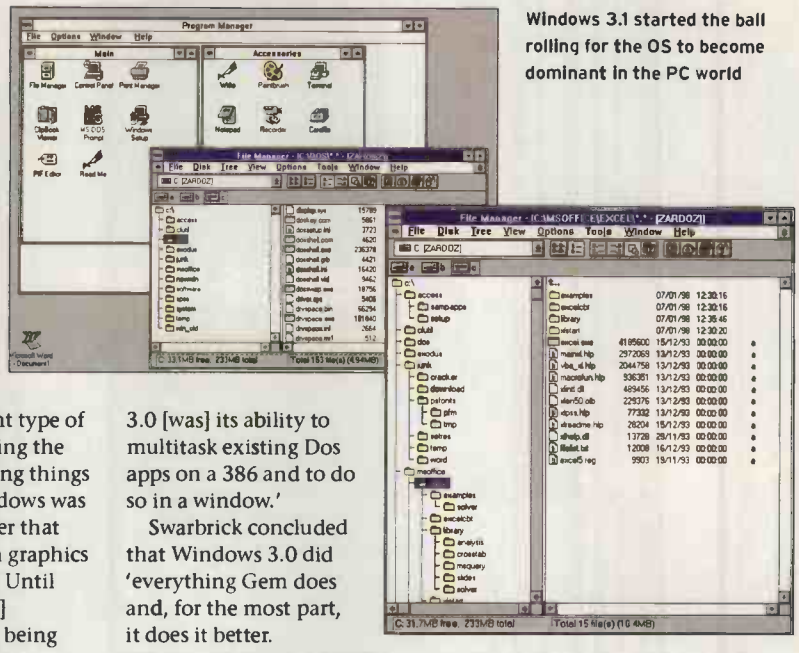
In May, as Intel introduced the 33MHz 486, Microsoft launched a new era with Windows 3.0. And Xerox lost its suit over Apple's use of its windowing GUI.

CP/M pioneer Digital Research, soon to be bought by Novell, launched DR-Dos 5.0, its rival to MS-Dos. Federal anti-trust officials began investigating Microsoft.

In September IBM and Microsoft finally agreed to a parting of the ways: IBM to go the way of OS/2, Microsoft to rule desktops with Windows.

In November a 10MHz 286 processor, 2MB of Ram and a 30MB drive were specified as minimum for a multimedia PC. Back in the real world, Microsoft shipped the first Object Linking and Embedding (OLE) library.

Windows on the future



Windows 3.1 started the ball rolling for the OS to become dominant in the PC world

In July's *PCW*, editor Guy Swarbrick checked out Windows 3.0. He said: 'Apple may have been the first company to successfully produce a GUI as a commercial product, but it wasn't long before the PC-based imitations began to appear. Microsoft's Windows was a different type of program altogether. Using the term GUI [was] stretching things more than a little. Windows was a text-based file manager that just happened to run in graphics mode and use a mouse. Until recently Windows [had] suffered, not only from being awkward to use, but from having few applications available for it that were capable of luring users away from Dos. Windows 3.0 should answer both these criticisms as well as providing a useful increase in speed and the ability to multitask both Windows and Dos apps.'

The Program Manager allowed you to sort your applications into customisable groups. The File Manager had been radically upgraded, no longer requiring keyboard intervention to copy, move or delete files. 'Perhaps the most important feature of Windows 3.0 [was] its ability to multitask existing Dos apps on a 386 and to do so in a window.'

Swarbrick concluded that Windows 3.0 did 'everything Gem does and, for the most part, it does it better. Windows 3.0 may even be the program to make OS/2 a success at last. Once hooked on Windows 3.0, I suspect the reliance on traditional Dos programs will gradually fade, and when everything is done under Windows anyway, the transition to OS/2 should be relatively painless.'

He added: 'Windows' success depends largely on Microsoft's marketing. If the company can forget the pretence that Dos 4 is a friendly OS and sell Windows 3.0 to OEMs as the standard OS for 286, 386 and 486 PCs, it may yet fend off the Unix challenge.' Microsoft clearly did its marketing right and, with the release of Windows 3.1 two years later, its OS became a dominant force.

Bus war accelerates

You wait ages for a bus to come along, then two arrive at once. Well, almost. In January 1990, *PCW*'s Peter Jackson continued to report on the impending high-speed bus war between IBM's MCA and the 'gang-of nine' clone-makers who produced the Extended Industry Standard Architecture (EISA).

We managed to get a peek at the first EISA machine, but they were certainly in the minority. Jackson concluded: 'With 3.5 million MCA machines already in use and no EISA machines yet shipped, IBM need not panic yet. It must do more talking, and more convincing talking, to gather more MCA believers before the EISA evangelists do any more damage.'

No amount of evangelising could halt the power of Intel which came along a few years later with its PCI bus, banishing EISA, MCA and Vesa's VL local bus to the depot in the sky.

Big noise from multimedia

Arguably, 1990 was the year multimedia begun with a vengeance. We take it for granted on today's PCs but back then the arrival of CD-Rom drives and sound facilities was monumental. There were a few ill-fated crossbreeds such as Commodore's CDTV and Philips CD-i, but multimedia was definitely here to stay.

Remember when...

A 1.44MB floppy drive cost £97 » £1,500 got you a 20MHz 386 Bravo PC with a 20MB disk and 14in colour display » An HP Laserjet IID printer cost £1,835 » Microsoft had $1.18b revenue and 5,635 staff. It spent $3m on the Windows launch » Intel made $650m on $3.9b revenue » IBM made $6.2b on revenues of $67b

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- Lightspeed Memory Architecture™ II
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1991

Sharp fall in prices of PCs

Applications began to catch up with the GUI boom, with Windows versions of Word, Excel, Pagemaker and Coreldraw. AMD put pressure on Intel with cheap 20MHz and 40MHz 386 clones.

In April Intel introduced the 20MHz 486SX and Apple released its System 7 operating system. This was no threat to Windows 3.0, which by May (when Microsoft announced Visual Basic) had sold three million copies.

In June Microsoft shipped MS-Dos 5.0, finally replacing its ludicrous Edlin editor and adding an overdue Undelete. It also (prematurely) announced NT.

In July Borland bought Dbase owner Ashton-Tate, starting a fatally long haul to develop a Windows version.

August saw a lifting of a ban on business use of the Internet. And in September the first Psion 3 palmtop launched.

Motorola, Apple and IBM formed an alliance to build a flexible platform around the PowerPC chip.

In October Apple unveiled a range of Powerbooks and Quadras. In December we previewed Windows 3.1 with praise but it was essentially a streamlined bug-fix.

Prices were falling. Early in the year we featured two 'cheap' 486 PCs on our cover. Each cost around £4,000. In December you could buy a 486 for less than £2,000.

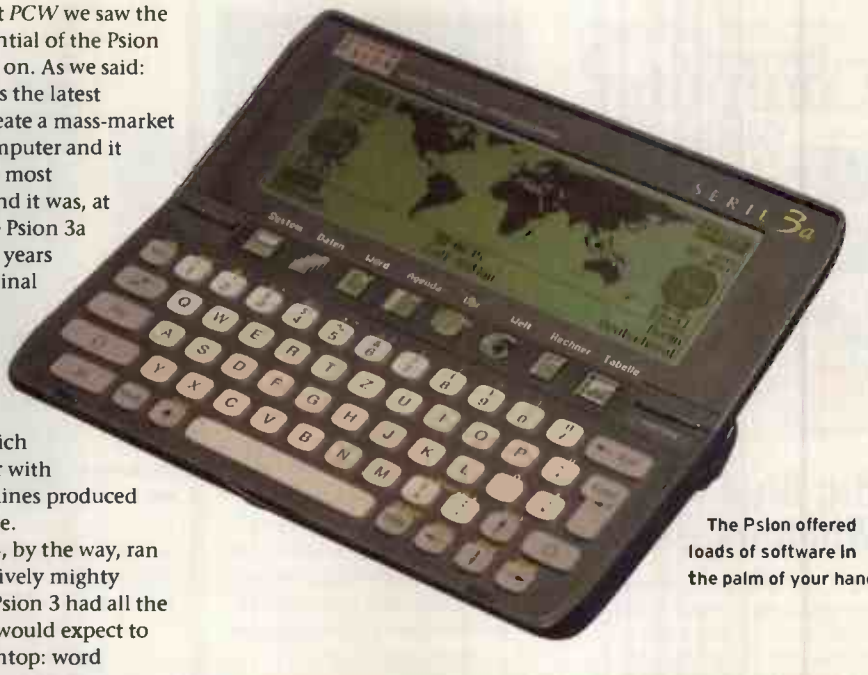
Sound cards were improving: Ad Lib announced its Gold series and Creative Labs introduced the first PC stereo model, the Soundblaster Pro Deluxe.

Psion of the portable times

Here at *PCW* we saw the potential of the Psion early on. As we said: 'The Series 3 is the latest attempt to create a mass-market handheld computer and it should be the most successful.' And it was, at least until the Psion 3a came out two years later. The original Psion 3 used an NEC V30H processor running at 3.84MHz, which put it on a par with desktop machines produced 15 years before.

The Psion 5, by the way, ran at a comparatively mighty 18MHz. The Psion 3 had all the software you would expect to find on a palmtop: word processor, spreadsheet, calendar, database, alarms and, of course, a calculator.

The price depended on how much memory you wanted. The 128KB version was £170, going up to £212.72 256KB.



The Psion offered loads of software in the palm of your hand

Creative card adds stereo to the PC

The trend toward convergence of your home entertainment appliances with your PC can be traced back to 1991. Creative Labs was the first company to bring out a stereo PC sound card, the Soundblaster Pro Deluxe, and has since continued to set the standard by which all other sound cards would be judged.

Not that sound on a PC was a new thing. Steve Wozniak decided in 1977, when first designing the Apple II, that his machines had to have sound, but up to this point the sound on games was limited to the odd pip and you would not have listened to CDs on your PC. The 16bit version came in 1993 and with proper OS support, multimedia started to take off.

Dos 5 and System 7 compete

Microsoft had messed up with the release of MS-Dos 4 and was not about to repeat the failure. It put out 7,000 beta copies for full testing and sat on the launch until content it was stable.

Dos 5 was optimised to run Windows 3.0 and 3.1 faster, although Windows 3.1 was still two years off delivery. It was also meant to be more memory efficient, running from high memory and allowing you to load drivers in high memory. It came with a full-screen editor, undelete and unformat utilities, and task swapping. GW-Basic was replaced by Qbasic, based on Microsoft's Quickbasic.

Microsoft was bullish about the future of Dos. Vice-president Brad Silverberg boasted of Dos that it would be '...with us forever. We've learned how passionate people are about Dos'. That's a very short forever, no doubt.

In the same year Apple released System 7, which at the time knocked Windows 3.0 into a cocked hat. *PCW* gave it a rave review, concluding: 'As it comes out of the box, System 7 is a great achievement. It delivers major user interface, font presentation, file management and networking functions without losing compatibility with old applications.'

Apple continued a good year with the release of Quicktime in December.

System 7 beat Windows 3.0 hands down

Remember when...

A 50MHz 486 cost $644. 100 times faster than an 8086, it was 36 times cheaper per mips ▸ ZDS' Mastersport 386 SX notebook cost £3,695 ▸ £1,500 got you a 33MHz 386 PC with a 44MB disk and 2MB of Ram ▸ Microsoft had $1.8b revenue and 8,226 staff ▸ Intel made $818m on an income of $4.8b ▸ IBM lost $2.8b on revenues of $65b

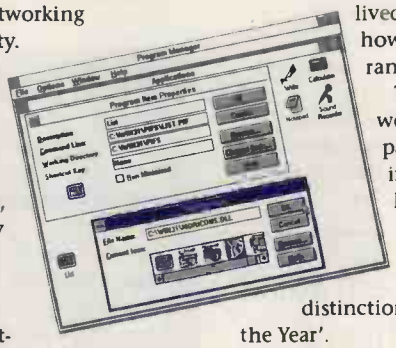
1992

OS feast confuses users

Hey, good lookin'... OSs begin to look pretty

In 1992 a plethora of operating systems arrived to confuse the poor user.

First off, in March, IBM released the first GUI version of OS/2 in version 2. Microsoft hit back in April with Windows 3.1 and followed it in October with Windows for Workgroups 3.1 with networking functionality. And we had a sneak preview of Windows NT 3.1 beta, renamed by Microsoft from OS/2 version 3.



An object-oriented operating system was a jolt to the system for Windows and Dos users, but that is precisely what they got with OS/2 version 2.

Some things about it were not in doubt. *PCW* declared: 'That OS/2 is technically superior to Dos and Windows, is beyond question; the battle is to demonstrate that OS/2 also makes a sound business case.'

In other words, it lived or died on how applications ran on it.

The results were not particularly impressive. In our 1993 *PCW* Awards it received the dubious distinction of 'Turkey of the Year'.

Windows 3.1, meanwhile, was a considerable improvement over Windows 3.0. It had drag-and-drop and multimedia capabilities built in and supported OLE (Object Linking and Embedding). Most of all it looked pretty, with icons splattered across the desktop.

Funnily enough, migrating from Windows 3.1 to OS/2 v2, was not entirely successful.

However, it was the second version of Windows for Workgroups, 3.11, released in 1993, with its 32bit file access, which probably stole the crown as 'most useful operating system' because it proved to be a significant improvement for business users.

Big Blue has Windows blues

Psion was not the only company thinking small; in January 1992 Apple chairman John Sculley, the Newton still a gleam in his eye, coined the term Personal Digital Assistant.

In February AMD, after a five-year court battle with Intel, was granted full rights to produce 386 clones.

IBM (aka Big Blue), despite huge revenues, reported a year-end loss of $564m and was running scared of Windows. In March it formed Taligent with Apple to develop a platform-independent OS; and amid Microsoft-scale hype, it launched OS/2 2.0. Also failing to stem the Windows tide was Quarterdeck with a new Desqview X.

Intel showed the 25MHz 486DX2, running a clock-doubled 50MHz internally.

In April Cyrix offered a cheap 25MHz 486 and Microsoft shipped Windows 3.1, selling a million copies in 50 days.

In June Intel released the Peripheral Component Interconnect (PCI) local bus for PC systems – a month before the Vesa VL-Bus standard. These rival buses were to confuse buyers for a couple of years.

Microsoft shipped Windows for Workgroups 3.1 in October, dipping its toe into networking. And *PCW* featured its first group test of video accelerator cards.

In November Microsoft shipped its Access database for Windows, Digital unveiled its 64bit 150MHz Alpha, and Intel shipped the 486SL for notebooks.

Bickering damages CD-i standard

Having announced CD-i as a standard the previous year, 1992 witnessed the first hardware and Philips was vaunting it as the product of the decade.

CD-Rom had been a Sleeping Beauty waiting to be awakened by the kiss of low prices, while the ability to store movies and multimedia content on it made CD-i appear at first glance like the DVD of its day. But Philips managed to bicker about standards for so long with so many other manufacturers, that CD-i ended up as welcome at the ball as one of the ugly sisters making a pass at Prince Charming.

Alpha beats Intel

Since its release in February 1992, Digital's Alpha had been significantly faster than any chip produced by the opposition: the latest Alpha ran at a blistering 700MHz. The first incarnation, the 21064, clocked on at 200MHz. The fastest Intel chip at the time, the 80386SL, sauntered along at a leisurely 25MHz, while Mips had a 64bit 100MHz R4000.

The Alpha used an open 64bit architecture, was designed to support multiple operating systems and to have a 25-year lifespan. Intel decided early on not to license the Alpha technology, although six years later with a confusing array of deals between Intel, Compaq, Samsung and Digital itself, Intel manufactured the Alpha under a cross-licensing agreement with Digital.

Remember when...

A $600 66MHz 486DX2 was 50 times cheaper per mips than the first 8086 > £1,500 got you a 50MHz 486 with 4MB of Ram and a 210MB hard disk... > ...add £105 to complete your system with a Star dot-matrix printer > Microsoft had $2.7b income and 11,542 staff > Intel made $1.1b on an income of $5.8b > IBM lost $4.96b on revenues of $64.5b

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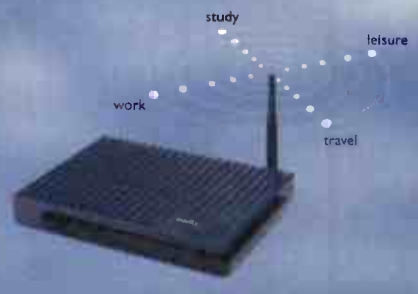

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1993

Internet starts to weave web

After years of milking the mainframe market, IBM posted a $4.96b loss from 1992 in January – the biggest in US history. Stac sued Microsoft over disk-doubler compression in Dos 6.0.

Next dropped its hardware in February and Apple launched a completely revamped range.

In March *PCW*'s Newsprint section reported that a 32bit version of Windows, codenamed Chicago, would ship in 18 to 24 months. And Amstrad beat Apple to market with a PDA, the Penpad.

Motorola shipped the first PowerPC 601 in April. But most eyes were looking to the launch of the long-awaited next-generation Intel chip, although when the Pentium shipped in June it was an anti-climax.

A July group test revealed that the first 60MHz and 66MHz Pentiums were slower on some counts than fast 486 chips. (Speeds quickly rose as system boards and software were optimised.) Meanwhile, Microsoft shipped Windows NT. In August Apple lost its court fight against Windows.

In September *PCW* reviewed the Apple Newton.

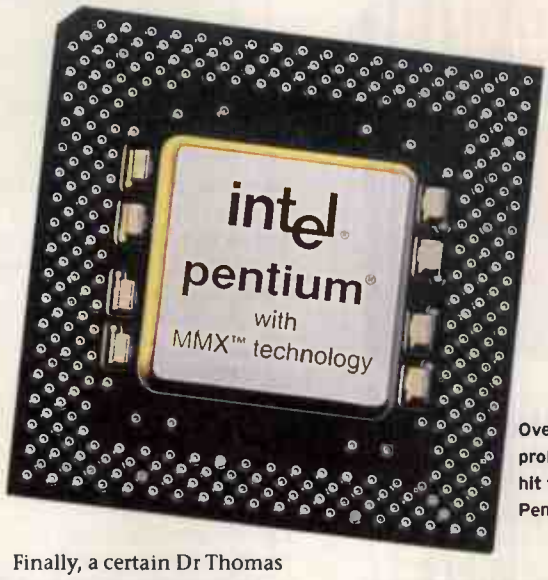
Momentous events were happening online. A group of US students was working on a graphical browser called Mosaic. As each version was posted at their National Centre for Supercomputing Applications site, it was downloaded by the thousand. The web explosion had begun.

Temperatures rise as first Pentiums arrive

Few chips have caused such a stir as the Pentium, and not always for the right reasons. First there was the great legal battle over the name '586'. US courts ruled that Intel did not have sole rights to the tag, leaving rivals like Nexgen free to release the Nx586. So, the moniker Intel Pentium Processor was born.

The original 60 and 66MHz Pentiums were late. They were announced in March 1993, but even when Intel had launched them they were still largely vapourware and getting hold of one to buy was not easy.

On top of this, there was a heat problem which led to crashes and the inevitable resulting data losses. As *PCW* commented: 'In the kind of mission-critical data server applications for which Pentium is targeted, this is a problem.' And we went on to rub salt in Intel's wounds on our Chipchat page: 'Finally, it's a moot point whether or not Intel's new Pentium processor really is as "hot" as Intel claims. 'It overheats and it's crap,' was one *PCW* staff member's view.



Overheating problems hit the first Pentiums

Finally, a certain Dr Thomas R Nicely of Lynchburg College, Tennessee, came across a little floating-point bug which bugged the hell out of Intel.

However, Intel, whose profits had passed the billion dollar mark earlier in the year, was quick to recover any lost ground. In October it released the P75 which overcame many of the criticisms levelled at the first Pentiums, helped along by the faster bus speeds of PCI which first appeared in May.

Meanwhile, Intel had started to produce more motherboards. Until then, the company had regarded this as something of a sideline, but stepped up production to go with the Pentiums, taking a large wedge of the market.

After this, PCs started to look far more like the clones they are supposed to be.

In the first Pentium round-up, the *PCW* reviewer said: 'The first three all looked the same, with their clothes off.'

Open Access

Microsoft had dabbled with databases for some time. It had licensed R:base and in 1992 bought Foxbase which originally produced Foxpro, and had developed other projects in-house which were shelved before release.

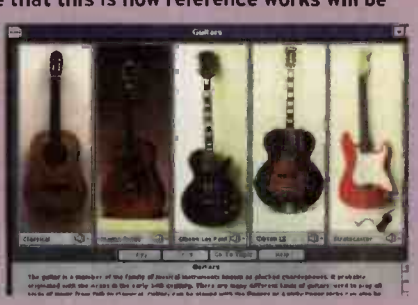
The original version of Access came with Sbasic prior to moving to the now standard Visual Basic, but it was also compatible with Xbase, Paradox, SQL and Btreive data. *PCW* had a few grouches about its structure but the verdict was that it was a 'very solid, very slick and very powerful product'.

Encarta becomes reference point

Microsoft was not the first company to produce a multimedia encyclopaedia and it will not be the last.

From its first version Encarta was a groundbreaking product. As *PCW* said: 'Encarta is an exciting and fascinating experience and it's a jolt to realise that this is how reference works will be from now on.'

Encarta has since gone on to set the standard for multimedia reference works, and with its Research Organizer, Encarta 98 even rivalled Britannica in its usefulness.



Remember when...

The 66MHz Pentium cost 66 times less per mips than the 8086 and was nearly 200 times faster • £1,500 bought you a 33MHz 486 PC with 8MB of Ram and a 340MB disk • A US Robotics 1.4Kbits/sec fax-modem cost £252 • Microsoft had $3.75b revenue and 14,430 staff • Intel made $2.3b on an income of $8.8b • IBM made $8.1b on $62.7b income

1994

Web users fix on bandwidth

PC users began to take processing power for granted. Ram (or rather Ram prices) and subsystems such as graphics were major constraints on performance. The Internet, growing exponentially, generated a new fixation: bandwidth.

In January Apple showed its first PowerPC product, a Mac upgrade board.

Windows 3.11 – the last big 16bit upgrade shipped in February.

In March Intel shipped its first clock-tripled 486 chips, perversely called the DX4, clocking 25MHz externally and 75MHz internally. Apple shipped its first PowerPC-based Macs.

The following month, *PCW* featured the PC600 from Acorn, which had been way ahead of Apple in using Risc chips.

PCW's Newsprint section reported on a Hayes modem that would run at 28.8Kbits/sec when a standard had been agreed.

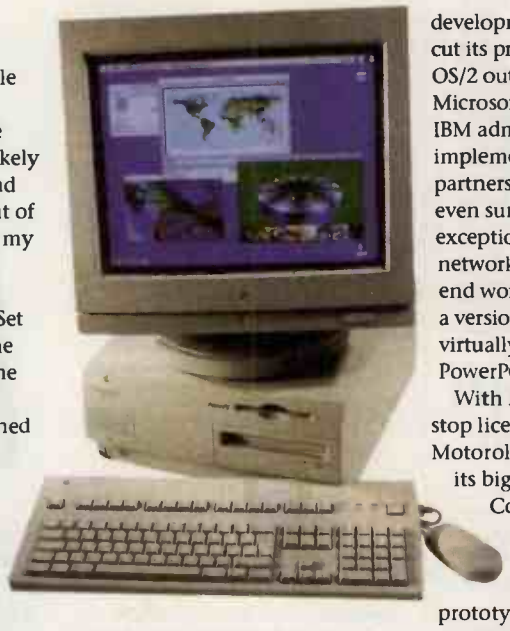
In July CP/M pioneer Gary Kildall was killed. And Microsoft agreed to change some of its licensing deals to satisfy anti-trust lawyers.

In August Marc Andreessen, who led the Mosaic team, joined what was to become Netscape. *PCW* pictured the top-secret P6, successor to the Pentium.

In September Kodak showed a digital camera based around a Nikon P90. It cost £8,195.

In December Newsprint declared: 'New free Mosaic wows the web'. It was called Netscape Navigator.

PowerPC alliance bears fruit but Intel holds firm



The first fruits of the PowerPC Alliance, formed by IBM, Apple Computer and Motorola in 1991, began to appear at the beginning of 1994. The unlikely allegiance between Apple and IBM seems to have arisen out of the principle 'The enemy of my enemy is my friend'; in this case, Microsoft and Intel.

The Reduced Instruction Set Computer (Risc) chip was the most important project of the alliance. As part of the Risc project, the group also planned the Common Hardware Reference Platform (CHRP). This was a standard that would allow the CHRP machine to run a number of different operating systems. The three companies hoped not only to challenge Intel's dominance in the processor market but to take on the up-and-coming Microsoft as well.

With the market for Intel's Complex Instruction Set Computer (Cisc) chips reaching saturation point, Risc seemed like a good bet. Not only was the PowerPC chip cheaper than Intel's, but in many cases it was also faster. Manufacturers and users alike waxed rhapsodic over the possibility of a computer with this combination of flexibility and compatibility.

In January Apple released its first PowerPC product, a Mac upgrade board. And it started shipping its Powermacs in May. With the Powermac users could take advantage of 32bit applications, which wouldn't be available for the PC until Windows 95 was released.

PCW had reservations about the lack of native applications available, but was nevertheless optimistic about the Power-mac's chances: 'Once the software is available to take full advantage of the power of the processor, Apple's Macs are primed to take the lead over PCs, not just in ease of use and built-in features but, for the first time, in price and performance, too,' we said. We even went so far as to predict that Intel would have to struggle to keep up with Powermac in the future.

Unfortunately for the alliance, Intel was not to be pushed out so easily. Not only did it ramp up its development cycles, but it also cut its prices. In 1996 IBM pulled OS/2 out of CHRP and, in 1997, Microsoft did the same for NT. IBM admitted that NT implementation had cost the partners $150m. Netware never even surfaced. With the exception of a couple of IBM network computers and high-end workstations (which run on a version of Unix), Apple had virtually taken over the PowerPC standard.

With Apple's decision to stop licensing clones (even to Motorola) and the purchase of its biggest competitor, Power Computing, the number of Risc customers was dwindling. At the 1997 Macworld, a prototype demonstration gave hope that there would be 500MHz Powermacs by the summer of that year. But Apple didn't order the fast chip and the chip manufacturer went out of business. In 1998 Motorola and IBM still planned to produce PowerPC chips, but some analysts were predicting that Apple would switch to Intel processors by the end of the year.

Acorn takes Risc to rival Apple

Cambridge-based Acorn challenged Apple's Powermac in June 1994 with the desktop Risc PC 600, but response was lukewarm. One of the very first companies to use Risc processing, Acorn launched its ARM (Acorn Risc Machine) family way back in 1987.

The Archimedes won fierce loyalty from its fans but, due to its price, never became widespread. Acorn was an equal partner with Apple in ARM, which stands for Advanced Risc Machines.

Remember when...

The 100MHz Pentium was 276 times faster than the first 8086 > £1,500 bought you a 66MHz 486DX2 multimedia PC with 8MB of Ram and a 540MB disk... > ...add £500 to get a 90MHz Pentium equivalent > Microsoft had $4.6b revenue and 17,801 staff > Intel made $2.28b on $11.5b revenue > IBM made $3.2b on revenues of $64b

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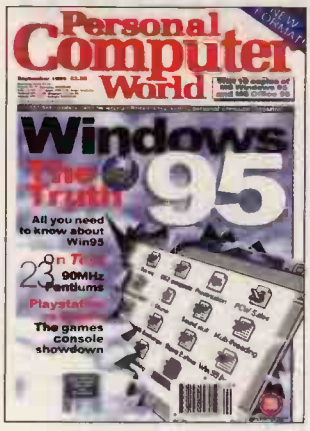


Windows 95 finally arrives

'Nicely does it,' observed *PCW*'s Newsprint column of the general schadenfreude as Intel fumbled its response to a furore over a bug in the Pentium, discovered by the improbable professor Tom Nicely of Lynchburg. It cost Intel $400m.

In April *PCW* looked at some of the latest quad-speed CD drives. Newsprint reported the early stages of what was to be a running battle for a DVD standard.

Escom took over 231 high-street stores from Rumbelows in May. Newsprint reported Iomega's new 100MB Zip superfloppy. In June IBM bought Lotus and Sun launched Java.

In July Compaq said it would bring out the 120MB LS120 superfloppy which also read 1.44MB floppies. The launch of Windows NT 3.51 was overshadowed by the saga of whether Windows 95 would be delayed by legal action over the bundling of a sign-up for Microsoft's new online service, MSN. Windows 95 did ship in August – to more publicity than any software is likely to get again (see story above right).

MSN, as launched, was perhaps Bill Gates' biggest public mistake. It was not ready and, worse, it was not on the Internet.

In November Newsprint warned of the new macro viruses, Intel released the Pentium Pro and Oracle's Larry Ellison raved about the Network Computer. In December we looked at five PC/TVs, reflecting a growing convergence between technologies.

Long-awaited creation begins life on stormy seas

Microsoft spent $200m hyping Windows 95, but no money could have bought the amount of publicity it got. The media, for no very good reason, decided it was a huge story and the launch was reported everywhere.

This for what was basically a kludge: an operating system designed to run both old 16bit applications and new 32bit ones.

Windows 95 required hardware upgrades for many

Microsoft boasted of a new easy-to-use interface yet it had not resolved a fundamental weakness of Windows 3.x, which offered two frequently conflicting views in the form of Program Manager and File Manager. Windows 95 also had two: Explorer (the equivalent of File Manager) and My Computer which led to a more Mac-like view. Each had its own little ways, where a single, coherent way of working would have been more elegant.

Windows 95 looked like something designed by a committee, as indeed it had been. Millions were spent on usability labs, focus groups and user surveys to produce an interface on which you pressed the Start button to exit.

Microsoft had been telling journalists for months that Windows 95 needed only 4MB of Ram. This, it quickly became clear, was less than candid. Windows 95 needed at least 12MB, preferably 16MB, to run faster than Windows 3.x, especially with 16bit applications. So most people needed to upgrade their hardware after installing Windows 95, which caused much resentment.

For all that, Windows 95 was a major advance and an operating system in itself. It provided better memory management, crash protection, better multitasking and many little usability boosts that are now taken for granted.

It introduced plug-and-play, which allowed the operating system to interrogate an add-on device to decide configuration automatically. Remember, Windows 95 had to be able to talk to just about every device going – unlike the Mac OS which had introduced this feature earlier.

Plug-and-play, which relies on device compliance, did not always work but it was clearly the way of the future.

Iomega drives process to zip up storage market

Windows 95 also brought home the fact that multimedia and graphical software would require far more storage than that in most PCs of the day, which had 250MB hard disks.

Disk capacities began to rise rapidly and the cost per megabyte dropped almost in step, but there was a need for an easy way to add random access storage (as opposed to sequential storage such as tape) to existing PCs.

Digital pictures and richly formatted electronic documents became too big for the standard 1.44MB floppy, creating a need for a more capacious transfer medium – what Newsprint called the superfloppy.

Iomega's Zip drive was the first low-cost device to answer both these needs. It came in at a price of £149, with 100MB disks costing £13 each, and it was a sensation. So much so that it knocked Iomega's market-leading arch-rival, Syquest, sideways, even though Syquest quickly brought out the faster EZFlyer.

In 1998 the Zip was still selling well but could not read or write 1.44MB disks and so we felt it was unlikely to replace the floppy drive. The 120MB LS-120 drive, which arrived many months after its announcement (see left) was made by several companies and was backwards compatible, as was a 200MB drive Sony displayed at Comdex in 1994.

Remember when...

A 166MHz Pentium Pro was roughly 600 times faster than an 8086 › £1,500 got you a 75MHz Pentium multimedia PC, 8MB of Ram and a 540MB hard disk... ...add £595 for an HP Laserjet 5P › Microsoft had $5.9b revenue and 17,801 staff › Intel made $3.6b on an income of $16.2b › IBM made $5.4b on revenues of $76 b

1996

Gates sets out to get netted

Bill Gates saw the Internet light late in 1995 and 'turned on a sixpence', as a Microsoftie put it. Massive resources were diverted to net-enable Microsoft products. In January he announced his new strategy: MSN was to get netted and he would give away a browser called Internet Explorer.

Meanwhile, chip cloners AMD and Nexgen merged and IBM launched OS/2 for the PowerPC.

In March Microsoft sold the 30-millionth copy of Windows 95, and AMD shipped its $75 5K86 processor.

In April, ailing Apple appointed Gil Amelio as CEO and licensed the Mac OS to Motorola. Netscape shipped Navigator 2.02 in May. Microsoft quickly countered with Explorer 2.0.

In June Intel shipped the first 200MHz Pentium, Cyrix shipped the P200+ 686 and AMD launched the K5.

Nintendo shipped its 64bit games module.

In July, months after having bought into UK high streets, Escom AG went bankrupt.

In August, Microsoft released Explorer 3.0 – the third upgrade in a year.

In September Motorola launched its Starmax Mac clones and USR announced its x2 modems with a claimed data rate of 56Kbits/sec.

The first Windows CE handhelds appear at Comdex in November. And Steve Jobs returned to Apple, which bought his Next Software for $424m.

Umbilical cord severed as Sun and Oracle see future

Two related 1995 events had a growing impact in 1996: Sun's launch of Java, and Oracle chief Larry Ellison's promotion of the diskless Network Computer (NC), running software downloaded as needed from a server.

The NC was not a new idea. It was virtually identical to what IBM called a thin client and a bare update of the antique 'dumb terminal', millions of which were due for replacement.

But Ellison touched some raw nerves. The NC offered a perfect fit with Java (see box below) and both were promoted openly as an attack on Microsoft.

The Network Computer did boast some advantages, albeit of a kind more likely to excite the boardroom than the user. IT managers could maintain software centrally on a server, cutting maintenance costs, saving work, increasing security and keeping bolshie users in their place (the PC had caused a shift of political as well as processing power, from the IT department to the desktop).

All of these aspects, lumped under the heading 'cost of ownership', had been skimped by Microsoft and Intel in the rush for PC development and have been addressed to the point of tedium by all major suppliers ever since.

Sun's Scott McNealy (top) and Oracle's Larry Ellison (bottom) saw Java and the NC as a way of getting at Microsoft

In a way, the furore was nonsense. Cut-down PCs could match the advantages of Network Computers. There was also the equally viable Windows terminal, which exchanged only keypresses and screen draws with an application running on a server.

PC, NC, NetPC or Winterm – which you chose was a matter of horses for courses. But there was a wider significance, hardly touched upon by Ellison. The NC offered a model for web appliances such as smartphones and set-top boxes, and focused minds on the fact that the Internet had almost by accident achieved the Holy Grail of computing: an environment independent of hardware and operating system. Any machine could hang off the net so long as it talked TCP/IP.

So, computing no longer needed Microsoft or Intel – it had cut the umbilical. Like IBM, the two companies might get bigger and richer, but they would never again hold the grand sway of their glory days.

Wake up and smell the Java

Java overturned the idea that software had to be tailored to its host hardware; instead, a platform was enabled to run Java. This was done by software or firmware called a Java Virtual Machine (JVM), which interpreted the code. All browsers included a JVM.

Java was thus ideal for any network linking dissimilar machines, because it allowed the same program to run on any of them. Clearly, too, it was ideal for the NC (see above).

The Java language was similar to C++ but was 'sandbagged' from activities carrying a security risk, like the ability to wipe a hard disk.

Sun offered the Java spec as an 'open' standard but insisted on retaining control of updates. This was opposed by rivals.

Microsoft tried to kill Java with kindness. It claimed the best Java development environment and the fastest compiler, yet insisted on including Windows-specific extensions, a move which destroyed Java's universality.

There were delicate lines to tread in taking Java forward: between power and security, and (in Microsoft's eyes) between what an applet did and what an operating system did.

Remember when...

Intel stopped using mips to measure processor speed > £1,500 got a 200MHz Pentium multimedia PC, 1.6GB drive, 16MB of Ram and a 15in monitor... ...add £313 for a Canon BJC-610 colour printer > Microsoft had $8.67b revenue and 20,511 staff > Intel made $5.1b on an income of $20.8b > IBM made $5.42b on $75.9b revenue

1997

Pentium MMX and II launch

Intel launched the Pentium MMX processor using 57 new instructions. It had a mixed reception, because it rendered out of date all PCs bought in the 1996 Christmas rush.

In February the first 56K modems appeared. There were four rival specs, none of which produced anything like a 56Kbits/sec throughput.

In March Intel previewed its forthcoming Pentium II chip and a German hacker highlighted the danger of Microsoft's downloadable ActiveX controls. And in May, AMD's new K6 chip beat the equivalent 200MHz Pentium MMX in tests. Explorer 4.0 was reported to have been delayed by security fears.

In June Intel launched the Pentium II at an unprecedented low entry price. And Microsoft posted an early beta of Windows 98. Promised features include support for the new USB serial port, scheduled to replace the PC's serial and parallel ports. In August Psion launched the Series 5 palmtop to compete with CE models. Apple CEO Gil Amelio quit after the firm lost $1.5b in 18 months.

The main attraction at Comdex in November was a new class of mini-notebook. But there were signs of change, including devices using USB and the faster 1394 (Firewire) ports.

In December, cheaper ISDN came a step closer with British Telecom trials of a hybrid Home Highway system.

Chips galore but timing of MMX release a bit fishy

The year began with much wailing and gnashing of teeth. Thousands of distraught consumers had bought Pentium PCs before Christmas 1996, only for Intel to launch its new MMX chips in January 1997. *PCW* noted that 'Cannier buyers, who knew the 166MHz and 200MHz MMX Pentium chips were coming, were waiting for old Pentium prices to drop in the hope of picking up bargains.'

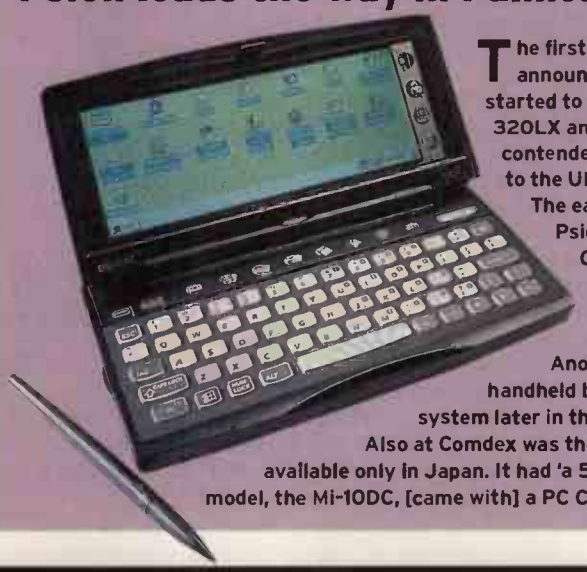
The MMX processors offered around a 10 per cent speed increase over standard Pentiums, running non-MMX optimised code. Our first MMX PC group test said: 'Every single PC in this group test, including the 166MHz Dell, beats the living pants off the fastest machine in last month's top-end 200MHz test [of standard Pentiums].'

Not content with one radical new chip, Intel also launched the Pentium II processor (pictured) which moved away from a socket design to Slot 1. This new design was not without its problems: 'According to our source, the Pentium II processor has been ready for market for months. The only thing holding back its release was the actual mechanical design of the slot... One industry source said that the chips have been known to fall out of the slot in tower models.'

With its Slot 1 design, the Pentium II apparently suffered some mechanical design problems

Three other chip makers also launched new products in 1997. Cyrix came up with the M2, and little-known Integrated Device Technology introduced the IDT-C6 for the cheap-desktop market. AMD entered the fray with the K6 in 166MHz, 200MHz and 233MHz speeds. We said: '*PCW* tests confirmed AMD claims that the K6 is faster than the latest Pentium MMX... endorsed by Microsoft as fully Windows compatible. It is also cheaper than Intel chips.' However, 'the K6 is not the PII killer many said it would be... But the K6 shows its strength for mixed 16- and 32bit Windows 95 operating systems, which is where the PII is weak'.

Psion leads the way in Palmtop devices



The first Microsoft Windows CE palmtops, announced at Comdex, Las Vegas in late 1996, started to arrive in the UK. The Hewlett-Packard 320LX and the Philips Velo 1 were two of the early contenders, but the small dribble of products on to the UK market failed to make much of a dent. The earth moved for a lot of people when Psion launched the Series 5 in August. Complete with touchscreen and a notebook-like keyboard, the 5 was Psion's attempt to reinforce its status as the big cheese of the PDA world. Another manufacturer, Geofox, announced a handheld based on Psion's Epoc 32 operating system later in the year.

Also at Comdex was the first Zaurus handheld from Sharp, available only in Japan. It had 'a 5in, 65,000-colour screen and one model, the Mi-10DC, [came with] a PC Card-based digital camera'.

Remember when...

Pentium II speeds rose rapidly beyond 266MHz > £1,500 bought you a 200MHz Pentium MMX multimedia PC, 4.3GB hard drive, 32MB of Ram and a 17in monitor... > ...add £82 for a 56K fax-modem card.... > ...add £150 for an HP 670C colour deskjet > Microsoft had revenues of $11.35b > Intel made $6.9b on revenue of $25.1b > IBM made $6.09b on revenue of $78.5b

1998

Millennium and IE controversy

Our 20th birthday year was filled with controversy as Microsoft came under fire for bundling Internet Explorer (IE) with Windows. And the world started to worry about the millennium bug, which threatened to cause IT systems to fail on 1 January 2000.

January saw the arrival of the 300MHz Pentium II (PII), joined by the first colour Windows CE machines. Cloners AMD, Cyrix and Centaur-IDT united to save Socket 7 motherboard design as Intel pushed the Slot 1 design.

The 333MHz PII turned up in March, along with the new low-cost Celeron and news of more MMX-style enhancements.

May saw the PII squeezed into notebooks, while Motorola, Nokia and Ericsson came up with a new initiative for wireless data transmission, known as Bluetooth.

Despite court battles, Windows 98 was released in June. A new 'web-style' look and tighter Internet integration plus several technical advances had the industry singing its praises. Many features were already available to Windows 95 users with IE4.

Ericsson teamed up with Psion to form Symbian – designed to exploit the Epoc32 OS and tackle Microsoft on the palmtop front.

Apple unveiled the Imac in September, a return to the all-in-one design. Along with a funky 'bondi-blue' casing and a £999 price tag it abandoned the floppy drive, and had no PCI slots.

In November Dixons delivered free Internet access with Freeserve.

Monopoly lawsuit saga finally ends for Microsoft

This year saw Microsoft engaging in an historic antitrust court battle as the US Department of Justice (DoJ) and attorneys general from some 20 states sought to force the company to separate Internet Explorer from the Windows operating system.

Things kicked off in late 1996 with the accusation that Microsoft was allegedly forcing vendors to bundle its Internet Explorer browser with Windows 95, providing an unfair advantage over rival products such as Netscape.

Later the focus switched to include Windows 98, which integrated the browser further into the OS, and Microsoft abusing its dominant position in the PC market in other ways.

Meanwhile, additional lawsuits were filed against the Redmond giant by Netscape and Sun over unfair practices and the use of Java respectively.

After a long five-year haul, Bill Gates said that the antitrust decision was a 'good compromise'

The case spiralled and dragged on for five years, with Microsoft being declared a monopoly and found guilty of violation of both Sections I and II of the Sherman Antitrust Act. There were even moves to break up the company.

While it had to make several agreements to change its practices, including sharing some APIs (application programming interfaces) which allowed its applications to run better than those of its competitors, Microsoft emerged intact with what many saw as victory at the end of 2002.

Bill Gates said of the 97-page ruling: 'It forces more flexibility in information disclosure and software configurations, but it's a good compromise, a good settlement.'

Apple 'thinks different' with Imac

With co-founder Steve Jobs back at its helm, 1998 saw Apple's fortunes turn around, thanks in no small part to the launch of the Imac. Jobs wanted people to 'think different', and the Imac certainly followed that philosophy. From its return to the all-in-one design to its bondi-blue transparent casing and matching cables, it was one of the best-looking computers ever seen.

The Imac wasn't just about looks, though. Under the hood lay a speedy 233MHz PowerPC G3 processor, which Apple claimed gave performance almost twice as fast as a PII of equivalent clock speed. This was backed by 32MB of SD-Ram, a 4GB hard disk and a 24-speed CD-Rom. Crucially it also featured a built-in 56K modem and software designed to get users up and running on the Internet in a flash.

A lack of expansion slots and a missing floppy drive combined with limited graphics capabilities forced *PCW*'s Cliff Joseph to conclude that 'the Imac won't be suitable for all users', but that overall it was 'a superb machine for home users and education'. His comments on the £999 consumer-friendly price-point and belief that the Imac would do well at Christmas proved absolutely spot on.

Remember when...

PII speeds continued to climb, reaching a whopping 450MHz > £1,500 bought you a PII 450MHz with 64MB of Ram, a 16MB graphics card, 10GB hard disk, 17in monitor and dual-speed DVD drive > Despite its court antics Microsoft posted revenues of $14.48b > Intel made $6.1b on a record $26.3b revenue > IBM made a net income of $6.3b on $81.7b revenues

1999

Internet boom becomes bigger

The threat of the millennium bug loomed large as we all set out to party like it was 1999. What's more, we did it online as some 43 million of us linked up to the Internet.

In February, it was all about three. Intel released its fastest chip yet, the Pentium III (PIII), starting at speeds of 450MHz. Not to be outdone, AMD introduced the K6-III.

Elsewhere, the increasing popularity of MP3 audio files started to cause concern in the music business. In our Newsprint section, Clive Akass got excited about impending ADSL and cable modem services, which looked to revolutionise the Internet.

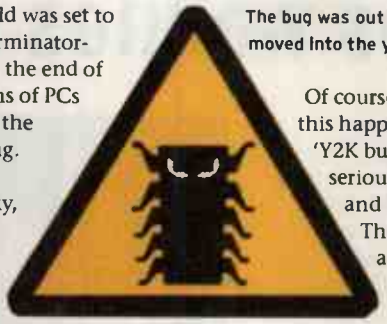
In May many of us received the unwelcome attentions of Melissa. The macro virus spread itself via email, sending messages to the first 50 names in the recipients address book.

June saw Microsoft update Windows 98 with the much-improved Second Edition, and AMD unveiled its seventh-generation processor, Athlon. The new kid on the block quickly reached speeds of up to 650MHz, and hype grew as it consistently outperformed Intel chips in benchtests.

Towards the end of the year in October, Hi-Grade handed *PCW* its first PIII notebook, which turned in impressive test scores compared to desktop machines. However, this couldn't match November's overclocked 1GHz Athlon from Carrera, costing over £5,000.

The end is nigh... or is it?

The world was set to end Terminator-style at the end of 1999 as millions of PCs crashed due to the millennium bug. Planes would fall from the sky, cashpoints would dry up or give away all your money, housewives were getting ready to fight shoppers for the last tin of Spam and anything with a date-based calculation was doomed.



The bug was out to get us as we moved into the year 2000

Of course, none of this happened but the 'Y2K bug' was a serious concern and big news. There was even a special edition of *Neighbours* about it.

The problem centred on hardware and software based on six-figure dates refusing to recognise the 21st Century, producing errors or sending us back to the start of the 1900s at the stroke of midnight as we move into 1 January 2000.

Fortunately the majority of the IT industry proved to be on the ball (*PCW* was telling people how to spot and fix problems with their PCs in mid-1998) and the Government set up the Action 2000 taskforce to educate people. Many software patches and Bios updates were needed but we pretty much all made it safely into 2000. Although that hangover was murder.

Chips wars

The end of the 1990s saw things literally hotting up inside PCs as a horde of new processors burst onto the market.

Sporting an enormous heatsink, Intel's PIII expanded on the power of its predecessor with a set of some 70 new instructions, codenamed Katmai. Like MMX these were designed specifically to help with multimedia applications. Improved floating point maths functions were ideal for mpeg video work, MP3 audio encoding and improving 3D graphics performance.

We put PIII through its paces in our April issue, and said: 'Despite the inclusion of the new instructions, at 450MHz its performance is virtually identical to that of a PII of the same speed. Applications must be specifically written to take advantage of the new instructions.'

Not to be outdone, AMD introduced the K6-III but it was the K7, renamed Athlon, that stood out from the crowd. This seventh-generation design featured the industry's first fully pipelined, superscalar floating point unit for x86 platforms, new cache technology, enhanced 3DNow instructions for better multimedia performance and a 200MHz system interface.

The Pentium III had 70 new instructions, but we found its performance to be almost the same as a PII at 450MHz

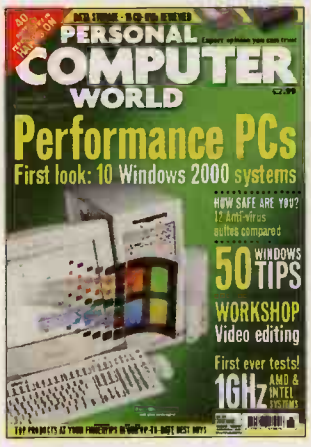
AMD claimed a 40 per cent performance increase on the PIII clock for clock, and in our first Athlon group test we noted that 'if this test has proved anything, it's that the AMD Athlon is going to be a force to be reckoned with. It's a faster CPU than Intel's 600MHz PIII and it costs less.'

Meanwhile, Intel's low-cost Celeron processor hit 500MHz, and the 366MHz model was doing especially well with overclockers. At around £45 it was cheaper than a £400 600MHz PIII and, as our Hands on Hardware guru Gordon Laing discovered, could be successfully clocked to up to 550MHz in many cases.

Remember when...

PIII arrived, rising to 800MHz > £1,500 got you a 600MHz PIII with 128MB of Ram, a 13GB hard disk, DVD-Rom, Zip drive, 56K modem and a 19in monitor... ...add £299 for Psion Revo organiser > Intel reported record sales of $29.4b and net income was $8.1b > Microsoft's total revenue was $19.75b, with net income of $7.79b > IBM had a net income of $7.7b, on revenues of $87.5b

2000



Chip speeds at Gigahertz level

Microsoft had a busy year with three new versions of Windows, while processor speeds soared to 1GHz and beyond. Meanwhile, outside *PCW* Towers, robot dogs took to the streets.

January kicked off with the first chips from Transmeta, employer of Linux creator Linus Tolvalds. The Crusoe processors offered cutting-edge power management.

In February Windows 2000, arrived as a replacement for NT4.

Nokia unveiled the 7110e mobile phone with a springloaded 'Matrix-style' cover and Wap (Wireless Application Protocol) Internet services. Speed was terrible and services sparse but the phone was cool! A flurry of digital cameras offered 3.3megapixel resolution. Intel showed off USB2, which boasted 40 times the bandwidth of the current version.

March saw AMD shoot ahead of Intel with the first true 1GHz processor. Meanwhile, two rival writable DVD formats battled at the Cebit show. Backed by Hitachi, Toshiba and Panasonic, DVD-Ram moved to 4.7GB storage. Sony, Philips and others offered DVD+RW, a caddyless system they claimed to be compatible. Sony also launched a little something called the Playstation 2 in Japan.

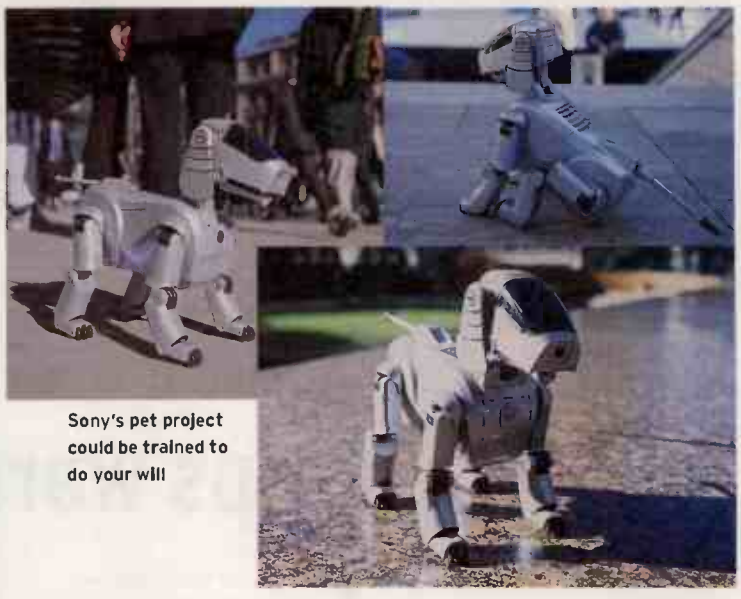
Microsoft introduced Pocket PC, a revamped Windows CE for handheld devices, in April.

September brought us Windows Millennium Edition (ME). Ending the year with a splash, the P4 arrived in November, starting at 1.4GHz and 1.5GHz.

It's a dog's life as Aibo goes walkies in Europe

Though it was delivered to a select few in Japan and US in 1999, Sony's amazing Aibo finally hit European shores in 2000.

Powered by two lithium-ion batteries, a 64bit Risc processor and 16MB of Ram, our ERS-111 review model, named Matilda by doting staff at Sony, featured some 18 degrees of movement, a 180,000 CCD camera to detect colours and shapes, stereo mics to place sounds, and infra-red sensors. Sticking an 8MB Memory Sticking up its bum allowed you to train it from puppy to full-on best friend.



Sony's pet project could be trained to do your will

PCW's Will Head said: 'After two weeks with Matilda, I'm definitely going to miss the small beeping bundle of wires and motors when she eventually returns home to Sony. In terms of ability, Aibo is a very clever invention. It really does learn from its experiences and it is quite staggering how "smart" it is. However, I have to confess that I'd still rather have a real dog.'

Ipaq packs a pocket punch

By far the fastest and most interesting of the new Pocket PCs to launch in 2000 was Compaq's Ipaq. Looking like something off of the Starship Enterprise, its sleek silver case held an easily readable 240 x 320 pixel backlit colour screen TFT, 200MHz Strongarm processor and 32MB of Ram.

The Ipaq quickly built an army of followers in corporate offices and homes but it wasn't without its faults. Though flexible, a slide-on expansion pack was required to gain facilities built in to rivals, like Compact Flash (CF), and though it received full marks in most reviews, and still remains a favourite today, battery life proved a sore point over long-term use.

ADSL services go mainstream, sort of

Mass broadband Internet access started to become a reality in 2000 as BT attempted a broader rollout of its Asymmetric Digital Subscriber Line (ADSL) service across the UK.

ADSL works by piggybacking an RF signal onto a standard phone line to provide always-on Internet access, with downstream speeds of up to 2Mbits/sec.

Sadly, all did not go to plan. Technical problems occurred, including a two-week 'data freeze' by engineers hit by a computer virus. Staff training issues, high subscription prices and accusations from rivals about cherry picking exchanges meant delays and frustration for users.

However, testing it *PCW*'s Gordon Laing said: 'ADSL has changed the way I work and I could not return to a conventional dial-up account. When it works, ADSL is wonderful.'

Remember when...

The P4 arrived at speeds of up to 1.5GHz > £1,500 bought you a 1GHz Athlon system with 128MB of Ram, 30GB hard disk, DVD-Rom, CD-writer, 64MB graphics and a 19in monitor... > ...add an Epson Stylus Photo 870 for £173.90 > Microsoft announced a net income of $9.42b > Intel posted at net income of $12.1b > At IBM, net income for the year was $8.1b

2001

Shaky start for year of the PC

The PC industry was shaken in more ways than one in 2001. Microsoft finally delivered a unified version of Windows, HP snapped up Compaq and a downturn in the US economy combined with a decrease in consumer demand and the 11 September terrorist attacks sent shockwaves around the world.

The year got off to a shaky start following the burst of the dot-com bubble, especially in Norway where the Y2K bug struck train services a year late. Some 29 trains refused to start. Microsoft declared war in the games market unveiling its Xbox. Meanwhile, Apple squeezed its G4 processor into a notebook. Running at 500MHz, the Powerbook G4 had a light titanium body and a 15.1in widescreen TFT display.

Linux pushed further into the mainstream in February and we reviewed seven high-profile distribution versions.

In March Apple's MacOS X hit the shops. This featured an all-new interface and Unix-like core for extra speed and stability.

At Cebit, wireless technology dominated with the focus on GPRS, which gives mobile phones and PDAs always-on net access at dial-up speeds, and Wifi networking.

IBM marked the 20th anniversary of the PC in August, just as Intel unleashed the P4 running at 2GHz. The chip was approximately 18,000 times more powerful than the company's original 4004 microprocessor. Intel marked the 30th anniversary of the microprocessor in November.

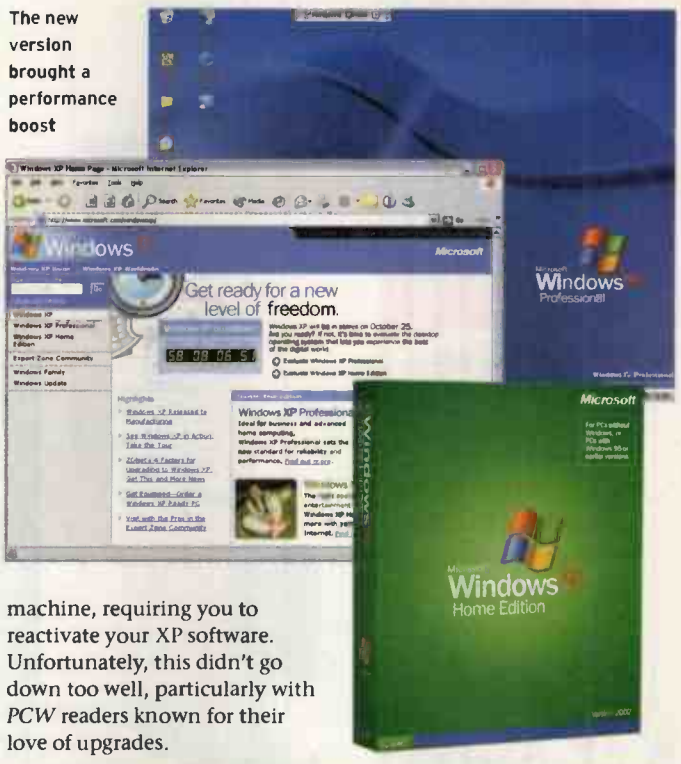
Windows XP activated

The biggest version of Windows since 1995, XP arrived in 2001 to combine the consumer technologies and friendliness of the 9x series with the stability, speed and plumbing of NT and 2000.

Microsoft certainly hyped up the product but, for once, it really did bring a performance boost with dramatically faster system times, proper memory management and pre-emptive multitasking.

The new OS also included tighter integration with online services and a built-in firewall for Internet security, updated features for digital camera users and home video, instant messaging with MSN Messenger and easier setup for multiple users.

In addition, Windows XP brought one rather controversial feature. Microsoft introduced Product Activation, an anti-piracy measure designed to check that software is not being used on more PCs than intended by the software's licence. To fully use the software users had to perform an activation via the Internet or telephone, and too many changes to your PC could result in XP seeing it as a different machine, requiring you to reactivate your XP software. Unfortunately, this didn't go down too well, particularly with *PCW* readers known for their love of upgrades.



The new version brought a performance boost

Hewlett-Packard swallows Compaq

In a move that shook the foundations of the IT industry, HP 'merged' with Compaq in a takeover bid worth approximately $22b. Keeping the HP name, the computing pioneers created an IT giant second only to IBM.

The deal itself didn't finally go through until 2002, when it was given the green light by shareholders. However, victory was not certain as Walter Hewlett, son of co-founder Bill Hewlett, was against the move and built a significant following behind him.

Happy anniversary to the PC!

Though still younger than *PCW*, the IBM PC celebrated its 20th birthday in 2001. Launched in 1981 (see page 57) and running at a mere 4.77MHz, the machine set the standards for the desktop computer boom.

Looking back, we said: 'The hardware was nothing special, though its five expansion slots lent some versatility. It used Intel's latest processor, the 8088, but this was a castrated version of the three-year-old 8086. However, in retrospect it is clear why the IBM PC took off as it did. Each new make of machine at the time needed software specially written (or, at best, tweaked) for it. Some vendors deliberately made their machines as different as possible in the hope of selling proprietary software. The world needed a standard and to all intents and purposes IBM was.'

The IBM PC – 20 years old in 2001

Remember when...

The P4 reached 2GHz › £1,500 got you a 1.4GHz Athlon PC with 256MB of Ram, 60GB hard disk, CD-RW and DVD-Rom drives, 17in flat-panel TFT monitor, 64MB video card and surround-sound speakers › Intel's net income dropped 70 per cent to $3.6b, on $26.5b revenues › Microsoft posted revenues of $25.30, with $7.34b net income › IBM's net income was $7.7b on revenues of $85.9b

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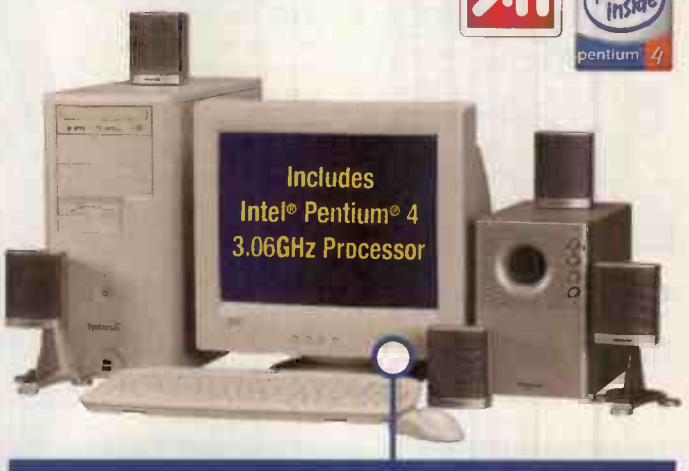

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2002

Slim and small make headway

While a slow market meant some companies struggled to survive, 2002 was the year of the slim and the small as TFT prices dropped and mobile computing powered up. Broadband Internet use in the UK started to match Europe and PCs became even more affordable.

In January Apple's Imac was redesigned taking advantage of the price drop in TFT flat screens. ADSL went truly mainstream with inexpensive DIY installation kits and cheaper subscriptions.

In February AMD showed off Hammer, a 64bit processor capable of running current 32bit x86 code native while taking advantage of 64bit operation. In the consumer space, nine vendors agreed on the next-generation format for DVD. Named Blue-Ray it will allow 27GB of storage on a single side. Digital cameras were demonstrated at 12.1megapixels.

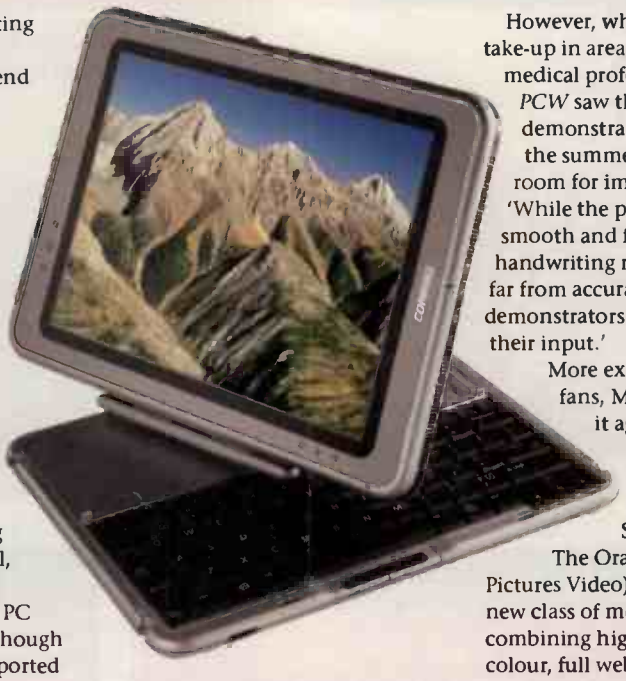
Billed as the next big thing, Microsoft gave its first showing of Tablet PC in May. In Europe an EU directive banned 'spam' email.

The IT industry shipped the billionth PC in July, and in October *PCW* saw just how affordable high-spec PCs have become with a round-up of systems at £699. The winner boasted the latest Athlon 2200+ processor, 512MB of Ram, an 80GB hard disk, CD-writer, 17in monitor and a 128MB graphics card.

In November Intel broke the 3GHz barrier with the P4. As well as an increased clock-speed it had Hyperthreading technology, which the company claims boosted PC performance by up to 25 per cent.

Tablets are small but not quite perfectly formed

Mobile computing got a boost towards the end of the year when two exciting new devices arrived on the scene.



First up, Tablet PCs sported much of the same technology found in traditional notebooks but, as with Pocket PCs, the main interface was pen-based. Microsoft spent three years developing the software, which included 'digital ink' technology with advanced handwriting recognition. In general, the screen was used in portrait mode and the PC held like a clipboard, though many machines also sported a keyboard.

The first Tablet PCs were very lightweight and offered four to six hours of battery life, and up to 1.3GHz processors. Companies offering machines included Acer, Toshiba, HP and Fujitsu Siemens.

However, while we could see take-up in areas such as the medical profession, when *PCW* saw the first demonstration of Tablets in the summer there was some room for improvement: 'While the pen strokes were smooth and fast, the handwriting recognition was far from accurate, with many demonstrators having to correct their input.'

More exciting for gadget fans, Microsoft was at it again with Orange for the introduction of the first Smartphone.

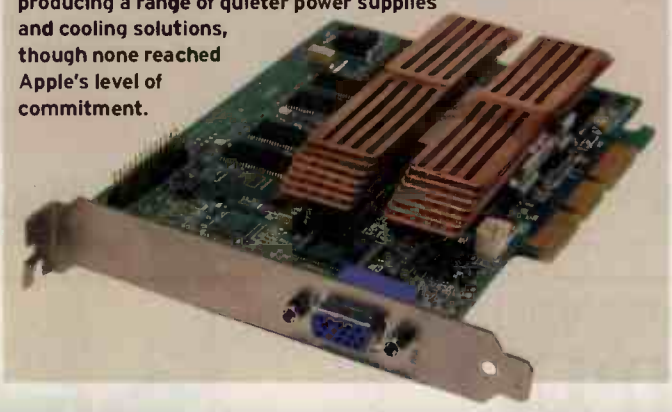
The Orange SPV (Sound Pictures Video) introduced a new class of mobile phone combining high-resolution colour, full web access, easy-to-use wirefree email and instant messaging. An attachable camera allowed picture messages to be sent.

Silence of the Rams

Highlighted by virtually silent Imac, PCs generated unparalleled levels of noise in 2002 as high-performance chips required extra cooling fans and CD drives and hard disks also spun faster.

With some systems registering the same on the decibel scale as the average fridge, or higher, the issue became important to *PCW* readers, as your many letters testified.

In our August issue we explored ways to keep the noise down and PC manufacturers slowly started to wake up to the fact, producing a range of quieter power supplies and cooling solutions, though none reached Apple's level of commitment.



Sony strikes blow to end DVD wars

In a fit of common sense Sony made a bid to end DVD writer confusion with the first drive to support both DVD-RW and +RW formats, along with CD-RW and CD-R formats. The DRU-500A came in at just under £250 and though early adopters reported problems with some media, we were impressed: 'DVD-R and DVD+R media behaved impeccably and could be read on every drive and player we tried. The safest bet in DVD writing.'

Remember when...

Intel's P4 breaks the 3GHz barrier > Just under £1,500 got you an Athlon XP 2600+ system with 512MB of Ram, a 120GB hard disk, 19in monitor, 128MB graphics card, CD and DVD writers, and Dolby Surround Sound... > Intel expected its fourth-quarter revenue to be between $6.8b and $7b > Microsoft's revenue was $28.37b, net income was $7.83b > IBM had yet to post results

2003 – PCW predicts

As evident at the end of 2002, mobile devices, integration and wireless communications are some of the topics set to dominate 2003. Phones now act as digital cameras and personal stereos, while PDAs powered by 400MHz processors feature Bluetooth and Wifi connections as standard, or via an easy upgrade.

In the mobile PC arena the emphasis is likely to shift towards power saving rather than out-and-out performance. After all, it's no good having the fastest portable PC around if it only lasts an hour on battery power. Chips such as Transmeta's Crusoe processor and Intel's Xscale line will undoubtedly become more popular. Sony is already employing Crusoe technology in some of its Vaio range, and HP has adopted the 1GHz version for its Compaq Tablet PC. As a side issue, NEC has gone for the chip in its new planet-friendly compact desktop, the Powermate Eco.

Once Microsoft properly optimises Pocket PC for the Xscale technology this, too, is likely to see more use. However, Intel's latest mobile project, Centrino, looks even more promising. Scheduled for the first quarter of 2003 and featuring an entirely new processor micro-architecture, the Centrino platform is designed to 'provide extended battery life, outstanding performance, new thin and light form factors, and simple, seamless wireless connectivity'. It can only be a good thing.

Along with this, prices on PDAs and Pocket PCs in particular are expected to fall. According to market research gurus Gartner Dataquest, 'Dell Computer will reset market expectations on pricing of personal digital assistants (PDAs) and be the catalyst for a 15 per cent reduction in the Pocket PC average selling price in 2003.'

Given our experiences so far, though, devices such as the Tablet PC will need to improve the handwriting recognition front (and perhaps add voice recognition too) before we see any kind of mass adoption. Hopefully, we will see this happen soon. However, products such as the Orange Smartphone (pictured) are far more likely to be the big hits, especially with the growing trend in media-rich messaging.

Smartphones like the Orange SPV look set to be incredibly popular in 2003

Communications

When it comes to communications, wireless technology is set to become cheaper and much more common over the coming year. As the price of broadband drops and both bandwidth and usage increase, home users are likely to adopt Wifi kits to share lines and devices around the house. Bluetooth and Wifi will become a standard part of notebooks and PDAs, though this may be as a checklist point rather than as a requirement for a killer application.

Surfing, email and instant messaging will continue to be the driving forces for many to go online and, even with the EU move on spam, if you thought you got a lot of emails last year, then get set for an even bigger this time round.

Some other Internet developments we are likely to see are far more media-rich websites – in fact, this is a must if broadband is to mean anything other than simply faster access to pages – and more businesses and customers happier with the idea of 'click and buy' paid-for online content, as secure and easy-to-use services such as BT's Micropayment system become more popular.

The coming year will be dominated by wireless technology and mobile devices, such as the Tungsten T

Don't forget the desktop

While many of 2003's most interesting developments will be elsewhere, desktop PCs will obviously improve. Intel's Pentium 4 has just hit the 3GHz mark, and we can expect even faster processors this year.

More important will be the launch of AMD's Athlon 64, previously codenamed Clawhammer, a 64bit chip capable of running today's 32bit applications natively while benefiting from the power of 64bit processing. While Intel already has its 64bit Itanium and Itanium 2 chips, neither are aimed at the traditional desktop x86 market and the fastest runs at 1GHz. Athlon 64 is being marketed for use with digital entertainment such as games, streaming video and audio, DVDs and music as well as more traditional business applications.

Elsewhere, the price of TFT displays is set to fall further and 15.1in screens will become increasing common. Greater adoption of USB2 will see it flourish alongside Firewire next year as more peripherals are upgraded to these standards. Those looking to see a complete shift to attractive Imac-style 'designer PCs' will be disappointed – we love 'em, they're the future, but the beige box will last for some time yet. However, more compact form-factor machines, known as mini PCs, are set to appear.

So much for products and trends most likely to happen in the coming year. On page 99 we take a look further into the future for the shape of things to come.

Fantastic voyage

It may seem like science fiction, but organic screens, cybernetic implants and holographic storage are some of the technologies we're likely to see in the not so distant future

Unless your name happens to be Mystic Meg, predicting the future can be a very tricky business. When it comes to computing, things are doubly difficult. We all speculate that technology will get cheaper and faster over time, but just what other breakthroughs will we see in two, five or 10 years' time? Will there ever be *Star Trek*-style transporters? Will organic technology allow us to build huge, living machines?

Never afraid of a challenge, the *PCW* team dusted off its crystal balls to catch a glimpse of what's to come around the next few corners.

Siemens has taken the idea of wearable computers a step further, with these spectacles

Back to the future

Of course, this isn't the first time we've tried to predict the future. At the end of 1998, we made some predictions about what we expected to see in the coming year. One idea was convergence. It was assumed digital set-top boxes would have decent web and email capabilities, turning the TV into the deserved entertainment and communications centre of the home. On the subject of mobile computing, Adele Dyer was convinced we'd see the introduction of lighter devices running more impressive OSs with far greater connectivity. Moreover, there might even be digital cameras built into several models.

While the set-top box isn't quite there yet, things have certainly improved in this area. TV programmes on services such as Sky allow viewers at home to interact – you can vote, change camera angles, place bets, play games and more. However, the PC still takes pride of place when it comes to email, surfing and online entertainment.

On the mobile front, we got a bit nearer the mark. Today's handheld and palmtop devices are not only lighter and smaller, but operating systems such as Pocket PC 2002, Palm 5 and Linux give us more flexibility. What's more, though we're still some way from all models having fast Internet access as standard, most can be used online quite easily and some feature always-on, wireless connections.

Digital cameras have made their way not only into a PDAs such as Sharp's Zaurus and the Sony PEG-NR70V, but also into the latest mobile phones. They're not exactly the best quality but as an added extra, they're great.

Wear now

Moving on a step, in 1999 we investigated the idea of wearable computers with Steve Mann at the Massachusetts Institute of Technology (MIT). According to Mann, a 'Wearcomp' would be 'subsumed into the personal space of the user'. In practice, the user would have one or more of their senses augmented by such a device, built into familiar-looking items such as spectacles or even a baseball cap.

Though the original idea hasn't come to full fruition, a quick trip to www.scottevest.com reveals that things are on track. The Scott Evest is a reasonably smart outdoor jacket designed to carry a multitude of personal electronics, such as your MP3 player, PDA and mobile phone. Wires can be channelled through special conduits keeping them tucked away, and devices can even be connected from pocket to pocket – some versions have over 22 pockets.

Siemens has gone a step further by showing a pair of glasses featuring a tiny projector that beams an image onto the lens from a Bluetooth-linked pocket computer. You can see the way ahead as well as the image, in the way of a heads-up display for pilots.

'The future isn't what it used to be'
Arthur C Clarke

But perhaps the most remarkable development in this area involves Kevin Warwick of Reading University, who is experimenting with cybernetic implants. In 1998 he had a chip implanted into his arm, which transmitted a signal to a computer in his building to identify him. The computer would then open doors or switch on lights depending where he was.

To him, though, it was only the beginning: 'We have a phone system, TV and radio, the Internet offering pseudo realtime pictures... it's no longer feasible. Meanwhile, your PC sits there, inanimate: you have to sit at it and type into it. But if you have an inbuilt interface with it, like this implant, you could simply write letters in the air, which your PC could interpret and type for you. It's intuitive computing, not typing.'

Warwick has recently had a further implant that allows the computer to read signals from his nervous system, and he hopes to eventually be able to transmit data – such as pain or emotions – to his wife, who also has an implant.

Samsung has shown a prototype phone featuring an organic screen

Looking forward

Five years ago, *PCW* interviewed popular British author Peter James, who believed the book in its current format was dying. James predicted 'a sort of smart book. It will be

Above: Folding organic light-emitting diode (Oled) screens, will soon be used by mobile phones and PDAs

Left: A watch using a full-colour Lep screen

a piece of plastic or flexible silicon that's as nice to read as a sheet of paper, that can be read in the bathtub or in direct sunlight. And, like paper, you'll be able to fold it up and put it in your pocket'. Complete fantasy? Not at all.

You may think your new 15in TFT panel is the business, but in a few years you could be using an organic display that's cheaper, consumes less power and rolls up when not in use, thanks to companies such as UK specialist Cambridge Display Technology (CDT). Already being used in some mobile phones, and set to reach PDAs by 2004, the new screens exploit a technology known as Organic Light-Emitting Diodes (OLEDs). These are similar in principle to LEDs, except they use carbon-based material that emits light when exposed to an electrical charge, rather than traditional silicon semiconductors. CDT uses Light-Emitting Polymers (LEPs), which are essentially plastic LEDs containing large carbon-chain molecules.

The benefits of LEP displays include a very fast response time (sub-microsecond), operation unaffected by temperature, and the light emission occurs at low voltages – less than 5v. The intensity of light is proportional to current. Perhaps even more amazing is that LEP screens can be printed layer upon layer by an inkjet, avoiding costly production techniques needed for rival technologies.

Technology like LEP displays go hand-in-hand with recent initiatives like the Tablet PC or Orange Smartphone, and could boost their popularity and usefulness. Moving even further into the future, the development of solar-powered versions could later lead to personal displays built into clothing.

More from Moore

We all expect processors to get faster and, until now, things have moved along according to Moore's Law. Defined by Intel co-founder Gordon Moore, this states that the number of transistors on a microprocessor will double approximately every 18 months. The more transistors you can cram on, the more powerful your chip can be.

In order to keep pace with this theory, Intel's latest research has taken it into the realms of nanotechnology. The company's upcoming 90nanometre chips house transistors smaller than the Influenza virus, operating at one Terahertz (1,000GHz). The first processor to use this technology is the next-generation Pentium 4, codenamed Prescott, due this year. It incorporates close to 100 million transistors and is expected to reach a 4GHz clock-speed quickly. Fellow co-founder Andy Grove predicted 'the microprocessor in 2011 could have as many as one billion transistors'. Intel now expects chips with a one billion or more transistors as early as 2007, perhaps running at 15GHz.

Intel is also working on 'silicon radios'. Over the next few years, these radios will be integrated into future Intel chips, so any device powered by one would have wireless radio communication capabilities. 'We believe that integrated silicon will deliver innovative, ubiquitous and low-cost technologies to enable a world in which all computers will communicate and all communication devices will compute,' said Pat Gelsinger, Intel's chief technology officer.

The company is also experimenting with Ultra Wideband (UWB) communications as a potential replacement for cables, which could challenge both Bluetooth and, for some purposes, Wifi. UWB is very short range, very low power, and could hit up to 500Mbytes/sec – a bit more than USB2 and 10 times faster than Bluetooth.

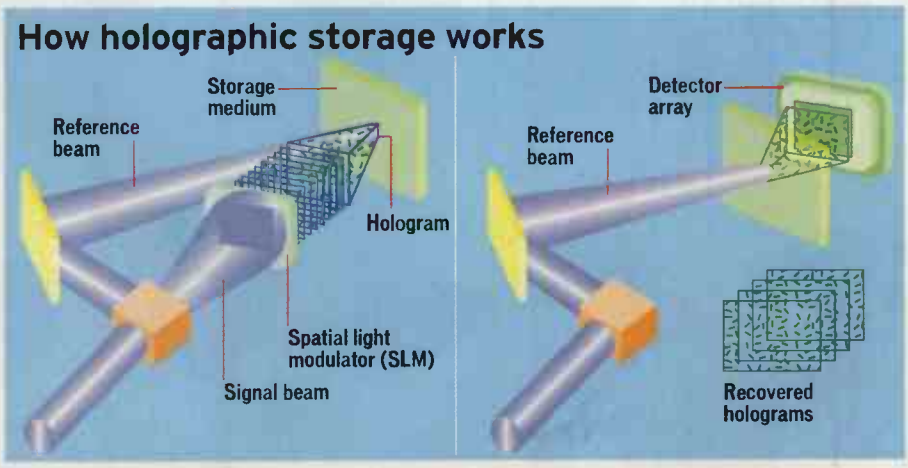
Storage is another area set for a huge boost in the future. While the next-generation of DVD discs employing 'blue laser' technology to store 30GB per disc sound promising, how about holographic storage?

Under development by companies such as IBM, holographic storage uses dual lasers to create an interference pattern within a special optical material – each pattern representing a page, or multiple pages, of digital data (see diagram below). Each page can store over one million bits of data, giving the possibility of storing terabits (1Tbit is approximately 125GB) of data per cubic inch and transfer rates of Gigabits/sec. However, while IBM has shown a prototype, commercial products are still a long way away.

'640KB of memory ought to be enough for anybody'
Bill Gates, 1981

Given these exciting developments, this time it's hard to disagree with Microsoft chairman Bill Gates who said: 'The productivity gains that technology will drive during this digital decade [2001-2010] will be double those of the 1990s.' We can't wait.

How holographic storage works



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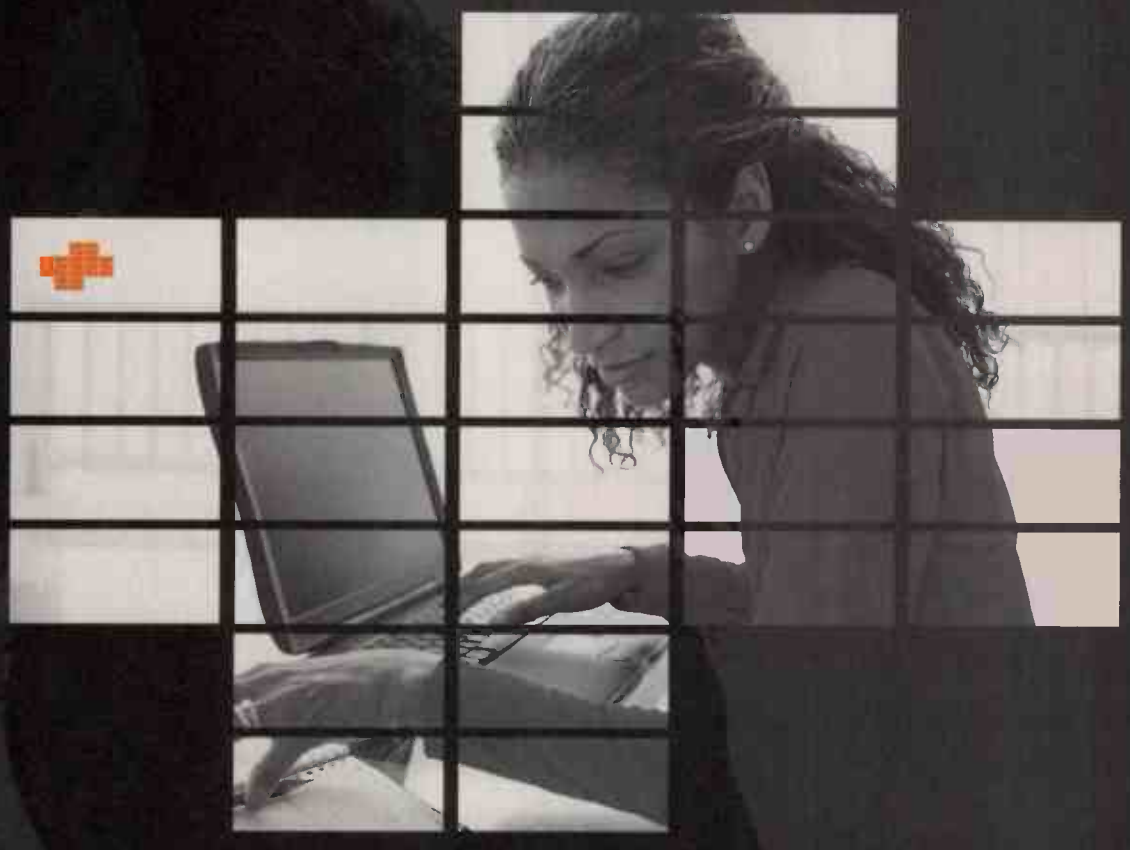

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Blast from the past

Without a doubt, *PCW* wouldn't have seen out 25 years without the knowledge, expertise and sheer enthusiasm of its staff and contributors, which include many former readers. We asked some of the people who've made the magazine what it is to share their fondest memories

Angelo Zgorelec, *PCW* founder

When I started *PCW*, never in my wildest dreams did I expect it to become so successful. Incredibly, the first issue of the magazine sold almost its entire 30,000 print run. The distributors couldn't believe it as I had not been able to afford any sort of promotion. An enormous help was that *The Sunday Times* devoted two pages to personal computing in its colour supplement, in which the magazine was mentioned.

Zgorelec: *PCW* is the best magazine

'Never in my wildest dreams did I expect it to become so successful' Angelo Zgorelec

The other significant factor in the success of the magazine was the first *Personal Computer World* Show, held six months after the first issue was published. The main attraction was the *PCW* European Micro Computer Chess Championship, which had seven entrants. The exhibition was so busy that, for safety reasons due to overcrowding, hundreds of people had to wait over an hour to be let in.

Two years later, the experienced publisher Felix Dennis took a majority stake in the magazine, with me still remaining a minority partner. After two years together, we received an offer for the magazine and exhibition from VNU which we couldn't refuse. Felix is now the biggest private publisher in the UK, and one of the richest people in the country, and I can claim some credit!

Although I later published other magazines, I always closely followed my first magazine. I believe it is the best magazine in its field.

Aping the real thing... Our Sinclair Z88 was a wooden mock-up

Derek Cohen, *PCW* editor 1986-1989, currently editorial director Dennis Publishing

PCW had established a reputation for featuring exotic animals on its covers. Most famously we used a chimpanzee whenever a product from Sir Clive Sinclair appeared. When Sir Clive launched the Z88 (at the *PCW* Show, no less) we featured a chimp riding a bicycle with the machine in the basket at the front. What the readers didn't know was that we were so keen to be ahead of everyone else that we couldn't wait for the Z88 to be manufactured. So we photographed a mock-up and used that throughout the magazine. Yes you heard it here first. In March 1987 *PCW* ran the world exclusive review of a piece of wood...

Being a technical magazine *PCW* always liked to photograph the bits inside computers. When we reviewed a 386-based Toshiba laptop, we unscrewed the case and disassembled it to show the processor and so on. Little did we realise that those laptops were all assembled in a jig by machine as otherwise it would require an

'*PCW* ran the world exclusive review of a piece of wood...' Derek Cohen

octopus to align the parts while the screws were tightened. When the Toshiba engineer arrived to take it away his face went totally white. 'But it's the only one in the country and we'll never get it back together again. It's supposed to go to *PC User* next.' Honest, we didn't know.

Geof Wheelwright, *PCW* contributor 1985-present, (editor, 1990)

I guess my most abiding memory of *PCW* was doing celebrity CEO interviews. They were always a lot of work to arrange, but they were fun.

I distinctly remember doing an interview with Bill Gates in or around December 1990 that involved driving down to Seattle from Vancouver in a blinding snowstorm with my photographer friend Stuart Davis. We arrived at his office wearing snow gear (ie boots and ski jackets) and stayed for the better part of an hour. Then Stuart managed to get him to sit for more photos for another half hour or so. Gates was not expecting to spend any extra time having his picture taken and I have to credit Stuart for getting some great photos of him – despite glaring looks of impatience throughout.

'We arrived at Gates' office wearing snow gear (boots and ski jackets) and stayed for the better part of an hour' Geof Wheelwright

Chris Cain, *PCW* 1987-1996, editor, *What PC?* 1996-2002

Cain: Writing three pages on a mouse was tough

Of all the many wonderful memories I have, the moment I'll never forget was rushing down to Logitech in the early 1990s with Guy Swarbrick, the editor, after he had been promised an exclusive review of some exciting new kit. We held three pages for it and a space on the cover, and when we got there it was... a mouse. It was the world's first ergonomic model, and a joy to use compared to previous devices, but writing three pages took some doing.

Guy Kewney, *PCW* columnist, Newsprint section editor 1978-1993

Of the many memories I have of *PCW*, the one which probably entered legend was the story of Sprint.

Sprint was the word processor which was going to make Borland into a rival to Microsoft. It was a brilliant bit of code, and what made it exciting was the fact that it never lost a keystroke. Every time you gave it more than three seconds of inactivity, it saved your keystrokes to a keystroke file, from which it could reconstruct the file you were working on from the last saved version, plus the changes you had made.

I used it enthusiastically; and one night, when my colleague Steve Gold came into the office just as I was finishing putting together the Newsprint section, we had the opportunity to put this ability to the test.

'Borland's Philippe Kahn told me it was this piece which wrecked Sprint' Guy Kewney

The system crashed; and I looked smug. 'Watch; Sprint won't have lost a single character out of any of the open files I've been working on.'

Well, that was what it was supposed to do, and had done in the past. This time, it didn't. Not only had Sprint, on this occasion, lost the contents of the open files, it had also scrambled its records of all the other files I was working on, too.

With remarkable presence of mind, I contacted a technically expert friend, and asked if he knew a way of dumping the entire disk area. I don't remember exactly how I did it; I do know that it produced a long, complex file with Ascii text, bits of machine code, chunks of other software, and – in fragments – all the copy I'd written. I went through it literally sector by sector, and as the sun came up next morning, I had managed to produce something which the PCW staff were able to use.

And then I added a description of my experience. I probably was more vehement than I absolutely had to be, and I'm told that the piece became something of a 'must-read' by other journals at the time. And of course, readers read it, too.

Later, Borland's Philippe Kahn told me – with commendable self-restraint – that it was this piece which wrecked Sprint. After that article, sales collapsed; first in the UK and in Australia, where Newsprint was syndicated to Australian *PCW*, then to the US.

Robert Schifreen, *PCW* staff writer 1987-1988, currently editor of www.securitysavvy.com

As a freelance writer one of the first articles I produced was a lengthy piece on how to write and run batch language programs on the Telecom Gold email system. I sent it to Peter Jackson, the editor of *PCW*. To my surprise and delight he accepted it, and it appeared in print a couple of months later.

By early 1987 I'd made it onto the staff of Britain's best-known computer magazine. By the time I arrived, however, Peter had moved on and I worked under Derek Cohen.

My time at the magazine includes many highlights and great memories. For example, writing the UK's very first review of a computer from PCs Limited, the company which later changed its name to Dell. And being the first person in Britain to review OS/2. And moving *PCW* into the world of online communications, by establishing a dial-up Bulletin Board so contributors could send us articles more easily.

It wasn't all plain sailing, though. I remember when Microsoft's PR company sent a bike courier with a copy of a brand new version of Macro Assembler. But when I copied the files from the floppy disk to the hard disk of my PC I got my parameters the wrong way round and wiped the diskette! I had to call and ask for another copy.

Gordon Laing, *PCW* columnist 1992-present (editor 1997-1999)

Like many, my first exposure to IT was back in 1977 when the first 'affordable' personal computers arrived. As a seven-year-old kid though, my only experience of Apple IIs and TRS-80s was through shop windows or poring over adverts in a new magazine called *PCW*. Over the following years, the magazine was my companion on a journey through numerous Sinclairs, Commodores, Acorns, Apples and Ataris.

When I started work at *PCW* in 1992, the IBM PC was unquestionably dominant. The exciting part then, as it is today, was not the PC itself, but the amazing things you could do with it. Probably the single most impressive

'When I started work at *PCW* in 1992 the IBM PC was dominant' Gordon Laing

product I tested in the early 1990s was the first high-resolution 24bit graphics card. Videologic's Rapier 24 boasted resolutions up to 1,152 x 882 in glorious full colour with a whole fiver's change from two grand! Never before had Coreldraw's Snowbarn file looked so magical!

PCW's been with us for two and a half decades, from the birth of personal computing. Over this time we've seen sub-megahertz processors accelerate by over 3,000 times, and I genuinely believe the best is yet to come.

Until next time...

PCW would like to thank all those who shared their memories, and in particular we'd also like to say thank you to the most important people, our readers. Without you we wouldn't be here. We look forward to the next 25 years. ■

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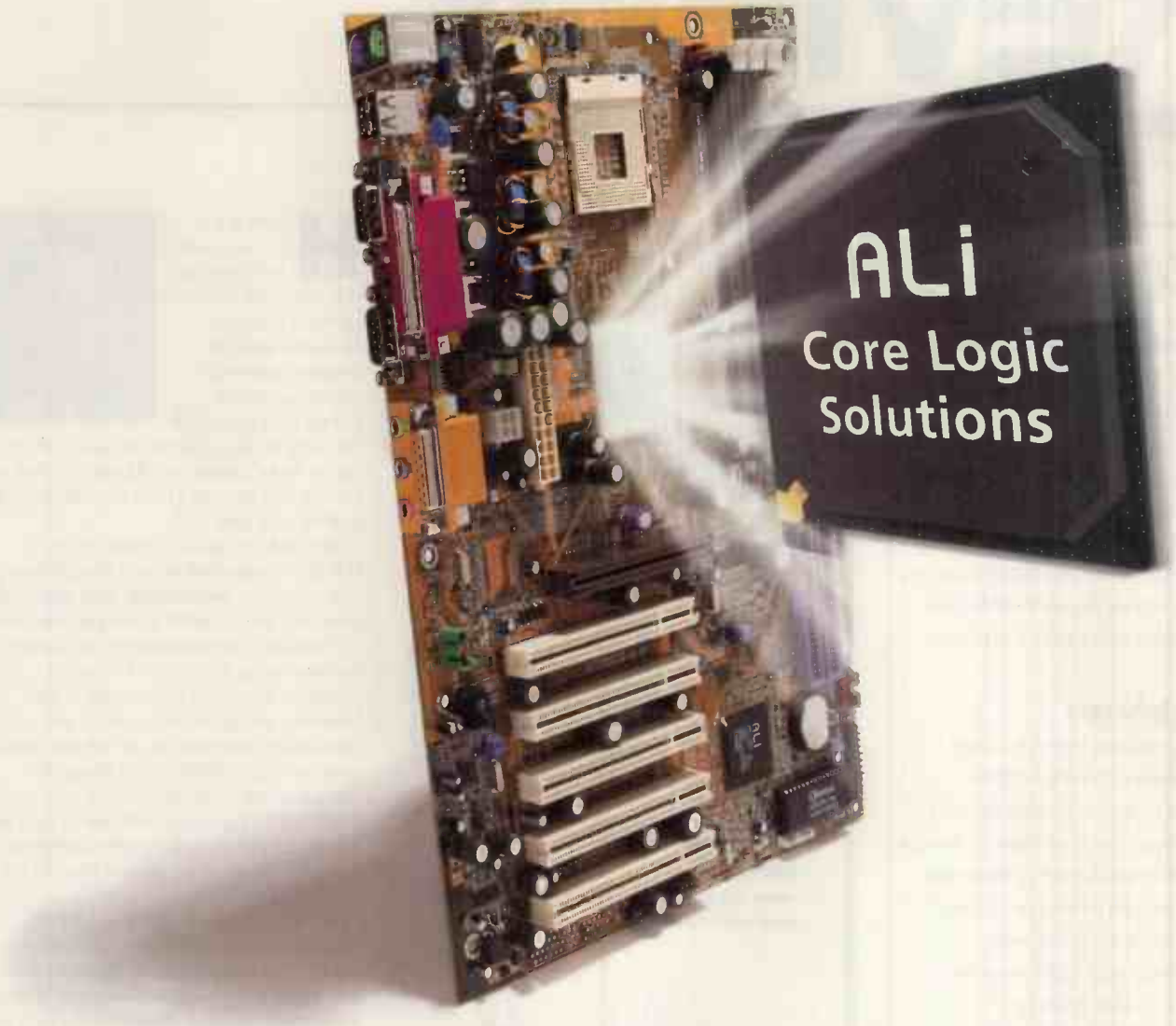

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Reviews

EDITED BY MARK WALSH

EXCELLENT ★★★★★ VERY GOOD ★★★★★ GOOD ★★★★★ BELOW AVERAGE ★★★★★ POOR ★★★★★

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Mesh and Evesham go head to head with PCs built with the latest Athlon chip, Barton

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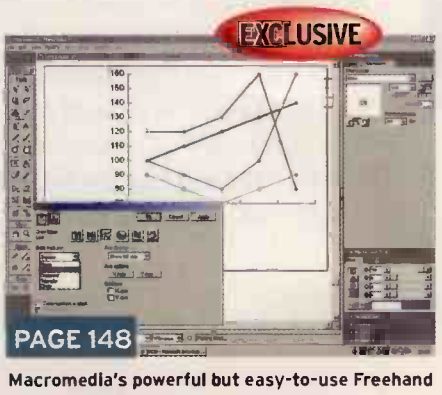
A bevy of wireless networking devices are reviewed in our five-page round-up



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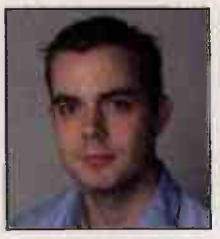
Macromedia's powerful but easy-to-use Freehand MX beta is fully tested and reviewed



Hello, good evening and welcome to the new-look Reviews section. Besides a new look and the introduction of a pretty light blue colour (as opposed to the very stern burgundy of yore), we've made some important changes to how we review and test our PCs. Let's deal with the testing side first.

First off, Unreal Tournament 2003 (UT2003) has replaced Jedi Knight II as our real-world 3D benchmark. This will be used primarily to test all PCs and graphics cards, to determine performance in an OpenGL environment. UT2003 is one of the toughest games on the market at the moment and provides accurate and consistent information on the real-world graphics capabilities of the device in question. For your reference, a card reaching 75 frames per second (fps) in Jedi Knight II will manage roughly 50fps in UT2003. See How we test on page 13 for more details.

In the next few months our other component performance tests, Sysmark and 3Dmark, will undergo their annual revisions; both were well into beta testing as we went to press. As and when they are finalised, we'll let you know exactly what changes have been made and how that is reflected in the final score.

Elsewhere, total cost of ownership will become a permanent feature in all our printer reviews. With inkjet cartridges costing £25 a pop, replacing them three times costs more than many printers themselves. So, where possible, we will supply you with the cost per page of both colour and black and white print jobs, to give you greater piece of mind.

This month, we finally take a look at Nvidia's long-awaited Radeon 9700 killer; the Geforce FX. We've held off reviewing it until now because the board was not complete and therefore any benchmark results we attained would not reflect the performance of the released product. As you'll see on the opposite page, it's one hell of a device on paper, but is not without its flaws.

Also featured are the latest two chips from AMD, the latest wireless networking kit, Apple's stunning new notebooks and Macromedia's fantastic Freehand MX. All of that in what is traditionally one of the quietest times for the industry. Maybe that's a sign that the slump is finally over.

Mark Walsh

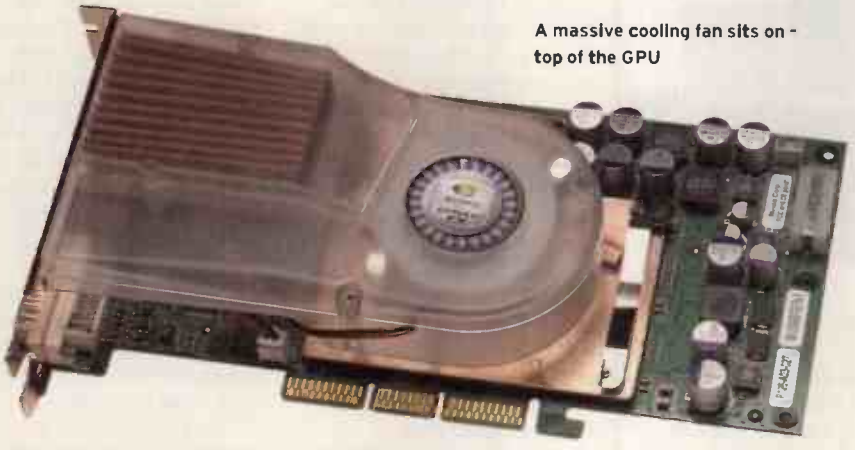
EXCLUSIVE
Hi-Grade notebook
Widescreen 2GHz heaven on page 116

EXCLUSIVE
Sony subnotebook
A fully featured system tested & reviewed - page 117

HIGH-END GRAPHICS CARD

PNY Geforce FX 5800 Ultra

Nvidia's highly specced and long-awaited graphics chip is put to the test to find out if it lives up to the company's claims



A massive cooling fan sits on top of the GPU

It's taken quite a while, but Nvidia's Geforce FX graphics chip has finally arrived in our labs. Nvidia claims that this, its answer to ATI's DirectX 9 (DX9) Radeon 9700, will be the 'dawn of cinematic computing'. It's quite a bold claim, but, taking into account the quoted specifications, the chip could almost live up to it.

This 125-million transistor GPU is the first to be clocked at 500MHz – until now, the fastest was 325MHz. It's the memory that's more impressive though, running at 1GHz, (or 500MHz DDR). Matrox's Parhelia card (see September 2002) is the only one to come close at 800MHz. It's packed with 128MB of DDR 2 memory – the first CPU or GPU chip to use this new technology. The more vital improvement, though, is the 0.13micron process that Nvidia has used to make the chip; ATI cards are currently stuck at 0.15microns. Shrinking it down means the chip consumes less power and, due to the distance signal has to travel inside the chip, runs faster. However, the FX still requires a standard power connector, as well as the wattage supplied by the AGP bus.

The FX is unsurprisingly fully DX9 compatible, yet Nvidia has made a few enhancements on top. In particular, the vertex shaders from DX9 have been enhanced, so shading is by vertex, as opposed to by object. It's also capable of 65,536 instructions; DirectX 9 only requires a comparatively weak 1,024. Finally, it's also capable of 128bit precision. If we're totally honest, though, we couldn't notice any particular difference in any of today's games or tests, but that's not to say that in the future the FX won't shine.

These leaps in technology cause a good few problems though. First, it's massive, taking up two bays on the back of your PC because of the immense cooling fan that sits on top of the GPU. The fan sucks in air from one side of the metal plate and blows it out the other. While this is an improvement on the design Abit uses in its OTES cards (see December 2002, p64), and despite Nvidia's claims that it is supposed to run hot, we weren't particularly pleased when it burnt our fingers. The copper heatsink that surrounds both GPU and memory was too hot to touch after 10 minutes of even non-3D usage.

Third, and most importantly, the fan makes such a racket that it's clearly audible through casing, and about 10 yards away; it's really that loud. Luckily, the fan isn't always this loud as it only switches to Dyson-mode when producing 3D graphics. Even in quiet mode, though, it's louder than anything else on the market.

With earplugs in, we proudly ploughed our way through our 3D tests. The FX 5800 Ultra was run on a 2.8GHz P4 on an 845 chipset with 512MB of DDR memory and on an Athlon 3000+ with an Nforce2 and 512MB of memory. The results attained in 3Dmark are the fastest on the market, but only by a hair's breadth, reaching 13,349 on the P4 and a record breaking 16,154 on the Athlon platform. Results with full-scene anti-aliasing (FSAA) and anisotropic filtering (AF) still win over the competition. But when we ran Unreal Tournament 2003 at 1,024 x 768, we were mightily disappointed. ATI's Radeon 9700 was more than four frames faster in the botmatch test; very much unexpected considering the chip's specification. When we upped the ante, running it at 1,600 x 1,200 with FSAA and AF on their highest settings, the FX just won over the 9700.

As you can currently buy a 9700 Pro for £220, just over half of this monster's asking price, £400 for this behemoth really doesn't make this an attractive buy. However, as with many high-end cards, there is precious little in the way of games, and even benchmarks that can fully show off what this chip is capable of. It's very much possible that the Geforce FX will shine in the future, but at the moment, and at this price, it's hard to recommend.

Mark Walsh

DETAILS

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CONS Price; game performance disappointing
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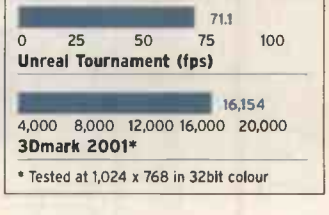


* Tested at 1,024 x 768 in 32bit colour

AMD BARTON PCS

Evesham Axis 3000+ and Mesh Matrix 2800+ Xtra

The latest Athlon chip, codenamed Barton, is the basis for two very different, yet stunning performers from Mesh and Evesham

AMD has made another revision to its Athlon XP chip. Codenamed Barton, it currently comes in two forms: the 2800+, running at 2.1GHz, and the 3000+ at 2.17GHz. We got our hands on both the 2800+, in a PC from Mesh, and two 3000+ chips; one straight from AMD and the other from Evesham.

There has only really been one physical change to the chip; the Level 2 cache. This has been raised to 512KB from the previous 256KB. A quick processor lesson: besides the DDR memory on a typical board, the chip relies on two memory banks; Level 1 and Level 2 cache, both of which are contained within the chip itself. Level 1 cache is responsible for performing tasks and therefore stores the most basic instructions, as well as those for programs you are using at that exact moment. Level 2 serves as a form of backup for Level 1. SD-Ram could then be seen as a further backup for instructions. There is a Level 3 cache, but this is found only in workstation motherboards for chips such as Xeons. Therefore, if the amount of Level 2 cache is doubled, the chip itself has a capacity for almost twice as many instructions, and therefore needs to refer to the SD-Ram less frequently than it used to. As the time taken to access Level 2 cache is far less than that taken for SD-Ram (because it's physically closer), tasks are performed a lot faster.

Even given the effect cache has on the performance of a system, the resultant scores in Sysmark are far higher than we expected. An 'old-school' Athlon 2700+ system with the same configuration would score in the region of 214. A 2800+ Barton PC manages a whopping 246 in Sysmark. Better still, Mesh has configured its offering to manage 256. As a frame of reference, an Intel 2.8GHz PC gets 259. This means AMD's PR ratings are accurate, so a 2800+ Athlon is relatively similar in performance to a 2.8GHz Pentium 4.

The two retail systems could not be further apart, as Evesham has included high-end components, while Mesh has included the chip in a mid price range system, without skimping on any features.

Evesham Axis 3000+

First off, the Evesham (picture above). Running on an Nforce2 board, this time from Leadtek and with 512MB of DDR memory, the system scored 262 in Sysmark. This is incredibly fast, even for the chip, and makes it the fastest PC we've seen that hasn't been overclocked. A 200GB Western Digital hard disk is included; the 8MB cache on this 7,200rpm model will have helped the Axis 3000+'s phenomenal performance record.

Optical storage comes from two LG drives. The primary is an LG Multidrive. This means it's both a DVD and CD recorder, and can burn to both DVD-R and DVD+R formats. The other, rather disappointingly, is a DVD drive. It's a shame that it's not a DVD/CD-RW combo drive, as CD burning times on DVD-R drives are far slower than you'd wish for from a £2,350 PC.

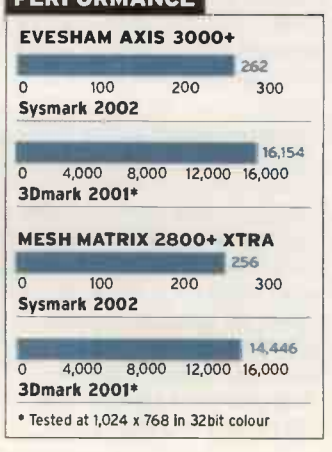
The other technical innovation in this PC is the Geforce FX card. PNY is the only manufacturer, so far, to release cards into the UK. The 5800 Ultra card makes this PC a very noisy beast; see page 103 for a full review of the card. The high system performance score was matched by the fastest 3Dmark result we have ever seen: a huge 16,154. Frame rates in Unreal Tournament were equally as impressive, at just over 71 per second; again, the highest we've encountered. The supplied Samsung 19in TFT is a competent little fellow, and certainly not cheap; it's likely that this is responsible for roughly a third of the total system asking price.

The Nforce2 board gives plenty of options for expansion. As well as the two USB ports at the front, there are two at the back, as well as an Ethernet connection, two serials, a parallel and a Midi/joytick port. Evesham has also supplied a three-port Firewire card and modem, each of which take up a PCI slot.

Sound comes from an Audigy 2 card, which takes another PCI slot, leaving just one free for expansion.

Running at true 24bit, 96KHz sound, it's one of the best cards on the market, as well as being one of the best for gaming, as it

PERFORMANCE



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

is less demanding on the CPU and system memory than most of the competition. This is coupled with Creative's own Inspire 6700 speakers.

Running on XP Professional, the Axis 3000+ also comes with Ability Office, which wins our office suite group test (see page 194), and Pinnacle Studio 8.

At £2,350, you'd expect nothing but the best, and Evesham has, on the most part, done exactly that. Just beware that it's only hardcore gamers who will appreciate this system, even given the widespread myth that TFTs aren't competent gaming screens; the majority of users would be happy with the Mesh.

Mesh Matrix 2800+ Xtra

The Matrix 2800+Xtra comes with a 2800+ chip, and so runs slightly slower than Evesham's offering. The overall Sysmark score was 256, so the difference is marginal, and almost within Sysmark's margin of error; a credit to Mesh's construction. It comes with a 120GB hard disk, also with a 8MB buffer.

Mesh has also used an Nforce2, this one being more fully featured. Mesh's new case comes with two USB ports at the front, and there are four more on the board itself. On the subject of Mesh's newly designed case (see picture over page, below left), we're not too keen on the new beige and grey look. However, it's certainly a more versatile beast than its predecessor.

Both Ethernet ports on the board are installed and operational – handy if setting up a home network. As this is an MCP-T Nforce2 board, there's onboard 5.1 sound which Mesh has opted to use. While we normally disapprove of onboard sound chips because of the poor sound quality, the Nforce chip is the best of the bunch by a long shot and, considering the overall cost of this PC, we can forgive Mesh just this once. Creative's 5300 Inspire speakers are also supplied. There's a coaxial S/PDIF output on the board, as well as one free Dimm slot and three free PCIs.

The Radeon 9700 card remains the best high-end graphics card on the market, particularly considering its current price. The Connect 3D model installed here obtained 14,446 – not quite a match for the Geforce FX in the Evesham, but still incredibly fast; its Unreal score is a decent 68.6 frames a second. The Diamond Pro 19in monitor is also a superb model, so no complaints there.

Our only criticism of the Mesh is the lack of a secondary optical drive. While the dual-format Sony DVD burner is a valuable and future-proof asset for the PC, it means you can't do disc-to-disc copies. Mesh's Matrix 2800+ Xtra is amazing value at £1,300, and is therefore highly recommended. Evesham's Axis 3000+ has a far higher spec, in particular the Geforce FX card. It also comes with our recommendation, but few users will need such a high specification.

Mark Walsh

DETAILS

EVESHAM AXIS 3000+
PRICE £2,348.83 (£1,999 ex VAT)
CONTACT Evesham
www.evesham.com
SPECIFICATIONS
AMD Athlon 3000+ processor • 512MB of DDR memory • Leadtek Nforce2 motherboard • 200GB hard disk • LG DVD-/+R and DVD-Rom drives • PNY Geforce FX 5800 Ultra • Samsung 19in LCD monitor • Windows XP Professional • Ability Office
PROS Speed; features
CONS May be more powerful than you really need; noisy
VERDICT
Fast and brilliantly featured, this will only leave your bank balance wanting

PERFORMANCE	★★★★★
FEATURES	★★★★★
VALUE FOR MONEY	★★★★½
OVERALL	★★★★★

MESH MATRIX 2800+ XTRA
PRICE £1,291.33 (1,099 ex VAT)
CONTACT Mesh
www.meshcomputers.com
SPECIFICATIONS
AMD Athlon 2800+ processors • 512MB of DDR memory • Asus A7N8X Nforce2 motherboard • 120GB hard disk • Radeon 9700 graphics card • Mitsubishi Diamond Pro 930 monitor • Windows XP home • Microsoft Works Suite 2003
PROS Fast; great value
CONS No secondary optical drive
VERDICT
Besides the solo optical drive, this system is beyond reproach. Very much recommended

PERFORMANCE	★★★★★
FEATURES	★★★★½
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★

GAMING PC

Systemax Inspire 7392

For £700 you'd expect less power and speed than this system gives you

For just over £700, Systemax has supplied a system with an Athlon 2100+ processor, 256MB of memory and an 80GB Samsung hard disk. Not bad so far, especially with a score of 186 in Sysmark under its belt.

Graphics power comes from ATI's new Radeon 9100 chip. It's a revision of the 8500 chip that was used to make last year's 9000. Disappointingly, it's only AGP 4x, but it does have a 250MHz clock speed and is DirectX 8.1 compatible. A score of 8,774 in 3Dmark is excellent, as is 50.2 frames per second (fps) in Unreal Tournament's Botmatch demo. The card also comes with DVI and S-Video ports, and costs roughly £100 on its own – great value for money.

It's not all perfect, though. Besides being rather noisy, as PC boxes go, the included CTX Executive Flat monitor is a bit of a letdown, although you shouldn't expect anything spectacular for £700. The onboard surround sound and speaker set are pretty mediocre, but again that's to be expected. These are the system's only real downfalls though, as the optical drives are both high speed and it comes with a host of decent software.

We were also impressed by the two-port Firewire card and four USB ports at the back. The MSI KT4V-L motherboard also provides an Ethernet connection and S/PDIF optical in and outputs on a bracket. This blocks one of the three free PCI slots and, due to the way the system has been configured, there isn't a single spare usable PCI slot.

Overall, this is a great-value, fast system, that just misses out on an award.

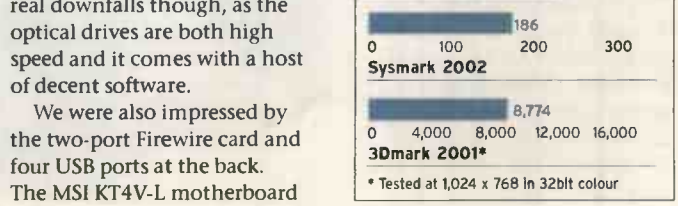
Mark Walsh

DETAILS

PRICE £703.83 (£599 ex VAT)
CONTACT Systemax
0870 729 7366
www.systemax.co.uk
SPECIFICATIONS
Athlon XP 2100+ • 256MB of DDR memory • 80GB hard disk • 16x DVD, 48x CD-RW • Radeon 9100 graphics • CTX 17in monitor • Onboard 5.1 sound • Smartsuite 9 • 3yr RTB warranty
PROS Fast; great value
CONS Weak monitor; noisy
VERDICT
Great value with performance far beyond what you'd expect

PERFORMANCE	★★★★½
FEATURES	★★★½★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★½

PERFORMANCE



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

>> Wireless networking round-up
DIY networking kit compared – turn to page 122

17IN NOTEBOOK

Apple Powerbook G4 17in

It's got the largest screen you've ever seen on a notebook, together with some great features for mobile creatives

In addition to launching what it called the world's most compact notebook (see page 108), Apple unveiled the world's largest notebook screen, the 17in Powerbook G4. This is the first portable computer with a 17in screen, yet it's lighter and thinner than most of its Windows competitors. At just 2.6cm thick, it's the same as the existing 15in model, and it weighs 3.1kg, which feels quite heavy at first, but considering its the size that's very impressive.

The display is the same as that used in the 17in TFT Imac, with a widescreen aspect ratio and a resolution of 1,440 x 900 pixels, giving enough screen real estate for the most demanding professional users. It's this sector that the 17in Powerbook is targeting, especially those in creative markets such as design, video and audio. The screen is driven by the top-of-the-range (for the Mac, at least) Nvidia Geforce4 440 Go with 64MB of dedicated DDR memory, which also supports an external display at up to a massive 2,048 x 1,536 resolution. External displays can be connected through either DVI, VGA, S-Video, or Composite video out (all with a supplied adaptor).

These output methods take up just two of the plethora of ports that sit on both sides of the unit. There is a USB port on either side, although Apple still uses USB 1.1, rather than the faster USB2. Instead, there is one Firewire port, and the first ever use of a Firewire 800 port (IEEE1394b) which, as its name suggests offers data connections at up to a blazing 800Mbits/sec, although as yet there are few Firewire 800 peripherals. There's also audio in and out and a PC Card/Cardbus slot, as well as a modem and Gigabit Ethernet as standard. Like its 12in little brother, Bluetooth is built in, and the 17in also has wireless networking, using the new 802.11g standard.

In common with the 15in model, the 17in Powerbook uses a 1GHz PowerPC G4 processor, but its performance is boosted by a significant redesign of the internal architecture, such that it uses 333MHz DDR memory modules (512MB supplied) and an ATA100 hard drive. It has a slot-loading Superdrive (DVD-R/CD-RW combo) which, when used with the bundled IDVD software, allows you to create professional-quality video DVDs.

Like the 12in model, the 17in Powerbook is constructed from aluminium, making it more robust and less susceptible to scratches and wear-and-tear than the titanium of yore. The screen uses the same contour-balanced hinge system, but the 12in model's three-speaker system is replaced by two much larger speakers that take up a significant proportion of the area surrounding the keyboard. This helps the aesthetics somewhat, since the standard-sized notebook keyboard looks a little lost. It's a shame the keyboard could not have been expanded to fit the available space.

Another touch, unique to the 17in model, is that the keyboard, which in other respects is the same as that on the 12in model, features an ingenious backlight system. Fibre-optic light sensors, hidden below the speaker grilles, detect ambient light, and illuminate the character on the keyboard when the light falls below a certain level. The degree of keyboard illumination is inversely proportional to the ambient light, or it can be easily adjusted with two of the F keys. The light-sensing system also dims the backlight on the computer's screen in dark conditions, which prevents glare and significantly saves battery life. Again this can be easily overriden using F keys.

Despite the large screen, Apple still claims a battery life for this machine of four and a half hours, thanks to the use of prismatic battery technology, which allows more crystals to be crammed into the same amount of space. As with all notebook batteries, don't take this figure too literally. You will get somewhere approaching four hours of use out it, provided you turn the screen brightness right down and turn off battery-draining features such as wireless networking and Bluetooth.

Mark Heaton

DETAILS

PRICE £2,599 (£2,211.91 ex VAT)
CONTACT Apple, 0800 039 1010
www.apple.com/uk
SPECIFICATIONS
1GHz PowerPC G4 processor • 512MB DDR memory • 60GB hard disk • DVD-R/CD-RW drive • Geforce4 440 Go graphics • 17in TFT display • 56K modem & Ethernet • Bluetooth. 802.11g • 2 x USB ports, Firewire & Firewire 800 ports • DV-I, S-Video out port • Mac OS X 10.2 • 392 x 259 x 26mm (w x d x h) • 3.1kg • 1yr limited warranty
PROS Screen; Bluetooth; 802.11g
CONS Large; expensive
VERDICT
A dream machine for graphics, video and audio professionals on the move. It provides a true mobile workstation, if you have the strength to carry it

FEATURES	★★★★★
VALUE FOR MONEY	★★★★☆
OVERALL	★★★★½

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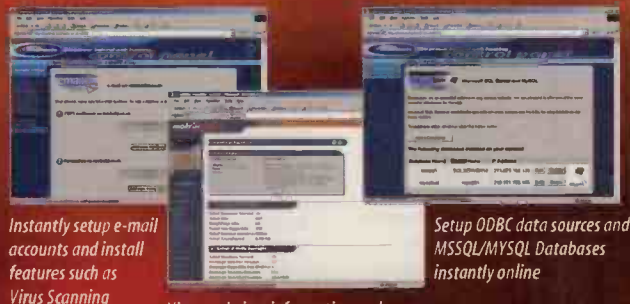

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SUB-NOTEBOOK

Apple Powerbook G4 12in

The power of a G4 combined with the portability of an Ibook in a very small, stylish and well-designed package

Just two months after the launch of its most significantly revamped notebook in nearly two years (see February 2003 p45), Apple has upped the ante once again with the launch of the 12in Powerbook G4. The previous Powerbook included a fast 1GHz processor and a Superdrive (combined DVD-R/CD-RW drive) for the first time, but was physically and cosmetically unchanged. But Mac users have been clamouring for a notebook that combines the power and features of a Powerbook with the portability of the Ibook.

The new 12in Powerbook does just that, and Apple hopes that it will also help it to win over a few more Windows users, by offering a package with excellent value for money. At its January launch in San Francisco, Apple CEO Steve Jobs called it the world's most compact, fully featured notebook. It is in fact marginally smaller in every dimension than the Ibook, and slightly lighter too, yet it features the same high-quality 12in XGA resolution screen and a host of extra features. The most important is the use of a G4 processor, in line with the rest of Apple's professional line-up. This model uses an 867MHz version, which may not sound fast compared to the latest from Intel and AMD but as with all Macs, bear in mind that Motorola processors use a much more efficient design so perform about as fast as a Pentium 4 with twice the clock speed. The G4 is optimised for vector processing, speeding up graphics, design and video applications, as well as Mac OS X itself.

Having heeded the criticisms about the previous Powerbook's titanium casing, which made it light but a little flimsy and fragile, Apple has opted for aluminium on the new chassis. This makes it more durable and robust, yet keeps the weight down. Another bonus is that it looks gorgeous. Opening up the Powerbook, using Apple's push-button release mechanism rather than a catch, reveals a redesigned keyboard with metallic keys, which looks good and is also a pleasure to type on.

The screen is supported by a similar hinge to the Ibook, so that it sits behind the lower half of the computer when opened. This design has numerous advantages; it allows the overall case design to be more compact when closed. The hinge also uses a contour-balance system so that the screen can easily be tilted backwards and forwards with the touch of a finger. The third advantage is an innovation peculiar to the 12in model: the stereo speakers are mounted at the back of the notebook, and their sound reflects off the screen surround towards you, providing an impressively vibrant and rich sound – probably the best we've heard on a notebook. There is also a third speaker below the keyboard, all of which means you don't have to use headphones when watching a DVD or playing a game.

The redesigned keyboard is a pleasure to type on

There's a Firewire and two USB ports around the sides, but sadly these are version 1.1.Unlike on previous models, the keyboard is fixed and can't be removed so you can access expansion slots. Instead, you can install additional memory by removing a small plate on the underside, while access to the wireless networking card slot is via the battery panel. The Powerbook is equipped to take Apple's new wireless card, Airport Extreme, which uses the 802.11g standard and is fully compatible with existing 802.11b networks. The wireless card is a £79 optional extra.

Mark Heaton

DETAILS

PRICE £1,399 (£1,190.63 ex VAT)
CONTACT Apple 0800 039 1010 www.apple.com/uk
SPECIFICATIONS
867MHz PowerPC G4 • 256MB DDR SD-Ram • 40GB UltraATA100 hard disk • Slot-loading combo DVD-Rom/CD-RW drive • Nvidia Geforce4 420 Go with 32MB of DDR SD-Ram • 12in TFT display, 1,024 x 768 resolution • 56K V.92 modem • 10/100 Base-T Ethernet • Bluetooth • Airport Extreme (802.11g) card slot • 2x USB ports, Firewire port • Mac OS X 10.2 • Apple software • 277 x 219 x 30mm (w x d x h) • 2.1kg • 1yr limited warranty
PROS Very small, light, portable; stylish; full-featured for the price
CONS Lacks built-in wireless networking and USB2
VERDICT
A powerful and relatively full-featured system in a small, light and attractive case

FEATURES	★★★★☆
VALUE FOR MONEY	★★★★★
OVERALL	★★★★☆

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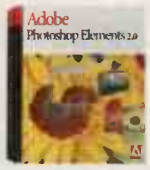

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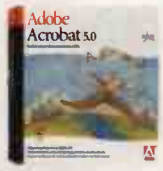

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DESKTOP REPLACEMENT NOTEBOOK

AJP 8640

With its 2.53GHz P4, this is well-featured and comes in at a reasonable price

Built around a 2.53GHz desktop P4 and 512MB of DDR memory, this average-looking desktop replacement notebook is no slouch. While 190 overall in Sysmark 2002 isn't the fastest we've seen, it's more than speedy enough for today's applications.

The 8640 comes with a 40GB hard disk, but we'd have liked to have seen more for £1,500. There's also a DVD/CD-RW drive and an external floppy.

Round the back, there are four USB2 ports, a mini-Firewire and S/PDIF. While these ports are becoming commonplace, it's good to see a healthy variety. Serial, parallel and VGA, as well as PS/2 and 10/100 Ethernet port, complete the rear, and there's a single PC Card slot and 56K modem on the left.

The right-hand side houses the CD-RW drive and infra-red port, and there's a volume control, headphone out and mic in minijack ports at the front.

Two nifty additions are the smart card reader slot, on the right, and integrated wireless Lan module. The smart card reader can take Memory Stick, Multimedia Card (MMC), Secure Digital (SD) and Compact Flash (CF), and the wireless module is fully 802.11b compliant.

Graphics power comes from Nvidia's Geforce4 Go chip. This 64MB version gave us 4,896 in 3Dmark – good enough for most games, and on a par with many desktops, but it's no graphics powerhouse. The screen is absolutely magnificent though; every one of its 15.1 inches is crystal clear and really shone in our graphics tests.

The large keyboard and comfortable touchpad makes office work a doddle, so despite the disappointing battery life we were pretty impressed.

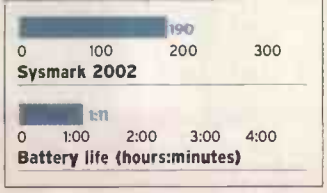
Mark Walsh

DETAILS

PRICE £1,408.83 (£1,199 ex VAT)
CONTACT AJP www.ajp.co.uk
SPECIFICATIONS
2.53GHz Pentium 4 • 512MB of DDR memory • 40GB hard disk • DVD/CD-RW • Modem 10/100 Ethernet • Geforce4 Go • 15.1in TFT • Wireless Lan • Smart card reader • 332 x 285 x 39mm (w x d x h) • 3.4kg
PROS Fast; well featured
CONS Small hard disk
VERDICT
Despite the small hard disk, this is a very well-featured notebook at a respectable price

PERFORMANCE	★★★★☆
FEATURES	★★★★☆
VALUE FOR MONEY	★★★☆☆
OVERALL	★★★★☆

PERFORMANCE



BUDGET LAPTOP

Fujitsu-Siemens C1020

Considering the price and the specs list, this laptop is worth considering

A price of £764 is very cheap for a notebook, and, despite its great value, it's clear from the spec where the savings have been made; the 1.5GHz Celeron is the first clue. However, it still gives us a decent Sysmark result of 124. In spite of this, though, it feels a lot slower than the majority of notebooks that have crossed our paths recently.

A 16MB portion of the total 256MB of system memory has been taken for the S3 Pro Savage8 graphics, though up to 32MB can be supported. The notebook produced a meagre 506 in 3Dmark 2001 so it's not up to 3D gaming.

There are plenty of interesting features, though, if you can forgive performance foibles. We were impressed by the CD-RW/DVD combo drive on the right-hand side, and by the hard disk size. The mini Firewire and S/PDIF ports at the back were a fantastic discovery, and the two USBs, serial, parallel, PS/2 and VGA complement them very well.

The C1020 also has modem, Ethernet, headphone and mic in ports, and two PC Card slots. We expected far less from this budget offering.

The keyboard is good to type on, as the Qwerty keys are large and correctly positioned. However, pretty much all other keys have been squashed in around the sides, so are very difficult to master. At least they're all in the right place. Battery life came in at a decent hour and a half.

The 14in screen is rather lifeless, but does the job, which pretty much sums up the notebook as a whole. Therefore, at £764, it's definitely worth consideration if you're in need of a spare notebook.

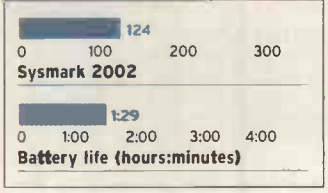
Mark Walsh

DETAILS

PRICE £762.58 (£649 ex VAT)
CONTACT Fujitsu-Siemens www.fujitsu-siemens.com
SPECIFICATIONS
1.5GHz Celeron processor • 256MB of DDR memory • 20GB hard disk • S3 Pro Savage8 graphics • 14.1in TFT screen • DVD/CD-RW drive • Windows XP Professional • 319 x 260 x 34mm (w x d x h) • 2.9kg
PROS Ports; price
CONS Slow; screen
VERDICT
It's not fast, but the C1020 is well featured, particularly considering the price

PERFORMANCE	★★☆☆☆
FEATURES	★★★★☆
VALUE FOR MONEY	★★★★½
OVERALL	★★☆☆☆

PERFORMANCE



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WIDESCREEN NOTEBOOK

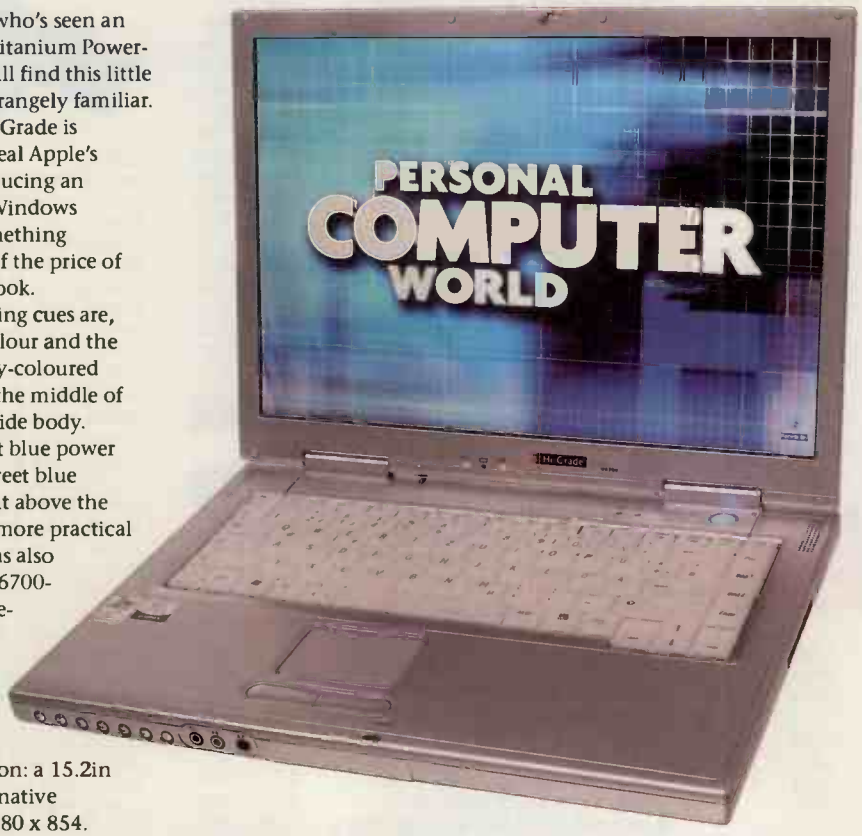
Hi-Grade Notino W6700-2000

EXCLUSIVE

This 2GHz notebook not only looks stylish, but it's also got what it takes under the bonnet with great specs and a wide-aspect screen

Anyone who's seen an Apple Titanium Powerbook will find this little number looks strangely familiar. It seems that Hi-Grade is attempting to steal Apple's thunder by producing an equally stylish Windows notebook at something approaching half the price of a real Ti Powerbook.

The main styling cues are, of course, the colour and the translucent ivory-coloured keyboard set in the middle of the machine's wide body. The luminescent blue power button and discreet blue pinpoint LEDs sit above the keyboard. On a more practical note, Higrade has also bestowed the W6700-2000 with a wide-aspect screen identical to that of a Ti Powerbook's, at least in terms of size and resolution: a 15.2in diagonal with a native resolution of 1,280 x 854. Finally, along the front edge a slinky row of mirror-silver buttons – and accompanying blue LED – will let you play audio CDs when the machine itself is switched off.



Looking a little closer it's clear that the low price of the W6700 notebook hasn't been achieved without a few design compromises. First off is the fact that while a Ti Powerbook's case is made of titanium, the Higrade has to make do with lowly silver-effect plastic, thus the illusion is shattered as soon as you touch it. We also get the feeling that the screen has been designed and sourced separately from the main body of the machine, since its three integrated power status indicators are plain, dull green LEDs, which does rather spoil the effect of those classy high-intensity blue ones. It's not all plastic though: the internal chassis is magnesium-reinforced and feels relatively sturdy, and doesn't creak ominously under its own weight when you pick the machine up with one hand.

The finer points of design aside, there's no question that the W6700 has got what it takes where some people would say it really counts: under the bonnet there lurks a 2GHz Pentium 4-M, 256MB of DDR SD-Ram and a graphics system equal to anything that Apple has to offer. The Nvidia Geforce 440 Go chipset has a comfortable 64MB of dedicated memory and achieved 5,232 in 3Dmark. Our review unit had a 40GB hard drive, but the shipping model will sport 30GB. The full range of connectors is present, including two USB2 ports, Firewire, network, modem, parallel port and a PC Card slot.

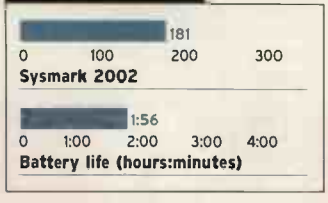
We haven't seen a bad notebook screen in our labs for quite some time and the Hi-Grade fortunately bucks no trends in that department, with a good viewing angle, brightness and contrast. The 1,280 x 854 resolution is a real benefit in terms of the increased working area over standard 1,024 x 768 screens but without Windows text and icons becoming too small. And, of course, the wide aspect ratio is a better option for watching DVDs on the integrated combo drive. The battery lasted nearly two hours in our tests.

The size and weight of the W6700, with its large 352 x 260mm footprint but moderate 2.7kg weight means it lies in a bit of no-man's land between a truly portable mobile and a full desktop replacement machine. But the full-size, full-travel keyboard with its solid feel and the big high-resolution screen means using it as your main or sole PC is certainly a viable proposition. The unit ran for a respectable one hour, 56 minutes in our battery life test, so using it on the road isn't out of the question either. And it's certainly fast enough, with a Sysmark score of 181, although we've seen notebooks topping 200 of late.

Any 'real' Ti Powerbook user would certainly turn their nose up at the W6700, and you might even get the odd sniffy look from Sony Vaio users, but the machine is at least a departure from the dull design of many mid-price notebooks. In all honesty the posh look doesn't quite come off, but beauty is only skin deep and there's no doubt that the W6700 is a good value, capable notebook on its own terms.

David Fearon

PERFORMANCE



DETAILS

PRICE £1,291.23 (£1,099 ex VAT)
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0800 074 0403 **www.higrade.com**
SPECIFICATIONS
2GHz Mobile Pentium 4 • 256MB DDR memory • 30GB hard disk • DVD/CD-RW combo drive • 64MB Nvidia Geforce 440 Go graphics • 15.2in wide-aspect WXGA+ TFT screen • Windows XP Home • MS Works 7 • 2.7kg • 352 x 260 x 31mm (w x d x h), 2yr international C&R warranty
PROS Looks; price; performance
CONS Plastic casing is a shame
VERDICT
The W6700 looks very swish, at least from a distance, and puts its money where its mouth is with a wide-aspect screen and good specs. It's hardly likely to be a true Apple-killer though

PERFORMANCE	★★★★½
FEATURES	★★★★★
VALUE FOR MONEY	★★★★½
OVERALL	★★★★½

SUBNOTEBOOK

EXCLUSIVE

Sony PCG-V505AP

Superb, stylish and fully-featured, the latest corporate-orientated Vaio from Sony is out to impress

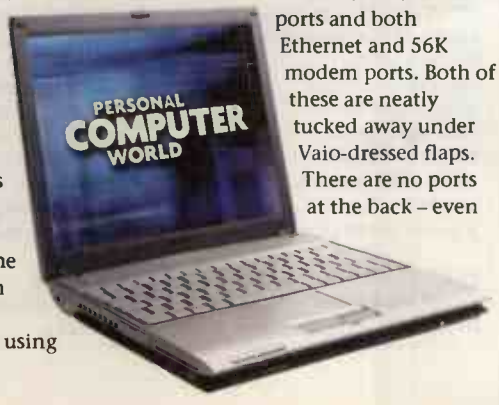
Sony's latest, corporate-orientated subnotebook crams all the conveniences of a desktop replacement into a tiny, beautiful bundle. At 2kg, and wrapped in Sony's usual silver and purple combination, the styling remains good looking, though the pretentious among you may find it a little too 1990s.

It comes with a Mobile 2GHz Pentium 4 processor and 512MB of DDR memory, though our review unit was supplied with 256MB. Either way, it's a very fast performer, achieving a score of 186 in Sysmark, the fastest we've seen in either the sub- or ultra-portable notebook categories. A 40GB hard disk is plenty for its intended use.

A Mobility Radeon 7500 graphics chip has been used, with 16MB of its own memory. It's not a bad graphics chip as such, just quite dated, so 3D performance really isn't that impressive, though a 3Dmark score of 1,522 shows it could run some games. However, this is a corporate desktop so gaming isn't the priority. More importantly the chip's 2D output is fantastic.

As ever, Sony's TFT screen is superb. Measuring 12.1in diagonal and with a 1,024 x 768 native resolution, every pixel is as near to perfect as we could ask for; only IBM can top it when it comes to text clarity, and watching a DVD through it is a pure delight.

The CD-RW/DVD combo drive on the right-hand edge is an impressive inclusion in something of this size. It was also good to have the drive pop open the instant you touch the eject button (provided it's not using the disc at the time), as many notebooks can take a few seconds to release the disc. Above this is a Magic Gate compatible Memory Stick port. Magic Gate means it is capable of storing audio as well as data.



As of this year, any Sony product released will be compatible with the new Memory Stick Pro and Duo formats. The former is the high-capacity version of the format – the original was only capable of up to 128MB. This can potentially stretch up to 32GB, though the current maximum is 1GB. Memory Stick Duo is half the size of a traditional stick, yet with the same capacity.

Other ports on the right are the first of two USB2 ports and both Ethernet and 56K modem ports. Both of these are neatly tucked away under Vaio-dressed flaps. There are no ports at the back – even the power cable (which incidentally glows yellow when plugged in) is on one of the sides. This is because the screen folds around the main body at the back, so there's no room.

The left-hand side takes the Kensington lock, VGA output (also tucked away under a little silver/grey flap), the other USB2 port, headphone, mic in, mini Firewire and a single PC Card. The release button for the latter was a little hard to unhook as it is rather small and buried deep within the chassis.

We didn't like the position of the power button at the front right edge, as it means the notebook could be easily turned on by accident, as could the wireless Lan switch that is similarly placed on the left side.

Nevertheless, wireless Lan, in this instance the 820.11b variant, is not something to be sniffed at, as it's rarely found built into subnotebooks. The V505 uses Windows XP Professional and, besides the wealth of Sony's own software, comes with Photoshop Elements.

The keyboard is surprisingly usable considering its size. The Qwerty keys are comfortable to type on (we made very few errors even right from the start), but keys such as Shift and Caps lock are squished to the sides.

Battery life is decent at one hour, 49 minutes and the battery is removable, with spare ones available from Sony's website.

While our current Best Buy in the portable notebook category, Sony's PCG-SRX41P ultraportable (see page 153) manages a whacking three and a half hours in battery life, it lacks the performance and features of this little marvel.

The V505 has far more features than you would expect of a notebook this size, but at £1,800, you are definitely paying a premium for its size and style.

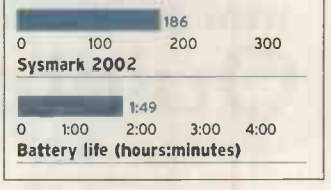
Mark Walsh

DETAILS

PRICE £1,799 (1,534 ex VAT)
CONTACT Sony
www.sony-europe.com
SPECIFICATIONS
2GHz Pentium 4-M • 512MB DDR memory • 40GB hard disk • CD-RW/DVD combo drive • ATI Radeon 7500 graphics • 12.1 TFT LCD screen • Windows XP Professional • Adobe Photoshop Elements • 274x 241 x 36mm (w x d x h) • 2kg
PROS Fast; compact
CONS Expensive
VERDICT
Stupendously stylish and chock full of features, this latest Vaio is a superb corporate machine – if only it was cheaper

PERFORMANCE	★★★★☆
FEATURES	★★★★★
VALUE FOR MONEY	★★★☆☆
OVERALL	★★★★☆

PERFORMANCE



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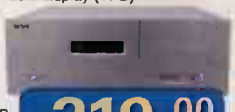

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PC CASES

Antec & Mitron chassis

Two of the latest cases to hit the market

PC cases are often ugly, and noisy with it. These two cases, however, buck the trend, as they look good, and one is the quietest we've ever seen.

The **Antec Performance Plus660AMG** (pictured left) is a well-made case featuring a quiet power supply and a lockable tool-free side panel. It features an Antec Truepower power supply which uses Antec's own Low Noise Technology. This thermally controls the variable-speed PSU fans, running them at the lowest appropriate speed. Fan-only power connectors allow the PSU to control the case fans too.

There are tool-free drive mounts for all the bays and you can remove the drive cage by undoing a latch, which makes hard drive installation easier. The two front and single rear fan housings are of the clip-in type, while a fourth fan is built into the side panel. Under a flip-up lid on the front fascia are two USB and a Firewire port. On the downside, the motherboard tray isn't the slide-out type.

The **Mitron Prism Perspex** (pictured right) midi tower case comes flatpacked ready for self-assembly. Construction is straightforward, although the instructions could be clearer. There are holes pre-cut for four 80mm case fans, two in one side, one in the top and one in the rear panels.

The case is held together by gold-coloured screws, and the motherboard, hard drive and floppy drive stand-offs are gold too, as are the studs that fix the cover plates for the four 5.25in and two 3.5in drive bays that have external access. There are another five internal 3.5in bays. Panel quality is excellent; all the edges are smooth and polished – put simply, it looks fantastic.

Simon Crisp

DETAILS

ANTEC PERFORMANCE PLUS660AMG
PRICE £101.99 (£86.80 ex VAT)
CONTACT Overclock.co.uk
020 8574 5592
www.overclock.co.uk
SPECIFICATIONS
206 x 473 x 434mm (w x h x d) • 10.4kg
PROS Build quality; low noise
CONS Fixed motherboard tray
VERDICT
A good-quality case

FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★

DETAILS

MITRON PRISM MIDI TOWER
PRICE £128.08 (£109 ex VAT)
CONTACT Overclock.co.uk
020 8574 5592
www.overclock.co.uk
SPECIFICATIONS
220 x 472 x 442mm (w x h x d) • 7.2kg
PROS Panels; easy to build
CONS No EM shielding; expensive
VERDICT
The best Perspex case currently available in the UK

FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★

6MEGAPIXEL CAMERA

Fujifilm Finepix S602 Pro

Sports photographers will appreciate the speed of operation and there are a load of extras thrown in too

Originally released last year as the S602 Zoom, Fuji has revamped the basic model with 'pro' features and thrown in some extras. There's now a PC socket for connection to a studio flash, and a cable release thread has appeared on the shutter release for shake-free tripod shots. The primary extra is a bundled 340MB IBM Microdrive, which will let you store around 150 pictures at full resolution and minimum jpeg compression. The Pro now uses AA batteries, and comes with four high-capacity 1,800mAh nickel-metal hydride AAs and a slow charger.

The camera still uses the same third-generation SuperCCD, delivering 6megapixel pictures from a 3megapixel sensor. The honeycomb structure of Fujifilm's SuperCCD means that it requires twice as many pixels for interpolation in order to make sense of the data that has been captured. However, it's still not capturing as much real detail as the conventional 5megapixel CCDs now sported by the prosumer competition, notably Nikon and Sony.

One great feature of the S602 is its ability to capture full-frame VGA (640 x 480 pixels) video, the only limitation on length being the amount of free storage. In the case of an empty 340MB Microdrive, that's about five minutes at VGA or 10 at QVGA (quarter VGA) resolution. Bear in mind that the files are labelled as avis but are in fact compressed with an mjpeg (motion jpeg) – not mpeg – video codec. This needs a fast PC for smooth playback at full VGA resolution.

Conventional film photographers will feel at home using the rotary mode switch at the top of the body, which allows you to choose from fully automatic, aperture or shutter-priority and program modes. An additional digital rotary thumbwheel allows you to adjust aperture or shutter speed quickly. The bright 1.8in LCD screen is augmented by an excellent electronic viewfinder with high resolution and dioptre.

In keeping with its high-end pretensions, most of the common functions amateur photographers will need – macro mode, auto/manual focus selection, flash mode and exposure compensation – are served by dedicated buttons on the body of the unit. Having said that, metering modes, as well as other less-used settings such as ISO sensitivity must be selected by pressing the Shift button on the left of the body while simultaneously pressing another button and rotating the thumbwheel, which isn't quick or intuitive. When taking photos, however, the Fuji feels very fast, with only around a second's delay between taking a shot and the camera being ready for the next one.

Round the back is a bright screen and excellent electronic viewfinder

If you're looking for a digicam to take close-ups, the S602 offers a two-stage macro mode, macro and 'supermacro', and the latter will focus down to an impressive 1cm and measures up well to Nikon's legendary macro facilities, albeit with a touch of barrel distortion. A second interesting feature is the ability to increase the ISO sensitivity up to 800 or 1,600. This comes at a cost, however, since it's achieved by coupling neighbouring pixels on the CCD and thus maximum image resolution in these modes is reduced to 1,280 x 960; a meagre 1.2megapixels.

The only real disappointment with this camera is image quality. It's great as far as it goes, but the amount of detail it can capture, despite the boasts of 6megapixel output, is not in the same league as any of the decent 4 or especially 5megapixel prosumer models.

With its 800 and 1,600 ISO sensitivity modes and short inter-shot delay, the S602 will appeal to sports photographers concerned more with capturing the moment than with out-and-out quality. For most others, the lure of the increased detail and sharpness of the true 5megapixel competition makes it difficult to recommend, even with the extras thrown in. It's a well thought-out camera serious amateurs will find enjoyable to use, but the competition's image capturing technology – and even Fuji's own, now that the fourth-generation SuperCCD has been announced – tends to outweigh those considerations.

David Fearon

DETAILS

PRICE £800 (£680 ex VAT)
CONTACT Fujifilm 020 7586 1477 www.fujifilm.co.uk
SPECIFICATIONS
2,832 x 2,128 max resolution • 6x optical zoom • 35-210mm focal length (35mm equivalent) • f2.8 max lens aperture • Normal focus range 90cm-Infinity • Supermacro focus range 1-20cm • Flash modes: auto, off, redeye • 1.8in LCD screen
PROS Fast; easy handling; excellent macro performance
CONS Image quality; resolution
VERDICT
The Microdrive makes this a tempting proposition, but what it really needs is a higher-resolution SuperCCD

PERFORMANCE	★★★★☆
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★☆

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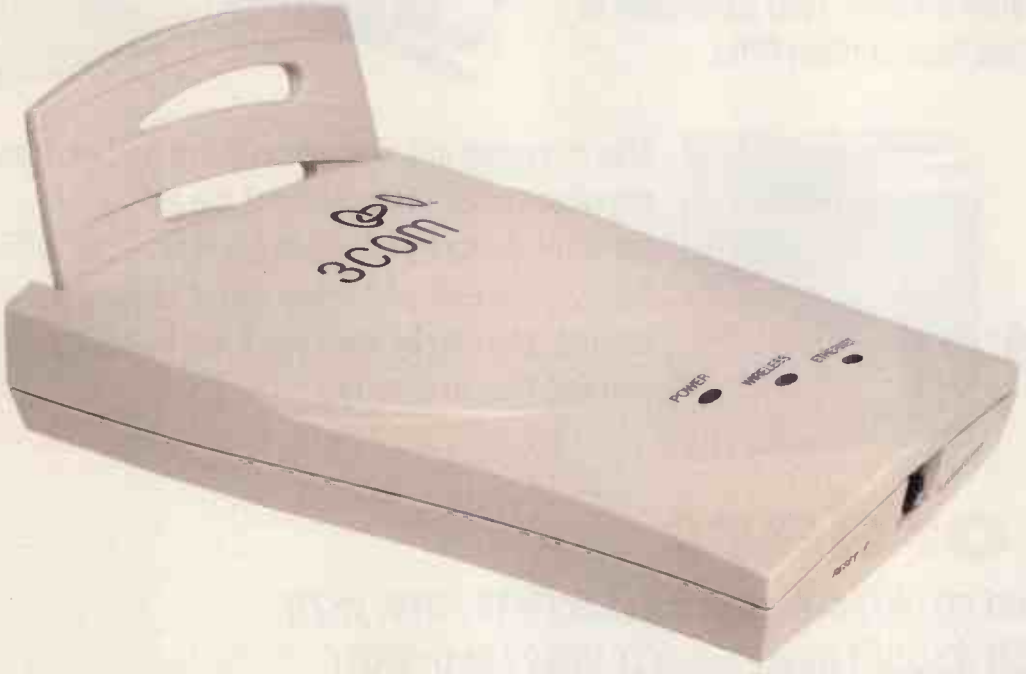
>> Share your Internet connection
We tell you how – see page 263

WIRELESS NETWORKING

Round-up of wireless devices

If you want to get connected without dozens of cables littering your floors, we've tested 12 products that will achieve your aims



3com's Access Point 6000 is fully Wifi certified and offers decent transfer speeds

Wireless technologies are revolutionising the way we connect our devices and access services. Wireless networking allows companies to easily share resources throughout buildings with a minimum of disruption. It can connect two PCs on opposite sides of your home without drilling holes or snaking wires around. It can even deliver high-speed Internet access through the air to portables in public places.

Today there are a number of wireless technologies designed for different jobs. The most well known are Bluetooth and 802.11. While Bluetooth can be used for networking, it's ultimately designed to make temporary, short-range connections between personal devices such as phones and PDAs or notebooks. The 802.11 family is more appropriate for wireless networking and these are the products we've tested over the following pages.

The reason 802.11 is so good at networking is because it's simply a wireless version of Ethernet, and can perform the same tasks in the same way as a traditional cabled network. It does, however, come in several flavours, each identified by a small letter tagged on the end.

The most common is 802.11b, which operates at a frequency of 2.4GHz and delivers maximum speeds of 11Mbits/sec. Next up is 802.11a, which operates at 5GHz and boasts speeds up to 54Mbits/sec, but over a shorter range. Possibly offering the best of both worlds is the forthcoming 802.11g standard, which boasts 54Mbits/sec and long ranges, but on a 2.4GHz frequency which should be backwards-compatible with 802.11b.

In theory, 802.11b products from different manufacturers should work together, but look for the Wifi badge, which means the kit has been certified for interoperability with other Wifi products. By the time you read this, the Wifi Alliance should have begun certifying 802.11a products, and it intends to test 802.11g once the standard is finalised – see www.wi-fi.org.

Over the following pages we've tested no fewer than 12 wireless networking products, including 802.11b, 802.11a and a first look at 802.11g. We tried every combination for compatibility and ran speed tests by copying a 110MB folder containing 68 digital images between them. To measure the impact of range, we performed at each test at a distance of 4m through a thin wall, and at 20m through a thicker partition.

3Com Access Point 6000

3Com's Access Point 6000 is a fairly large and plain-looking 802.11b wireless device. It's fully Wifi certified and, unlike the stick antennas of the other devices in this round-up, features a single wide, flat adjustable antenna.

Realising most wireless access points are mounted high on a wall, 3Com has cleverly kept wiring to a minimum by delivering both data and power along a single normal Ethernet cable. This cable connects to the AC power brick, which has a second Ethernet port for linking to your network. 3Com supplies brackets for ceiling mounting.

A utility for Windows 95B upwards identifies the access point, then launches a web-based configuration interface that's clear and easy to set up. As you'd expect from a higher-end access point, there are many sophisticated features such as searching for a clear channel and delivering excellent security, along with the usual settings including 128bit WEP (Wireless Encryption Protocol).

In our wireless tests, the Access Point 6000 came third out of six, taking an average time of four minutes 22 seconds to transfer our 110MB folder to an adjacent room. Impressively at a distance of 20m where most other access points halved their speeds, the 3Com delivered the files in precisely the same time as when we were standing almost next to it. The coverage didn't appear to extend much further though.

This access point delivers the kind of serious performance and features you'd expect from 3Com, and the mounting and wiring options are great. It's ideal for any sized business, but most home users could live with something cheaper.

3Com 11Mbps Office Connect PC Card

As its name suggests, this is an 802.11b PC Card adaptor. It's Wifi certified and features a pop-out antenna. Drivers are supplied for Windows 98SE upwards.

In our wireless tests, the 3Com card came third, taking an average of four minutes 14 seconds to receive our 110MB folder from an adjacent room. Its slightly higher price and highly respected badge will see it adopted mostly by business users who won't be disappointed with its performance.

3Com's 11Mbps Office Connect PC Card's performance won't disappoint

Belkin's wireless desktop network card communicated with all six 802.11b access points

Belkin F5D6130u

Belkin's F5D6130u Wireless Access Point is a compact 802.11b device with a pair of adjustable antennas. The supplied Access Point Manager utility works with Windows 95 upwards and is easy to configure.

The F5D6130u is not Wifi certified, but communicated with our four 802.11b adaptors on test, and came fourth out of six in the speed tests with an average time of four minutes 32 seconds to transfer the 110MB folder to an adjacent room. In line with most of the other 802.11b access points, the speed halved at our 20m location.

If you're after a budget access point for use with 802.11b adaptors, the F5D6130u will do the trick, but below average speed and lack of Wifi certification will rule it out for others.

Belkin F5D6001u

The F5D6001u Wireless Desktop Network Card is an 802.11b PCI card. Drivers and the configuration utility are supplied for Windows 98 upwards.

Neither Belkin's card nor its access point had gone through Wifi certification, but this wasn't an issue in our tests as the card communicated with all six 802.11b access points. Taking just four minutes and four seconds to receive our 110MB test folder, the Belkin card was second fastest of our five 802.11b adaptors.

Lack of certification will concern some users, but being fitted in a desktop minimises the number of access points with which it needs compatibility. That said, Netgear's MA311 PCI adaptor has fractionally faster speeds and a lower price.

Buffalo G54 Router

Buffalo's Airstation G54 Wireless Broadband Router has a four-port 10/100 Ethernet switch and an 802.11g wireless access point. It's designed to share a broadband connection from an Ethernet cable or ADSL modem, although can also be used as a four-port switch with wireless facilities.

A supplied utility for Windows 95 upwards identifies the Airstation, then launches a web-based configuration process, including separate sections for Cable or ADSL connections.

128bit WEP is supported, along with an intrusion detector which claims to protect against various external scans.

The Airstation G54 worked with all four of our 802.11b adaptors and extracted the best performance from each, taking an average of just three minutes 19 seconds to transfer 110MB from an adjacent room.

Switching to Buffalo's G54 802.11g card in our notebook, Windows XP reported a 54Mbits/sec connection, although in practice this only reduced the transfer time from the adjacent room to one minute, 38 seconds. This may only be around twice as fast as its 802.11b performance, but virtually equalled our 802.11a results.

More impressively though, the 802.11g combination performed the best at long range, taking just three minutes 35 seconds to transfer the 110MB folder at 20m. The coverage area was also slightly larger than we experienced with 802.11b, and this was using the internal antenna; a plug for an external antenna is also offered.

As such, 802.11g really seems to deliver the goods, although its performance is significantly reduced in the presence of even one other 802.11b device – our folder transfer dropped from one minute 38 seconds to three minutes 16 seconds when a single 802.11b device was also connected to the access point.

At the time of writing, 802.11g was still a proposed draft standard, but we were impressed by its performance and backwards compatibility. To enjoy the maximum speed benefits, though, you shouldn't have any 802.11b devices connected, which eliminates its advantage for those looking to upgrade an 802.11b installation.

If you're building a new wireless network and don't have any nearby 802.11b devices, 802.11g makes sense, although our experience so far is limited to two products from one manufacturer. If you intend to use 802.11g products from multiple suppliers, it's worth waiting for the specification to be finalised around May.

Buffalo's G54 performed well with existing 802.11b adaptors and the company promises a firmware update or replacement should it not fully comply with the final 802.11g specification. It's also cheaper than the 802.11b Linksys router reviewed in this round-up.

Buffalo G54 PC Card

The Airstation G54 PC Card is an 802.11g-compliant card with a fixed antenna section that protrudes 25mm from the slot. Drivers are supplied for Windows 98 upwards, but to enjoy maximum performance, you'll need a Cardbus-compliant slot on your notebook.

The card worked fine with all the 802.11b access points, taking an average of four minutes 19 seconds to receive our 110MB folder from an

Belkin's wireless access point offers below average speed at a low price

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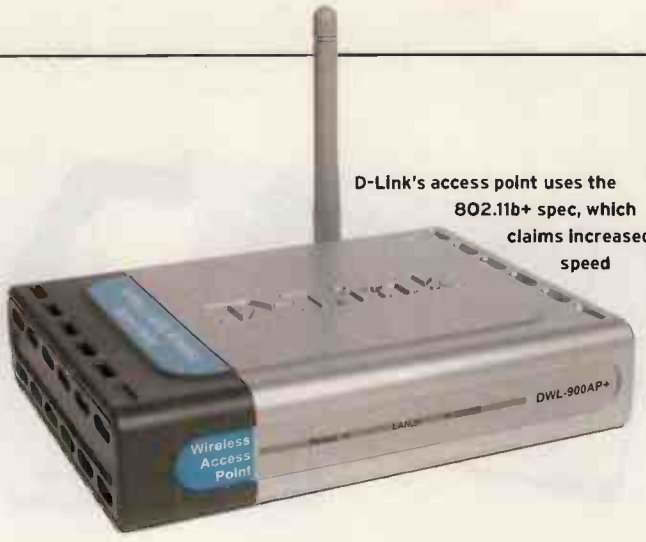
Buffalo's Airstation G54 router delivers the goods

Buffalo's G54 PC Card offered impressive speeds when connected to Buffalo's access point



D-Link's access point uses the 802.11b+ spec, which claims increased speed

adjacent room. Impressively when connected to Buffalo's Airstation G54 access point, it virtually matched 802.11a speeds by taking just one minute 38 seconds.

As our only 802.11g adaptor it's impossible to fully evaluate, but in theory it provides the flexibility for someone who wants to use both new 802.11g and existing 802.11b networks. If you can confirm that it's compatible with your access points, then the G54 card represents good value for early adopters, although most users will want to wait for the 802.11g draft spec to be finalised.

D-Link DWL-900AP+

D-Link's DWL-900AP+ is a Wifi-certified 802.11b access point with a difference. It uses the enhanced 802.11b+ spec, which claims to double the throughput to 22Mbits/sec when used with an 802.11b+ adaptor; it also claims to deliver up to 20 per cent faster performance with standard 802.11b adaptors. It's easy to set up with a web-based interface and encryption up to 256bit (for 802.11b+).

Delivering our 110MB test folder from an adjacent room in an average of just three minutes, 30 seconds was pretty quick, placing it second fastest of the 802.11b access points with our five compatible adaptors.

We tested the 802.11b+ facilities with D-Link's DWL-520+ PCI card. Using the standard settings, it reported a connection of 11Mbits/sec and scored three minutes, 13 seconds. Once the card's utility was configured to operate at 22Mbits/sec, Windows reported the faster rate, and the time reduced to two minutes, 21 seconds. Connecting other 802.11b devices eliminated the performance benefit, however.

While the enhanced 22Mbits/sec mode did increase speeds, it's overshadowed by 802.11g, which is imminent and supported by just about the entire wireless industry. To be fair, the DWL-900AP+ delivered excellent performance from plain 802.11b adaptors, but Buffalo's G54 comes in fractionally cheaper with a four-port router and 802.11g support.

Linksys BEFW11S4

The BEFW11S4 Wireless Broadband Router has a four-port 10/100 switch and an 802.11b wireless access point. It can share a broadband connection from an Ethernet cable or ADSL modem, although it can also be used as a four-port switch with wireless facilities.

Configuration is with a clean and simple web-based interface that offers the usual wireless options including 128bit WEP encryption. It's quick and easy to get up and running.

Our test model didn't have Wifi certification, but again worked with all five 802.11b-compatible adaptors. Taking an average of five minutes to transfer our 110MB folder from an adjacent room, it was the slowest of the access points.

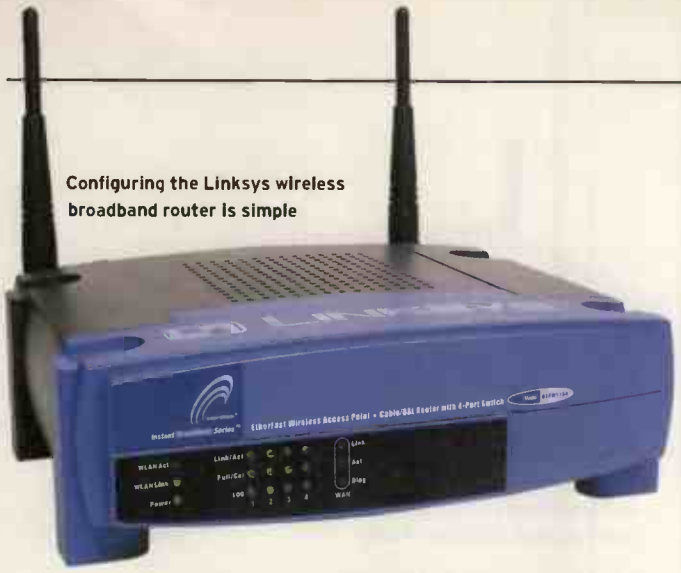
The BEFW11S4 is a good router, but Buffalo's G54 offers faster average 802.11b speeds and 802.11g compatibility.

Linksys WUSB11

The Linksys WUSB11 Wireless USB Adaptor is a Wifi-certified

Details

MANUFACTURER	3COM	3COM	BELKIN	BELKIN	BUFFALO
MODEL	ACCESS POINT 6000	11MBPS OFFICE CONNECT	F5D6130U ACCESS POINT	F5D6001U NETWORK CARD	AIRSTATION G54 BROADBAND ROUTER
Price inc VAT (ex VAT)	£351.27 (£298.95)	£69.45 (£59.11)	£99.99 (£85.10)	£59.99 (£51.06)	£123.36 (£104.99)
Contact	01442 438 000	01442 438 000	0800 2235 5460	0800 2235 5460	01753 555 015
URL	www.3com.com	www.3com.com	www.belkin.co.uk	www.belkin.co.uk	www.buffalo-technology.com
OS support	Windows 95B onwards	Windows 98SE onwards	Windows 95/OSR2 onwards	Windows 95/OSR2 onwards	Windows 95/OSR2 onwards
Wireless standards	802.11b	802.11b	802.11b	802.11b	802.11b, 802.11g
Wifi certification	✔	✔	✗	✗	✔ (for 802.11b)
WEP security support	64bit, 128bit	64bit, 128bit	64bit, 128bit	64bit, 128bit	64bit, 128bit
Ports	One 10Mbit RJ45	N/A	One 10Mbit RJ45	N/A	Four 10/100 RJ45, one 10Mbit Wan, external antenna
Size (wxdxh)	144 x 253 x 41mm	54 x 105 x 5mm (antenna ext'd)	Not available	114 x 54 x 10mm	155 x 171 x 76mm
Warranty	Lifetime	Lifetime	Lifetime	Lifetime	2yrs
Verdict	With excellent performance, facilities and design, this is ideal for any business	An excellent and affordable choice, with high reliability and performance	Good value, but poor performance and lack of Wifi certification could rule it out	Performed well, but lack of Wifi certification will bother some	Excellent value at £123.36 - throw in 802.11g support and you've got a bargain
SCORES					
Performance	★★★★☆	★★★☆☆	★★☆☆☆	★★★★☆	★★★★★
Features	★★★☆☆	★★★☆☆	★★☆☆☆	★★☆☆☆	★★★★★
Value for money	★★★☆☆	★★★☆☆	★★☆☆☆	★★★★☆	★★★★★
Overall	★★★★☆	★★★☆☆	★★☆☆☆	★★★☆☆	★★★★★



Configuring the Linksys wireless broadband router is simple

The Linksys wireless USB adaptor can be fitted to notebooks without opening the case

802.11b USB 1.1 adaptor, which can be fitted to notebooks or desktops without opening the case. A USB cable allows the compact device to be positioned on a desktop. Drivers are supplied for Windows 98SE up.

The WUSB11 talked to all our 802.11b-compatible access points, but it was the slowest of the adaptors taking an average of four minutes, 45 seconds to receive our 110MB folder from an adjacent room.

It may have taken almost a minute longer to perform our tests on average and cost around £20 more than a PCI adaptor, but the WUSB11 shows how easy it is to equip a desktop with Wifi and as such is ideal for anyone who doesn't want to open their case. With a USB interface, it's also easy to reconnect it to other machines.

Netgear MA311 802.11b

The Netgear MA311 PCI Adaptor is an 802.11b PCI card with drivers and a configuration utility for Windows 98 onwards.

It didn't have the Wifi badge, but is based on a chipset with certification, and worked with all six 802.11b-compatible access points. Taking an average of just three minutes 57 seconds to receive our 110MB folder from an adjacent room, it was the fastest adaptor on test.

The absence of a Wifi badge will put some people off, but being fitted in a desktop minimises the variety of access points it will come in contact with. At £45 ex VAT, it's the cheapest desktop adaptor in this round-up, so if you can verify that it works with your other wireless equipment, the MA311 comes recommended.

Netgear DG824M

Featuring an ADSL modem, router, four-port 10/100 Ethernet switch, firewall facilities and an 802.11b wireless access point, Netgear's DG824M could fulfil most, if not all the requirements of an ADSL subscriber wanting to share a broadband connection.

As the only device here with a built-in ADSL modem, the DG824M connects directly to your phone line; an ADSL line filter is included, although you may need to buy more for your other phone points.

Like most broadband routers, the DG824M is configured using a web-based interface. Upon first logging in, the unit offers to auto-detect what kind of ADSL you're using, and ours recognised and configured the technical settings of BT's network. After this, the unit only needs your username and password to start working.

The router configuration has a number of domain-blocking and port-forwarding options, preventing access to sites, while passing services such as online gaming, video-conferencing and instant messaging.

Performance was just behind the slowest of the access points, averaging four minutes 58 minutes to transfer our 110MB folder to a nearby room. The product didn't have the Wifi badge, but was based on a certified chipset and worked fine with the other products.

As with other all-in-one products, the DG824M has both pros and cons. On the upside, there's just one box, one mains plug and one configuration to go through. On the downside,

BUFFALO AIRSTATION G54 PC CARD	D-LINK DWL-900AP+ ACCESS POINT	LINKSYS BEFW11S4 ROUTER	LINKSYS WUSB11 USB ADAPTOR	NETGEAR MA311 802.11B PCI ADAPTOR	NETGEAR DG824M ACCESS POINT	ORINOCO AP-2500 ACCESS POINT
£52.86 (£44.99)	£128.08 (£109)	£139.83 (£119)	£81.08 (£69)	£52.88 (£45)	£250.28 (£213)	£851.88 (£725)
01753 555 015	020 8731 5525	0870 041 6624	0870 041 6624	01344 397 021	01344 397 021	Proxim 01494 562 734
www.buffalo-technology.com	www.dlink.co.uk	www.linksys.com	www.linksys.com	www.netgear.co.uk	www.netgear.co.uk	www.proxim.com
Windows 98 onwards	Requires browser	Browser & Javascript	Windows 98SE onwards	Windows 98 onwards	Web browser configuration	Windows 98 onwards
802.11b, 802.11g	802.11b, 802.11b+	802.11b	802.11b	802.11b	802.11b	802.11b, 802.11a optional
✔ (for 802.11b)	✔ (for 802.11b)	Not labelled	✔	✗	✗	✔ (for 802.11b)
64bit, 128bit	64bit, 128bit, 256bit (802.11b+)	64bit, 128bit	64bit, 128bit	64bit, 128bit	64bit, 128bit	64bit, 128bit
N/A	One 10/100 RJ45	Four 10/100 RJ45, one 10Mbit Wan	N/A	N/A	Four 10/100 RJ45, one RJ11 ADSL line jack	Two PC Card slots, one 10/100 RJ45
54 x 110 x 6mm	109 x 142 x 31mm	186 x 154 x 62mm	91 x 71 x 23mm	65 x 120 x 7mm	255 x 169 x 34mm	185 x 261 x 50mm
2yrs	5yrs	2yrs	2yrs	3yrs	3years	1yr
Worked well with 802.11b access points, and supports the 802.11g specification	One of the fastest access points on the market, delivering good test results	The Linksys BEFW11S4 is a good solid product, that's also easy to set up	The WUSB11 proves how easily Wifi can be installed; USB makes sharing easy	Highly recommended, with fast 802.11b performance, and a low price	A great choice for new self-install and existing ADSL owners	A serious piece of kit at a relatively affordable price
★★★★☆	★★★★☆	★★☆☆☆	★★☆☆☆	★★★★☆	★★★★☆	★★★★★
★★★☆☆	★★★☆☆	★★★★☆	★★☆☆☆	★★☆☆☆	★★★★★	★★★★★
★★★★☆	★★★☆☆	★★★★☆	★★★☆☆	★★★★★	★★★★☆	★★★☆☆
★★★★☆	★★★★☆	★★★☆☆	★★★☆☆	★★★★★	★★★★☆	★★★★☆

Netgear's PCI adaptor was the fastest on test

Orinoco's device is the most sophisticated access point here

all your eggs are in one basket and upgrading effectively means neglecting at least one feature you've paid for.

That said, the DG824M is a triumph of integration and the only product we've tested to offer a truly complete wired and wireless solution to ADSL users. It comes highly recommended to new self-install and existing ADSL owners who want to share their broadband and build a wired and wireless network with a single tidy box.

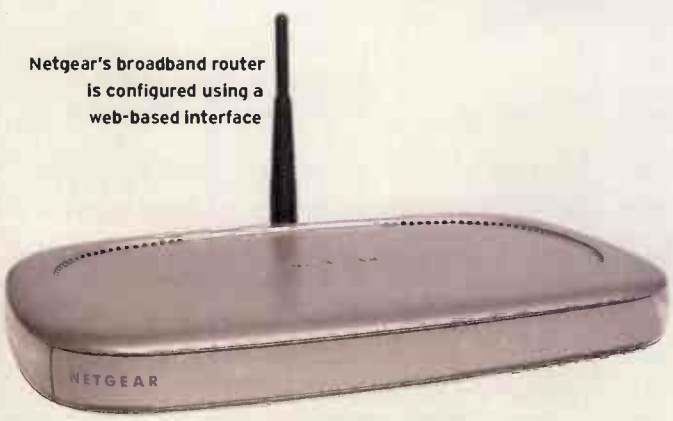
Orinoco AP-2500

Billed as being able to 'instantly create wireless public hotspots', the Orinoco AP-2500 Access Point is the most sophisticated in this round-up, and one which also involves a little assembly by the user. At its heart lies a metal box with two PC Card slots: one for the supplied 802.11b Wifi card and the other for either a second 802.11b card (supporting more users) or an 802.11a card (with higher performance) – we tested the 802.11a option.

Basic identification and configuration is offered by a utility running under Windows 98 upwards, after which you can throw yourself into a detailed web-based interface. As you'd expect from a product of this calibre, the options are vast, including a wealth of management controls and fine tuning of radios. There are a number of billing options you can activate for hotspot applications.

To test the AP-2500's 802.11a facilities we fitted our notebook with an Intel Pro/Wireless 5000 PC Card adaptor – to see the benefits you'll need a Cardbus slot. Our 110MB test folder took just one minute, 29 seconds to transfer from an adjacent room, making the Orinoco/Intel combination the fastest in this round-up, but it's only fractionally quicker than the Buffalo 802.11g kit. 802.11a does have a lower range than either 802.11b or 802.11g though, and we only got halfway to our 20m test-point before the signal disappeared; moving to 9m resulted in four minutes 38 seconds for the folder transfer.

Make no mistake, the Orinoco AP-2500 is designed for commercial environments, and delivers everything you need if you're setting up a public hotspot. Its supplied 802.11b performance is excellent, and the option to fit 802.11a offers superb short-range speeds without the congestion issues of 802.11g. The AP-2500 may sound expensive at £725 (and £153 for the 802.11a kit), but is reasonable for a professional access point and should certainly be considered by commercial installations.



Netgear's broadband router is configured using a web-based interface

Getting wireless

It was reassuring that all the products that should have worked with each other did so without complaint, including combinations of Wifi and non-Wifi certified products. It was also good to see our 802.11g card work on 802.11b access points and vice versa.

In terms of speed, our 30 802.11b combinations resulted in an average of four minutes 16 seconds to transfer a 110MB test folder from an adjacent room. Extending this range to 20m saw the time double in all cases apart from the higher-end access points which maintained their speed. Beyond 25m indoors we lost all coverage.

Our tests with 802.11a and 802.11g produced similar speed results of around one minute 30 seconds to transfer 110MB over a short range. We were hoping for a fivefold speed increase, but had to make do with less than threefold. Speeds were reduced at longer distances, but 802.11a had a much shorter range than b or g.

All the tests were performed without encryption, and adding 64bit and 128bit WEP did result in a performance hit.

Our tests showed that 802.11b delivers sufficient performance for most environments and since it's also used in public areas, we'd advise having compatibility in your portable. It's too early to judge 802.11g, but performance looks good so long as other 802.11b devices aren't connected. An 802.11g adaptor could be a good bet as it'll work on 802.11b networks, but offer better speed if used exclusively on an 802.11g network. If you're building a new network and don't have any 802.11b clients, an 802.11g access point makes sense. The final spec is expected around May.

As more homes and offices adopt wireless networks, congestion will be a serious problem. The only way to avoid this is to use a different frequency: 802.11a. Dual-mode access points like the Orinoco also offer 802.11b compatibility without compromising 802.11a performance. Few homes will be able to justify 802.11a, but it's becoming increasingly sensible for businesses or environments where there's 2.4GHz saturation.

Finally to put everything into perspective, it took only 16 seconds to transfer the same 110MB folder using the wired 100Mbit Ethernet ports found on almost every PC today. That's 16 times faster than our average 802.11b score and over five times quicker than 802.11a or g. It's also effectively free and works over long distances without interference. Wireless may be wonderful, but if you can lay cables, we recommend doing so.

Of the wireless products tested, two stood out. Netgear's MA311 was the fastest 802.11b adaptor and joint cheapest – ideal for equipping a desktop with wireless.

The wireless broadband routers we tested worked out only slightly more expensive than the cheapest access points, while also offering an easy way to share the connection and build a network.

While the 802.11g spec is still in draft, Buffalo's G54 router got the best result from all our 802.11b adaptors and was relatively cheap – with that in mind, support for draft 802.11g could be considered a bonus.

Gordon Laing

17IN LCD MONITOR

Sharp LL-T17A3

This boasts an attractive price, solid design and a twisting stand

This TFT LCD monitor is similar to Sharp's15in LL-T15G3, which we featured in our monitors group test last month, but it also has a price that's pretty attractive for a 17in model.

The LL-T17A3 is well constructed, has an attractive black chassis, and certainly looks the part. The unit tilts through 25 degrees and comes with a turntable integrated into the stand so that you can twist the screen through 90 degrees. It's multimedia ready too, with a 3.5mm audio jack around the back, and a pair of stereo speakers built into the bezel under the screen. As is so often the case, though, the speakers are distinctly tinny.

Sharp has only fitted an analogue D-Sub port, which is a shame as we expected to see a DVI port too. The majority of new graphics cards have DVI outputs, so it's a waste not to take advantage of this cleaner digital signal. Furthermore, there are no USB ports.

The display has a native resolution of 1,280 x 1,024, and the 500:1 contrast ratio makes for a vibrant display. The LL-T17A3 is let down by some compression at the extreme highlight and shadow ends of our colour scale and greyscale tests, but shades such as skin tones do appear realistic.

Five buttons for power, menu access, mode select, and left and right cursors that double up as volume controls, are positioned below the display. OSD (On-Screen Display) navigation is simple, and settings for clock, phase and position are present. Two auto-adjust options are nested within the menus – one for overall adjustment and the other for black level and contrast. 'Standard' and 'sRGB', colour presets also exist.

The LL-T17A3 is a well-finished 17in TFT LCD. However, shop around and you're likely to find a DVI-equipped TFT LCD that can handle colour and greyscales with more finesse.

Jalal Werfalli

DETAILS

PRICE £439 (£373.62 ex VAT)
CONTACT Sharp 01923 434 647
www.sharp.co.uk
SPECIFICATIONS
17in LCD • 1,280 x 1,024 native resolution • D-Sub, 3.5mm audio-in jacks • 398 x 376 x 188mm (w x d x h) inc stand • 6.5kg • 250cd/m² • 500:1 contrast ratio • Horizontal 160 degree, vertical 135 degree viewing angles
PROS Design; stand; vibrancy
CONS No DVI or USB ports; compression at ends of colour/greyscales
VERDICT
Respectable build quality and a vibrant screen, but we expect more colour consistency and at least a DVI port for the price

PERFORMANCE	★★★☆☆
FEATURES	★★★☆☆
VALUE FOR MONEY	★★★☆☆
OVERALL	★★★☆☆

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SOUND CARDS

Dolby Digital EX 7.1 sound cards

Terratec's Aureon 7.1 Space and M-Audio's Revolution 7.1 compared

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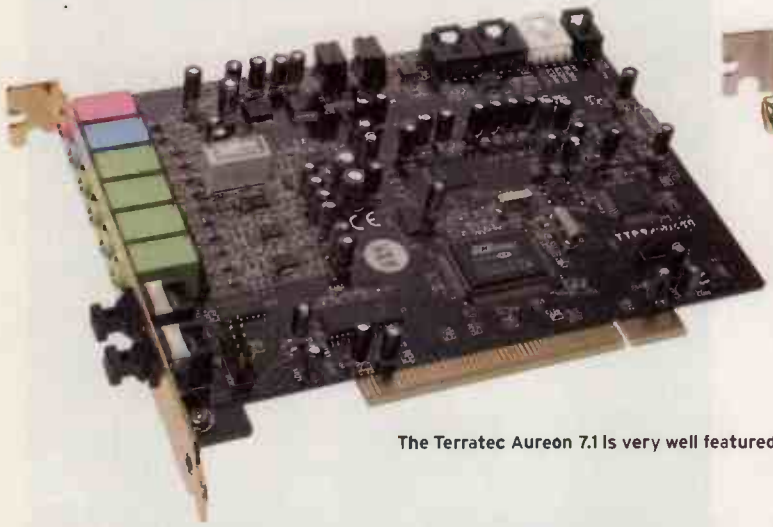

The Terratec Aureon 7.1 is very well featured

The M-Audio is fantastic value, producing great sound quality

Let's be honest – a 7.1 sound card is currently pretty pointless, as there are no multimedia speakers that can output all eight Dolby EX-compliant channels. However, as eight-channel speaker sets are on their way, the manufacturers of these cards are calling them 'future proof', rather than pointless. Whether they are right remains to be seen, however there are plenty of other interesting features on the cards.

Both these cards use the same Via chip, the ICEnsemble Envy 24HT. This is a 7.1-enhanced version of the Envy 24 chip used in Terratec's incredible 6Fire card (see Best Buys, p153), but with nifty features such as the hardware mixer removed to cut down the cost. As you might guess by its name, it's a true 24bit chip. Terratec was the first to release cards of this quality for PCs with the 6Fire; Creative followed about a year later. The difference in quality from 16bit/48KHz cards is immense, though you won't notice much difference when playing a CD, as CDs run at 16/48.

The chip can also handle 192KHz audio, as well as the more common 96KHz and 44.1KHz. 192KHz is currently rare (as file sizes are immense) and found only in DVD-Audio discs, but audio quality at this rate is truly superb.

As they use the same chip, these two cards are very similar, with only cost and a few features separating them. Neither, however, have a Midi/joystick port. The reasons for losing it are clear: there's very little space on the card, the need has diminished among most users, as joypads and sticks are primarily USB-based and Midi users are unlikely to want a 7.1 sound card. But the cost of an extra bracket is minimal, and the fact that there isn't even an option to expand on either card, which is a bit of a shame, particularly considering Asio 2.0 is fully supported.

Both cards have mic and line inputs as well as the required four minijack outputs for 7.1 sound. Terratec has rather wisely opted to use optical S/PDIF, as this has become far more common in external devices (such as minidisc) than its coaxial partner, despite the fact that the signal degrades after less than a metre. Both an Input and output are included, while M-Audio has gone for a single coaxial out and no input.

Both cards installed quickly and without a hitch. M-Audio makes life far simpler than Terratec, first by colour coding the minijack outs with the traditional green, orange and black, with silver used for the fourth jack. Each jack also has its own little diagram indicating which port is for which speaker set – very handy. At the opposite end of the ease of use-o-meter, all Terratec's outputs are green and the only way you know what goes where is by the engraved letters on the bracket; for example 'F' for the front stereo speakers. Not user friendly.

As mentioned, the Terratec has an internal connector that could house a bracket that looks like it's for a Midi/joystick port. Disappointingly, though, there will be no bracket sold. The Aureon also has two inputs for the optical drives, an auxiliary in and a CD-digital port. These hark back to the days when the transfer of data between optical drive and sound card via the southbridge could be interrupted if other data was passing through at the same time. Nowadays, these aren't necessary, and you're unlikely to put this into a system that old.

Despite the extra optical input and internal inputs on the Terratec, the M-Audio wins hands down, as it is easier to install and far cheaper. The Hercules Fortissimo 3 7.1 (November 2002, p64) is only £50, but the sound quality is far inferior, at 16bit, 48KHz.

Mark Walsh

DETAILS

M-AUDIO REVOLUTION 7.1
PRICE £79 (£67.23 ex VAT)
CONTACT M-Audio 0871 717 7100
www.midiman.co.uk
SPECIFICATIONS
Via Envy24HT chip • 24bit, 192KHz recording and output • Speaker support 2.0 up to 7.1 • Coaxial S/PDIF output • Dolby Digital EX & 5.1
PROS Sound quality; price
CONS No digital or internal inputs; no Midi port
VERDICT
A fantastic value, high-quality 7.1 sound card

PERFORMANCE	★★★★★
FEATURES	★★★☆☆
VALUE FOR MONEY	★★★★★
OVERALL	★★★★☆

DETAILS

TERRATEC AUREON 7.1 SPACE
PRICE £129.99 (£110.63 ex VAT)
CONTACT Terratec 0118 982 1612
www.terratec.co.uk
SPECIFICATIONS
Via Envy24HT chip • 24bit, 192KHz recording and output • Speaker support 2.0 up to 7.1 • Optical S/PDIF in and out • Dolby Digital EX & 5.1
PROS Features; sound quality
CONS Expensive; no Midi port
VERDICT
Better featured than the M-Audio, and just as good quality, but not worth the extra £50

PERFORMANCE	★★★★★
FEATURES	★★★★☆
VALUE FOR MONEY	★★★☆☆
OVERALL	★★★★★

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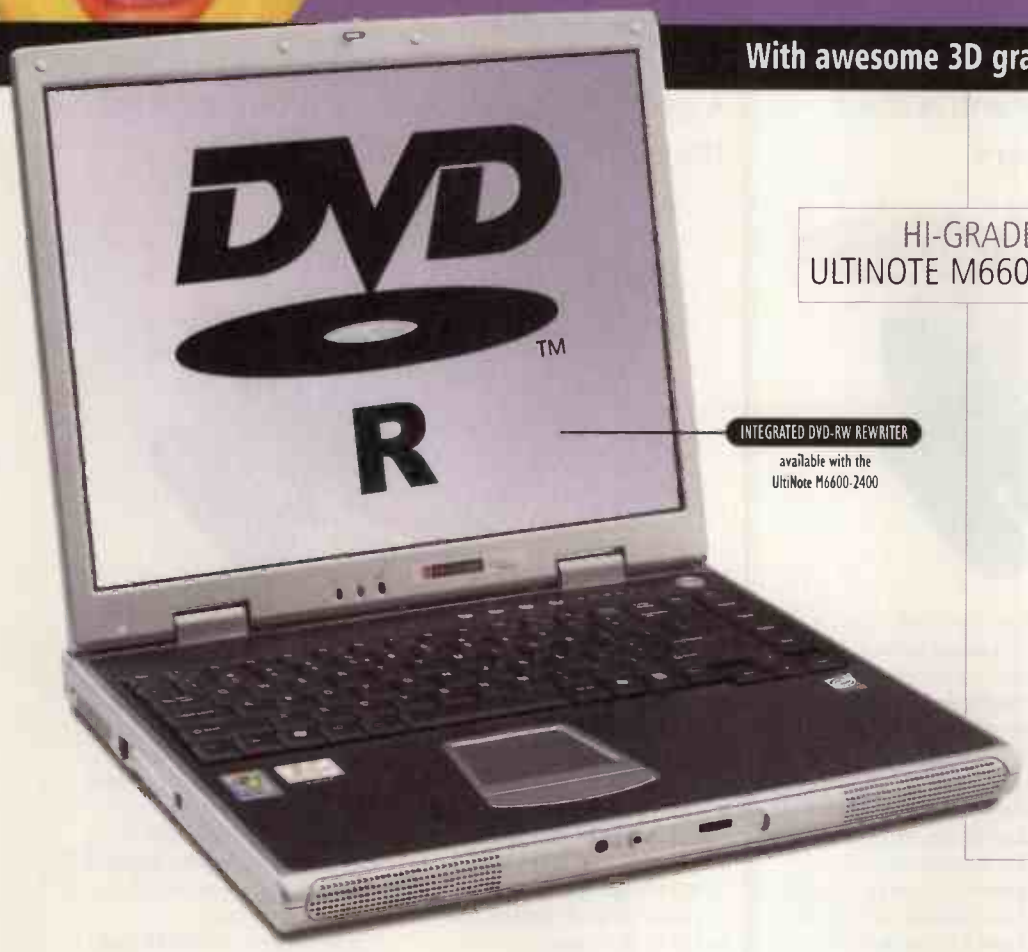

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3,000 LUMENS LCD PROJECTOR

Hitachi CP-X880

It's large but not too heavy and is ideal for home movie connoisseurs

This is the largest projector we've ever seen, with the exception of the one at our local cinema, however it isn't grotesquely heavy, weighing in at 5.6kg so, despite its size, the CP-X880 is just about portable.

Inside this huge casing the CP-X880 uses LCD technology rather than DLP so the contrast ratio is only 450:1, but it is very bright with a rating of 3,000 lumens. Its bigger brother the CP-X885 has a rating of 3,500 lumens.

On the back is a huge range of input and output ports (see specifications in details box) and Hitachi supplies the cables for power, VGA and component video plus a Scart-to-component adaptor. The only extra port that we would like to see is Scart input.

Once the projector is plugged in and ready to go you are faced with a huge array of buttons both on the projector itself and on the remote control. You can use either set of inputs if the projector is placed on a table, but there is an optional wireless networking module for the CP-X880 that allows you to communicate using a suitable notebook or PC which is ideal if the projector is ceiling mounted. Clearly that will require use of the remote at all times, and this includes a mouse control and laser pointer.

The CP-X880 has a native resolution of 1,024 x 768 but can stretch to 1,280 x 1,024 and the images look absolutely wonderful. Colour control in particular is good and the projector is so bright that you can easily use it in a fully lit room. The low contrast ratio means that dark greys and blacks do rather merge together which is a distinct flaw.

Impressively, the Hitachi has a very low quoted noise level of 35dB, and it is certainly very quiet, which will enhance home movie use.

Well featured but shockingly priced, this is one solely for the sickeningly rich.

Leo Waldock

DETAILS

PRICE £5,051.33 (£4,299 ex VAT)
CONTACT Hitachi 0845 7581 455
www.hitachidigitalmedia.com
SPECIFICATIONS
3,000 Ansi Lumens • 450w lamp power • 450:1 contrast ratio • 1,024 x 768 native resolution • Aspect ratio 4:3 and 16:9 • VGA In & out, BNC, DVI, S-Video, Composite & component video, audio in, audio out • 5.6kg • 390 x 305 x 120mm (w x d x h)
PROS Colour control; ports; quiet
CONS Expensive; low contrast ratio; huge size
VERDICT
The home movie buff need look no further, but the CP-X880 is way over the top for most homes and offices

PERFORMANCE	★★★★☆
FEATURES	★★★★★
VALUE FOR MONEY	★★☆☆☆
OVERALL	★★★☆☆

BUDGET DLP PROJECTOR

Infocus X1

A good value device at a decent price for the home and small office markets

You may think that Infocus has made a terrible mistake by pricing its new X1 DLP projector at £999 ex VAT, but no, it really is that cheap. It is aimed at the home and small office markets where users don't want to spend £2,000 or £3,000 for a device they only use on occasion but, of course, display quality still has to be acceptable.

The native resolution is SVGA (800 x 600), but the X1 can scale to 1,024 x 768 when connected to a notebook or PC and display quality remains acceptable. Brightness is only 1,000 lumens. It's still viewable in a room with the lights on, but you'll definitely benefit from turning the lights out and drawing the curtains. We found that setting up the brightness and focus required care, and it took a minute or so to get the projector set up using either the remote control or the controls on the projector itself.

As the X1 uses DLP technology, rather than LCD, it has a high contrast ratio of 2,000:1 so black is very nearly black and white is very nearly white. The limiting factor here was the cleanliness of the walls that we used as a screen, rather than the technology used by Infocus. Projection range is a minimum 1.5m and a maximum 9.8m, which should suit small presentation rooms and your average living room.

You have the choice of using the default 4:3 aspect ratio or a 16:9 widescreen aspect ratio, and there is an optional ceiling-mounting kit if you prefer a permanent installation, and all the standard adaptor cables are supplied.

We were impressed by the colour definition and greyscales that the X1 can display for such a low price.

Our biggest concern is that the projector is not absolutely quiet, which would be no problem at all in an office presentation, but you'd want to sit a good distance away when watching a movie at home.

Leo Waldock

DETAILS

PRICE £1,173.83 (£999 ex VAT)
CONTACT Infocus 01628 666 622
www.infocus.com
SPECIFICATIONS
1,000 Ansi Lumens • 150w lamp power • 800 x 600 SVGA native resolution • 4:3 & 16:9 aspect ratio • VGA in and out, S-Video, Composite video and audio in, USB for optional mouse control • 2000:1 contrast ratio • 3.1kg • 249 x 318 x 106mm (w x d x h)
PROS Cheap; good quality picture; intuitive controls
CONS Not very bright; a bit noisy
VERDICT
A very good value DLP projector, even if it is a little noisy

PERFORMANCE	★★★★☆
FEATURES	★★★☆☆
VALUE FOR MONEY	★★★★★
OVERALL	★★★★☆

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PC Advisor, 08.02

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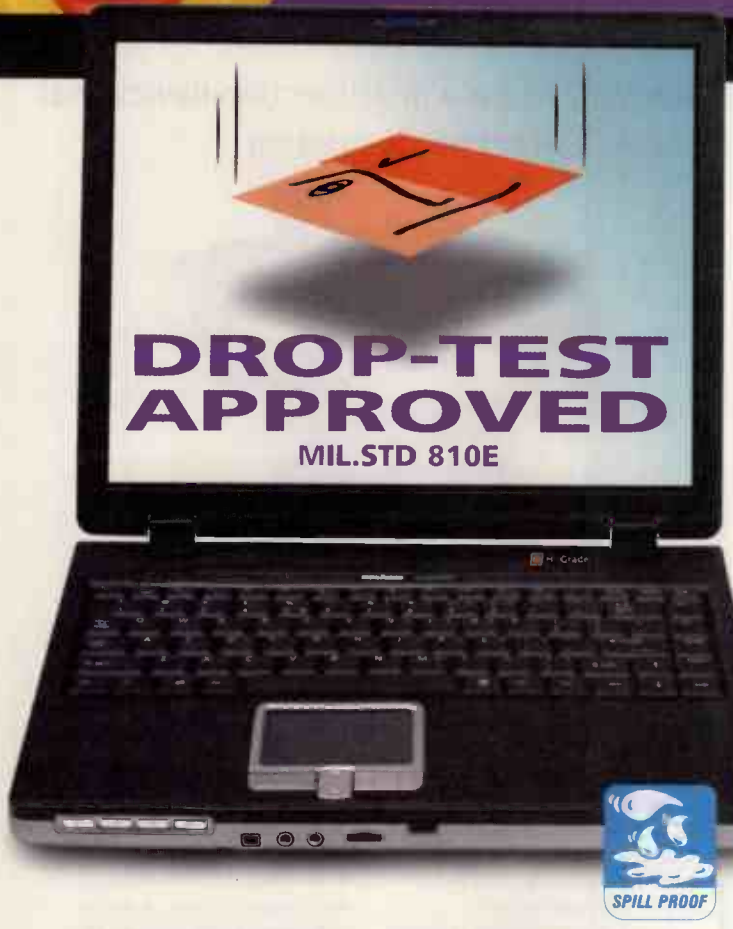

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MULTIFUNCTION DEVICE

HP Officejet 6110

Despite its price tag the 6110 is easy to use and produces good-quality printouts

Multifunction devices don't always come with fax options and, even when they do, they're often thrown in as a software-only after thought. HP's Officejet 6110 puts full hardware and software faxing on a par with print, scan and copy functions to produce a first-rate all-in-one for the small office.

The product looks very similar to HP's other PSC and Officejet all-in-ones, essentially being a photo inkjet printer with an A4 flatbed scanner on top, plus a button control pad at the front. Additionally, the Officejet 6110 sports an Automatic Document Feeder (ADF) on the scanner lid, letting you stack up to 35 sheets for hands-free multipage faxing and colour copying while you make the tea.

You can conduct all your fax and copying tasks using the control pad even when your PC is switched off: in fact, it's quicker and simpler that way. That said, HP has provided an excellent software package to go with the machine, being unobtrusive on screen but extremely versatile and easy to use.

We scanned a printed document through OCR (Optical Character Recognition) direct to Microsoft Word in just three or four mouse clicks – it's that simple. Perhaps the scanning driver, clear and intuitive though it is, might be a little too hands-off for some users.

Scan and print quality was outstanding. This is a true photo printer, and you can further enhance the results by using a special six-colour ink cartridge. However, printing is slow, taking up to five minutes for a full A4 image, whether it's on plain paper or glossy. But all-round ease of use, not to mention a one-step installation for the entire machine and HP's wonderful fax setup wizard, make the Officejet 6110 one of the best, although most expensive, all-in-ones you can buy.

Alistair Dabbs

DETAILS

PRICE £349.99 (£297.02 ex VAT)
CONTACT HP 08705 474 747
www.hp.co.uk
SPECIFICATIONS
1,200 x 1,200dpi print (4,800dpi with Photoret IV), 1,200 x 2,400dpi scan • Printing technology: thermal inkjet • Scanning technology: CCD, 48bit • Fax: 33.6Kbits/sec • 10.9kg • 496 x 394 x 300 mm (w x d x h) • USB
PROS Print quality; easy to use
CONS Print and copy speeds; limited scan controls; expensive
VERDICT
HP proves it can produce a multifunction device that screams quality, though you'd expect it for the price. Small office serial faxers will love it

PERFORMANCE	★★★★☆
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★½

MULTIFUNCTION DEVICE

Canon Smartbase Photo

The MPC200 is a multifunction device that also has direct photo printing

Canon's Smartbase 200 Photo multifunction device isn't the prettiest of units, as it looks like a scanner has been rather unceremoniously dumped on top of a bog-standard printer without taking style into consideration. It is, however, packed with features and is really rather cheap, so we can forgive its weak design.

In addition to the usual print, scan and photocopy options, you can use the supplied PC card adaptor to print directly from Compact Flash memory, and if you use the correct adaptor it will read all the popular camera media formats.

Disappointingly, we found the control panel was hard to get to grips with. We reached for the manual on more than one occasion, even though it only has 10 buttons to master.

The print and scan quality from Canon's latest separates has been a cut above the rest, as have its digital cameras, so we expected great things from this. However, our impressions were a bit mixed.

Quoted printing speeds are 14ppm for monochrome and 10ppm for colour, but our testing showed that the true speeds were significantly slower, at 5.6 and 3.9ppm respectively. This isn't particularly fast, but still perfectly usable.

Text output is clear and crisp, and very pleasant on the eye even on plain photocopy paper. Colour quality is a different matter as photo printing on Canon photo paper was very clear, we found the picture was excessively bright and the colours washed out.

When we made colour photocopies on various paper types the colour was at fault again, except this time they were too dark. However, text on the photocopy was excellent.

As scan quality is so good, we had to put it down to the device's print quality. This was particularly surprising as most of Canon's latest printers have been outstanding.

Leo Waldock

DETAILS

PRICE £199 (£169.36 ex VAT)
CONTACT Canon 0870 514 3723
www.canon.co.uk
SPECIFICATIONS
600 x 600 monochrome copying, 1,200 x 1,200 colour copying, 600 x 1,200 scanning at 36bit, 2,400 x 1,200 printing • Bubble Jet Technology • CIS scanning • 396 x 413 x 276mm (w x d x h), 8kg • Easy Photoprint 1.1, Omni Page SE • USB2
PROS Price; text quality; direct photo printing
CONS Photo print quality
VERDICT
Scanning and text printing are excellent, but photo printing is a bit of a letdown. It's good value otherwise

PERFORMANCE	★★★½☆
FEATURES	★★★★½
VALUE FOR MONEY	★★★★★
OVERALL	★★★½☆

MONO LASER PRINTER

Lexmark T420DN

A good value budget device aimed at workgroups

Monochrome A4 printing is the bread and butter of most offices, and that's just the market the Lexmark T420DN monochrome laser printer is aimed at. It's unexceptional to look at, or, in marketing speak, it has a small footprint and low profile.

This is such an understated printer that the Lexmark press release draws attention to the 'Cancel job button', and well it might as almost every function is controlled by the drivers, simplifying matters intensely.

The D suffix on the model code is for duplex and the N is for network, and there is also a T420D (with no 10/100 Lan and only 16MB memory) priced at £621.58 (£529 ex VAT) if you prefer a cheaper printer that is directly connected to a single PC or Mac.

Lexmark claims a speed of 22ppm. In our tests the T420DN ran at a true speed of 20.6ppm once the initial page had spooled. This is very impressive, particularly as the quality of printed text on ordinary photocopy paper is excellent. Photo printing quality was acceptable yet unexceptional, particularly on skies, which is what we expect from any monochrome laser.

Our only quibbles are that the drivers default to letter size paper, rather than A4; this is typical of laser drivers though, so we can't really complain. The 16MB memory upgrade installed in the DN model costs £100 direct from Lexmark. Clearing a paper jam from the printer is a bit awkward as the paper feeds almost vertically, so once you remove the paper tray you are trying to pull the jammed sheet downwards into the desk.

The single-element toner cartridge costs £159 and it's a 10,000-page unit, so running costs are 1.59p per page (plus paper).

This is an excellent monochrome A4 laser printer, and we were very impressed.

Leo Waldock

DETAILS

PRICE £950.58 (£809 ex VAT)
CONTACT Lexmark 08704 440 044
www.lexmark.co.uk
SPECIFICATIONS
250-sheet tray • Quoted 22ppm mono, 12ppm duplex • 300 x 300 or 600 x 600dpi (1,200 using image quality) • One cartridge • 200MHz processor, 32MB of memory • USB, Centronics IEEE1284 parallel, Ethernet 10/100TX • 13.8kg • 406 x 425 x 258mm (w x d x h) • 500-sheet drawer upgrade option
PROS Excellent text quality; fast; duplex; good value
CONS Clearing paper jams awkward
VERDICT
Fast, good value, with duplex and networking and excellent text

PERFORMANCE	★★★★★
FEATURES	★★★★½
VALUE FOR MONEY	★★★★★
OVERALL	★★★★½

MONO LASER PRINTER

HP Laserjet 1005W

A personal laser printer that offers high speed and low cost on consumables

Inkjets may have photo printing wrapped up, but still have some way to go before matching laser output. For this reason, home workers and anyone who enjoys the luxury of a private office will appreciate HP's latest sub-£200 personal laser printer.

The Laserjet 1005W is not as small as many other personal lasers on the market, but it's easier to install and maintain than most. In particular, we like the way that swinging open the front engine cover causes the combined toner/developer cartridge to pop out and meet you. Parallel and USB connectors are hidden under the left-hand side panel, so once they're plugged in and the panel replaced, there's little chance of your printer cable being yanked out by accident. Another good feature is the power-on LED which very clearly flashes orange at you when the paper tray is empty.

Paper is loaded into an open tray which juts out at the front of the machine, protected by a see-through cover on which single-sheet multipurpose feeder guides are mounted. Printed sheets churn out face-down on top of the printer, or can be ejected face-up across a fairly straight paper path to a door at the rear.

Printing is fast for text and graphics-heavy documents alike. In our tests, we output 20 copies of a Word document in one and a half minutes, with the first sheet completing in just 10 seconds. Text and general graphics print quality is good too, although we had trouble with photo images even after experimenting with different resolutions and other print driver options. That said, you don't buy a personal mono laser for printing photos.

With this proviso, and the inevitable limitation of having no network upgrade path or Mac compatibility, the HP Laserjet 1005W is still a good product at a sensible price.

Alistair Dabbs

DETAILS

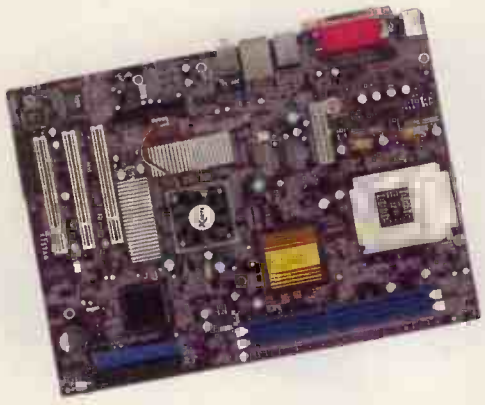
PRICE £199 (£169.36 ex VAT)
CONTACT HP 08705 474 747
www.hp.co.uk
SPECIFICATIONS
250-sheet input tray, single-sheet MP tray, 150-sheet output tray • 14ppm mono • 600dpi (1,200dpi quality with Ret) • Single cartridge (2,500 sheets at 5 per cent coverage), toner cartridge £49.07 (£41.76 ex VAT) • 1MB memory • USB2 & parallel connections • 7.3kg • 415 x 486 x 254 mm (w x d x h)
PROS Speedy output; easy to install and use
CONS No Ethernet upgrade option; poor halftone quality
VERDICT
You can churn out business documents at high speed

PERFORMANCE	★★★★½
FEATURES	★★★★★
VALUE FOR MONEY	★★★½☆
OVERALL	★★★½☆

INTEGRATED GRAPHICS MOTHERBOARD

ECS K7S7 AG

It may just sport the bare necessities but this Socket A delivers great performance



It comes as a pleasant surprise to find a very fast motherboard with integrated graphics that doesn't use an Intel/Nvidia/Via solution. Instead, the ECS K7S7AG uses an integrated Xabre 200 from Sis with its own 64MB of memory as opposed to sharing system memory.

The board is built on a purple PCB, and is well laid out. As there's no AGP slot, there is plenty of space around all the major components.

The Socket A sits on its own, without the usual crowd of capacitors. Instead the majority of these are grouped to one side, so using a large cooling fan shouldn't present too many problems. Lurking under the heatsink and cooling fan is a Sis746 northbridge while its companion southbridge, a Sis963 chip, also sports a heat sink.

The ECS K7S7AG supports up to 2GHz of DDR266/333/400 memory in the two Dimm slots positioned on the far right-hand side of the board, under which sit the two IDE ports. One surprise is where the floppy drive port sits: right across the board on the left-hand side so the cable goes right across the graphics memory and the northbridge fan.

The star of the board though is the integrated Xabre 200, which supports both AGP 8x and DirectX 8.1, and is the fastest integrated graphics package we have seen, as shown by the blistering 3Dmark score.

Although the board doesn't support Raid or Serial ATA, all the other usual goodies are here; integrated 10/100 Ethernet, 6.1 audio and four USB2 ports so the provision of only three PCI slots and a CNR slot for expansion isn't a problem.

It's very much a barebones motherboard, but performance, both in Sysmark and 3Dmark, is truly exceptional.

Simon Crisp

DETAILS

PRICE £88.13 (£75 ex VAT)
CONTACT ECS 01908 481 830
www.ecs.uk.com
SPECIFICATIONS
Socket A • 2 Dimm slots • 3 PCI slots • 2 PS/2 • 1 parallel, 1 serial • 1 VGA • 4 USB2 • RJ-45, 3 minijack
PROS Graphics performance; layout
CONS No Raid or Serial ATA
VERDICT
The fastest integrated graphics motherboard we have tested, though it lacks many features

PERFORMANCE	★★★★☆
FEATURES	★★★☆☆
VALUE FOR MONEY	★★★★☆
OVERALL	★★★★☆

PERFORMANCE

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

MULTIFUNCTION DEVICE

Lexmark X5150

Good photo quality and fast output times make this all-in-one great value

Lexmark has made real inroads into the all-in-one market over the past six months. The X5150 is more high end than previous offerings, using the printing and scanning technology from Lexmark's latest standalone devices, offering 4,800 x 1,200dpi on photos, and 48bit scanning.

The latter is a bit of a mystery though as, while the CIS sensor inputs at 48bit, the output image is 24bit. Even though only a few programs, like the Photoshops of this world, can handle 48-bit images, we're not sure why there isn't an option to output as 48-bit. The nippily-produced 300dpi scans are pretty decent anyway, though ours were a little pale and seemed to be lacking in the blue tones.

Photo print quality is up there with the best all-in-ones, and would give some standalones a run for their money as well – we really struggled to find fault with the output. It's also one of the fastest in its class, taking roughly three minutes per page.

Text was less impressive, as it was a little smudged and poorly defined, but it is reasonably fast, if a lot less than the quoted 19ppm, at 6.5ppm. When we ran a 200dpi scan through the copy function at the default settings the output was pretty poor, especially with text – the settings definitely needed a tweak before we got a decent copy.

Average looking, this device is simple to use, with all the functions you will require on the right hand side. The cartridges are also easy to access, though running costs are quite high.

The driver interface is a great improvement over those of previous Lexmark devices, as it's very easy to use. However, the options are very limited, particularly the scan and print resolution options.

The Lexmark X5150 isn't perfect, but at £170, this really is a superb value and easy-to-use all-in-one, with photo quality prints and fast output times.

Mark Walsh

DETAILS

PRICE £170 (£144.68 ex VAT))
CONTACT Lexmark
0870 444 0044
www.lexmark.co.uk
SPECIFICATIONS
4,800 x 2,400 print resolution, 600 x 2,400dpi 48bit scanning • Thermal inkjet printing CIS scanning • Up to 19ppm mono and 14ppm colour print speed • 6.6kg • 469 x 395 x 240mm (w x d x h) • Compatible with Windows 98, ME, 2000, XP and Mac OS 9.2/10.1 • USB2 connection
PROS Speed, photo output
CONS Text a little dodgy
VERDICT
Fast, easy to use and with great photo quality, but poor text output lets it down

PERFORMANCE	★★★★☆
FEATURES	★★★★☆
VALUE FOR MONEY	★★★★★
OVERALL	★★★★

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INKJET PRINTER

Canon I850

You get quality output at high speed – but you'll have to dig deep as it's not cheap

Canon has opted for a breadbin style, two-tone casing that houses a large print head holding four individual wells. Although they are not keyed – and so can be dropped into the wrong slots – they are clearly labelled. They are held in place by a sturdy clamp, on the top of which a slider selects paper or envelope as the output medium. We prefer Epson and HP's modeless operation, but there is nothing intrinsically wrong with this approach.

Two buttons on the casing advance the paper and control power while a single light blinks out status updates. The trays and supports fold neatly into the bodywork, presenting a very tidy appearance when not in use.

The I850 boasts an impressive 2picolitre drop size and a top resolution of 4,800 x 1,200dpi, which even outclasses professional photo printers such as Epson's A3 heavy-weight, the Stylus Photo 2100. By and large it pays off, too, with fine definition on our test image. Colours were also good, with skies a satisfying natural blue. Our wooded walkway scene was a little faded, but regular users will soon learn how to optimise their pictures for this device before sending them out to print. Printing the photo in just one minute 57 seconds, it was blindingly fast. If it had featured in our December 2002 group test it would have wiped the floor in the speed stakes.

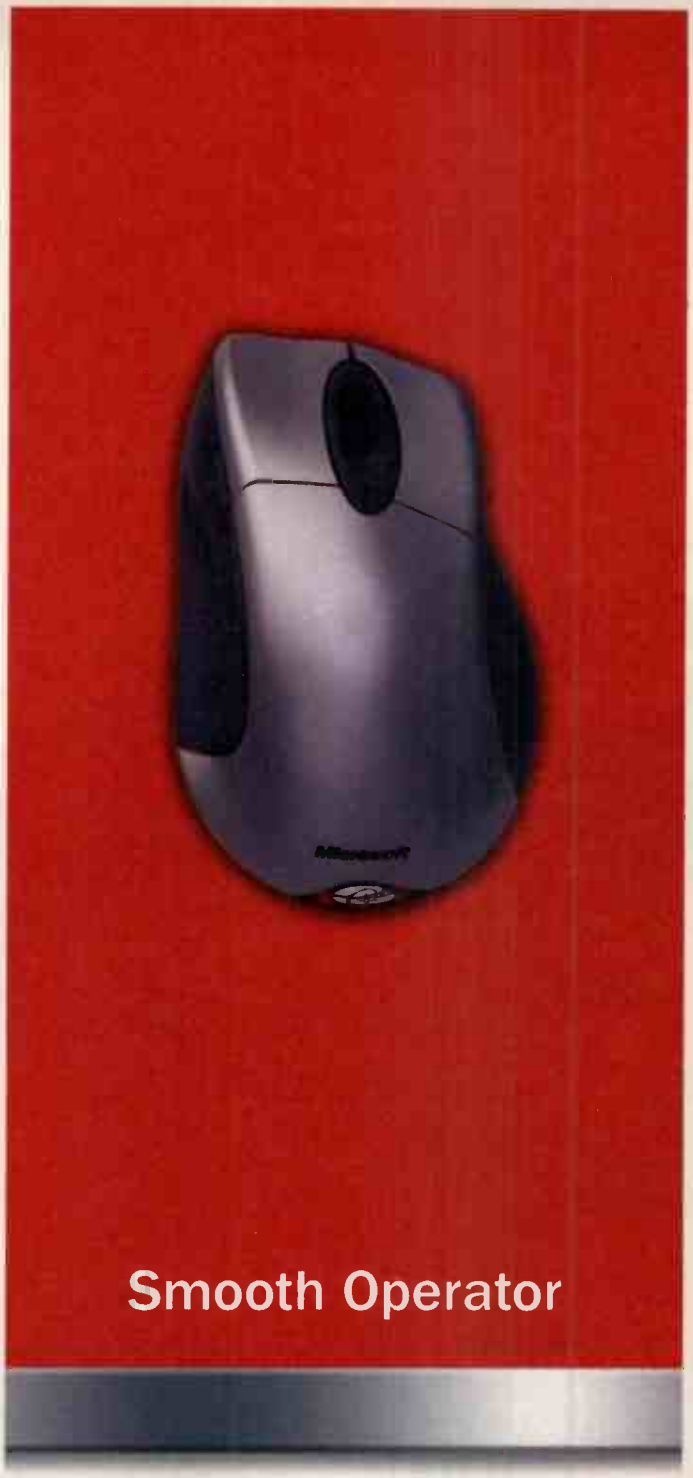
We spotted very minor feathering when printing text on photocopy paper using default settings, but even 2pt text remained legible. Large characters were solid and dark, giving the finished product a very professional feel. At five per cent coverage, the black cartridge is slated to last around 330 pages, which equates to a very reasonable 3.2p per page – not that far beyond the costs of laser printing. It's slightly higher at 5.3p a page in colour, but again this is clocked at five per cent coverage. A photo will obviously be far higher.

Nik Rawlinson

DETAILS

PRICE £169 (£143.83 ex VAT)
CONTACT Canon 08705 143 723
www.canon.co.uk/bubblejet
SPECIFICATIONS
Thermal inkjet • 150-sheet feeder • 22ppm mono, 14ppm colour • 4,800 x 1,200dpi • Four cartridges • Four colours • USB and parallel interfaces • 418 x 274 x 159mm (w x d x h) • 4.8kg
PROS Fast; high output quality
CONS Expensive; styling
VERDICT
There are cheaper options available, but if speed and quality are paramount the I850 is worth consideration

PERFORMANCE	★★★★☆
FEATURES	★★★★★
VALUE FOR MONEY	★★★☆☆
OVERALL	★★★★☆



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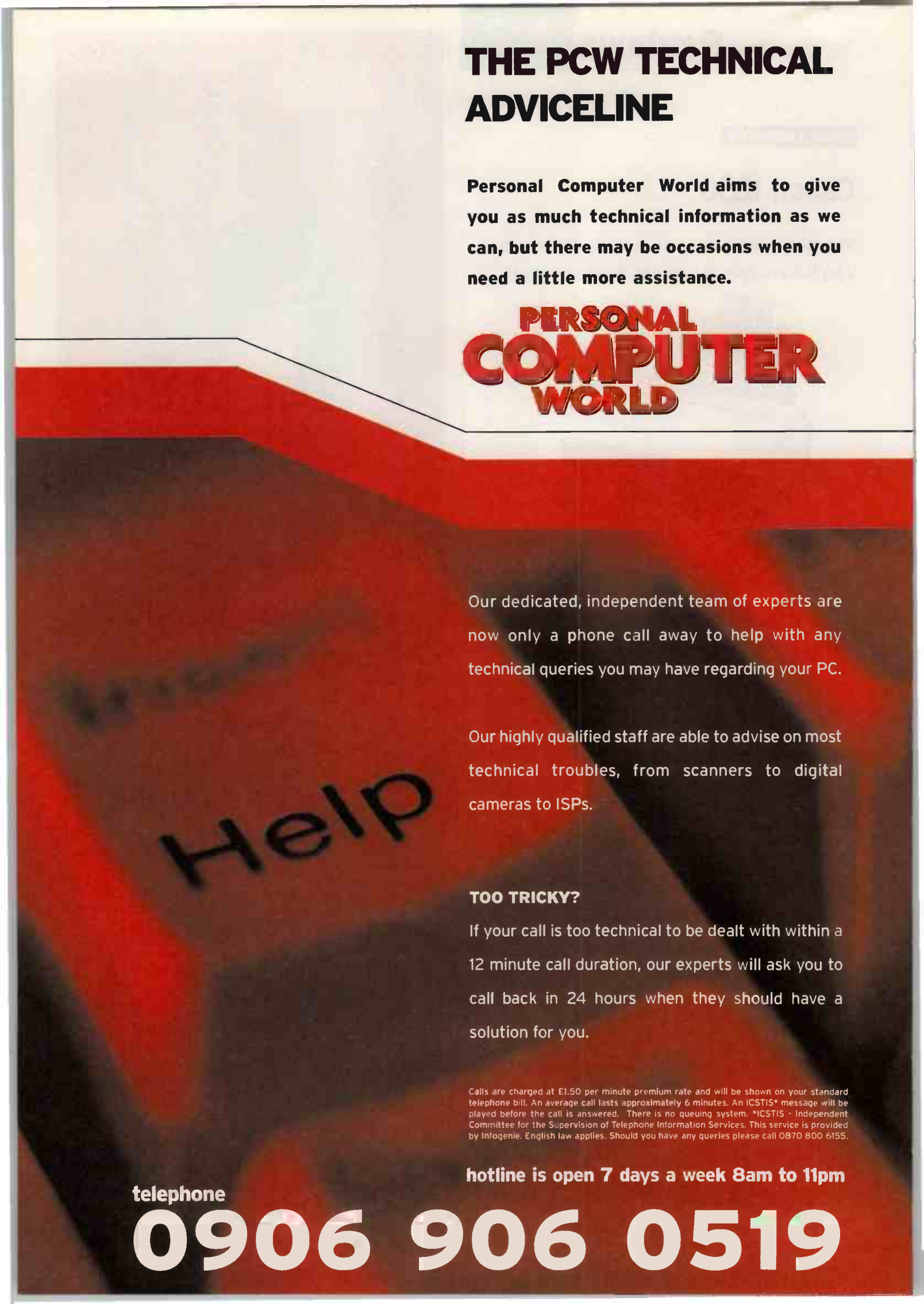

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OPERATING SYSTEM

Suse Linux Office Desktop

This great value package is relatively easy to use and includes some good software

The Yast2 setup tool makes it easy to add users or change system settings

This is Suse's first stab into the competitive Linux desktop market, and is fundamentally Suse Linux 8.1 Personal with the latest set of patches and some extras.

You get Star Office 6, Crossover Office and Plugin, plus Acronis OS Selector. Star Office is fully compatible with Microsoft Office formats, while the Crossover software lets you install Office. It also supports Lotus Notes and enables many Windows web-browser plug-ins to work in their Linux equivalents. Acronis' software also lets you repartition and resize partitions, including NTFS.

Installation is straightforward with a number of customisation options. The standard software set installs KDE and Gnome desktop environments, although the former is better configured by Suse; Gnome was unstable and badly put together.

We had a few problems getting our test PC up and running; the video settings were difficult to change, and the method of selection is clunky. The printer, sound card, mouse and modem were all identified and configured, but the DVD-Rom drive was not, and we had difficulty accessing our CD-RW drive through KDE.

Web browsing is catered for by Konqueror and Mozilla, and worked perfectly with the common web formats. File browsing on the whole was fine; clicking on a pdf file opened up Adobe Acrobat and MP3 files gave us the XMMS media player. Despite Crossover Office being installed, clicking on Windows .exe files gave a 'not found' error.

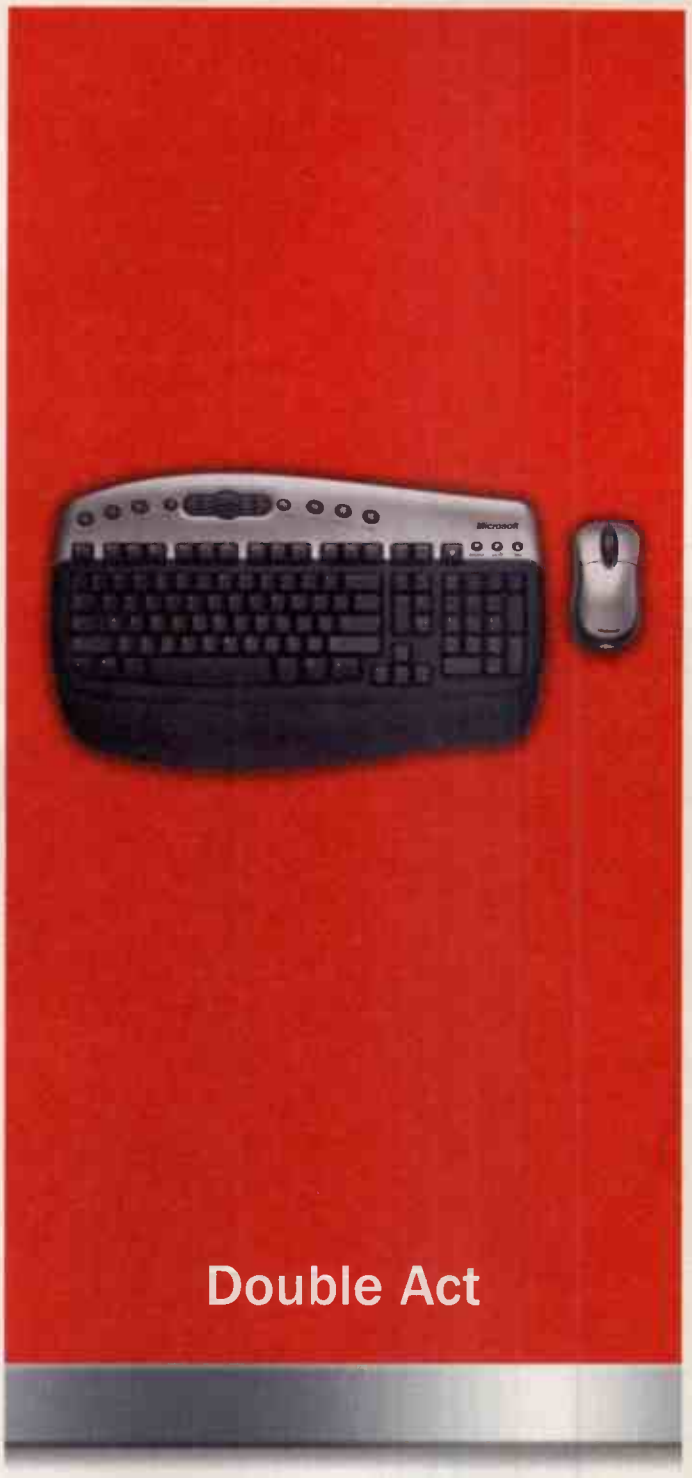
The update process was tedious – it took over half an hour just to get a list of updates, even before downloads began. The Yast2 setup tool is otherwise easy to use, making it simple to add users or change settings.

Barry Shilliday

DETAILS

PRICE £89 (£75.74 ex VAT)
CONTACT Suse Linux
020 8846 3918
www.suse.co.uk
SYSTEM REQUIREMENTS
200MHz processor, 64MB of Ram, 400MB hard disk space
PROS Good value; well established
CONS No development software
VERDICT
A great-value product that needs bugs ironing out, but this should be fixed with updates

EASE OF USE	★★☆☆☆
FEATURES	★★★★☆
VALUE FOR MONEY	★★★★★
OVERALL	★★★☆☆



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www.microsoft.com/uk/hardware/desktop

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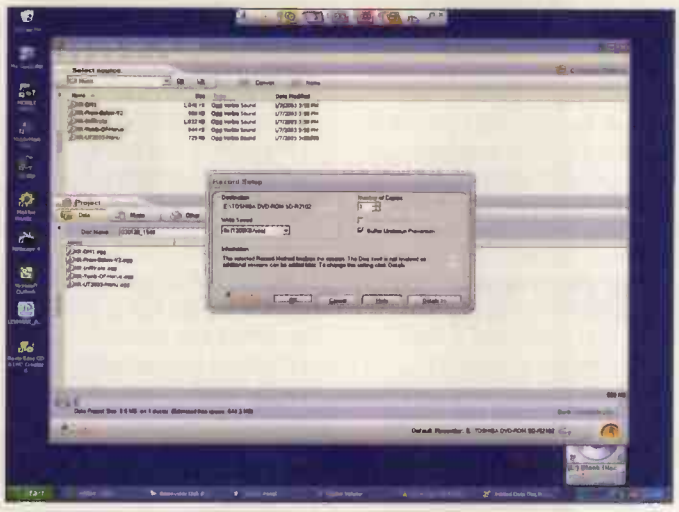
0906 466 4429

CD & DVD BURNING

Roxio Easy CD Creator 6

CD and DVD burning software beta that also edits photos and plays music



Diehard Roxio users can revert to the traditional 'Creator Classic' interface

Roxio Easy CD & DVD Creator 6 beta is an extensive piece of software with many features, but the use you will get out of it will depend on the software you already have installed on your PC, and which version of Windows you use.

In addition to simple, intuitive CD writing, Easy CD Creator 6 has a photo editor and a media player, and the whole lot is joined together with a very tidy interface, while diehards can revert to the Creator Classic interface. The photo editor has clearly come from Roxio's acquisition of MGI and it is a very basic tool that can handle cropping, rotating and cleaning up images. It's no substitute for Photoshop Elements or Paintshop Pro, but it'll suffice for sorting photos before you drop them on a CD.

The Audiocentral media player adds little or nothing over Windows Media Player or Winamp, but it makes it easier to maintain a unified Roxio media library. It also uses what seems like Windows Media Player visualisations; we can only assume that the use of these was part of the deal that allowed Roxio's CD-burning technology into Windows XP.

DVD Builder allows you to drop movie clips onto a timeline with a soundtrack, and then burn to + or – DVD media, much like Windows Movie Maker. If you already have Windows XP and some CD writing software there is little reason to shell out £50 on this, but if you don't have XP and prefer the all-in-one approach, Roxio Easy CD & DVD Creator 6 will suit you well.

Leo Waldock

DETAILS

PRICE £49.99 (£42.54 ex VAT)
CONTACT Roxio 01908 278 100
www.roxio.co.uk
SYSTEM REQUIREMENTS
1.6GHz Pentium 4, 128MB of Ram, Windows 98SE and above, 600MB of free hard disk space, 800 x 600 display for audio, 1,024 x 768 display for DVD Builder
PROS CD writing software; tidy interface; useful help files
CONS The majority of functions can be found in Windows XP
VERDICT
Roxio has united four disparate applications to make a solid package, but unless you need packet writing, you may find your money wasted

EASE OF USE	★★★★☆
FEATURES	★★★★☆
VALUE FOR MONEY	★★★★★
OVERALL	★★★★☆

AUDIO RESTORATION

Steinberg Clean 4.0 Plus

Confusing interface aside this is ideal for ridding your MP3s of snap, crackle and pop

Clean 4.0 Plus lets you apply filters and EQ effects to 'unclean' MP3 and wav files, and then save the results onto hard disk or burn to CD. It comes with a very unsightly and overly large preamp that connects and is powered by USB 1.1. Both minijack and phono inputs are available, though only a minijack cable is supplied. Disappointingly, there are only three volume settings for both input and output, which limits the precision of the device.

Quality through this amp is good, though you'd expect little else from Steinberg, and audio capture is pretty simple. On the other hand, Clean itself isn't very well laid out, so you may find yourself a bit confused as to where to begin.

The Intelliassistant will guide you through the process in 11 steps, though. This being Steinberg, there are far more options to clean up your tracks than with other programs, from Declicking, hiss crack and the new De-essing function.

Direct MP3 import is another new feature in version 4.0; these are automatically converted to wav. However, occasionally we found the file was decoded at half speed. This was normally down to the low bit rate of the file, but nevertheless a real annoyance. The automatic sample rate converter was particularly useful, although we weren't sure why you'd need reverb, nor did we find the 'Carsimulation' (optimising your audio for playback in a car) effective in the least.

Steinberg's own Label Editor is included on the CD. It's not particularly special, containing 15 basic templates and the ability to add basic text.

Mark Walsh

DETAILS

PRICE £49.99 (£42.54 ex VAT)
CONTACT Arbiter 020 8970 1909
www.steinberguk.com
SYSTEM REQUIREMENTS
Pentium II or Duron processor, 64MB of Ram, 2.25GB hard disk space, 16bit compatible sound card, Windows 98 and above
PROS Number of features; very powerful
CONS Ease of use
VERDICT
Effective and well featured, Clean 4.0 Plus would be superb if it weren't for the interface

EASE OF USE	★★☆☆☆
FEATURES	★★★★☆
VALUE FOR MONEY	★★☆☆☆
OVERALL	★★★☆☆

Declicking, hiss crack and De-essing are among Clean 4.0 Plus functions

Encoding video for the web
Learn how to stream video – see page 250

DV WEBCAM CONVERSION

Orange Micro Webcam DV

A DV camcorder and a Firewire port is all you need set up your own webcam

Putting an otherwise under-employed camcorder to good use

Webcam DV turns a DV camcorder into a webcam, which, on the face of it, sounds a little like turning a 750cc performance bike into a shopping trolley, but it really isn't as mad as it sounds. If you already have a highly capable video camera doing nothing most of the time then why not put it to good use?

A camcorder has a number of advantages over a bog-standard webcam. For starters the quality of the optics is vastly superior: not many webcams have a 20x optical zoom, autofocus, low-light mode, image stabiliser, time-lapse function, night vision and a range of special effects.

There's also more flexibility as to what you can do with it – provided your cable is long enough – although it's not easy to balance a DV camcorder on top of a flat-panel display.

Setting up the Webcam DV was no more difficult than with a normal webcam. A four- to six-pin Firewire cable is supplied as well as a minijack audio cable that connects to the headphone socket on the camcorder and the mic socket of your sound card. This allows you to make use of the stereo mic mounted on the camera. If your camera doesn't have a headphone socket you'll have to use a separate mic or find an adaptor to connect the sound plugs on the analogue video output into the mic socket.

After installing the software a test application verifies everything is working. You can use the webcam with Microsoft's Netmeeting, included in XP or downloadable from Microsoft's site, or whatever other capable software you have installed.

Given that it costs as much as, and in some cases more than, a dedicated if rather bog-standard webcam, we wouldn't recommend this as a substitute. However, if you have a webcasting job that requires features a webcam can't provide, such as an inaccessible subject that needs a powerful optical zoom, or night time webcasting, this would be the perfect solution.

Ken McMahon

DETAILS

PRICE £29.36 (£24.99 ex VAT)
CONTACT Channel Dynamics
0870 607 0540
www.channeldynamics.net
SYSTEM REQUIREMENTS
Windows 98SE and above, 700MHz Pentium, Firewire port, DV camcorder
PROS Utilises DV camcorder features; easy to install and use
CONS Costs as much as some webcams; needs headphone jack to use camcorder mic
VERDICT
Better than a webcam, but expensive for a simple utility. A software-only version for those who don't need an extra Firewire cable would be a good buy though

EASE OF USE	★★★★☆
FEATURES	★★★☆☆
VALUE FOR MONEY	★★☆☆☆
OVERALL	★★★☆☆

DVD BACKUP

E-promocard Movie Jack 2

An easy-to-use DVD copying application as long as you're prepared to wait

Movie Jack 2 from E-promocard is, according to the jacket blurb, Europe's leading DVD backup and copying software, a claim made by at least half a dozen similar applications, most of which are responsible for much of the spam that arrives in the *PCW* mailbox.

Movie Jack is a suite of four applications which provides everything you need to copy DVD video to a variety of destinations – your hard drive, a recordable DVD or CD – in a variety of formats including mpeg-1, mpeg-2 and any other format for which you have a codec installed.

The ripping application is easy to use with a simple enough interface as to render the wizard superfluous. The source file on the DVD is automatically located for you, and all that remains is to choose from VCD or SVCD and opt for one of three quality settings.

Extended-length CD formats are supported and if you choose one of the better quality SVCD settings you can spread the movie over several discs. There's a preview option, and you can also set things up to rip to the hard drive initially, then burn the disc at a later stage.

Transcoding is hardly swift and for a full-length DVD the handbook recommends you make this an overnight, unsupervised task, just don't be surprised if it's still processing when you get up.

The other programs in the suite are similarly straightforward to use. The format converter will transcode avi files with any codec that's available, but if you want to produce mpeg4 files you'll need Quicktime 6 or another application that includes the mpeg4 codec. There's also a simple editing utility and a DVD driver manager for copying DVD video to your hard drive.

Ken McMahon

DETAILS

PRICE £29.95 (£25.49 ex VAT)
CONTACT E-promocard
01234 823 525
www.e-promocard.com
SYSTEM REQUIREMENTS
Windows 98 and above, Pentium processor, DVD-Rom, CD-R/RW, 64MB of Ram, 2GB of free hard disk space for video files
PROS Easy to use
CONS Poor preview; limited codecs; lengthy transcoding
VERDICT
An easy-to-use, if slow method of backing up DVD video

EASE OF USE	★★★★☆
FEATURES	★★★☆☆
VALUE FOR MONEY	★★☆☆☆
OVERALL	★★★☆☆

The ripping application's simple interface renders the wizard superfluous

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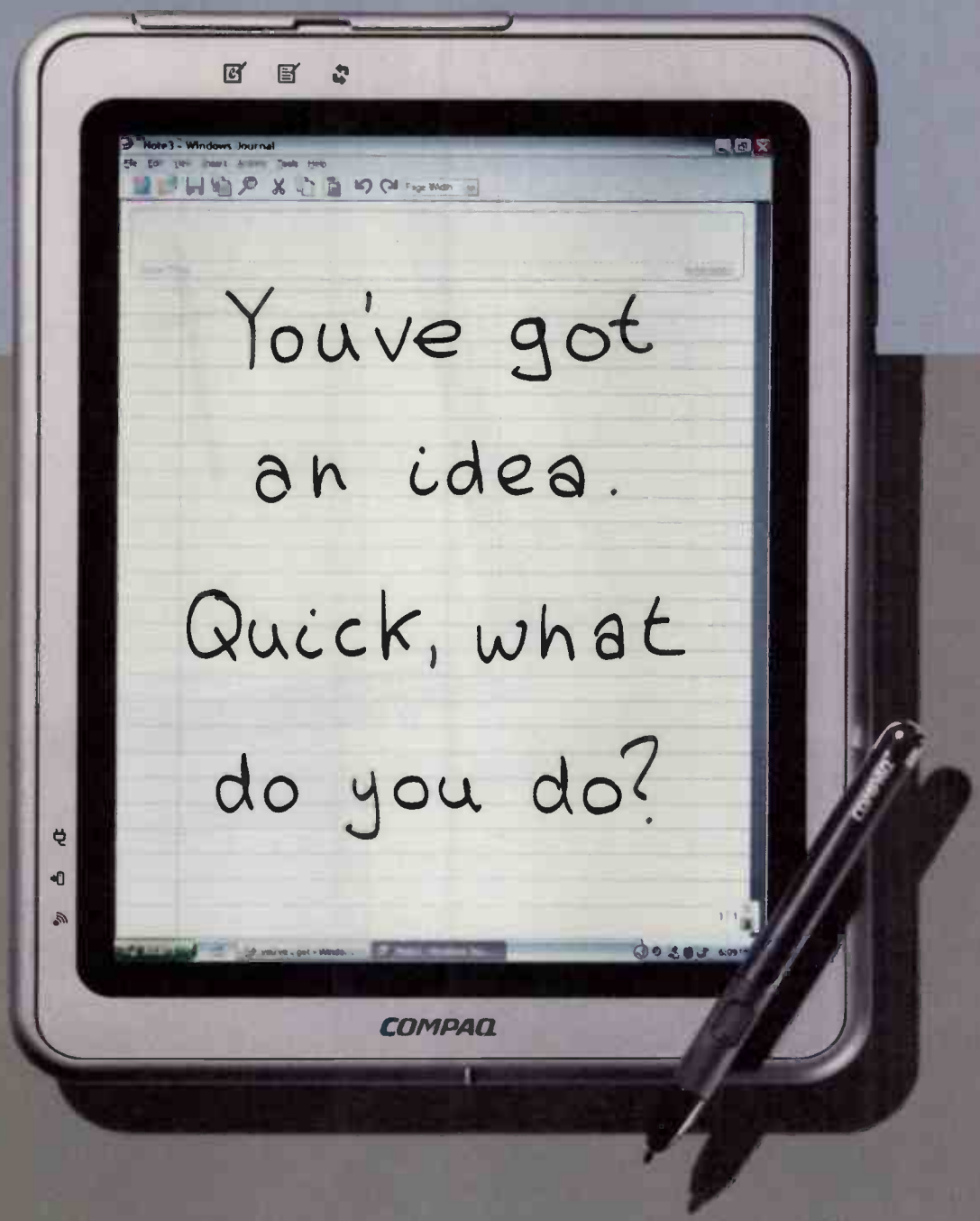
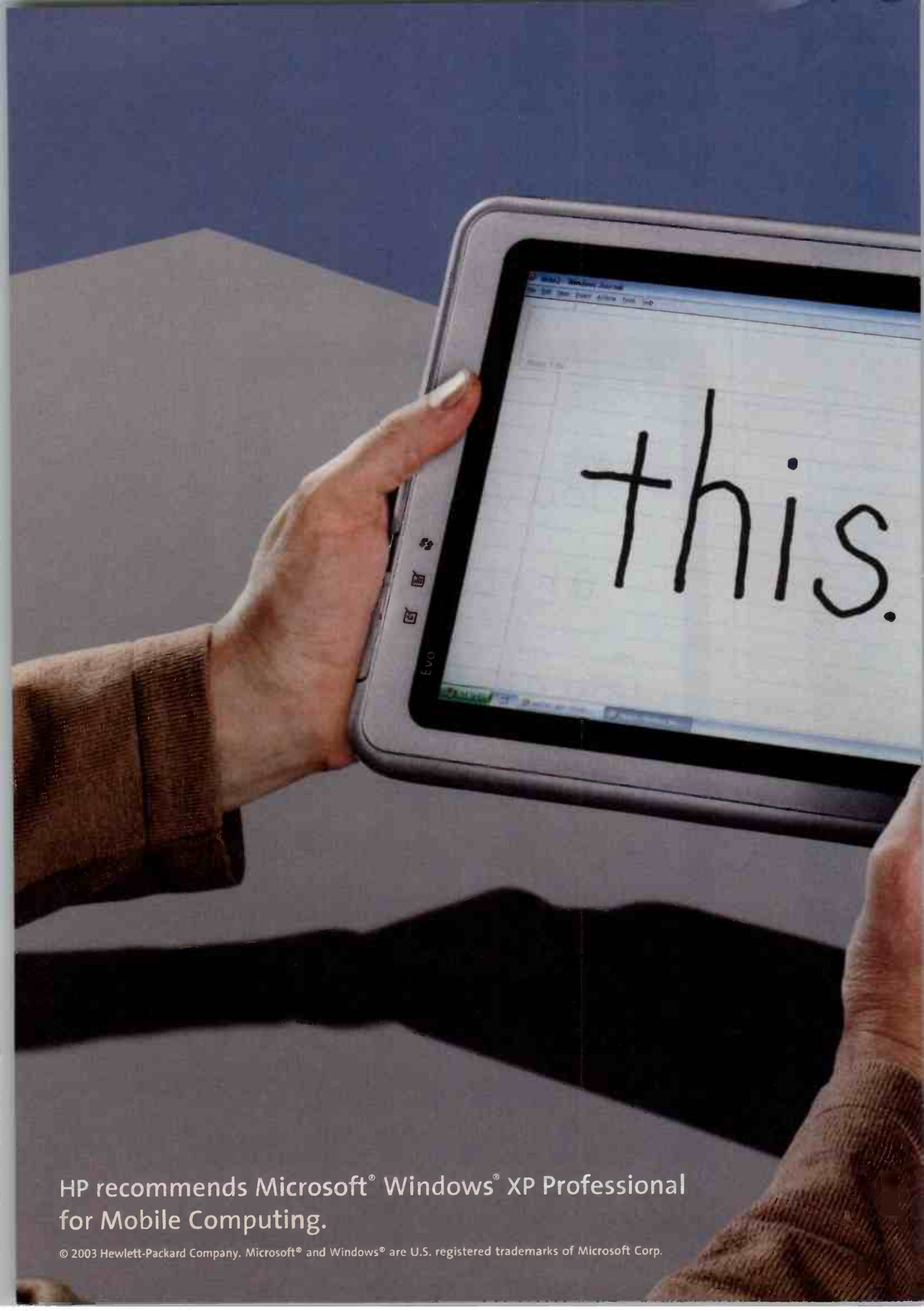
COMPAQ



Prices start from £1,333 ex. VAT (2 year warranty) to £1,449 ex. VAT (3 year warranty).
Call 0870 787 7147 for more information or visit www.hp.com/uk/tabletpc



HP recommends Microsoft® Windows® XP Professional for Mobile Computing.

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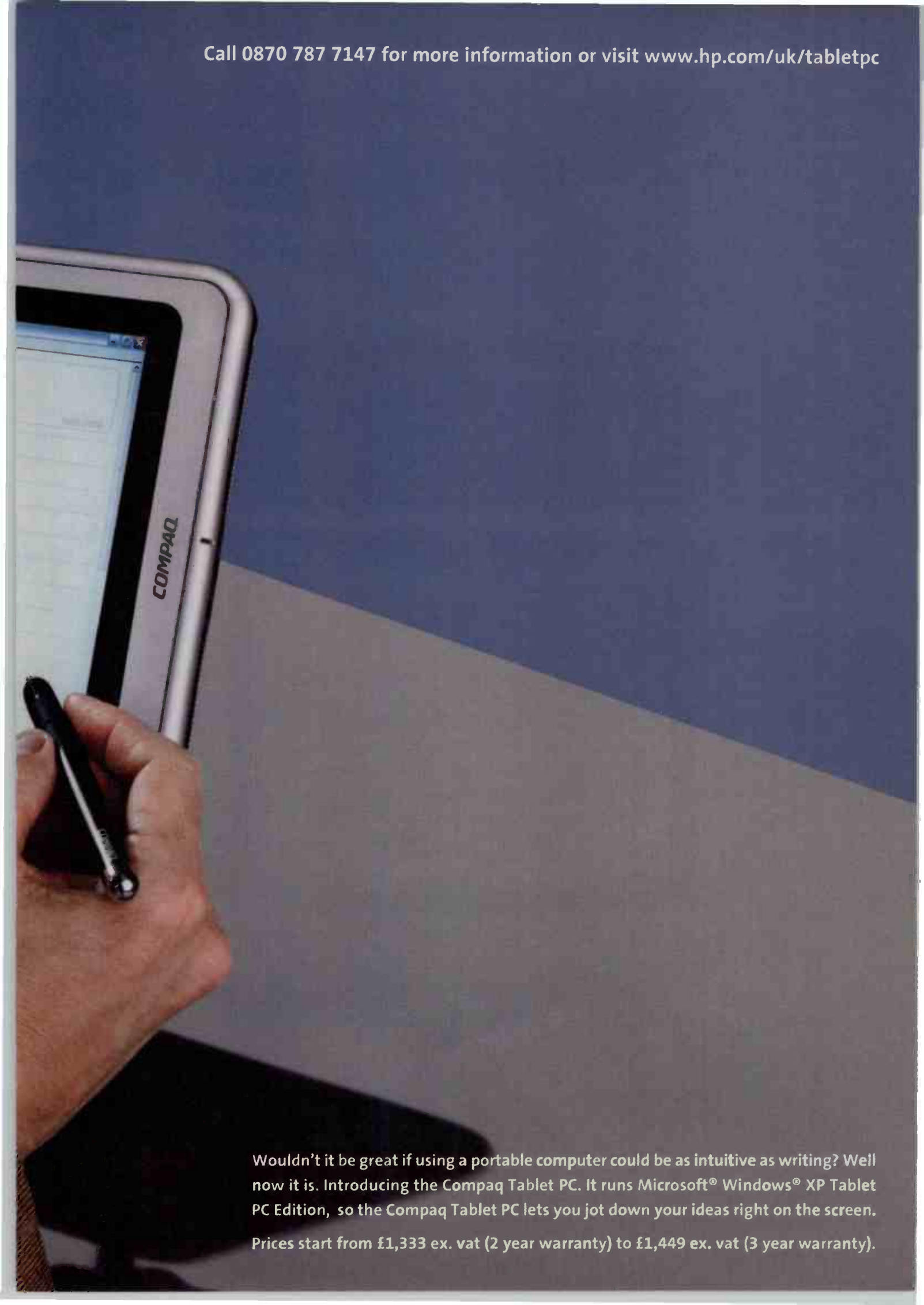
Call 0870 787 7147 for more information or visit www.hp.com/uk/tabletpc

Wouldn't it be great if using a portable computer could be as intuitive as writing? Well now it is. Introducing the Compaq Tablet PC. It runs Microsoft® Windows® XP Tablet PC Edition, so the Compaq Tablet PC lets you jot down your ideas right on the screen.
Prices start from £1,333 ex. vat (2 year warranty) to £1,449 ex. vat (3 year warranty).

HP recommends Microsoft® Windows® XP Professional for Mobile Computing.

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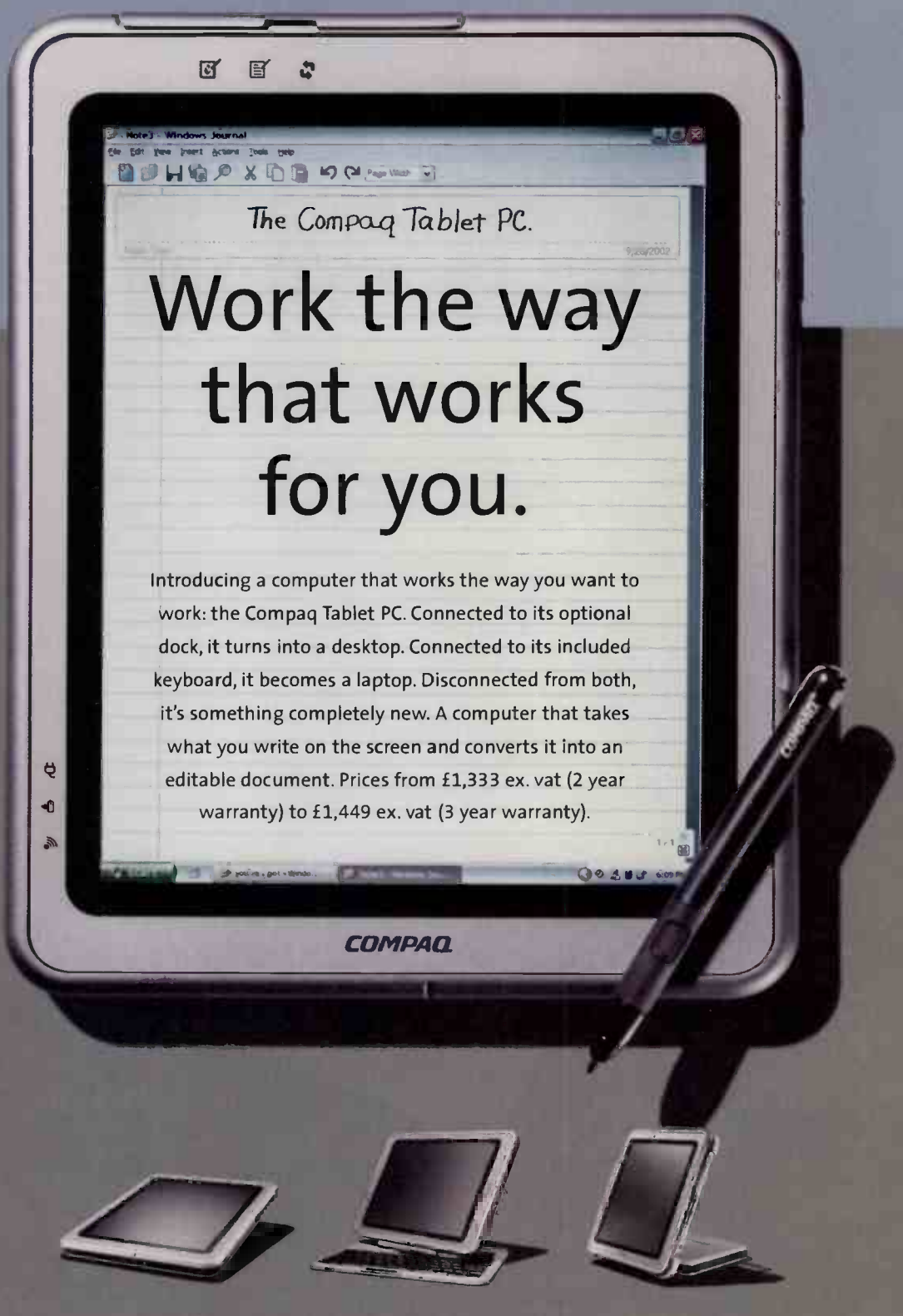
hp invent

COMPAQ



Write on it. Type on it. Dock it.

VIDEO-EDITING

Ulead Videostudio 7

Does this upgrade of the leading budget video-editing and DVD authoring suite live up to its claims of realtime performance?

Capture times are doubled in this upgrade

Ulead Videostudio 6 won the Editor's Choice award in *PCW*'s March video-editing software group test. Can version 7 improve on what is currently the best all-round budget video-editing and DVD authoring application? It certainly makes some grand claims, the boldest of which is the holy grail of realtime performance, but all too often such claims turn to dust when put to the test. Less ambitiously, but perhaps more practically, other new features include wider format support, content-based scene detection and on-the-fly mpeg transcoding during DV capture.

The Videostudio interface hasn't changed much, but then it didn't really need to. Its strong points are a huge preview window which can be expanded to fill the screen and a dual mode storyboard/timeline strip running beneath it. An options panel which provides extra editing tools and effects controls is on the left, and on the right a library panel provides drag-and-drop access to a comprehensive selection of video clips, stills, effects and transitions.

Videostudio 6 provided the option of directly transcoding captured clips to mpeg-2 format and version 7 goes a step further, providing on-the-fly transcoding to mpeg-1, mpeg-2, and wmv formats. You can also capture and edit mpeg-2 files from Sony's MicroMV format camcorders.

There is plenty of opportunity to tweak the transcoding settings, though most users will probably stick to the presets for VCD, SVCD and DVD recording. On-the-fly transcoding is swift and certainly less hassle than having to wait several hours for an entire DVD's worth of material. Both mpeg-1 and mpeg-2 captured clips took about the same time to transcode as to capture, effectively doubling the capture time. In other words a 20-second clip took 20 seconds to capture and a further 20 seconds to transcode.

As for realtime preview, let's just say that, having started out with a large dose of scepticism, we weren't all that surprised by the performance, or rather lack of it. While the efficiency of its realtime previewing, which Ulead calls Instaview, will very much depend on your hardware, we couldn't see a great deal of difference between this and Videostudio 6's 'instant preview' mode. This was the case both with native DV clips and mpeg.

The Playback button is now clearly labelled so you can toggle between clip and project preview. For previewing effects and transitions as well as the entire timeline, you're better off turning off the instant preview and electing for high-quality playback. Of course you'll have to wait while rendering takes place – typically around 15 seconds to a couple of minutes for transitions and effects filters on a short clip – but at least you can see what you're getting.

One new feature you'll definitely need to render to appreciate is the slow/fast motion effect, which ranges from 10 per cent to 1,000 per cent of the original clip speed. Likewise the five new video filters – old film, lighting, lens flare, comic and bubble.

In addition to a number of presets, these and many other filters now provide keyframable customisation. Adding keyframes and adjusting effects parameters is easy enough, but some of the presets would benefit from a description of some sort, rather than a tiny icon which tells you nothing.

One aspect of Videostudio that would benefit from keyframes but doesn't get them is the title editor. To be fair though, Videostudio's titling facilities are better than most low-end applications provide, with a good selection of titling templates and customisable animation options including rolling and crawling, flying, fading and zooming. Two new animation types, pop-up and turn, have been added to these and Cool 3D SE is also included.

A new extract video feature provides a quick and simple way of cutting several sections from a long clip by marking in and out points as it plays. The unwanted bits are trimmed and the remaining clips added to the timeline in a single step. The process can be inverted, so that the marked sections are retained rather than trimmed and editing is non-destructive, so you can reinstate the trimmings if you want, alternatively you can save the trimmed version to create a new clip.

Other significant improvements in this version include seamless capture that overcomes the Fat 32 4GB file size limit and post-capture content-based scene detection.

Ken McMahon

DETAILS

PRICE £49.99 (£42.54 ex VAT)
CONTACT Ulead 01327 844 880
www.ulead.co.uk
SYSTEM REQUIREMENTS
800MHz PIII, 128MB of Ram, Windows 98SE, ME, 2000, XP, 500MB of free hard disk space, 4GB for video files
PROS On-the-fly transcoding for VCD and DVD; keyframable effects; multi-cut editing
CONS Poor realtime performance
VERDICT
The realtime preview feature doesn't warrant an upgrade from v6, but this is a respectable suite that maintains Videostudio's pole position

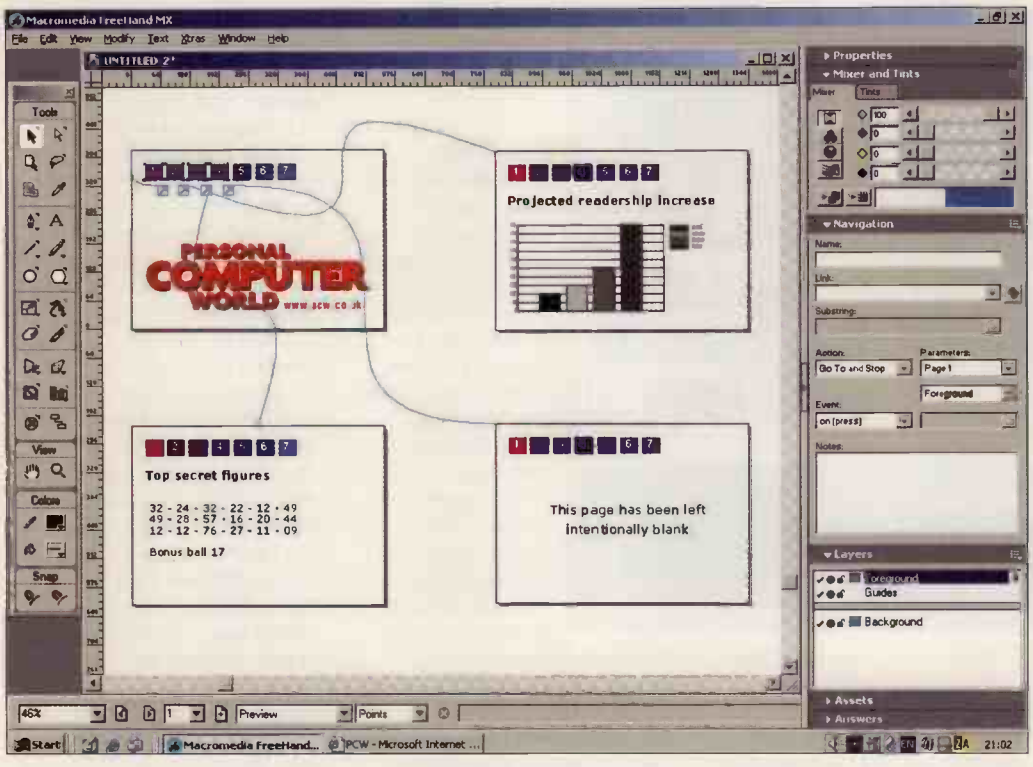
EASE OF USE	★★★☆☆
FEATURES	★★★★☆
VALUE FOR MONEY	★★★★★
OVERALL	★★★★☆

VECTOR GRAPHICS

Macromedia Freehand MX beta

EXCLUSIVE

A powerful, easy-to-use piece of software aimed at media and new media users, but home users may be tempted by it, too



The blue lines linking pages to objects on the opening page indicate the navigation routes. Clicking on an object takes you to the corresponding page when exported as a Flash movie

At heart, Freehand is a vector graphics tool used by print and web designers to knock out quick, attractive graphics – the kind of thing you'd see on the BBC News site mapping global troublespots, or the front of the financial pages tracking recent market growth. It is not a photo editor and, although it can save graphics for web use, it doesn't have the photo optimisation features of Fireworks. Its closest competitor is Adobe Illustrator.

With this release, the appreciably speedy MX-isation of Macromedia's headline products is complete. Beyond a few minor aberrations, of which more later, Freehand now looks and works just like Dreamweaver, Fireworks and Flash. The primary benefit – in theory at least – is that a common interface significantly shortens the learning cycle. It also encourages you to buy more Macromedia products on the basis of familiarity.

But this is far from a bark-no-bite release put out simply to kill the old look once and for all. Seasoned users will spend their first few minutes rolling the pointer across the tool well, which has grown exponentially. Many familiar icons now hide within fly-out menus containing similar functions, while new tools, such as fish eye and rotation, supplement the more familiar skew.

Enter 3D

There are far more exciting additions to be found elsewhere. The 'extrude' tool puts 3D objects just a click and a drag away, transforming a flat 2D square into a 3D cube, or a circle into a cylinder in less time than it takes to draw one on paper, while the concept of 3D rotation effectively combines both spinning and skewing in one operation. This takes a bit of getting used to, but once you've figured out the concept it's a real time saver. For the terminally artistic, there are smudging and shadowing options, which rank at least as more useful than the dubious 'graphic hose', which drops cycling patterns of shapes onto the canvas.

Before moving on from the tools, we must just touch on one other – mirror, which does exactly what its name suggests. A boon for office planners or house builders, it will precisely copy – in reverse – a selected object on the opposite side of a user-defined imaginary line. While you could achieve the same effect by copying and flipping the original, carefully moving the line back and forth will simultaneously position the object as necessary. Sadly this appears to work only on a horizontal plane, so can't be used for laying out street maps on a curve, or reflect above and below the line – for that you would use the more versatile Duet tool – but for a quick and simple fix its use pays dividends.

Duet resides with a raft of hidden functions buried in the Object inspector panel. While some are specialised, others, such as 'ragged', which scuffs up the edge of a shape, and the full range of bevel, glow and associated effects from Fireworks, will be an oft-used resource.

The real bonus of these tools, though, is that, like adjustment layers in Photoshop, they remain editable even after application. Attribute settings will infinitely tweak the default settings, and any alterations made to an original instance will be duplicated in any Duet 'daughter' objects. Even a change of colour or shape will ripple through into the associated secondary instances.

The tree-like application of these effects, where each one impacts on the effect that went before it, means the 'remove branch' button in the Object inspector enables you to jump back several layers in one go, quickly reversing several actions without stepping through multiple levels of undo.

A new connection tool should aid in flatplanning or flow charting with Freehand. Once the chart's process and decision boxes have been defined, the connections drawn between each of them will remember their relationship with the objects to which they are attached. So, if you move a box to the left to make room for a new process, the connecting line will follow and redraw on the fly to maintain the existing link. The one disappointment here is that when you are working on a normal page and connecting to objects drawn from the master page, our experience showed them to be

treated as a single group. So, four boxes side by side would be treated as a long rectangle, with connection points at either end, or above and below the gap between squares two and three.

Taking a lead from Flash, shapes such as rectangles and ellipses have a natural affinity towards perfection and regularity. As such they are effectively 'modeless', snapping to regular proportions (squares or circles) when within a certain margin, while allowing freeform movement outside that range. Freehand 10 would only retain perfect proportions if the Shift key was depressed, and in doing so lock out the freeform function.

The new chart editor is a versatile if simple addition, which will quickly prove its value to news sites. Split into two – a dumb spreadsheet that does no maths, and a chart formatting tab – it provides the basic tools necessary for putting together less challenging graphs, bar or pie charts. Shadows, legends and scales can be added or removed, as can axes, but the formatting doesn't go far beyond that, which is a shame. Dragging a colour onto the legend, for instance, does not shade the corresponding bars or segments to match, so be careful not to produce too many 100-year analyses you then want to tweak.

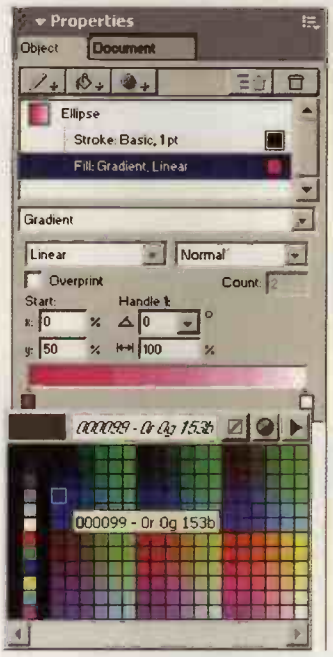
MX interface

Let's take a closer look at that MX interface. As already mentioned, there are a couple of deviations from the formula. The tool well, for instance, can only be docked horizontally at the top of the workspace. While this means it can be moved to overlap the channel-based panels at the edge of the screen, its lack of discipline makes the workspace less easy to organise than it is in Fireworks or Flash.

Moreover, the context-sensitive Properties inspector, which we had been assured was a mainstay of the MX interface and is commonly found running along the bottom of the screen, has been moved to the panel channel. There is method in this madness in that the layered object tab, discussed below, simply wouldn't fit into a horizontal layout without the use of scroll-bars. You also wouldn't be given as good an overall view of the state of your object as you do here.

This reworking of the Freehand interface is not only radical, but also spectacularly successful. The aforementioned Properties inspector is split in half – one part for the document as a whole, identical to the one in Freehand 10, and the other for the currently selected object. It is this latter half that is the most versatile, allowing you to change everything – and we mean everything – that defines how the object looks and even what it is (changing the 'sides' attribute, will turn a square into a pentagon into a heptagon, or whatever you choose).

Buttons within the object tab quickly add attribute entries for stroke, fill and effect, with each dropping down from the object



Change any object attribute in the expanded Properties inspector. Here we are picking the open and close colours of a gradient fill

name in the style of a Windows Explorer directory tree, allowing you to quickly click from one to the other, or select one and hit the bin icon to remove it – never again need you redefine useless attributes as 'none' from a dropdown menu, or change a stroke size to 0; if you don't want it, it won't be there.

By implementing the Properties inspector in this way, Macromedia has abandoned such Freehand stalwarts as the Fill panel, and the Window menu is now linear, rather than sectionalised. This may take a little relearning for anyone heavily indoctrinated into the ways of the old, but it's certainly well worth the effort.

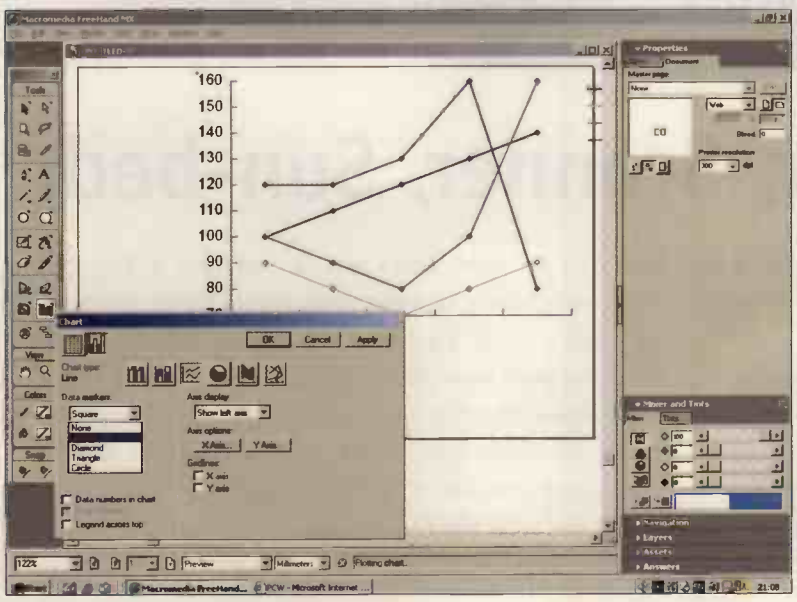
As with version 10, files can be exported as Flash movies, and they can be tested internally to save you firing up a browser or external Flash player. New in the MX edition, though, is a revised navigation palette, with expanded options and a wider range of Actionscript commands. After setting up navigation buttons on a master page you can quickly and easily turn them into hyperlinks or, if defining the navigation structure on a regular page, physically drag handles from each button to the page you want to link – rather like dragging the URL selector out of the Properties inspector in Dreamweaver.

The close working relationship between Freehand and Flash is evident from the Actionscript entry on the tool well, and any object with associated actions takes on a small blue icon to indicate its status. For the less demanding Flash user this may be a more efficient – and effective – way of creating Powerpoint-style presentations than full-blown Flash.

Beyond the interface, which cynics may claim was the driving force behind this release, there is plenty to justify the expense of an upgrade. While experienced users may find themselves relearning old tricks, the time spent mastering Freehand MX will be more than repaid in the savings made when they are completing complex assignments in half the time they did before.

There are a couple of rough edges here but among them all are some true gems.

Nik Rawlinson



The chart editor may not be complex, but it is the perfect tool for producing quick and easy graphs

DETAILS

PRICE £339.58 (£289 ex VAT); Upgrade from Freehand 10: £82.25 (£70 ex VAT); Upgrade from Freehand 9: £128.08 (£109 ex VAT) (available mid to late February)
CONTACT Macromedia
www.macromedia.com/uk
SYSTEM REQUIREMENTS
300MHz processor or better, Windows 98SE, ME, NT4 (SP6), 2000, XP, 64MB of Ram (128MB recommended) 1,024 x 768 16bit display, 70MB of free hard disk space, CD-Rom drive
PROS Powerful; simple to use
CONS Will require existing users to relearn some aspects
VERDICT
A massive overhaul of an impressive piece of software. Keenly priced, it will appeal to the media and new-media producer, but should be seriously considered by the high-end home user

EASE OF USE	★★★★☆
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★

Printer, Copier, Scanner, Sun-bed.

Introducing the **EPSON** Stylus CX3200, the most versatile sun-bed on the market. Additional features include printing, copying and scanning.

This space saving, three-in-one package doesn't compromise on quality. Using the latest **EPSON** technology it supplies 5760 optimised dpi with RPM helping you achieve true photo-quality output and borderless prints. There's a convenient standalone colour copy function (no need to use your PC), the **EPSON SMART PANEL** for exceptionally easy scanning, and an impressive speed-printing rate of up to 14ppm. What's more it comes with a "Copy Kit", which has templates for useful things like invitations, calendars, and cards - all at the touch of a button. In fact, it does everything you'd expect from separate machines - but all from a single cable-clutter-free unit at around £149.

Perfect for anyone with limited space or pale skin. If you'd like to know more about the **EPSON** Stylus CX3200 call **0800 220 546** or simply visit **www.epson.co.uk**

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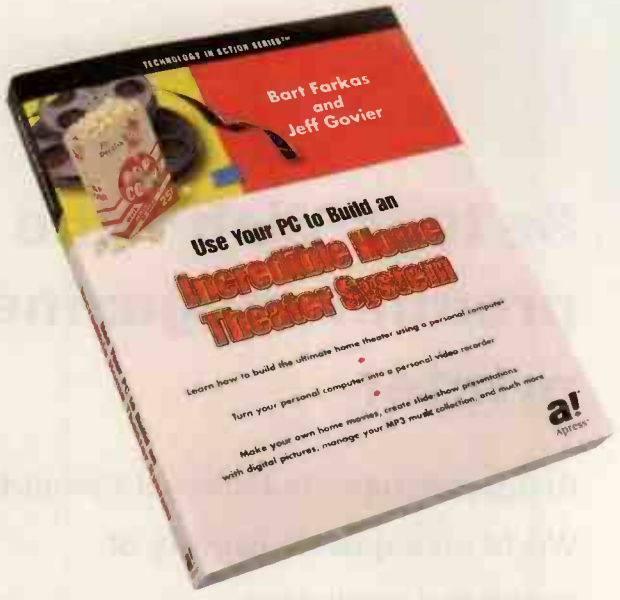
Build a Home Theatre PC

An American bias reduces the benefit of this book, but some may find it useful



So, you want to use your PC as a media centre to watch movies on your TV with the whole Dolby surround-sound experience. In that case you may want to grab a copy of Bart Farkas and Jeff Govier's *Use your PC to Build an Incredible Home Theater System*, but you'd better get used to the abbreviation HTPC (Home Theater PC) as this book uses it extensively. There's also a word of warning in the introduction: 'If you like things to work 100 per cent right out of the box with no fiddling, then an HTPC probably isn't for you... however, if you like to tinker a little and spend a fair amount of time on your PC then you likely have what it takes.'

One snag is hinted at in the spelling of 'Theater' as this is an American book, so the television standard referred to throughout is NTSC rather than our own Pal, which only merits passing reference in the index.

The authors get to the crux of the matter by telling us that the HTPC is more than just a DVD player but can also be used for gaming. This is then used as an excuse to cover most aspects of the selection of components for your new PC, however, the advice is rather general and lacks specific detail. The section on USB, for instance rather weakly states that 'it is probably worth the effort to get a motherboard that supports USB2'.

Although the matter of PC cooling and noise is touched on, it doesn't get nearly enough attention considering that the HTPC is likely to be located in your living room right next to your TV and hi-fi. We were also surprised that the brief section on Windows doesn't mention XP Media Center Edition, which has been specifically adapted for devices such as the HTPC.

Overall, we were unimpressed by this book, although it does have some worthwhile information and costs relatively little. If you have the knowledge to build and configure an HTPC you may find that this book saves you a little time, however the cash is probably better spent on a Radeon 9000 All-in-Wonder graphics card.

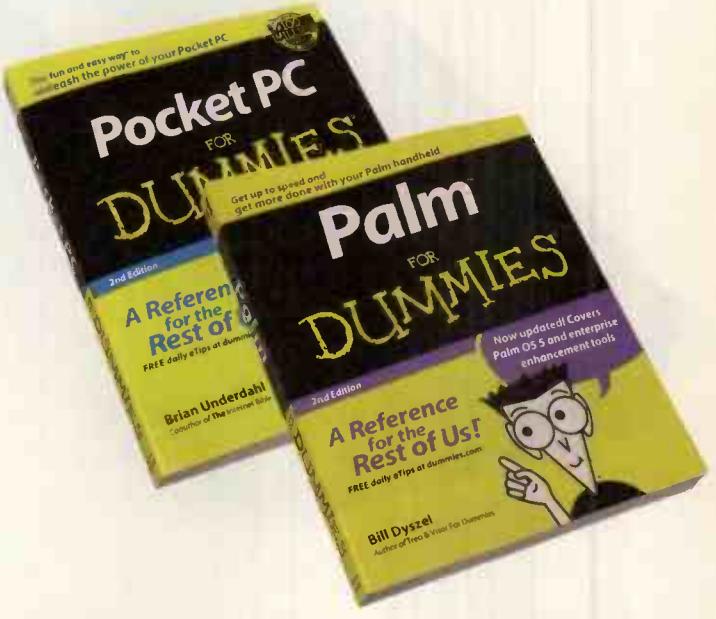
Leo Waldock

DETAILS

TITLE Use your PC to Build an Incredible Home Theater System
PRICE £15.95
AUTHOR Bart Farkas and Jeff Govier
PUBLISHER Apress
ISBN 1-590590-57-0
OVERALL ★★☆☆☆

PDAs for dummies

Pocket PC and Palm for Dummies aim to hold the hands of handheld users



Let's face it, the manuals that come with Pocket PCs aren't renowned for being comprehensive. Dell's new Axim, for instance, accompanies a svelte 130-page volume, little of which digs very deep. While it adequately covers everything the average user could want to know, there are hidden functions within Pocket PC that it cannot cover, and the same is true for Palm OS.

These two *Dummies* books aim to fill those gaps, and they do it very well. Both also look at some added extras. In the case of Pocket PC, this includes Pocket Money, a free download compatible with Microsoft Money on the PC, and for Palm there's coverage of word processor Writesmart Pro, database Jfile and third-party suite Documents to Go.

The trouble with this approach is that much of the information will be irrelevant to some readers. *Pocket PC for Dummies*, for example, guides you through Omnisolve, found only on HP's Jornada range, and currency conversion functions built into the standard calculator on the Audiovox Maestro and Toshiba e570. Great for HP, Audiovox or Toshiba customers, but not so good for the rest of us.

Strip out many of these extras from either book and you'll be back to the size of the manual bundled with your hardware.

On a more positive note, *Palm for Dummies* features standardised links that redirect to retailers selling the software covered, although in the case of anything redirecting to Amazon it pointed at the US site, which is not helpful for British readers.

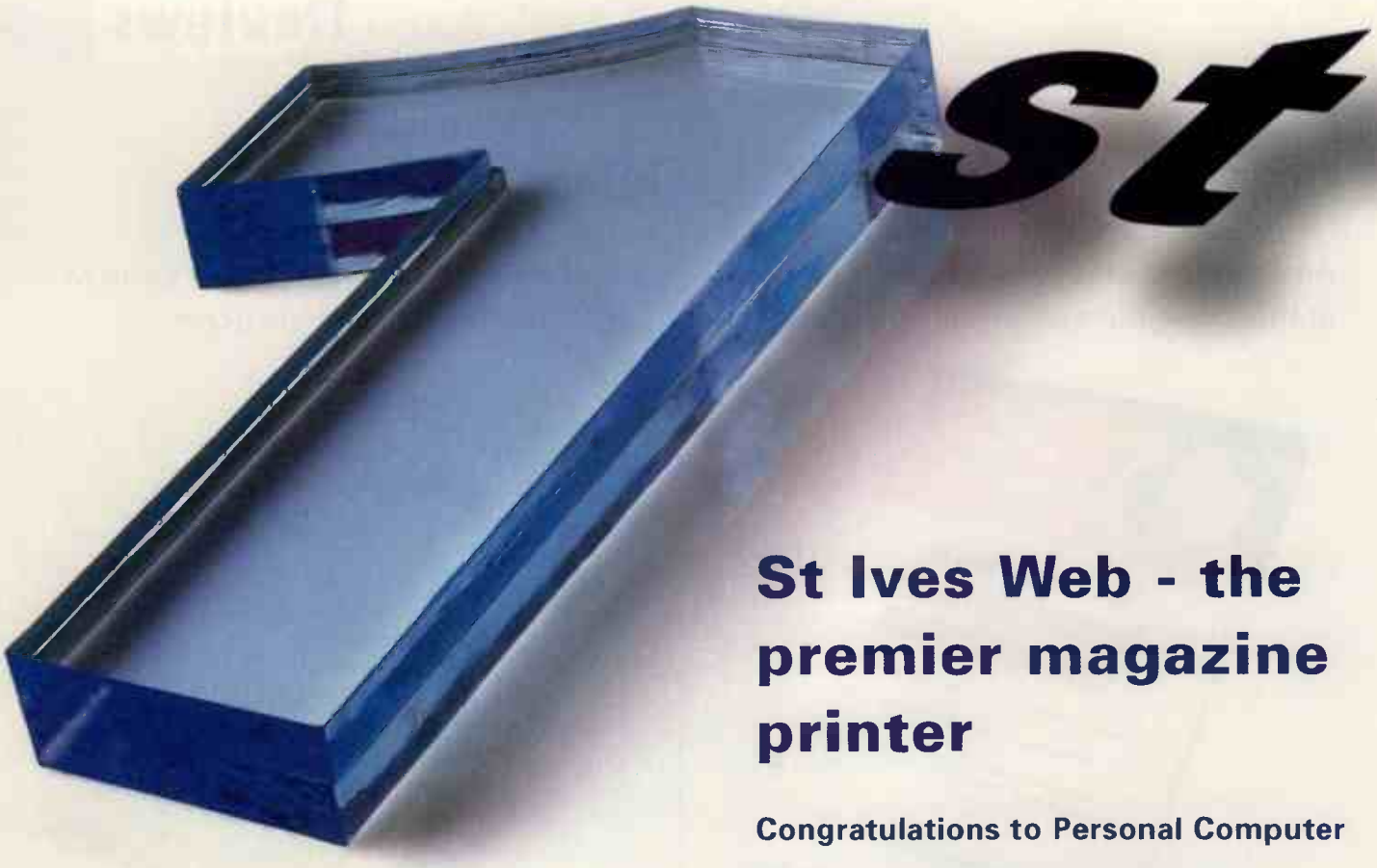
Each of these books offers a lot to the more adventurous mobile computer user, but for anyone looking to use the built-in apps and little else the manual bundled with each device will probably suffice. The 'for dummies' moniker should perhaps be replaced by 'for the slightly more ambitious'.

Nik Rawlinson

DETAILS

TITLE Palm for Dummies
PRICE £16.50
AUTHOR Bill Dyszel
PUBLISHER Wlley Publishing
ISBN 0-764516-74-4
OVERALL ★★★☆☆

TITLE Pocket PC for Dummies
PRICE £17.99
AUTHOR Brian Underdahl
PUBLISHER Wiley Publishing
ISBN 0-764516-40-X
OVERALL ★★★★☆



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Best Buys

YOUR GUIDE TO TODAY'S TOP PRODUCTS >>

ENTRY-LEVEL PC

Mesh XP 2400+DVX

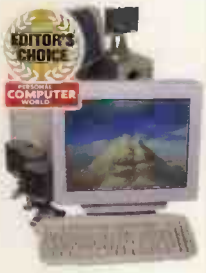
REVIEW March 2003, p52 **PRICE** £821.33
(£699 ex VAT) **CONTACT** Mesh 0870 046 4747
www.meshcomputers.com

Great performance and a very large hard drive are the standout features in this value PC. A number of extras, including the Radeon 9000 All-In-Wonder graphics card round off the package.

MID-RANGE PC

Multivision Vision KT4 bundle

REVIEW January 2003, p123 **PRICE** £1,056
(£899 ex VAT) **CONTACT** Multivision 0870 066 0885
www.multivision.co.uk



An Athlon 2200+ with 512MB of Ram gives this PC the edge in its price range. The graphics are handled by Gainward's Ti4200 Geforce4 and the excellent Iiyama 19in monitor.

HIGH-END PC

Hi-Grade Ultis PV4 GPW02

REVIEW February 2003, p109 **PRICE** £1,410
(£1,200 ex VAT) **CONTACT** Hi-Grade 0800 074 0403
www.higrade.com

Backing up the 2.8GHz CPU and 512MB of Ram is a massive 160GB Raid array and a Geforce4 Ti4600. A front-mounted unit takes various memory cards and features USB2 ports.

FULLY FEATURED NOTEBOOK

Hi-Grade M6600-2400

REVIEW March 2003, p50 **PRICE** £1,761
(£1,499 ex VAT) **CONTACT** Hi-Grade 0800 074 0403
www.higrade.com

This notebook offers great performance thanks to a 2.4GHz Pentium 4 Mobile processor, 512MB of memory and a Geforce 420 Go chip. It also sports a DVD-RW drive and four memory card slots.

ULTRA-PORTABLE NOTEBOOK

Sony Vaio PCG-SRX41P

REVIEW June 2002, p41 **PRICE** £1,155
(£982.97 ex VAT) **CONTACT** Sony 020 7365 2021
www.vaio.sony-europe.com

Possibly the best compact notebook we've seen, this is well designed and offers both wireless and Bluetooth. The icing on the cake is the battery life – a stunning three hours and 34 minutes.

BUDGET NOTEBOOK

Toshiba Satellite 3000

REVIEW July 2002, p108 **PRICE** £999
(£850 ex VAT) **CONTACT** PC World
www.pcworld.co.uk.

Fully featured and less than £1,000, the 3000 performs well, and its battery life is up there with the best. It's also the only notebook in its class capable of completing our graphics tests.

FLAT-PANEL MONITOR

AOC LM720A

REVIEW March 2003, p142 **PRICE** £269
(£228.93 ex VAT) **CONTACT** AOC 0239 226 8800
www.aocmonitor.com

With a screen size of 17in this panel has a lower price than many 15in LCDs. However, this doesn't come at the expense of quality as it also boasts good colours and image uniformity.

17IN CRT MONITOR

NEC-Mitsubishi Diamond Pro 750SB

REVIEW October 2002, p61 **PRICE** £163.32
(£139 ex VAT) **CONTACT** Dabs
www.dabs.com

The 750SB is pretty much infallible as far as 17in monitors go. It's very compact, reasonably good looking and has fantastic image quality, but it's the price that really stunned us.

19IN MONITOR

CTX PR960F

REVIEW June 2002, p125 **PRICE** £334.87
(£285 ex VAT) **CONTACT** Dabs
www.dabs.com

Excellent image quality, as well as a USB hub, make this 19in monitor more than worth its £335 asking price. Although a little on the large side, it does have both VGA and BNC inputs.

PDA

Palm Tungsten T

REVIEW January 2003, p61 **PRICE** £359
(£325 ex VAT) **CONTACT** Palm
www.palm.com/uk

The first device to adopt Palm OS5 is also one of the best PDAs around. It features wireless, the screen is almost without fault and it's the fastest PDA we've ever laid our hands on.

POCKET PC

HP Jornada 928

REVIEW October 2002, p53 **PRICE** £390
(£331.91 ex VAT) **CONTACT** Vodafone
www.vodafone.co.uk

Using Microsoft's Pocket PC Phone Edition, the 928 may be chunky but it also has an ease of use that beats the socks off its rivals. It also incorporates fully functioning GSM and GPRS.

MULTIFUNCTION DEVICE

Hewlett-Packard PSC 2210

REVIEW January 2003, p82 **PRICE** £269
(£228.94 ex VAT) **CONTACT** Dabs
www.dabs.com

This multifunction device is a rarity as it offers print and scan quality that is normally only seen in standlone devices. Card slots are also included making this an excellent bargain.

SCANNER

HP Scanjet 4500c

REVIEW February 2003, p125 **PRICE** £139.82
(£119 ex VAT) **CONTACT** Dabs
www.dabs.com

Once again, HP shows that it can combine good hardware with great software. The scanner has plenty of shortcut buttons and won't keep you hanging around for scans to finish either.

LASER PRINTER

Epson EPL-5900

REVIEW April 2003, p179 **PRICE** £304.33
(£259 ex VAT) **CONTACT** Epson 0800 220 546
www.epson.co.uk

Excellent photo and text quality, backed up by exceptional ease of use put the EPL-5900 in good stead. It may not be much to look at but it's a speedy worker that's ideal for the small office.

INKJET PRINTER

Canon i320

REVIEW January 2003, p89 **PRICE** £69
(£58.72 ex VAT) **CONTACT** Canon 08705 143 723
www.canon.co.uk/bubblejet

It may not be much of a looker, but the i320 is superb value. Photo printing is just as good as many models at twice the price, and it is very easy to use. All this for under £70 makes it irresistible.

WEBCAM

Philips Touchcam Pro PCVC-740K

REVIEW March 2002, p139 **PRICE** £55.22
(£47 ex VAT) **CONTACT** Dabs
www.dabs.com

This is a brilliant webcam that can be used for high-resolution still snaps, or 60fps video at 640 x 480. It is even capable of text recognition with the help of Xerox's Pagecam technology.

SPEAKERS

Acoustic Energy Aego2

REVIEW April 2002, p138 **PRICE** £199
(£169.40 ex VAT) **CONTACT** Acoustic Energy
www.aegoproject.com

Dressed in stylish plastic, the Aego2s are the best-looking 2.1 speakers we've seen. Sound quality is almost infallible too, but, as you'd expect, a setup of this quality comes with a big price tag.

SOUND CARD

Terratec DMX6Fire 24/96

REVIEW September 2002, p101 **PRICE** £158
(£134.47 ex VAT) **CONTACT** Dabs
www.dabs.com

Featuring true 24/96 sound, and a port-packed 5.25in bay, Terratec's 6Fire card gives you unrivalled sound quality, more ports than you can shake a stick at and a whole heap of software too.

HARD DRIVE

IBM Deskstar 120GXP

REVIEW April 2002, p69 **PRICE** £238.52
(£203 ex VAT) **CONTACT** Dabs
www.dabs.com

The performance of the Deskstar drives from IBM surpasses every EIDE drive we've previously seen. If you're after a large and fast hard drive, which makes very little noise, then look no further.

SOCKET A MOTHERBOARD

Chaintech Apogee 7VJL

REVIEW November 2002, p149 **PRICE** £77.26
(£65.75 ex VAT) **CONTACT** Scan
www.scan.com

It's certainly not a looker, but the 7VJL is a brilliant performer. It has four front-mounted USB ports, a head-phone socket and onboard sound all for only £90. Could you ask for more?

PENTIUM 4 MOTHERBOARD

Gigabyte GA-8IHXP

REVIEW November 2002, p144 **PRICE** £129
(£109.79 ex VAT) **CONTACT** Dabs
www.dabs.com

With an Intel 850 chipset and PC1066 RD-Ram support, this is the fastest board we've seen. It's also the best value and comes with 10 USB2 ports, 4.1 sound, Lan, IDE Raid and Dual Bios.

DIGITAL VIDEO CAMERA

Sony Handycam DCR-IP220

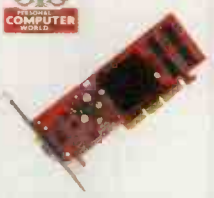
REVIEW January 2003, p71 **PRICE** £1,314.82
(£1,119 ex VAT) **CONTACT** Sony 08705 111 999
www.sonystyle.com

The first 2mega-pixel camera to hit the market is also one of the simplest to use and best looking. Using Sony's MicroMV format, both still and video picture quality is brilliant.

GRAPHICS CARD

Gainward Powerpack Pro/450 TV

REVIEW August 2002, p118 **PRICE** £53.33
(£46.93 ex VAT) **CONTACT** Komplett
www.komplett.co.uk



Geforce MXs mean great value for money. This card has a single VGA and a TV-out in addition to good performance. However, there isn't any extra software beyond the Nvidia drivers.

VIDEO-EDITING CARD

Hercules All-In-Wonder 9000 Pro

REVIEW March 2003, p74 **PRICE** £199
(£170.20 ex VAT) **CONTACT** Hercules 020 8665 1881
www.hercules-uk.com

The latest edition of the All-In-Wonder series offers the 9000 chip running at full speed. There's a break-out box and radio remote control, although it is lacking a Firewire port.

DIGITAL CAMERA

Canon Power Shot S45

REVIEW January 2003, p138 **PRICE** £481.75
(£410 ex VAT) **CONTACT** Dabs
www.dabs.com

Featuring a 3x optical zoom and a 32MB Compact Flash card, the S45 is an easy-to-use 4megapixel camera that doesn't skimp on features. It's way ahead of similarly priced competition.

DVD-RW

Ricoh MP5125A

REVIEW October 2002, p122 **PRICE** £199
(£169.37 ex VAT) **CONTACT** Dabs
www.dabs.com

Although quite basic and not the fastest drive around, the MP5125A does the job without any fuss. Nero and InCD are included and it also comes with Justlink buffer underrun and a 2MB data cache.

CD-RW

LG GCE-8400B

REVIEW October 2002, p117 **PRICE** £72.19
(£61.43 ex VAT) **CONTACT** LG 0870 607 5544
www.lge.co.uk

A great performer and superb value, this CD-RW drive is ahead of the pack. Featuring a technology that minimises writing times, this is the best all-round drive we've seen.

OFFICE SOFTWARE

Ability Office

REVIEW April 2003, p194 **PRICE** £50 (£42 ex VAT)
CONTACT Ability 0207 231 6310
www.uk.ability.com

Costing a fraction of Microsoft Office's price, Ability Office still manages to offer a similar look and features. There isn't a presentation package although it does include a macro language.

UTILITY SOFTWARE

Zone Labs Zonealarm Pro

REVIEW February 2003, p73 **PRICE** $49.95
(£32 approx) **CONTACT** Zone Labs
www.zonelabs.com

Building on the success of the free version, Zonealarm Pro offers more security but keeps the easy-to-use interface. However, support is limited to email and it is only available online.

WEB-EDITING SOFTWARE

Macromedia Dreamweaver MX

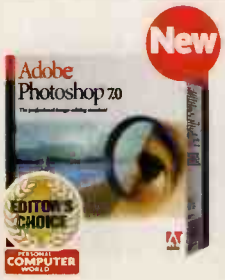
REVIEW December 2002, p153 **PRICE** £351
(£299 ex VAT) **CONTACT** Macromedia 0800 169 8216
www.macromedia.com/uk

A very powerful web-editing suite that supports most server technologies and integrates with other Macromedia products, Dream-weaver demands some effort but the results are worth it.

IMAGE-EDITING SOFTWARE

Adobe Photoshop 7

REVIEW September 2002, p115 **PRICE** £586.33
(£499 ex VAT) **CONTACT** Adobe 020 8606 4001
www.adobe.com



Photoshop remains the image editor of choice with every function that you could ever want. Version 7 offers some useful additions such as a file browser and batch renaming.

VIDEO-EDITING SOFTWARE

Ulead Videostudio 6

REVIEW March 2003, p162 **PRICE** £49.63
(£42.24 ex VAT) **CONTACT** Ulead 01327 844 880
www.ulead.co.uk

Aimed at beginners, this package doesn't sacrifice any quality or features and has integrated DVD authoring. It has an easy-to-use tabbed interface and includes several capture methods.

GRAPHICS SOFTWARE

3D Studio Max 5

REVIEW December 2002, P85 **PRICE** £3,166.63
(£2,695 ex VAT) **CONTACT** Discreet 020 7851 8000
www.discreet.com

This edition of 3D Studio Max builds on its previous success with more powerful tools and increased functionality. Despite its high cost this is the best package around.

Give us your feedback and you could win £1,000!

WIN!

Your opinion matters to us, so to make *PCW* even better we'd like to find out more about you, your computers and computing needs. Please take a few moments to complete the questionnaire below.

- Everyone who completes and returns the survey will be entered into a prize draw and one lucky reader will win the top prize of £1,000! And 25 readers will receive a year's free subscription to *PCW*.
- For your chance to win please complete the survey below and return it to us FREEPOST no later than 28 MARCH 2003.

Official rules & regulations to enter the prize draw: The promoters are not responsible for any entries lost or delayed in the post. Proof of posting is not proof of delivery. Entries that are late, damaged or defaced will not be accepted. Entries into the prize draw must only be posted. Faxes, photocopies or any other duplicates will not be accepted. Only one official entry per household. Only entries on the official form will be accepted. Proof of identity and eligibility will be required before any prize is awarded. The winners will be notified by post after the prize draw has taken place. The winners may be required to attend a special presentation to receive their prize and follow-up coverage of the event. A photograph and name of the winners may be featured in future publications and promotional material. This prize draw is open to all residents in the UK who are over 18 years of age, except for the employees of VNU and their various affiliates, agencies and suppliers and members of employees' immediate families. No cash alternative will be offered to the *PCW* subscription prizes, and the prizes are not transferable to any other person(s). If you have any questions about the prize draw please wirite to: Lucy Nebel, VNU, 32-34 Broadwick Street, London W1A 2HG. Closing date for entries is 28 March 2003; Prize draw held on 31 March 2003. No purchase is necessay to enter and win. You may enter without receiving or completing the reader survey. All entries must be sent in writing to Lucy Nebel at the address above.

We would like to start by asking you a few questions about THE MAGAZINE.

1. How often do you read *Personal Computer World*?

I have a subscription – *Please skip directly to Q3*	☐1
I have a regular order at a newsagents - *Please skip directly to Q3*	☐2
I buy every issue/almost every issue	☐3
I buy most issues *(around 3 out of 4)*	☐4
I buy it once every three or four issues	☐5
I only buy it occasionally *(around twice a year or less)*	☐6
This is the first time I have bought it	☐7

2. IF YOU DON'T HAVE A SUBSCRIPTION/REGULAR ORDER:
What made you buy this issue of *Personal Computer World*?
(Please tick all the things that made you buy it in the first column and the one item that is most important in the second)

	All reasons (please tick all that apply)	Most important (tick one only)
The free cover-mounted CD/DVD	☐1	☐1
Reviews of some specific products	☐2	☐2
General advice on purchasing IT products	☐3	☐3
Hands On section	☐4	☐4
Developing my PC skills	☐5	☐5
Advertisements – to buy products	☐6	☐6
Advertisements – to keep abreast of prices and products on sale	☐7	☐7
Generally interested in PCs	☐8	☐8
Cover caught my eye	☐9	☐9
Wanted to have anniversary issue	☐10	☐10
Other *(please write in)*	☐11	☐11

3. Have you ever used any of the CD-Roms/DVDs on the cover of *Personal Computer World*?

Yes ☐1 No ☐2

4a. How often do you use editorial information in *Personal Computer World* to help you choose PCs, peripherals or software that you are buying for yourself (ie for home use)?

4b. How often do you use the advertisements in *Personal Computer World* to help you choose PCs, peripherals or software that you are buying for yourself?

	I use it a lot	I use it occasionally	I seldom use it	I never use it
a) I use **editorial** information	☐4	☐3	☐2	☐1
b) I use the **advertisements**	☐4	☐3	☐2	☐1

5a. When you are buying a PC there are a lot of factors that will influence your decision. Some of them are listed below. In the first column, please place a tick against the ONE factor that you think is most important.

5b. Please tick in the second column against the ONE factor you think is the next most important.

5c. Please indicate the third most important factor by ticking the third column. *(One tick only, please)*

	a/Most impt	b/2nd	c/3rd
Technical reviews in *Personal Computer World*	☐1	☐1	☐1
Technical reviews in other computer magazines	☐2	☐2	☐2
Professional recommendation *(eg IT consultant)*	☐3	☐3	☐3
Colleague or friend's recommendation	☐4	☐4	☐4
Advertisements in *Personal Computer World*	☐5	☐5	☐5
Advertisements in other computer magazines	☐6	☐6	☐6
Buying recommendations and awards in *Personal Computer World*	☐7	☐7	☐7
Buying recommendations and awards in other PC magazines	☐8	☐8	☐8
Advertisements in national press	☐9	☐9	☐9
IT supplements in national press	☐10	☐10	☐10
Internet	☐11	☐11	☐11
Television advertising	☐12	☐12	☐12
Manufacturer's reputation	☐13	☐13	☐13
After-sales service	☐14	☐14	☐14
Other (please state)	☐15	☐15	☐15

6. How often do you read Micromart (the classified advertising section at the back of *Personal Computer World*)?

I read it in almost every issue I see	☐1
I read it in most issues I see	☐2
I only read it in some of the issues I see	☐3
I don't ever read it	☐4

7. Have you ever bought anything from an advertisement in Micromart?

Yes	☐1 (Go to Q8)
No	☐2 (Skip to Q9)

8a. IF YES: About how often do you purchase from advertisements in Micromart?

Once a year or less	☐1
Around twice a year	☐2
Three or four times a year	☐3
Five or more times a year	☐4

8b. How much do you think you have spent buying things from Micromart in the past 12 months?

Under £50	☐1
£50-£99	☐2
£100-£149	☐3
£150-£199	☐4
£200-£249	☐5
£250-£499	☐6
£500-£999	☐7
£1,000+	☐8

9. Have you ever made an enquiry or bought something as a result of any advertisements in *Personal Computer World*? *(Please tick all that apply)*

Yes – I have bought/enquired about things I use at work ☐1
Yes – I have bought/enquired about things for home/leisure use ☐2
No – I have not bought/enquired about anything because of an ad in *Personal Computer World*. ☐3

10. What do you generally do with the magazine after you finish reading it?

I keep it as a reference ☐1
I keep a part of it ☐2
I pass it on to a friend/relative ☐3
Put issue in library or common area at work ☐4
I throw it away/recycle it ☐5

11. How many people including yourself do you think will read your copy of *Personal Computer World*? *(Please write in the number on the line below)*

_____

12. What other computer magazines do you read nowadays (a) regularly – at least three out of four issues and (b) occasionally?

	a/Regularly	b/Occasionally
Computer*active*	☐1	☐1
Computer Buyer	☐2	☐2
Computer Shopper	☐3	☐3
Computer Weekly	☐4	☐4
Computing	☐5	☐5
Internet	☐6	☐6
MacUser	☐7	☐7
Micro Mart	☐8	☐8
.net	☐9	☐9
PC Advisor	☐10	☐10
PC Format	☐11	☐11
PC Guide	☐12	☐12
PC Know How	☐13	☐13
PC Plus	☐14	☐14
PC Pro	☐15	☐15
PC Zone	☐16	☐16
Web*active*	☐17	☐17
Web User	☐18	☐18
Any Internet magazine not mentioned above *(Please write in)* _____	☐19	☐19
Any other computer magazine *(Please write in)* _____	☐20	☐20
Any national press IT supplement *(Please write in)* _____	☐21	☐21
None	☐22	☐22

13. How often did you used to read *PC Magazine* before it closed down?

I was a subscriber ☐1
I read it regularly (at least three out of four issues) ☐2
I read it occasionally ☐3
I never read it ☐4

14. How often do you visit *Personal Computer World*'s website (pcw.co.uk)? *(Please tick the **one** answer that comes closest)*

At least once a week ☐1
At least once a month ☐2
Once every two or three months ☐3
Two or three times a year ☐4
Once a year or less often ☐5
Never ☐6
Don't know/can't remember ☐7

Now we would like to ask something about the computers that you use AT HOME.

15a. What type of computers do you have at home? *(Please tick all that you have)*

Desktop ☐1
Laptop ☐2
Handheld ☐3

15b. Which of these do you use most often? *(Please tick **one**)*

Desktop ☐1
Laptop ☐2
Handheld ☐3

16. Where did you buy your home computer?
(If you have more than one computer at home, please answer for the one that you use most often)

Computer dealer *(eg local independent shop)* ☐1
Computer superstore *(eg PC World)* ☐2
Computer chain *(eg Time)* ☐3
High-street shop *(eg Dixons)* ☐4
Internet ☐5
Mail order from a catalogue ☐6
Mail order from a magazine advertisement ☐7
Second hand from computer fair ☐8
Second hand elsewhere ☐9
Self built ☐10
Other *(please write in below)* ☐11
_____
I do not have a computer at home ☐12 *Please skip straight to Q19*

17. When did you buy it?

Month _____ Year _____

18a. Which of the following have you bought for home use in the past 12 months? We are interested in those you bought as separate items *not as part of a package with a new computer.*

18b. For each of the items you have bought, please write in how much you spent on it in the past 12 months. ***(Remember that we are talking about things you bought for home use)***

	a/Bought in last 12 months	b/Amount spent
Hardware		
Colour Inkjet	☐1	£ _____
Mono laser printer	☐2	£ _____
Colour laser printer	☐3	£ _____
Monitor	☐4	£ _____
Motherboard	☐5	£ _____
Network card	☐6	£ _____
Graphics card	☐7	£ _____
Sound card	☐8	£ _____
Hard drive	☐9	£ _____
Extra memory	☐10	£ _____
CPU	☐11	£ _____
Software		
Games software	☐12	£ _____
Educational software	☐13	£ _____
Video/image-editing software	☐14	£ _____
Office software	☐15	£ _____
Peripherals		
Scanner	☐16	£ _____
Digital camera	☐17	£ _____
Modem	☐18	£ _____
MP3 player	☐19	£ _____
DVD drive	☐20	£ _____
DVD writer	☐21	£ _____
CD writer	☐22	£ _____
PDA/handheld PC	☐23	£ _____
Digital video camera	☐24	£ _____
Mobile phone	☐25	£ _____
Consumables *(ie ink cartridges)*	☐26	£ _____
Other peripherals *(eg Zip drive)*	☐27	£ _____

19a. Do you plan to buy a new computer ***(including a laptop or handheld)*** **in the next 12 months?**

Yes ☐1 No ☐2 Don't know ☐3

19b. IF YES: What kind of computer will this be? ***(If there is likely to be more than one, please answer for the most expensive)***

Desktop ☐1 Laptop ☐2 Handheld ☐3

19c. About how much do you expect to spend on the package?

£ _____

20a. Which of these do you plan to buy for home use in the next 12 months? Again, we are interested in those you plan to buy as separate items *not as part of a package with a new computer.*

20b. For each of the items you expect to buy, please write in how much you plan to spend on it in the next 12 months. ***(Remember that we are talking about things plan to buy for home use)***

	a/Plan to buy	b/Plan to spend
Hardware		
Colour inkjet	☐1	£ _____
Mono laser printer	☐2	£ _____
Colour laser printer	☐3	£ _____
Monitor	☐4	£ _____
Motherboard	☐5	£ _____
Network card	☐6	£ _____
Graphics card	☐7	£ _____
Sound card	☐8	£ _____
Hard drive	☐9	£ _____
Extra memory	☐10	£ _____
CPU	☐11	£ _____
Software		
Games software	☐12	£ _____
Educational software	☐13	£ _____
Video/image-editing software	☐14	£ _____
Office software	☐15	£ _____
Peripherals		
Scanner	☐16	£ _____
Digital camera	☐17	£ _____
Modem	☐18	£ _____
MP3 player	☐19	£ _____
DVD drive	☐20	£ _____
DVD writer	☐21	£ _____
CD writer	☐22	£ _____
PDA/handheld PC	☐23	£ _____
Digital video camera	☐24	£ _____
Mobile phone	☐25	£ _____
Consumables *(ie ink cartridges)*	☐26	£ _____
Other peripherals *(eg Zip drive)*	☐27	£ _____

21. When people want a better PC, some will usually try to upgrade their existing PC by installing better components, others will buy a new machine with higher specifications. Which of the following statements comes closest to your own views?

I would always buy a new machine ☐1
I might upgrade some minor components but for a major change I would buy a new machine ☐2
I would generally upgrade my existing system, although I might buy a new machine if a fundamental improvement was needed ☐3
I would always upgrade my existing system ☐4

Now we would like to ask you about the computers that you buy AT WORK.

22. Please indicate your role in buying PCs and PC-related products at work. Tick the ONE statement that comes closest to your own position.

I recommend the purchase ☐1
I specify brands or suppliers for the purchase ☐2
I authorise the purchase/sign off IT purchases ☐3
I have little or no involvement with decisions about buying PCs or PC-related products (go to Q.23) ☐4
I do not work (go to Q23) ☐5

IF YOU RECOMMEND, SPECIFY OR AUTHORISE IT PURCHASE AT WORK, please answer the questions in this section. If not, please go to Q23.

W1. What is your annual PC equipment and software budget? ***(ie the budget of the department or area where you are involved in purchasing)***

Under £500	☐1	£5,000-£9,999	☐7
£500-£999	☐2	£10,000-£19,999	☐8
£1,000-£1,499	☐3	£20,000-£49,999	☐9
£1,500-£1,999	☐4	£50,000-£99,999	☐10
£2,000-£2,999	☐5	£100,000-£149,999	☐11
£3,000-£4,999	☐6	£150,000+	☐12

W2. How often are you involved in decisions to purchase PCs for your company?

Every week or two	☐1	Three or four times a year	☐4
About once a month	☐2	Once or twice a year	☐5
Five or six times a year	☐3	Less often	☐6

W3. How many PCs/laptops did your company purchase last year?

	PCS	Laptops
None	☐1	☐1
Less than five	☐2	☐2
6-10	☐3	☐3
11-20	☐4	☐4
21-50	☐5	☐5
51-100	☐6	☐6
Over 100	☐7	☐7
Don't know/can't remember	☐8	☐8

W4a. Which of the following items have you been involved in buying in the past 12 months? Please tick only those items that were specified individually – not those that came as part of a package with PC purchases.

W4b. For each of the items you have been involved in purchasing, please write in how much you spent on it in the past 12 months.

	a/Bought in last 12 months	b/Amount spent
Hardware		
Network servers	☐1	£ _____
Palmtops/PDAs	☐2	£ _____
Colour inkjets	☐3	£ _____
Mono laser printers	☐4	£ _____
Colour laser printers	☐5	£ _____
Scanner	☐6	£ _____
Digital cameras	☐7	£ _____
Modems	☐8	£ _____
Monitor	☐9	£ _____
Presentation equipment	☐10	£ _____
DVD drives	☐11	£ _____
DVD writers	☐12	£ _____
CD writers	☐13	£ _____
CPUs	☐14	£ _____
Motherboards	☐15	£ _____
Graphics cards	☐16	£ _____
Sound cards	☐17	£ _____
Hard drives	☐18	£ _____
Extra memory	☐19	£ _____
Other peripherals (eg Zip drive)	☐20	£ _____
Services/upgrades		
Hardware upgrades	☐21	£ _____
Storage	☐22	£ _____
Digital cameras	☐23	£ _____
Training	☐24	£ _____
Maintenance contracts	☐25	£ _____

	a/Bought in last 12 months	b/Amount spent
Software		
Networking software	☐26	£
Operating systems *(eg Windows XP)*	☐27	£
Business/office applications	☐28	£
Graphics/DTP	☐29	£
Finance/accounting	☐30	£
Personal organiser/scheduler	☐31	£
Project management	☐32	£
Utilities (eg anti-virus/firewall)	☐33	£

W5a. How many PCs/laptops do you expect to be involved in buying for work in the next 12 months?

W5b. How much do you expect to spend (in total) on desktop PCs and laptops in the next 12 months?

	a/Expect to buy in total	b/Expect to spend in total
Desktop PCs		£
Laptops		£

W6. Which of these are you a) planning to buy for your business in the next 12 months? Again, we are interested in those you plan to specify indlvidually not as part of a package with new PCs.

W6b. For each of the items you plan to buy, please write in how much you expect to spend in total on these items in the next 12 months?

	a/Plan to buy in next 12 months	b/Expect to spend
Hardware		
Network servers	☐1	£
Palmtops/POAs	☐2	£
Colour inkjets	☐3	£
Mono laser printers	☐4	£
Colour laser printers	☐5	£
Scanner	☐6	£
Digital cameras	☐7	£
Modems	☐8	£
Monitor	☐9	£
Presentation equipment	☐10	£
DVD drives	☐11	£
DVD writers	☐12	£
CD writers	☐13	£
Other peripherals *(eg Zip drive)*	☐14	£
CPUs	☐15	£
Motherboards	☐16	£
Graphics cards	☐17	£
Sound cards	☐18	£
Hard drives	☐19	£
Extra memory	☐20	£
Services/upgrades		
Hardware upgrades	☐21	£
Storage	☐22	£
Digital cameras	☐23	£
Training	☐24	£
Maintenance contracts	☐25	£
Software		
Networking software	☐26	£
Operating systems *(eg Windows XP)*	☐27	£
Business/office applications	☐28	£
Graphics/DTP	☐29	£
Finance/accounting	☐30	£
Personal organiser/scheduler	☐31	£
Project management	☐32	£
Utilities (eg anti-virus/firewalls)	☐33	£

W7. How often do you use

7a. editorial information in *Personal Computer World* to help you choose PCs, peripherals or software that you are buying for business use?

7b. advertisements in *Personal Computer World* to help you choose PCs, peripherals or software that you are buying for business use?

	I use it a lot	I use it occasionally	I seldom use it	I never use it
a) I use ***editorial*** information	☐1	☐2	☐3	☐4
b) I use the ***advertisements***	☐1	☐2	☐3	☐4

Finally, we would like to know something about YOU personally.

23. Are you:

Employed full-time	☐1
Employed part-time	☐2
Self-employed	☐3 *Please skip to Q26*
Not employed	☐4 *Please skip to Q26*

24. IF YOU ARE EMPLOYED please tick the one position below which comes closest to your own job title.

Partner/Director/Propietor/Owner	☐1	Other professional	☐6
Senior/Regional/Divisional Manager	☐2	Administrator	☐7
IT Manager	☐3	Lecturer/Teacher/Trainer	☐8
Other department or Function Manager	☐4	Other *(please write in below)*	☐9
IT professional	☐5		

25. How many people are employed by your company?

Under 50	☐1	50-249	☐3	500-1,000	☐5
0-49	☐2	250-499	☐4	Over 1,000	☐6

26. Which one of these best describes you:

Trained IT professional	☐1
Work in IT but have no formal qualifications	☐2
Enthusiastic IT user	☐3
I just use PCs – I'm not an enthusiast	☐4

27. How competent do you feel using your PC?

I feel very competent	☐1	I do not feel very competent	☐3
I feel quite competent	☐2	I do not feel at all competent	☐4

28. Are you:

Male	☐1	Female	☐2

29. How old are you?

Under 15	☐1	45-54	☐5
15-24	☐2	55-64	☐6
25-34	☐3	65+	☐7
35-44	☐4		

30. How many children (under 16) are there in your household?

None	☐1	Three	☐4
One	☐2	Four or more	☐5
Two	☐3		

31. Which of these bands does your annual income fall into?

Less than £10,000	☐1	£50,000-£59,999	☐6
£10,000-19,999	☐2	£60,000-£69,999	☐7
£20,000-£29,999	☐3	£70,000-£79,999	☐8
£30,000-£39,999	☐4	£80,000+	☐9
£40,000-£49,999	☐5		

THANK YOU FOR YOUR HELP

If you wish to take part in the prize draw to win £1,000 or one of 25 free subscriptions to *PCW* please fill in your name and address below.

We would like to add your name and address to our database of readers so that VNU or other companies can contact you with offers that may be of interest. Please tick here if you wish your details to be recorded in this way. ☐

Name: .....

Address: .....

.....

.....

Phone: .....

Email: .....

Please return this questionnaire to:
***Personal Computer World* VNU Business Publications**
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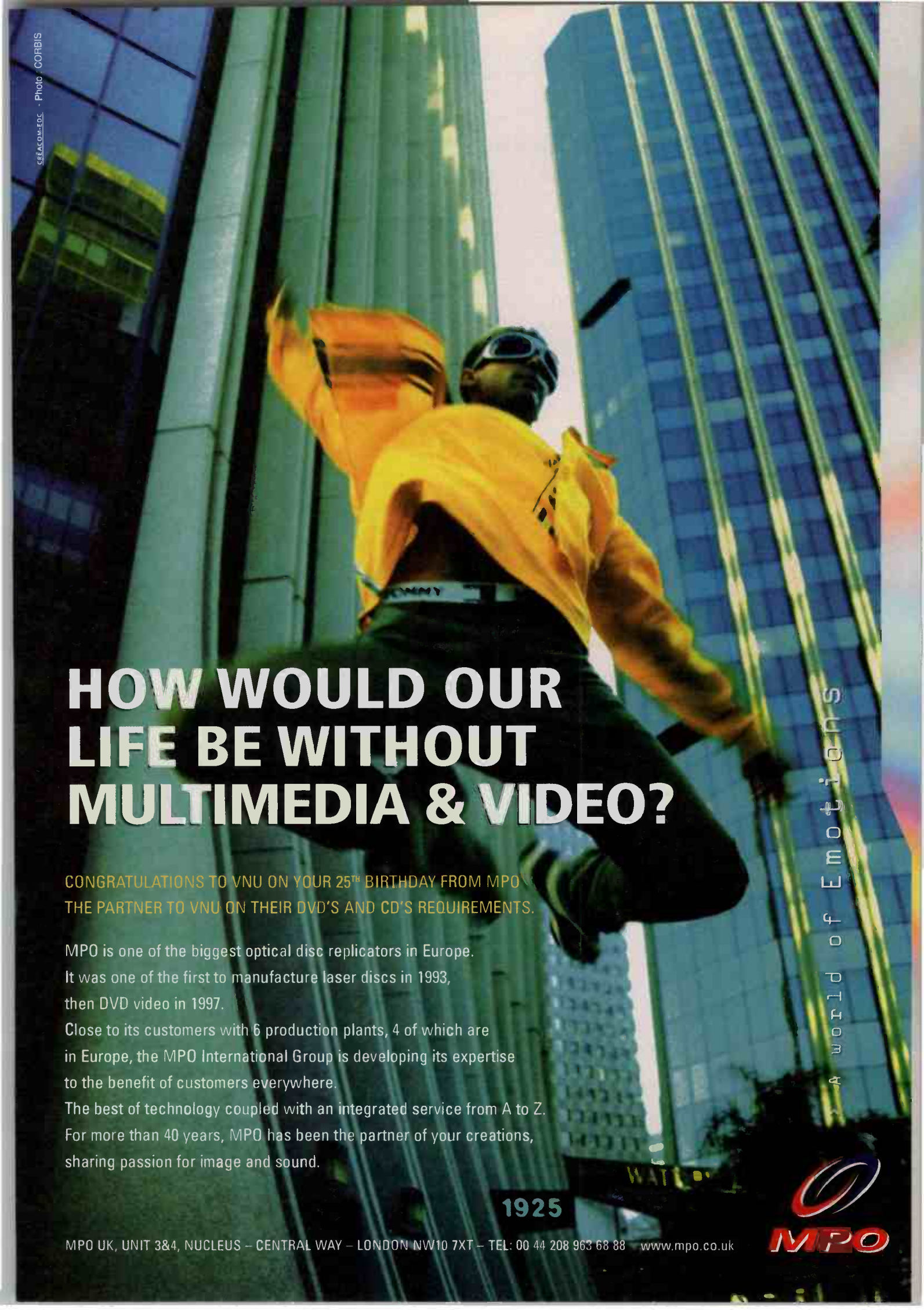
You do not need a stamp


CRÉACOM-EDC · Photo : CORBIS
HOW WOULD OUR LIFE BE WITHOUT MULTIMEDIA & VIDEO?
CONGRATULATIONS TO VNU ON YOUR 25TH BIRTHDAY FROM MPO
THE PARTNER TO VNU ON THEIR DVD'S AND CD'S REQUIREMENTS.
MPO is one of the biggest optical disc replicators in Europe.
It was one of the first to manufacture laser discs in 1993,
then DVD video in 1997.
Close to its customers with 6 production plants, 4 of which are
in Europe, the MPO International Group is developing its expertise
to the benefit of customers everywhere.
The best of technology coupled with an integrated service from A to Z.
For more than 40 years, MPO has been the partner of your creations,
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Prime movers

WORDS: LEO WALDOCK TESTING: VNU LABS PHOTOS: BRUCE MACKIE

Need a desktop replacement notebook but want it to be a mobile computer too? We've tested and reviewed 10 portables so read on to see if they have the power and performance you're after

With the global workforce becoming ever more mobile, there's a fair chance you'll feel the urge to at least check your email when you're supposed to be on holiday, on a train, or simply away from the office.

What you need is a notebook that can do everything you expect from a desktop PC, but with the added benefit of being mobile. Specifically, you want a desktop replacement notebook. There are all sorts of ways to define a class of notebook, with the weight, battery life and number of spindles (hard drive, optical drive and floppy drive) all playing their part. Ultraportables tend to weigh under 2kg and to have one or two spindles. We define a desktop replacement as having three spindles, no weight limit, and with all the features of a PC, plus you can use it on the move.

Of course, you'll pay more for a notebook than for a PC of similar specification, but with an upper price limit of £1,700 ex VAT, this group test shows that the difference is getting smaller. It takes a lot of work to cram all that technology into such a small package but, as you'll see over the next few pages, we were truly impressed by how much power a notebook has to offer these days.

Acer Travelmate 427LC

Every notebook in this group uses a Pentium 4 processor, ranging from 1.7GHz to 3.06GHz, in both mobile and desktop forms, so the Acer Travelmate 47LC is right in the middle of the range with a 2.5GHz desktop processor. Sysmark performance is surprisingly good, but the graphics side of things is let down by the Mobility Radeon 7500 chip. The specification is average in most respects, with a 15in screen featuring a resolution of 1,024 x 768 that was the norm in this group, as well as a 40GB hard drive and 512MB of DDR memory.

The Acer offers infra-red, although it only has the bare minimum of ports and a single PC Card slot.

That's not to say that the Travelmate 47LC is a poor notebook, but the only part of its specification that makes it stand out is the Memory Stick and SD (Secure Digital) media reader.

The chassis seems to be good and solid, and the keyboard is slightly curved and hints at a natural or ergonomic layout. Typing feels good and there is no excessive bounce and flex. The touchpad and mouse buttons are pleasantly styled with a scroll control between the buttons. The navigation controls work well and indicate some careful design.

Although the screen is unimpressive in terms of size, it looks good and is clear, sharp and bright. We've seen better screens, but the one on the Acer is still a pleasure to use.

All the regularly used ports are on the right-hand side, with just VGA, TV-out and a port replicator connector on the back. On the front are the infra-red receiver, combo drive and CD player controls giving the option of listening to music with the notebook turned off.

It's unfortunate that we're not giving an award for styling as it would most likely go to this notebook. However, while we also liked the two-year C&R warranty, the battery life of only one hour six minutes left us unimpressed.

DETAILS

PRICE £1,642.65 (£1,398 ex VAT)
CONTACT Acer 0870 900 2237
www.acer.co.uk
PROS Memory card readers; good Sysmark performance; warranty
CONS Poor battery life; no PS/2 port; average specification
VERDICT
The chassis and keyboard are stylish, but the Travelmate doesn't distinguish itself here

FEATURES	★★★★☆
PERFORMANCE	★★★★☆
VALUE FOR MONEY	★★★☆☆
OVERALL	★★★★☆

Advent 7015

Initial impressions of the Advent 7015 are not favourable as it has an unattractive two-tone blue and silver chassis with an off-white keyboard that looks as though it should glow in the dark. Added to that, Advent has put a large air intake between the speakers to make sure the 2.8GHz processor stays cool. As a result the cooling fan makes an intrusive and annoying noise which we feel is unacceptable. It's not exactly loud, but the noise bounces up off the screen right into your face.

This is all rather poor, given that the 7015 costs £1,799, but it could be overlooked if the notebook itself was a decent performer. Instead it is average in almost every way. For starters it uses the same Nvidia Geforce4 420 Go graphics chip as half of the other systems in this group, yet the test results in 3Dmark show the Advent performs slightly worse than the Evesham and Hi-Grade, even though all three use the same chipset and graphics chip, and the Advent has a much faster processor.

Much like Acer, Advent specified 512MB of DDR memory, a 40GB hard drive and a 15in screen, and there are very few ports on the Advent too. The big thing that the Advent has in its favour is the Toshiba combo drive, which handles CD-RW duties (16x 10x 24x) and DVD-Roms at eight-speed, much as you would expect, but in addition will write to DVD. The drive handles the -R and -RW formats, both at single speed, and you'll be able to do backups and compile huge data discs of photos and movie clips. The Nero 5.5 Burning Rom software is used for writing both CDs and DVDs, but it is not authoring software so if you fancy creating your own home movies you'll have to make an additional purchase.

Although the Advent has quite a tidy layout, and the keyboard and screen are fine in use, the 7015 simply didn't impress us. The one-year return to base warranty is also the worst in this group.

DETAILS

PRICE £1,799 (£1,531.06 ex VAT)
CONTACT Advent
08705 464 464
www.pcworld.co.uk
PROS DVD writer; fair Sysmark performance
CONS Noisy; no PS/2 port; poor warranty; unattractive styling
VERDICT
Middling in every respect apart from the DVD writer

FEATURES	★★★★☆
PERFORMANCE	★★★☆☆
VALUE FOR MONEY	★★★☆☆
OVERALL	★★★☆☆

AJP 8880E

The AJP 8880E is so large that rather than being a desktop replacement notebook it practically is the desk. It's a full kilogram heavier than the 3GHz Mesh but there's a good reason for that as it is absolutely loaded with features. For a start it has two optical drives (a Teac combo and a Teac DVD-Rom), which clearly take up space and add weight but it does make it much easier to copy CDs. This is one of the few notebooks in the group to offer wireless 802.11b networking, in addition to Ethernet 10/100 Lan. The back of the AJP is covered in ports and it has three PC Card slots, a Memory Stick reader and, on the front, CD player controls.

Although it is a big notebook, AJP hasn't wasted any space. At 15.7in the screen is slightly larger than those in the rest of the group and features a perfectly clear and usable resolution of 1,280 x 1,024.

In our tests the AJP scored well in both Sysmark and 3Dmark, which is what you would expect from a 2.66GHz Pentium 4 running on an 845MP chipset with a Mobility Radeon 9000 graphics chip. Unfortunately, though, the battery life isn't too hot at one hour 10 minutes which, again, is what you would expect from a notebook of this specification.

We weren't very impressed by the keyboard even though it is full size and feels quite solid. The problem is that the AJP is so tall that your hands end up at an unusual angle and mistyping crops up all too regularly. The layout is also a little unusual with the number pad right where you want an Enter key.

Our biggest complaints about the AJP notebook are its size, weight and battery life. Although it has quite a high price tag you still get a lot for your money. We weren't impressed by the return to base warranty as we prefer collect and return policies, but that doesn't change the fact that it is an impressive piece of hardware.

DETAILS

PRICE £1,809.50 (£1,540 ex VAT)
CONTACT AJP 020 8208 9777
www.ajp.co.uk
PROS Excellent performance; 60GB hard drive; big screen; 802.11b; two optical drives
CONS Very heavy; expensive; poor battery life
VERDICT
Loaded with features. It has decent performance too

FEATURES	★★★★★
PERFORMANCE	★★★★☆
VALUE FOR MONEY	★★★★☆
OVERALL	★★★★☆

Asus L3817C-DVDRW

One of the lighter notebooks on test, the Asus L3817C-DVDRW is slim and black, much like a Toshiba Satellite or IBM Thinkpad. Although the styling is a little dull and understated, that's no bad thing in a working notebook. The mouse and scrolling buttons look a little unusual but they work well, and the keyboard is decent enough, although Asus has made the cardinal mistake of placing the page up and page down buttons outboard of the Enter key.

One strong point is the high-resolution screen that works at 1,400 x 1,050 rather than the more conventional 1,280 x 1,024 to maintain the 4:3 aspect ratio. The screen is very sharp and clear with a good viewable angle, and the thin black bezel enhances the display too. There's little doubt that the ATI Mobility Radeon 7500 graphics chip helps as we have previously noted its colour presentation is very good.

In performance terms, the Asus didn't impress in Sysmark or our graphics tests, but then the CPU is the slowest on test at only 1.7GHz. Although the Asus came third in our battery test with a life of one hour 30 minutes, we were surprised that it wasn't better as both the Hi-Grade and Evesham lasted an hour longer.

The features list is quite a disappointment in comparison with the other notebooks, although it has the most important ports. The hard drive is 40GB and it has 512MB of DDR memory, 10/100 Lan and infra-red.

What it doesn't have is something to make it stand out from the other notebooks in the group. Although it is reasonably priced the poor performance of the Asus makes it a notebook that we can't recommend.

That's a bit of a shame as it isn't a bad product by any standard, but simply suffers in comparison to the competition. If the price was lower we would have looked on this machine far more favourably.

DETAILS

PRICE £1,467.58 (£1,249 ex VAT)
CONTACT Asus 0870 759 0330
www.asus.com
PROS Stylish looks; high-resolution screen; fair battery life
CONS Poor Sysmark performance; the slowest CPU here at only 1.7GHz
VERDICT
Overall this Asus notebook looks good but doesn't perform very well

FEATURES	★★☆☆☆
PERFORMANCE	★★★☆☆
VALUE FOR MONEY	★★☆☆☆
OVERALL	★★★☆☆

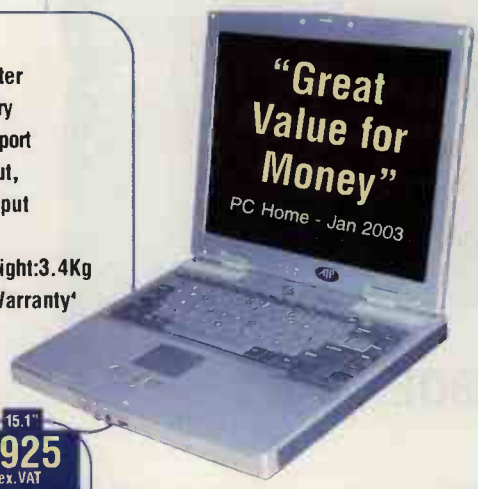
"Great Value, Solid Build"

PC Home Gold Award (8375) - Jan 2003

AJP 8375 - Mid Range Notebook

- 14.1/15.1" TFT XGA (1024x768)
- AMD Athlon XP Mobile 2000+ Processor with QuantiSpeed Technology[1] & PowerNow! Technology (upgradeable to 2200+/2400+)
- 256MB DDR (upgradeable to 1GB)
- 40GB HDD ATA-100 EIDE
- Combo DVD/CD-RW Drive
- Built in 56K fax/modem
- Built in 10/100 Ethernet Adapter
- 32MB DDR Shared Video Memory
- IEEE 1394 Firewire 400Mbps port
- Ports: 4xUSB 2.0, IrDA, TV-Out, Parallel, Monitor, S/P DIF output
- Built in Wireless Antenna
- 328(W)x274(D)x37mm(H)/Weight:3.4Kg
- Carry Case, 24 months RTB Warranty[4]

Standard Features: Built in 3D Sound & Speakers, (Optional) Wireless LAN module, 1x PC Card Slot, Smart Li-Ion Battery**, (Optional) External USB 3.5" FDD, Windows XP Home with CD & Manual



14.1/15.1" TFT	AMD Athlon XP 2000+	256MB RAM	Silent 40GB HDD	Combo Drive	14.1"	15.1"
					£875 ex.VAT £1028.13 inc.VAT	£925 ex.VAT £1086.88 inc.VAT

*Upgrade AMD Athlon 2000+ to 2200+ Add £39+VAT
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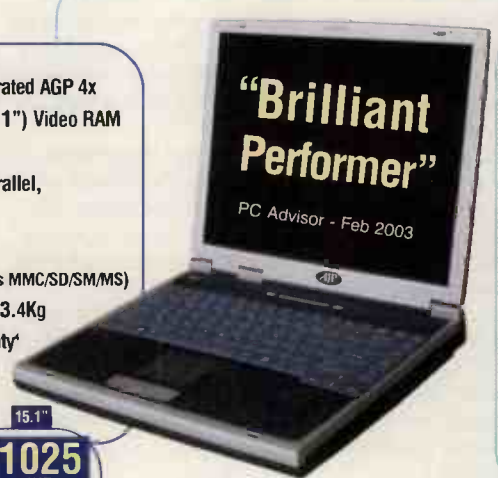
PC Home Gold Award Jan 2003

AMD Athlon XP

AJP 8640 - High End Notebook

- 14.1" TFT XGA (1024x768) or
- 15.1" TFT SXGA+ (1400x1050)
- 2.4GHz Intel® Pentium 4 with 512K Cache (Optional 2.53GHz, 2.66GHz, 2.8GHz)
- 512MB DDR RAM (upgradeable to 1GB)
- 40GB HDD ATA-100 EIDE
- Combo DVD/CD-RW Drive
- Built in 56K fax/modem
- Built in 10/100 Ethernet Adapter
- nVidia GeForce4 420 Go with Integrated AGP 4x
- 32MB DDR (14.1") 64MB DDR (15.1") Video RAM
- IEEE 1394 Firewire 400Mbps port
- Ports: 4xUSB 2.0, IrDA, TV-Out, Parallel, Monitor, PS/2, S/P DIF output
- Built in Wireless Antenna
- Built in Smart Card Reader (Supports MMC/SD/SM/MS)
- 332(W)x285(D)x39mm(H)/ Weight: 3.4Kg
- Carry Case, 24 months RTB Warranty[4]

Standard Features: Built in 3D Sound & Speakers, (Optional) Wireless LAN module, 1x PC Card Slot, Smart Li-Ion Battery**, 4 Hot Keys (one button access to any application), (Optional) External USB 3.5" FDD, Windows XP Home with CD & Manual



14.1/15.1" TFT	P4 2.4GHz	512MB RAM	Silent 40GB HDD	Combo Drive	14.1"	15.1"
					£975 ex.VAT £1145.63 inc.VAT	£1025 ex.VAT £1204.38 inc.VAT

Best Buy March 2003

Gold Award Feb 2003

nVIDIA GeForce4 Go

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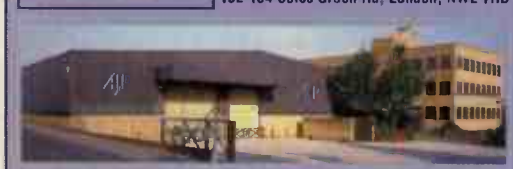
152-154 Coles Green Rd, London, NW2 7HD



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Upgrade 512MB to 1GB DDR	£190 (£223.25)
Upgrade 40GB to 60GB	£69 (£81.08)
Upgrade P4 2.4GHz to 2.53GHz	£59 (£69.33)
Upgrade P4 2.53GHz to 2.66GHz	£59 (£69.33)
Upgrade P4 2.66GHz to 2.8GHz	£129 (£151.58)
Upgrade P4 2.8GHz to 3.06GHz	£199 (£233.83)
External USB FDD	£49 (£57.58)
Wireless LAN PCI Module	£69 (£81.08)
Upgrade to Windows XP Pro	£39 (£45.83)
External USB Pen Drive (64MB)	£59 (£69.33)
Additional Options for the 8880/5600	
Additional DVD Drive	£79 (£92.83)
Additional 40GB HDD & Kit	£149 (£175.08)
Additional 60GB HDD & Kit	£199 (£233.83)
MP3 Player & 32MB Memory Card	£99 (£116.33)
TV Tuner & Remote Control	£89 (£104.58)
IP Sharing Module	£99 (£116.33)

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[2]Account is interest free if repaid in full with the 6th monthly payment. A 5% deposit is required. At the offset a 48 month finance agreement is issued at 29.8% APR. Typical example: £1,000.00 less 5% deposit, financed sum £950.00. A) For a 48 month finance agreement 48 monthly payments of £32.25, (total payable £1,598.00 APR 29.8% Variable) or B) For a 6 month INTEREST FREE finance agreement 5 monthly payments of £32.25 and the balance of £788.75 on the 6th month (total payable £950.00 APR 0%). All loans are subject to status. Written quotations available on request. AJP is a Licensed Credit Broker.

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Computer Shopper Hit Award (5600D) - Feb 2003

8880E - More Features than Ever, MP3, TV Tuner, Full Size Keyboard...

AJP 8880E - Ultimate Desktop Replacement

- 15.7" TFT SXGA+ (1280x1024)
- 16.1" TFT UxGA (1600x1200)
- 2.53GHz Intel® Pentium 4 with 512K Cache (Optional 2.66GHz, 2.8GHz, 3.06GHz)
- 512MB DDR RAM (upgradeable to 1GB)
- 40GB HDD ATA-100 EIDE
- Built in 3.5" FDD
- Bay 1 Combo DVD/CD-RW Drive
- Bay 2 Optional 2nd HDD, *DVD or IP Sharing
- Bay 3 Optional 3rd HDD or TV Tuner
- Bay 4 Optional MP3 Player / Storage Disk
- Built in 56K fax/modem
- Built in 10/100 Ethernet Adapter
- ATI Mobility Radeon 9000 with Integrated AGP 4x
- 64MB DDR (15.7") 128MB DDR (16") Video RAM
- IEEE 1394 Firewire 400Mbps port
- Ports: 4x USB 2.0, IrDA, TV-Out, Video In, Parallel, Serial, Monitor, PS/2, S/P DIF output
- Built In Wireless Antenna
- Sony Memory Card Slot
- Audio DJ onboard
- Full Size Keyboard & Separate Numeric Keypad
- 360(W)x299(D)x54.5mm(H) / Weight: 4.9Kg
- Carry Case, 24 months RTB Warranty*

Standard Features: (Optional) 4x IP Sharing Module for Networking/ADSL, (Optional) Wireless LAN module, Built in 3.5" FDD, Built in 3D Sound & Speakers, 2x PC Card Slot, Smart Li-Ion Battery**, 3 Hot Keys (Email, Web Browser, Application), Windows XP Home with CD & Manual

15.7/16" TFT | P4 2.53GHz | 512MB RAM | Silent 40GB HDD | Combo Drive

15.7" £1239 ex.VAT £1455.83 inc VAT

16" £1315 ex.VAT £1545.13 inc VAT

*An additional DVD will offer you a fast copy facility
For all other add ons, see 'Options & Upgrades'

PC ADVISOR Recommended Dec 2002

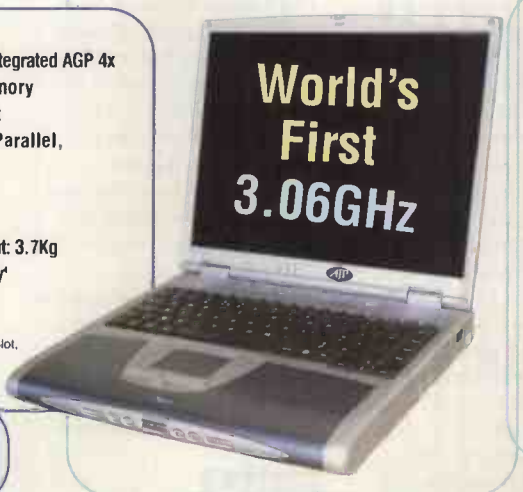
HIT! Computer Shopper Hit Award Nov 2002

PC PRO RECOMMENDED Recommended Oct 2002

AJP 5600D - Ultra High End Notebook

- 15.1" TFT SXGA+ (1400x1050)
- 2.4GHz Intel® Pentium 4 with 512K Cache (Optional 2.53GHz, 2.66GHz, 2.8GHz, 3.06GHz)
- 512MB DDR RAM (upgradeable to 1GB)
- 40GB HDD ATA-100 EIDE (Removable)
- Combo DVD/CD-RW Drive
- Built in 3.5" FDD (HotSwappable with 2nd Battery, *DVD or removable 2nd HDD)
- Built in 56K fax/modem
- Built in 10/100 Ethernet Adapter
- ATI Mobility Radeon 9000 with Integrated AGP 4x
- 64MB DDR Dedicated Video Memory
- IEEE 1394 Firewire 400Mbps port
- Ports: 4x USB 2.0, IrDA, TV-Out, Parallel, Monitor, PS/2, S/P DIF output
- Built in Wireless Antenna
- Audio DJ onboard
- 329(W)x290(D)x44mm(H) / Weight: 3.7Kg
- Carry Case, 24 months RTB Warranty*

Standard Features: Built In 3.5" FDD, (Optional) Wireless LAN module, Built in 3D Sound & Speakers, 1x PC Card Slot, Smart Li-Ion Battery**, 3 Hot Keys (Email, Web Browser, Media Player), Windows XP Home with CD & Manual



15.1" TFT | P4 2.4GHz | 512MB RAM | Silent 40GB HDD | Combo Drive

£1099 ex.VAT £1291.33 inc VAT

*An additional DVD will offer you a fast copy facility
For all other add ons, see 'Options & Upgrades'

HIT! Computer Shopper Hit Award Feb 2003

PC PRO RECOMMENDED Recommended Sept 2002

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2000 - Ranked in the top 10% of Computer Companies, Dunn & Bradstreet
1999 - One of the Fastest Fifty growing IT Companies in London, Deloitte &Touche
1999 - The Best Notebook of the Year, PC Advisor
1997 - The Special Achievement Award for Business, PC Direct

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Evesham Voyager 5815 2.2

The Evesham 5815 2.2 is a better performer than the Asus thanks to its 2.2GHz desktop CPU, and there is a large copper heatsink working to keep it cool with very little waste heat pumping out – something that would have benefited the AJP.

Sysmark performance is much better than that seen in the Asus, and graphics performance is also improved. The Nvidia Geforce4 420 Go chip is a decent performer and has a speed advantage of about 10 per cent over the ATI Mobility Radeon 7500, but in use the difference is quite small.

The rest of the specification is very conventional although it is good to see four USB ports, and the 60GB hard drive is as large as any on test here. In direct comparison with the Asus, the lower screen resolution of the Evesham fails to impress. That's not a criticism of Evesham as the standard 1,024 x 768 appears on six of these notebooks, but now that 15.1in high-resolution screens are available we expect to see them becoming very popular.

You'll have no problem with the keyboard although it does flex noticeably when you type vigorously.

Evesham and Hi-Grade have both used the same chassis, and the two notebooks sit side by side on our features table so it is quite easy to see the significant differences that gave Hi-Grade our Editor's Choice award while Evesham got nothing.

It also highlights the fact that the Evesham is essentially a good notebook that has fewer features than the Hi-Grade. However, the price difference is just too close to even consider buying the Evesham. It is also interesting to note that these two notebooks were streets ahead of the rest when it came to our battery test.

In our features table we list the warranty as two years return to base, but it's worth noting that it also includes accidental damage cover, which is really a form of insurance.

DETAILS

PRICE £1,702.58 (£1,449 ex VAT)
CONTACT Evesham 0870 160 9500
www.evesham.com
PROS Very good battery life; four USB2 ports; decent performance; 60GB hard drive
CONS No infra-red; no PS/2 port
VERDICT
The Voyager 5715 2.2 is more of a portable notebook than a desktop replacement

FEATURES	★★☆☆☆
PERFORMANCE	★★★★☆
VALUE FOR MONEY	★★★☆☆
OVERALL	★★★☆☆

Hi-Grade Ultinote M6600-2400

Once again Hi-Grade is offering a master class in how to win a group test. First take the same chassis as one of your major competitors – in this case Evesham. Next, use most of the same specification but make some thoughtful upgrades such as a mini-PCI 802.11b card to provide wireless Lan in addition to 10/100 Ethernet. Specify infra-red as well since the chassis can accommodate it. Then install a combo drive that handles DVD writing as well as CD writing and, to top it off, fit a new high-resolution screen. Finally, pick a processor that won't break the bank and almost certainly won't win any performance awards, but will be fast enough not to let down the rest of the notebook.

Then add a reasonable software package, provide a really good warranty and set the price low enough to make your rivals squirm.

Of course Hi-Grade and all the other manufacturers are working independently of each other, but it is easy to believe that Hi-Grade took all the good parts from the Advent, Evesham and Mesh machines and combined them in one notebook.

Whether by judgement or by luck Hi-Grade has managed to end up bang in the middle of the Sysmark graph and is third in our graphics test results. There's no doubt that you get enough performance for every office task as well as for decent 3D gaming, and that battery life means you can watch a DVD on the move if you fancy. The two-year international collect and return warranty also offers damage insurance much like Evesham does.

There are plenty of ways to build a notebook, with AJP choosing two optical drives, Mesh going down the route of brute power and NEC choosing to supply a thin and light model that has Office XP. These are all legitimate choices but we feel the balance chosen by Hi-Grade will suit more users most of the time.

DETAILS

PRICE £1,878.83 (£1,599 ex VAT)
CONTACT Hi-Grade 020 8532 6111
www.higrade.com
PROS DVD writer; battery life; 60GB hard drive; high-res screen
CONS Sysmark and graphics performance good but not great; no PS/2 port
VERDICT
This is an amazing notebook for the price

FEATURES	★★★★★
PERFORMANCE	★★★★☆
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★

Mesh Explorer 15in GT Ultra

Mesh deserves recognition for supplying the first 3GHz notebook we have seen. It's actually running at 3.06GHz courtesy of a full desktop processor backed up by 1GB of DDR memory.

Although Mesh has specified a fairly large chassis it's not huge, so we can only think that some fairly clever engineering has been used to cope with the power and heat of that processor and memory. The most obvious downside of the 3GHz specification is a dismal battery life of 37 minutes. You can forget all about using this notebook on the move as it just isn't an option. Indeed it may have made more sense for Mesh to dispense with the battery altogether and market the Explorer 15in GT Ultra as a portable PC.

In addition to the CPU and memory, Mesh has specified the impressive Radeon Mobility 9000 graphics chip, allied with a 1,400 x 1,050 screen. This notebook will handle any gaming or DVD duties with ease, and we would expect it to make mincemeat of video editing too. The ports include TV-out and Firewire, which should make life easier in that respect. Like most of the notebooks here, Mesh only supplied one PC Card slot, which gives you the option of adding either Bluetooth or wireless networking if you feel the need.

The chassis has a noticeably curved front edge, which makes typing very comfortable and the keyboard is one of the best in this group and, incidentally, looks identical to the unit used by Rock.

There are no flaws in the specification, but we feel that Mesh has gone too far down the power-is-everything route at the expense of battery life. The other inevitable effect of using that CPU and memory is the cost, and the Mesh is the most expensive notebook in the group test. In short, then, we're deeply impressed but the atrocious battery life is a very significant flaw.

DETAILS

PRICE £1,949 (£1,658.72 ex VAT)
CONTACT Mesh 0870 046 4747
www.meshcomputers.com
PROS Blazing performance in Sysmark and 3Dmark; 1GB memory
CONS Terrible battery life of 37 minutes; expensive
VERDICT
You get a great deal for your money, but this is not a notebook for using on the move

FEATURES	★★★★☆
PERFORMANCE	★★★★★
VALUE FOR MONEY	★★★★☆
OVERALL	★★★★★

Multivision Visage Plus

Multivision submitted the cheapest notebook in the group with the Visage Plus priced at a mere £999 inc VAT. Cheap isn't necessarily the same as good value, and the Multivision has had its features list pared down to keep the price low.

For starters this is the only notebook in the group to have a 14.1in screen, although it does offer the same 1,024 x 768 resolution as most of the other contenders. Second it has the smallest hard drive at 30GB capacity where every other notebook has 40GB or 60GB of storage, and finally it has only 256MB of memory rather than 512MB or even the 1GB used by Mesh.

Compared to all the other notebooks in this group test the Multivision is very light on features and we have marked it accordingly. The CPU is only a 1.8GHz chip and, as a result, the Sysmark score is also low. On the bright side, the Geforce4 420 Go graphics chip scored well in our 3Dmark tests.

The biggest surprise was that battery life wasn't impressive at only one hour 11 minutes, although it compares fairly well in the context of this group. We really can't see where the power is going as there is very little hardware to drain it that fast.

That makes the Multivision a very mixed bag. It's a decent enough notebook with a good range of ports, but it compares very poorly with the rest of the group due to its shortcomings with the memory, hard drive and screen. The chassis, touchpad and keyboard are also good, and the front-mounted combo drive could be handy on a small desk.

The problem is that this notebook's weight and size put it in the portable notebook category rather than being a desktop replacement.

In a group test with a £1,000 ceiling the Multivision would probably do rather well, but that's not the case here. The £999 price tag helps a great deal but the Visage Plus isn't a winner.

DETAILS

PRICE £999 (£850.21 ex VAT)
CONTACT Multivision 0870 066 0885
www.multivision.co.uk
PROS Very cheap
CONS Smallest screen in the group; poor Sysmark performance; 256MB of memory; 30GB hard drive
VERDICT
You get what you pay for

FEATURES	★☆☆☆☆
PERFORMANCE	★★★☆☆
VALUE FOR MONEY	★★★★☆
OVERALL	★★★☆☆

NEC Versa P440

Like Multivision, NEC sent us a portable notebook, and it's the lightest in the group at 3kg. Of course NEC is a very big name in the corporate notebook arena so it's no surprise that is the market at which the Versa P440 is aimed. For starters you get a copy of Microsoft Office XP Professional which currently retails for £475, and clearly makes up a large part of the price. The warranty is also very good; three years collect and return is not to be sneezed at.

From here on in the picture looks a lot less rosy when you compare the Versa P440 with the other notebooks in the group. It was bottom in our Sysmark test, second from bottom at 3Dmark and third from bottom in our battery test. We are quite prepared to admit that business users have no need for games-quality 3D graphics, but surely they want reasonable performance in applications, and half of Sysmark is based on Office XP, the very suite that is supplied by NEC. Since the NEC has a faster CPU than Multivision and Asus yet is significantly slower than either of them in Sysmark, we have to point the finger of suspicion at the Ali chipset used by NEC.

The corporate theme means that you get no media player buttons, and the 15in screen uses the conventional 1,024 x 768 resolution.

Sadly, although the design of the Versa P440 comes close to being sophisticated the silver finish looks very much like silver spray paint, which rather dents its appearance.

Some users won't mind that NEC has chosen the older Geforce2 Go graphics chip, the poor performance or the high price tag. Instead they'll focus on a neat, slim, light notebook from a major manufacturer complete with Office XP. Sadly, however, this is not enough to win it a recommendation. In spite of a good warranty and software bundle, the NEC has scored poorly for features as the hardware itself was below par in this group.

DETAILS

PRICE £1,878.83 (£1,599 ex VAT)
CONTACT NEC 0870 010 6322
www.nec-online.co.uk
PROS Office XP professional; infra-red; excellent warranty
CONS Poor performance in all our tests; expensive
VERDICT
This lost out in this desktop replacement group as it is very much a light, mobile notebook

FEATURES	★★☆☆☆
PERFORMANCE	★★☆☆☆
VALUE FOR MONEY	★★★★★
OVERALL	★★☆☆☆

Rock Quaddra

Our final notebook is a bit of a bruiser from Rock, weighing in at 4.2kg, and it also has the largest power brick of any notebook here. While we were impressed that the Mesh handled the heat from a 3.06GHz CPU and 1GB memory so effortlessly, the Rock positively chucks heat out of the exhaust vent on the left-hand side. Incidentally that power brick also contains a fan and throws out a significant amount of heat itself.

The Quaddra chassis is big and relatively unattractive, however, it is well organised. On the right-hand side you'll find that the Firewire and USB ports are readily available, while the less important ports such as parallel are tucked away on the back. As previously mentioned Mesh and Rock use the same keyboard and it feels excellent. We liked the touchpad and mouse controls too.

We were, however, deeply unimpressed by its graphics performance. This is the only notebook in the group to use an integrated graphics solution with shared system memory, rather than a dedicated graphics module.

Performance in 3Dmark and Unreal Tournament was poor, but we could live with that if the Rock was mainly going to be used for 2D duties. The problem is that the screen glares and is harsh and unpleasant to look at where the notebooks with ATI chips in particular have colours that are clear, sharp and warm.

We can't be sure if the culprit here is the Sis M650 chip or the screen itself, but the result is uncomfortable to use.

On paper this is decent notebook with good Sysmark performance and a healthy battery life. It's got all the ports you require for daily use and has a decent 60GB of storage. The price is fairly low and this is certainly a decent value notebook, but it has no unique selling point and suffers from terrible graphics performance and poor display quality.

DETAILS

PRICE £1,466.40 (£1,248 ex VAT)
CONTACT Rock 0870 990 9090
www.rockdirect.com
PROS Good Sysmark performance; 60GB hard drive; three-year collect and return warranty
CONS Very poor 3D graphics results; screen is harsh on the eye
VERDICT
A promising notebook that is let down by the display

FEATURES	★★★☆☆
PERFORMANCE	★★★☆☆
VALUE FOR MONEY	★★★★★
OVERALL	★★★☆☆

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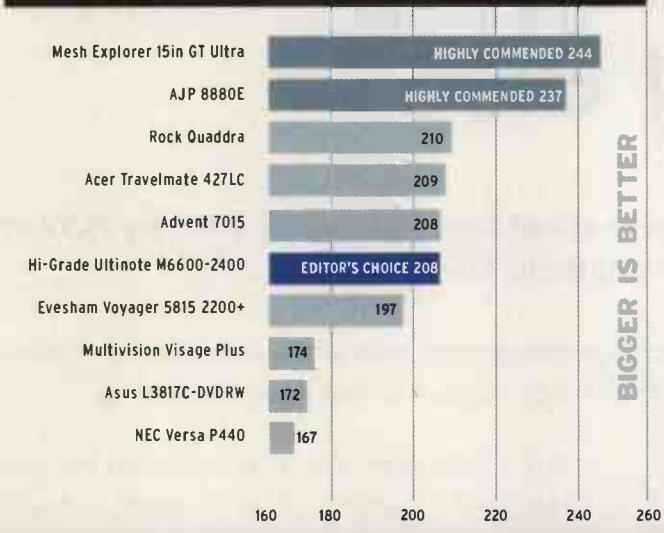
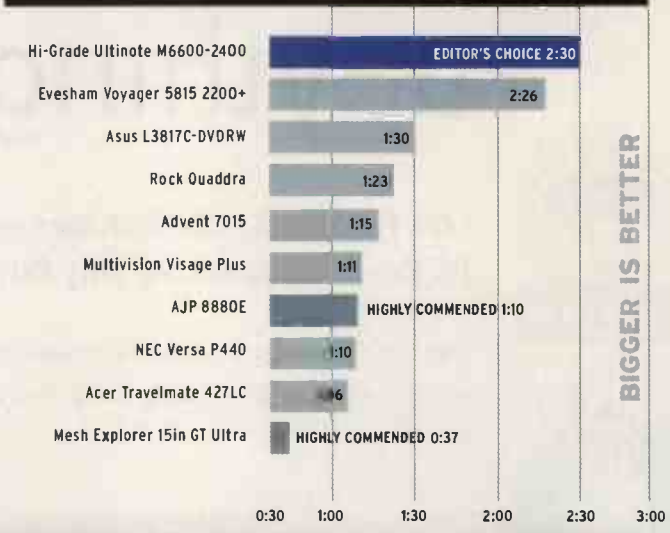
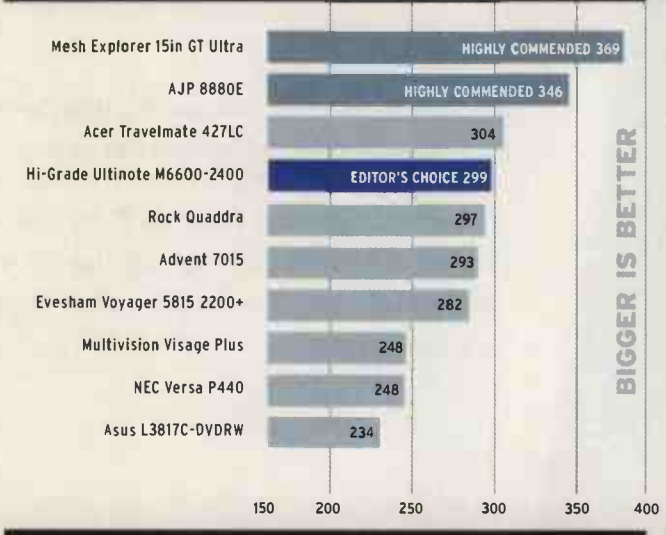
Sysmark 2002 overall



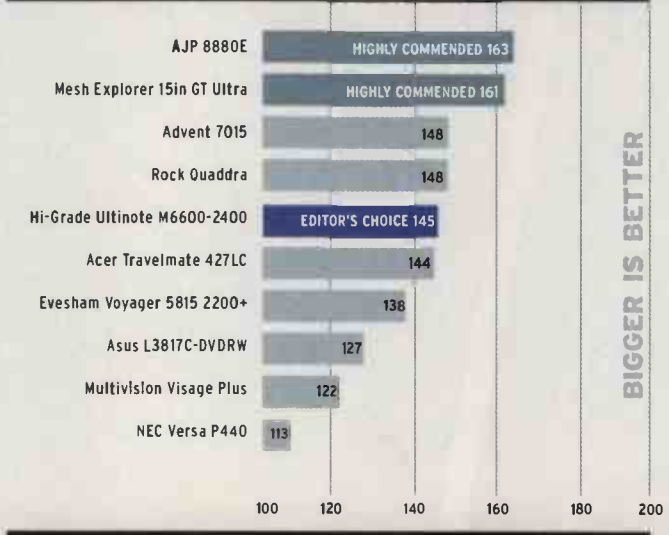
Battery life (hours:minutes)



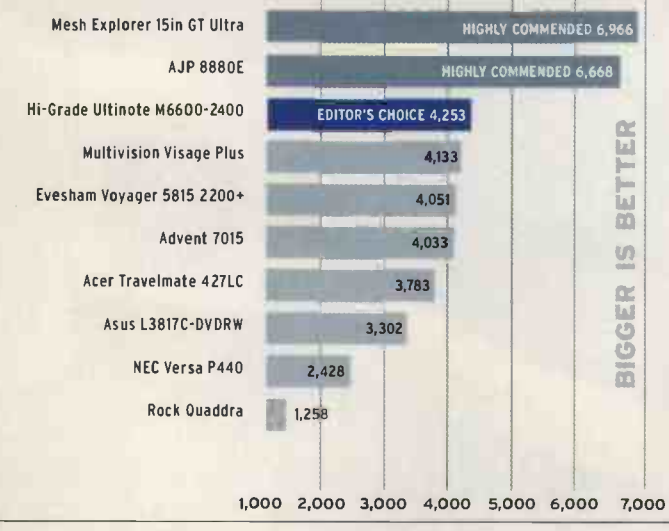
Sysmark 2002 Internet content creation



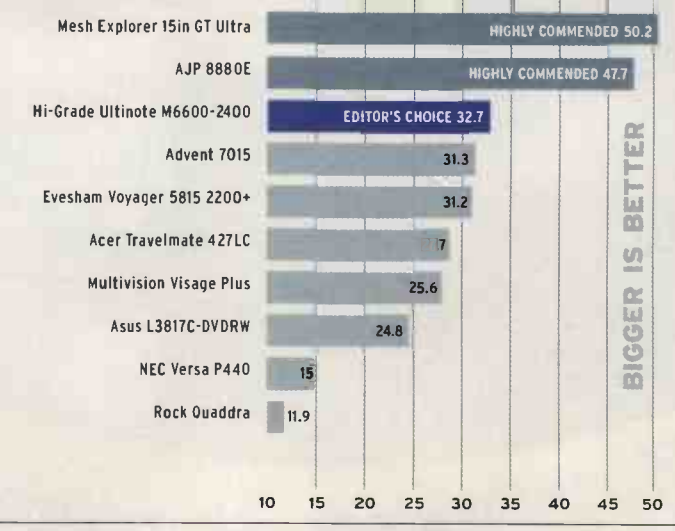
Sysmark 2002 office productivity



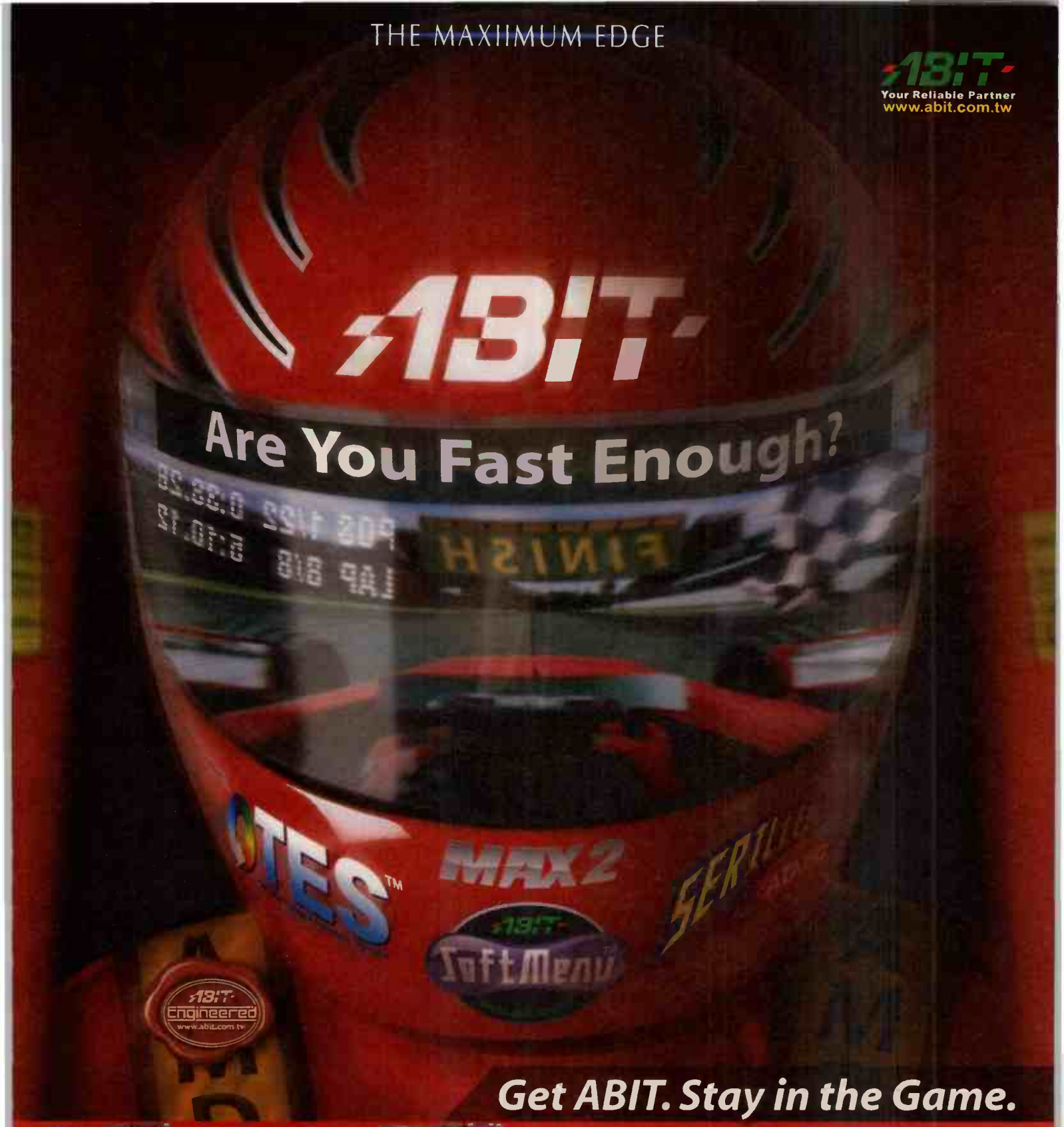
3Dmark 2001 (1,024 x 768 at 32bit)



Unreal Tournament (fps) (1,024 x 768)



Please see page 13 for an explanation of how we tested the PCs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- NVIDIA nForce2 chipset
- 3 Dual DDR DIMMs Support DDR 400/333/266/200
- ABIT Serillel™ATA(NF7-S)
- On board LAN, 6-Channel sound and S/PDIF out
- nVIDIA's Dolby Soundstorm ™Technology(NF7-S)
- USB 2.0, Firewire(1394) and AGP8X
- ABIT 5-bit FID and SoftMenu for overclocking

KD7 Series

- KD7-G, KD7-S, KD7-RAID, KD7
- Supports AMD Athlon™XP/Athlon/Duron Processors
- Socket A 200/266/333 MHz/FSB CPUs
- 4 DDR DIMMs support DDR 400/333/266/200
- 6-Channel audio and S/PDIF out
- USB 2.0, LAN and AGP8X
- ABIT Serillel ATA RAID(KD7-G/KD7-S)
- Gigabit LAN(KD7-G/KD7-S)
- ABIT 5-bit FID and SoftMenu for overclocking

BE7 Series

- BE7-G/BE7-S/BE7-RAID/3BE7
- Supports all Intel® Pentium® 4 Processors(Socket 478)
- Supports Hyper-Threading Technology
- 3 DIMMs Supporting DDR 200/266/333
- Supports USB 2.0 and S/PDIF out
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Table of features

Notebooks

MANUFACTURER	ACER	ADVENT	AJP	ASUS
MODEL NAME	**TRAVELMATE 427LC**	**7015**	**8880E**	**L3817C-DVDRW**
Price inc VAT	£1,642.65	£1,799	£1,809.50	£1,467.58
Price ex VAT	£1,398	£1,531.06	£1,540	£1,249
Telephone	0870 900 2237	0870 546 4464	020 8208 9777	0870 759 0330
URL	www.acer.co.uk	www.pcworld.co.uk	www.ajp.co.uk	www.asus.com
HARDWARE SPECS				
Processor	2.5GHz Pentium 4	2.8GHz Pentium 4	2.66GHz Pentium 4	1.7GHz Mobile Pentium 4
Chipset	Intel 845 MP	Sis 645DX	Intel 845MP	Intel 845MP
Available memory/type	512MB PC2100 DDR SD-Ram	512MB PC2100 DDR SD-Ram	512MB PC2100 DDR SD-Ram	512MB PC2100 DDR SD-Ram
Occupied/spare memory (Ram) slots	1/1	1/1	2/0	1/1
Max memory in this configuration	1GB	1GB	512MB	1GB
Hard disk manufacturer, model and spin speed	IBM Travelstar 40GN 4,200rpm	Hitachi DK23DA-40 4,200rpm	Hitachi DK23DA6TF 4,200rpm	IBM Travelstar 40GN, 4,200rpm
Hard disk size	40GB	40GB	60GB	40GB
No of PC Card slots	1	1	3	1
No of Firewire/serial/parallel/PS/2 slots	1/0/1/0	1/0/1/0	1/1/1/1	1/1/1/1
No of USB 1.1/2 slots	0/3	0/2	0/4	2/0
MULTIMEDIA				
Optical drive/floppy drive	QSI combo SBW-161/USB	Toshiba combo DVD-RW SD-R6012/internal	Teac combo DW-224E/internal	Toshiba combo SD-R2102/internal
Sound chip	Avance ALC202	AC97	Realtek ALC201	Crystal AC97
Graphics chip/memory	ATI Mobility Radeon 7500/32MB	Nvidia Geforce4 420 Go/32MB	ATI Mobility Radeon 9000/64MB	ATI Mobility Radeon 7500/32MB
Screen size and maximum resolution	15in 1,024 x 768	15in 1,024 x 768	15.7in 1,280 x 1,024	15.1in 1,400 x 1,050
OTHER INFORMATION				
Misc hardware/modem	Intel Lan, infra-red, Memory Stick and SD readers/56K	Sis 900 Lan/56K	Teac DVD-Rom, S/PDIF out, Memory Stick reader, Lan	Realtek Lan, infra red/56K
Weight (kg)	3.3	3.7	5.5	3.4
Dimensions (w x d x h) in mm	327 x 269 x 36	325 x 281 x 42	360 x 299 x 55	327 x 267 x 37
Battery technology	Lithium-Ion	Lithium-Ion	Lithium-Ion	Lithium-Ion
Operating system	Windows XP Professional	Windows XP Home	Windows XP Home	Windows XP Professional
Bundled software	Norton Anti-Virus, NTI CD Maker, Power DVD	Nero Burning Rom, Microsoft Works Suite 2002	Intervideo WinDVD 4, Roxio Easy CD Creator 5	PC-cillin 2000, Asus DVD2002, Nero 5
Standard warranty (RTB = return to base, C&R = collect and return)	2 years C&R	1 year RTB	1 year RTB, 1 year RTB labour only	2 years RTB
SCORE				
Features	★★★½☆	★★★½☆	★★★★★	★★½☆☆
Performance	★★★½☆	★★★½☆	★★★★½	★★★½☆
Value for money	★★★½☆	★★★½☆	★★★★½	★★½☆☆
Overall score	★★★½☆	★★★½☆	★★★★½	★★★½☆

	EVESHAM	**HI-GRADE**	**MESH**	**MULTIVISION**	**NEC**	**ROCK**
	VOYAGER 5815 2.2	**ULTINOTE M6600-2400**	**EXPLORER 15IN GT ULTRA**	**VISAGE PLUS**	**VERSA P440**	**QUADDRA**
Price	£1,702.58	£1,878.83	£1,949	£999	£1,878.83	£1,466.40
Price ex VAT	£1,449	£1,599	£1,658.72	£850.21	£1,599	£1,248
Telephone	0870 160 9500	020 8532 6111	0870 046 4747	0870 066 0885	0870 010 6322	0870 990 9090
Web	www.evesham.com	www.higrade.com	www.meshcomputers.com	www.multivision.co.uk	www.nec-online.co.uk	www.rockdirect.com
CPU	2.2GHz Pentium 4	2.4GHz Mobile Pentium 4	3.06GHz Pentium 4	1.8GHz Mobile Pentium 4	2GHz Pentium 4	2.53GHz Pentium 4
Chipset	Sis 645DX	Sis 645DX	Intel 845MP	Intel 845M	Ali Aladdin	Sis 650
Memory	512MB PC2100 DDR SD-Ram	512MB PC2100 DDR SD-Ram	1GB PC2100 DDR SD-Ram	256MB PC2100 DDR SD-Ram	512MB PC2100 DDR SD-Ram	480MB PC2100 DDR SD-Ram
Memory slots free/total	1/0	1/1	2/0	1/1	1/1	2/0
Max memory	512MB	1GB	1GB	768MB	1GB	480MB
Hard drive	Fujitsu MHS2060AT	Hitachi DK23EA-60	Hitachi DK23EA-60	Fujitsu MHR2030AT	Hitachi DK23DA-40	Fujitsu MHS2060AT
Hard drive speed	4,200rpm	4,200rpm	4,200rpm	4,200rpm	4,200rpm	4,200rpm
Hard drive capacity	60GB	60GB	60GB	30GB	40GB	60GB
Hard drive bays free	1	1	1	2	1	1
Optical drive bays free/total	1/0/1/0	1/0/1/0	1/0/1/1	1/0/1/0	1/0/1/0	1/0/1/1
Floppy drive bays free/total	0/4	0/4	0/4	3/0	2/0	3/0
Optical drive	QSI combo SBW-241/USB	Toshiba combo DVD-RW SD-R6012/USB	Teac combo DW-224E/internal	Toshiba combo SD-R2212/USB	Matshita combo UJDA730/USB	Teac combo DW-224E/ USB
Audio	Via AC97	AC97	Intel AC97	Avance AC97	CS4229-XQ	Avance AC97
Graphics	Nvidia Geforce4 420 Go/32MB	Nvidia Geforce4 420 Go/32MB	ATI Mobility Radeon 9000/64MB	Nvidia Geforce4 420 Go/32MB	Nvidia Geforce2 Go/32MB	Sis M650/ 32MB
Screen size	15in	15.1in	15.1in	14.1in	15in	15.1in
Screen resolution	1,024 x 768	1,400 x 1,050	1,400 x 1,050	1,024 x 768	1,024 x 768	1,024 x 768
Other ports	4-in-1 card reader, Lan/56K	4-in-1 card reader, Sis Lan, wireless 802.11b Lan/ infra red/56K	Realtek Lan, infra-red/56K	Realtek Lan, Smart Media reader/56K	Lan, infra-red/56K	Realtek Lan, infra-red/56K
Weight (kg)	3.7	3.6	4.4	3.1	3	4.2
Dimensions (mm)	332 x 285 x 31	332 x 285 x 31	329 x 290 x 44	310 x 273 x 34	328 x 275 x 35	331 x 280 x 44
Battery	Lithium-Ion	Lithium-Ion	Lithium-Ion	Lithium-Ion	Lithium-Ion	Lithium-Ion
Operating system	Windows XP Home	Windows XP Home	Windows XP Home	Windows XP Home	Windows XP Professional	Windows XP Professional
Bundled software	Cyberlink Power DVD, B recorder Gold	Microsoft Works 6, Nero Burning Rom, Panda Antivirus	Microsoft Works 2003	Lotus Smartsuite 9.7, Cyberlink PowerDVD, Roxio Easy CD Creator 5	Microsoft Office XP Professional	Cyberlink PowerDVD XP, Panda Titanium
Warranty	2 years RTB	2 years C&R	2 years RTB, 1 year RTB labour only	1 year C&R	3 years C&R	3 years C&R
Ease of use	★★☆☆☆	★★★★★	★★★★☆	★☆☆☆☆	★★☆☆☆	★★★☆☆
Performance	★★★★☆	★★★★☆	★★★★☆	★★★☆☆	★★☆☆☆	★★★★☆
Value for money	★★★☆☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Overall	★★★☆☆	★★★★☆	★★★★☆	★★★☆☆	★★☆☆☆	★★★★☆

Editor's Choice

We deliberately specified few requirements for notebooks submitted to this group test. We asked for only a floppy drive and DVD reader while limiting the price to £1,700 ex VAT or below. Most of the entrants took the opportunity to submit notebooks priced between £1,200 ex VAT and £1,700 ex VAT, although the cheapest, from Multivision, was only £850.21 ex VAT.

It is common knowledge that most manufacturers buy a generic chassis from Taiwan or China and then assemble the notebook to order in the UK using the appropriate CPU, memory, screen and graphics package. This can mean that we see a number of notebooks that are almost identical having only minor detail differences. In this group, however, we received 10 machines with different specs even though Evesham and Hi-Grade did use the same chassis.

The average specification was quite high for a PC, let alone for a notebook. As a result we generally saw 512MB of DDR memory, a 40GB hard drive, two USB ports, 10/100 Ethernet Lan and a 15in screen with a 1,024 x 768 resolution. Anything less received a black mark and anything more was a bonus. It so happens that every notebook used a Pentium 4 processor with some being

'The average spec was quite high for a PC, let alone for a notebook'

desktop chips while the remainder were the mobile equivalents.

Of course we ran our regular Sysmark 2002 and 3Dmark 2001 benchmark test, and we also ran Unreal Tournament to test Open GL performance, plus our Excel-based battery test. We usually set great store by battery life as we feel it can make a huge difference to how much use you get from your notebook. However, as this group test was for desktop replacement notebooks we felt it was fair to assume that most of the contenders would spend the majority of their lives plugged into the mains. Although a decent battery life is a bonus, we didn't count a poor battery life as a major problem.

Hi-Grade Ultinote M6600-2400

Mesh Explorer 15in GT Ultra

AJP 8880E

The winners

So, our first **Highly Commended** notebook is the **AJP 8880E**, a very large system weighing in at 5.5kg. The features list is as long as your arm, including two optical drives, wireless networking, Ethernet Lan, three PC Card slots, a 60GB hard drive and every port you are likely to want. AJP used the largest screen in the group at 15.7in where the majority were 15.1in.

The combination of a 2.66GHz processor, Intel 845MP chipset, 512MB of PC2100 memory and Radeon 9000 graphics chip put the AJP towards the top of our performance charts, although battery life was fairly poor at one hour 10 minutes which meant it only got four marks for performance.

Our second **Highly Commended** notebook is the **Mesh Explorer 15in GT Ultra** with a 3.06GHz processor and 1GB of DDR memory. That's a staggering specification for a notebook, let down only by a 37-minute battery life and a price of £1,949. Mesh used a high-resolution 15.1in screen that displays at 1,400 x 1,050, and looks surprisingly sharp and clear. Mesh was right up at the top in Sysmark, 3Dmark and Unreal, but that battery life made the Mesh too impractical to use on the move. We'll admit we were torn, but in spite of this the Mesh still deserved an award. It lives up to its billing as a desktop replacement notebook and has plenty of power for office work, movies, games and video editing.

And so we come to our **Editor's Choice**, the **Hi-Grade Ultinote M6600-2400**, with a terribly unwieldy model name but a stunning specification.

You get the 1,400 x 1,050 screen that we liked so much this month, plus a 60GB hard drive, wireless 801.11b, a 4-in-1 media card reader, loads of ports and a combo drive that will write to DVD-R and DVD-RW, as well as all the usual CD formats. Hi-Grade installed a relatively slow 2.4GHz mobile processor and a middle ranking Geforce4 420 Go graphics package so there was no way the Ultinote was going to win any performance test. It did, however, come home in the middle of the field with a decent score in every respect and was top of the charts in battery life. We liked the inclusion of Works 6 and Panda Antivirus which surely can't cost an OEM very much, and were impressed by the two-year collect and return warranty with international accidental damage insurance cover. This is a beautifully balanced package that should be of keen interest to a large number of notebook users or buyers. ■

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Computer Shopper - June 2002

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Life in the fast lane

WORDS: EMILIE MARTIN **TESTING:** VNU LABS **PHOTOS:** BRUCE MACKIE

If speed is what you're after then a mono laser printer should be right up your street. We've picked eight of the best for less than £300 to put some pace in your printing

When it comes to printers, the world can be divided into two types of people: those who want to live their life in the fast lane, and those who want to live their life in colour. If you identify with the former group, and value speed over photo-quality output, then you're likely to favour the mono laser printer.

With the number of people opting to work from home on the increase these days, the small form mono laser printer has found itself a new habitat in the home office. As a result, we decided to road test eight laser printers, to see which would triumph as the darling of the home worker.

Our invitation to manufacturers specified a £300 inc VAT price limit for units submitted for review. We then ran a suite of tests on each to compare plain text printing, pdf and mixed content printing, as well as photo-handling abilities. While the mono laser printer is hardly going to be the choice of the digital photography enthusiast, our test photo nonetheless gives a good indication of output quality.

When it came to evaluating the printers on test here, we took into account print quality, value for money, running costs, availability of consumables and ease of use among other factors that would shape a buying decision. After printing several trees worth of paper, we've put together a comprehensive guide over the next 10 pages to help you buy the right printer for your needs.

Brother HL-1440

The Brother HL-1440 is a sturdy looking unit clothed in a two-tone beige and blue case, with four LEDs, which provide status information, sitting beside a test page button at the front. Just below, a pulldown flap gives easy access to the toner cartridge, which is simple to remove and install.

The pull-out input tray holds up to 250 sheets of paper and features a handy cutaway slot on the front so you can keep an eye on your reserves without interrupting a print job. The 150-page capacity output tray is sunk into the top of the printer, but if you are printing on particularly heavy paper stock, pulling up a flap at the rear of the unit simplifies the paper path considerably.

Print quality was generally good. Characters printed at 100pt were well-rounded with neat edges and, while text at 2pt was a little on the faint side, characters were still legible and well-formed. Shaded screenshots in our 10-page mixed content document were smooth, and text printed over areas of shading lost none of its clarity.

Our test photo, however, caused problems. Although the Brother has an adequate 2MB of supplied memory, it refused to print the photo at 600dpi, throwing up an error message saying there was not enough memory to print at this resolution. Despite several attempts, we could only coax out a 300dpi image. Needless to say, the quality of the Brother's photo output lagged behind the rest of the group significantly. The image was badly posterised, with a small range of grey tones that made objects in the picture appear flat and areas of tonal gradation rough.

In terms of overall speed, the Brother was placed in the middle of this group. It took 54 seconds to print 10 pages of text, and produced both our 10-page pdf document and 10-page mixed-content document in 55 seconds. The test photo completed in 30 seconds.

DETAILS

PRICE £219.99 (£187.23 ex VAT)
CONTACT Brother 0870 544 3028
www.brother.co.uk
PROS Compact; robust; text print quality; fairly speedy; inexpensive
CONS Wouldn't print at 600dpi; no realtime status display
VERDICT
The Brother made a promising start but fell at the last hurdle in our test

OUTPUT QUALITY	★★★☆☆
SPEED	★★★★☆
FEATURES	★★★★☆
OVERALL	★★★☆☆

Canon Laser Shot LBP-1120

The curvaceous Laser Shot LBP-1120 is one of the better-looking printers in this group, and its white casing makes a refreshing change from beige. The minimalistic design of this unit means you have a single blue light on the front panel, which indicates that the printer is ready to go.

If you really look closely for other external features, you'll find an unobtrusive switch towards the bottom of the unit that allows you to change between face-up and face-down paper delivery.

The paper input tray is actually just a paper input slot with an opaque plastic paper support at the top of the unit, so you can only fit 125 pages in there at a time. Another slight drawback is that the face-up output slot has no tray to catch your printouts, leaving them to sprawl over your desk, and there's also no parallel connectivity.

The Canon's output speeds were hardly breakneck. It took one minute, 17 seconds to print 10 pages of text, and the same time to produce our 10-page mixed-content document. The test pdf took one minute, 56 seconds – by far the slowest time in the group, but it did do better when it came to the photo, which it did in 26 seconds.

Text quality at commonly used point sizes was crisp and clean. When the size of characters in our plain-text test was increased to 100pt, however, the rounded edges were a little stepped. At the other end of the scale, text at 2pt was not clearly legible, although you are unlikely to print regularly at this point size.

Meanwhile, the tone of overlaid shaded characters in our pdf was not reproduced evenly and the slightly spindly fonts produced in the test lacked the strength evident in the output of other printers. The Canon did cope better with the test image, though, picking out tonal variations well, and was only outperformed here by the Kyocera and the Epson.

DETAILS

PRICE £179 (£152.34 ex VAT)
CONTACT Canon 08705 143 723
www.canon.co.uk
PROS Looks good; the cheapest printer on test
CONS Slow; low-capacity input and output trays
VERDICT
Although it creates a great first impression it failed to live up to expectations

OUTPUT QUALITY	★★☆☆☆
SPEED	★★☆☆☆
FEATURES	★★☆☆☆
OVERALL	★★★☆☆

Epson EPL-5900

Let's not beat around the bush. The beige and grey clad EPL-5900 is not an attractive machine. It has an ungainly brick-like quality with a huge frosted blue plastic paper support protruding from the output tray, which is sunk into the top of the unit. The input tray accommodates 250 pages, and sticks out of the front at 90 degrees to the body of the unit.

A button on the left-hand side releases a forward-folding flap at the top of the unit that gives access to the toner cartridge. This has a large handle, making removal a doddle, and installation is similarly straightforward. Up on the top of the unit, three LEDs let you know when you are low on paper or toner or when a memory error has occurred.

The software that came with the printer was easy to install and gives you a good level of control over the printer settings.

The Epson produced good quality output across the board. Characters in our plain-text test (which the Epson ran off in a respectable one minute, one second) were well-defined and crisp at all point sizes, from 2pt through to 100pt.

On larger characters it was noticeable that the toner used is quite reflective in comparison with the matt output produced by the rest of the printers tested here, but the merits or otherwise of this boil down to personal preference.

It also took one minute, one second to get through our 10-page pdf, producing strong, solid characters with easily readable overlaid text. The EPL-5900 had some problems reproducing images within the pdf document, as there was some banding in shaded areas, which was also noticeable on images and screenshots in our mixed-content document.

Our test photo, on the other hand, was very well rendered. The Epson picked out fine detail and areas of tonal variation well. It also completed this test in the fastest time of all the group, delivering a printout in just 22 seconds.

DETAILS

PRICE £304.33 (£259 ex VAT)
CONTACT Epson 0800 220 546
www.epson.co.uk
PROS Good-quality output; fairly fast; toner installation and removal
CONS Not the prettiest printer; pricey compared to other units
VERDICT
The design may not be cutting-edge, but the EPL-5900 makes up for it in substance

OUTPUT QUALITY	★★★★★
SPEED	★★★★☆
FEATURES	★★★☆☆
OVERALL	★★★★☆

HP Laserjet 1200

With its curved contours, the Laserjet 1200 is quite easy on the eye, and is also functional. The input tray at the front of the unit can hold 250 sheets of paper at a time and has a frosted plastic cover that doubles as the manual paper feed.

Like the Canon Laser Shot, the design of the HP errs towards the minimalist. The casing is totally devoid of buttons and lights apart from an intriguing jelly-bean shaped LED with two tiny LEDs to one side. Once we installed the accompanying software all became clear: the lights wink at you in patterns that represent one of eight different error or status messages. An interesting concept perhaps, but not necessarily straightforward.

HP has decided to install a concealed USB port on this model, which means you need to employ a bit of brute force to wrench off the left-hand side of the casing to connect it to your PC. We were more impressed by the workings of the pulldown flap at the front of the unit which drags the toner cartridge from the depths of the printer as you open it, leaving you free to just lift the cartridge out when it needs replacing.

The HP sat towards the middle of the group across our output quality tests. Plain-text characters were strong with crisp outlines through a range of point sizes and even characters at 100pt appeared smoothly rounded and clean. Text at 2pt was less easy to read, though.

The Laserjet 1200 took one minute, 45 seconds to print a 10-page pdf document; one of the longest times in the whole group. Fonts were clearly reproduced throughout the document although the tone of large shaded characters was not always even – this was also evident our test photo. Areas of sky, in particular, were blotchy and some banding was apparent. The HP recorded by far the longest time taken to print our test photo at one minute, 24 seconds.

DETAILS

PRICE £266 (£226.38 ex VAT)
CONTACT HP 08705 474 747
www.hp-expo.com/uk/eng
PROS Good design; large input tray; 8MB of memory as standard
CONS Quality was slightly disappointing; slow photo print speed
VERDICT
It will look good on your desk but other printers here put in a better performance

OUTPUT QUALITY	★★★☆☆
SPEED	★★★★☆
FEATURES	★★★★★
OVERALL	★★★☆☆

Kyocera Mita FS-1010

The boxy FS-1010 is a reassuringly compact unit featuring Kyocera Mita's environmentally friendly Ecosys technology which allows usually disposable parts of the printer to be recycled.

At the front of the unit is a fold-down manual paper feed tray with paper guides and a fold-out support that feels slightly flimsy. This is also true of the input tray drawer, which holds up to 250 sheets of paper, but actually comes out of the unit in your hand if you are a little too enthusiastic. Owners have the option of buying a second paper cassette, which holds an additional 250 sheets.

At the top of the unit is a simple interface comprising four LEDs that inform you about power, spooling, paper and toner status, and two buttons: one for printing test pages and one for cancelling jobs.

The quality of the Mita's textual output was consistently high, and the printer coped well with a range of typefaces right down to 2pt. Its rendering of black characters at 100pt was on a par with the Epson, producing strong, well-defined characters, although the toner of the Kyocera Mita was much more matt than that of the EPL 5900.

Shaded areas on the screen grabs in our mixed-content document and icons in our pdf were smoothly rendered. Fonts in the pdf were heavier and darker than those produced by other printers on test but were nevertheless neat, and lighter overlaid text in a large typeface was very easy to read.

It printed our test photo in 23 seconds, lagging the Epson by just a second, and produced a good-quality image, although it seemed to have some trouble differentiating between areas of similar tone, so some detail was lost because of this.

The Kyocera Mita was among the fastest printers in all of our tests, taking 51 seconds to print the 10-page text document, and producing the test pdf and mixed-content document in 58 seconds and 55 seconds respectively.

DETAILS

PRICE £240.87 (£205 ex VAT)
CONTACT Kyocera Mita
0845 710 3104
www.kyoceramita.co.uk
PROS Fast; environmentally friendly; great output; inexpensive
CONS Some components feel flimsy
VERDICT
A great-value, environmentally friendly printer. Worthy of serious consideration

OUTPUT QUALITY	★★★★½
SPEED	★★★★★
FEATURES	★★★★★
OVERALL	★★★★½

Lexmark E320

Lexmark has opted for a fairly traditional printer design with the robust E320. The 150-sheet capacity input flap is mounted on the rear of the unit, with the manual feed nestling just in front of it. There are two exit options for output: the regular output slot with paper support is located at the top of the unit, and there is a fold-down flap at the front of the unit which exposes another output slot that simplifies the paper path.

To get at the toner cartridge you need to pull down on a cutaway handle at the top of the unit which pulls away about half of the front of the printer. Having so much of the casing come away in your hand can be a little alarming the first time, but once you're inside the cartridge clicks in and out with ease.

The Lexmark software was easy to install and use and gives you control over a simple range of options, including paper size, overlays, fonts and web links to online drivers.

In use, the Lexmark produced the clearest text in the whole group. Characters were strong and clean, and text was readable right down to 2pt. Other printers here coped better with the 100pt text but the imperfections around the edges of rounded characters were only really noticeable with the aid of a magnifying glass.

Fonts in the pdf produced by the Lexmark were very well rendered and overlying text was clear. Shaded parts and areas of solid black were smooth and, while there was occasional banding across vector images, it is important to bear in mind that the printers on test here are not necessarily designed for image printing. The E320 printed the clearest photo in the group, reproducing areas of fine detail and tonal variation well.

The running costs of this printer are high (see table) which lost it an award. However, laser printers are designed to be cheaper to run than inkjets, which unfortunately was not true here.

DETAILS

PRICE £217 (£185 ex VAT)
CONTACT Lexmark
0870 727 2100
www.lexmark.co.uk
PROS Solid; excellent output quality
CONS 150-sheet capacity input; sky-high running costs
VERDICT
Great output quality fails to offset page price, which ultimately costs it an award

OUTPUT QUALITY	★★★★★
SPEED	★★★★★
FEATURES	★★★★★
OVERALL	★★★★★

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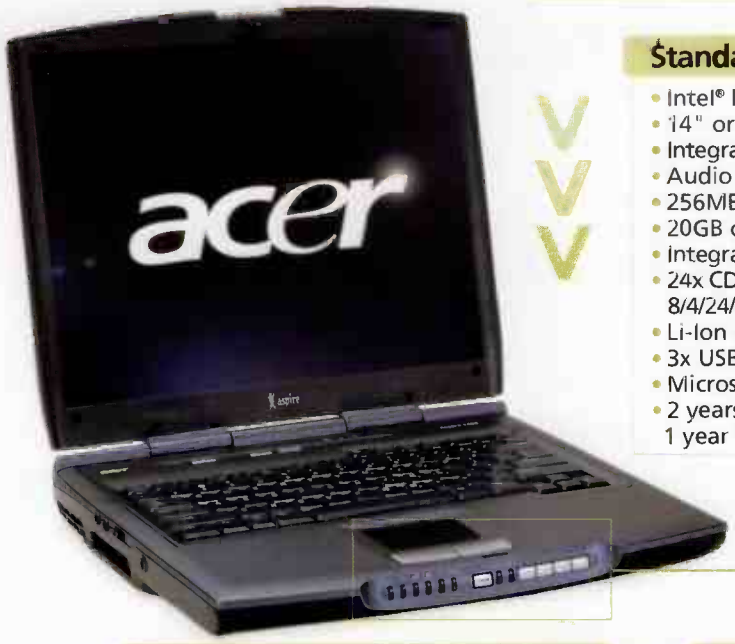

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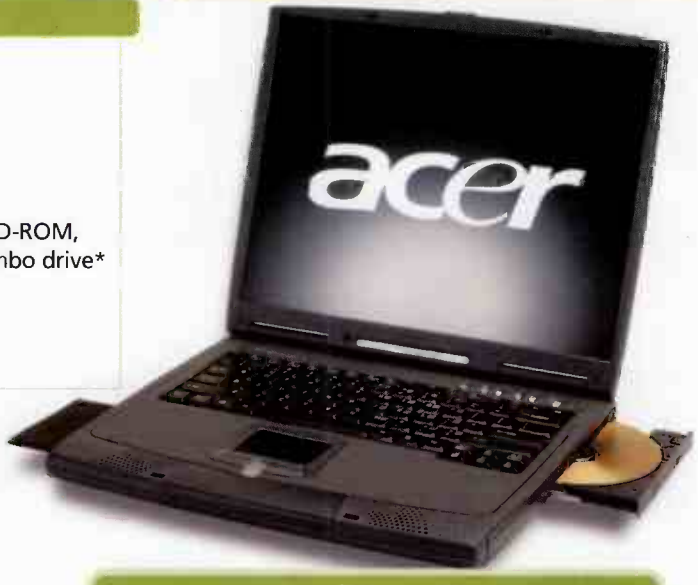

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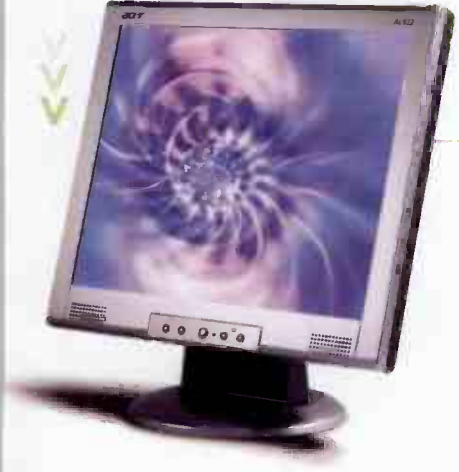

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Panasonic KX-P7100

Unpacking the Panasonic, we were struck with a feeling of deja-vu; the KX-P7100 bears a striking resemblance to the Brother HL-1440. It has a similar beige chasis with blue paper guides and the same pull-out input drawer at the front with a horizontal manual feed slot sitting just above. The pull-down flap that gives access to the toner is also located in the same place as the Brother and Panasonic has opted for the same style of fold-back paper support on the output tray in the top of the unit.

Only the interface is markedly different, with three LEDs over towards the left-hand side of the front panel. These indicate when the printer is ready or when an error or problem with the toner or drum unit has occurred, and there is also a 'continue' button.

Text quality was excellent down to 4pt and the 100pt characters produced by the KX-P7100 were the best that we saw in the entire test. Text at 2pt was a little fainter than we would have liked but this shouldn't be a problem if you're mostly going to be printing at regular font sizes.

The quality of the Panasonic's pdf output was good. Text was clear and icons were well-rendered, although lighter text set against a shaded background proved to be difficult to read, and the edges between areas of similar tone were very messy. Photo reproduction was fair, but nothing to write home about. Tonal transition in the sky of our test photo was not smoothly rendered, giving a rough, granular appearance and definition was lacking in some areas of fine detail.

The KX-P7100 was also a bit of a laggard when it came to printing speeds, recording some of the longest times in the group. Our test photo took one minute, 14 seconds to print, while 10 pages of mixed content took one minute, 27 seconds. Even the 10 pages of plain text took one minute, 26 seconds and the Panasonic also clocked up some lengthy spooling times.

DETAILS

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VERDICT
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OUTPUT QUALITY	★★★★☆
SPEED	★☆☆☆☆
FEATURES	★★★☆☆
OVERALL	★★★☆☆

Samsung ML-1450

The stocky Samsung ML-1450 has a substantial look to it and emits a smooth whir when you start it up. Everything about the design of this printer has a reassuring, solid feel.

The paper input drawer that slides out of the front can hold 550 sheets, while the output tray moulded into the top surface of the printer has room for up to 250 printouts. A second 550-sheet input cassette can also be added, although this will cost extra. In common with the Brother, the Samsung has a cutaway slot on the front of the input tray so you can keep an eye on the paper. Meanwhile, the manual feed is situated on the front panel.

On the top of the unit, three buttons control toner save, demo page printing and cancel/reprint functions, while four LEDs flag up errors and low paper stock and indicate when the printer is in manual feed mode or receiving data.

The software interface is well laid out with five tabs across the top of the screen giving access to the different settings. Our one main criticism is that contrast can only be set to normal, light or dark, whereas the software of some of the other printers featured a more responsive scale.

In use, the Samsung reproduced a range of typefaces well. Text was still clear and easily readable at 2pt but 100pt characters caused problems, with the toner taking on a cracked appearance that made text of this size look like a photocopy. There were also some irregularities visible to the naked eye around the edges of 100pt characters.

The ML-1450 coped well with our test photo, producing fine detail and smooth transitions between tones , although the banding across the sky did let it down.

Shaded areas were also a little patchy in our test pdf, although these were much more uniform in our 10-page mixed-content document. However, its printing speeds placed the Samsung in the middle of the field.

DETAILS

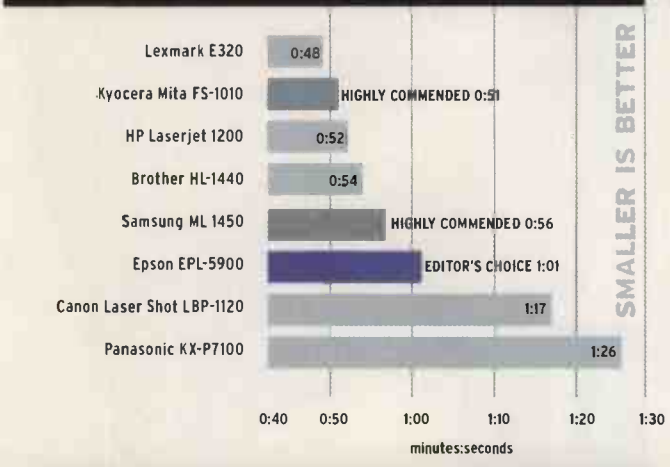
PRICE £234 (£199 ex VAT)
CONTACT Samsung 0800 138 5182 www.samsungelectronics.co.uk
PROS Input tray capacity; solidly built; handles regular font sizes well
CONS Very large characters appeared slightly cracked
VERDICT
Some good features and well-handled regular font sizes, make this ideal for growing offices

OUTPUT QUALITY	★★★★☆
SPEED	★★★★☆
FEATURES	★★★★★
OVERALL	★★★★☆

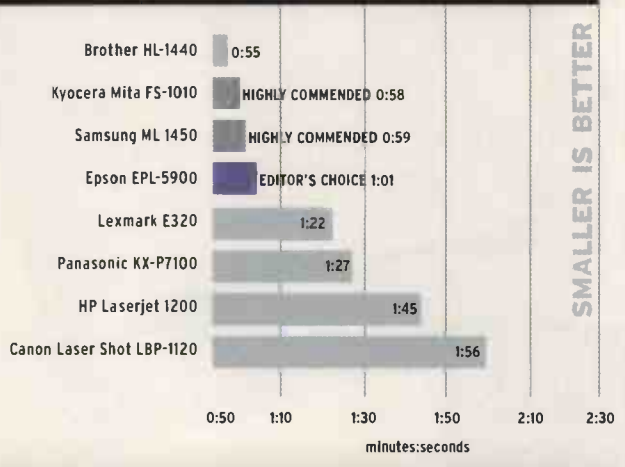
Lab results

vnu labs

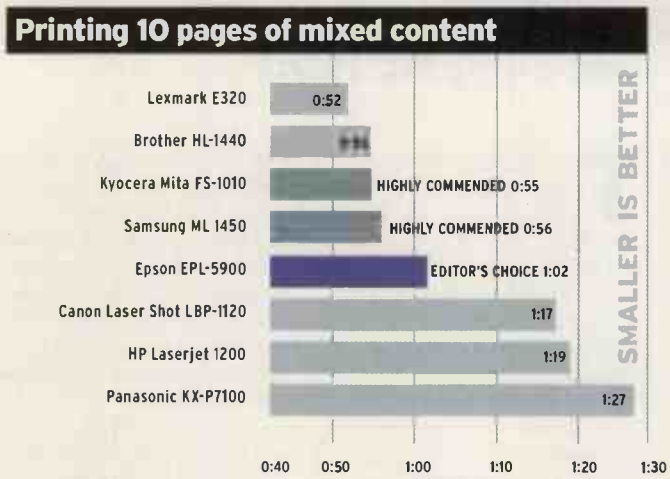
Printing 10 pages of plain text



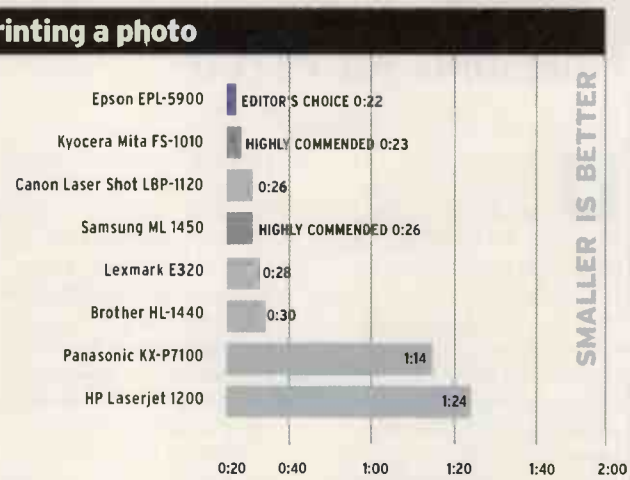
Printing a 10-page pdf document



Printing 10 pages of mixed content



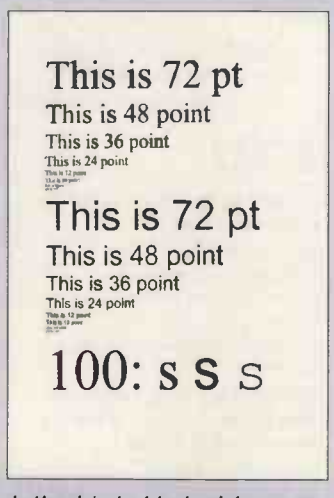
Printing a photo



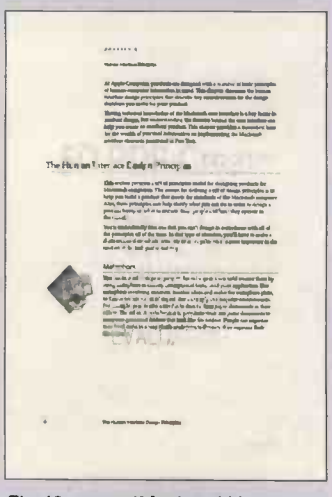
Printer output tests

Our test photo contained areas of fine detail and tonal transition

The 10-page mixed-content document included images and text



In the plain-text test, printers were faced with 2-100pt characters



The 10-page pdf featured blocks of plain text, as well as small icons

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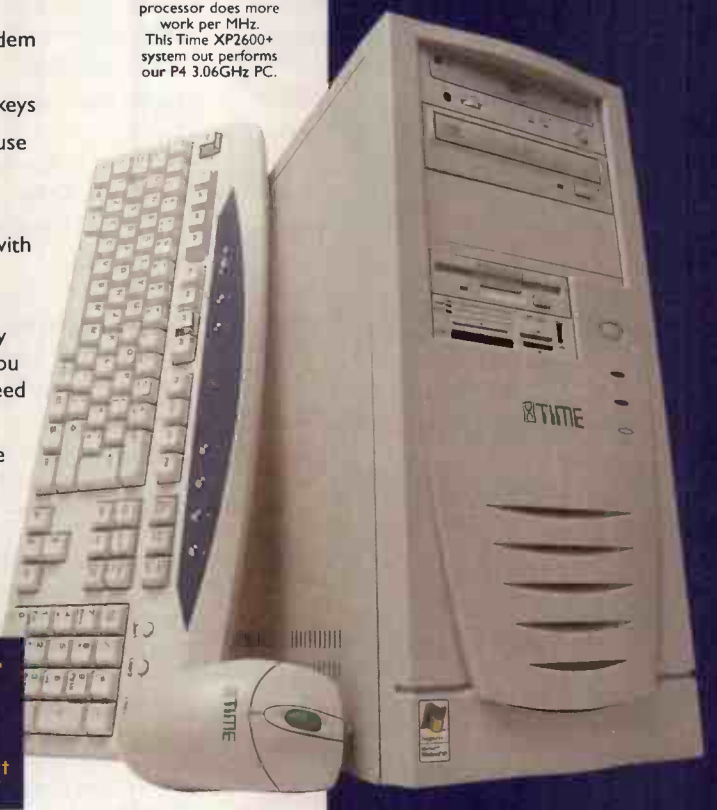
- Supanet Internet Access
- Microsoft Windows XP

The AMD Athlon XP processor does more work per MHz. This Time XP2600+ system out performs our P4 3.06GHz PC.

TIME PowerFlex XP2600+



XP2600+ AMD Athlon XP Processor · 120GB Superfast Hard Disk · 512MB DDR RAM Memory · 128MB 8x AGP nVidia GeForce 4 Graphics · 48x CD-Rw and 16x DVD · Multi MEMORY CARD Readers · CONNECT PLUS Front Panel and Floppy Drive · 6 CHANNEL Sound · ETHERNET ADSL Ready · USB 2.0 and FIREWIRE · 4 PORT TV/Video In-Out

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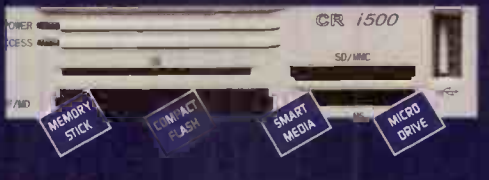
ConnectPLUS, Front Panel Ports and Memory Card Readers



- USB 2.0 Front port • Integrated memory card reader (reads and writes all standard memory cards)
- Memory Stick • IBM MicroDrive • Multimedia Card
- Compact Flash • Smart Media Card • SD Card

Power Flex XP2600+ Pro

As Power Flex XP2600+ but with:
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TIME Ultima Notebook

15.1" 1400 x 1050 SCREEN
Pentium 4 2.66GHz
512MB DDR RAM
GeForce 4 64MB
60GB HARD DISK
CD-Rw + DVD
MEMORY CARD READER
WINDOWS XP PROFESSIONAL EDITION

These Ultimate notebooks come with massive 15.1" 1400x1050 Screens, 64MB GeForce Graphics and Multicard Reader built-in.

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- 2.66GHz Intel Pentium 4 Processor with 533 Bus
- 512MB (expandable to 1024MB)
- nVidia GeForce 4 Go 64MB DDR Graphics card built-in
- 60GB Hard Disk
- Digital Memory card reader built-in
- CD-Rw CD-Rewriter/ CD-copier Drive
- DVD-ROM Drive (combo)
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- Built-in 10/100 Ethernet for ADSL router and networking
- TV-out port for large screen presentations
- 12 Cell Long life Li-ion battery and A/C adaptor/charger
- Built-in microphone and twin stereo speakers plus ports for external speakers, microphone and analogue/digital Line Out devices
- Standard ports including parallel printer, external SVGA
- Advanced keyboard and 2 button track pad
- Microsoft Windows XP Professional Edition

Ultima 2.66

£1229 +VAT
£1444.08 Inc. VAT
code: 10155

Ultima 2.8

£1329 +VAT £1561.58 Inc. VAT
code: 10156

TIME Traveller

14.1" XGA SCREEN
2.4GHz Pentium 4
512MB DDR RAM
60GB HARD DISK
CD-Rw
DVD (COMBO)
64MB AGP GRAPHICS

Take a closer look at this amazing specification that includes built-in CD-Rw and DVD drive, 512MB DDR memory, 60GB hard drive, 64MB graphics, 1394 Firewire, built-in ethernet and all the ports and expansion capability you will ever need!

Traveller P4-2400 CD-R Pro

- Intel Pentium 4 2.4GHz processor
- 14.1" TFT XGA (1024 x 768) screen
- 512MB PC2100 DDR Memory
- 60GB Hard Disk
- CD-Rw CD-Rewriter/CD-copier Drive
- DVD-ROM Drive (combo)
- 56K V9x modem and Supanet internet access
- Built-in 10/100 Ethernet (RJ45) built-in for ADSL router and networking
- 1394 Firewire port
- 64MB AGP x 4 graphics system
- TV-out port for large screen presentations
- Li-ion Long life 8 cell battery and AC adaptor/charger
- Built-in microphone & twin stereo speakers plus ports for external speakers, microphone and analogue/digital Line Out devices
- Parallel printer, external SVGA, Infra Red IRDA, 4x USB ports and one type II PC slot
- Advanced keyboard and 2 button track pad
- Power DVD video software and CD 'burn' software
- Microsoft Windows XP
- USB floppy drive £34.99 extra
- 3.4Kg 310 x 265 x 40mm

code: 10166

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Traveller P4-Cel 1700

As left but with:- Intel Celeron 1700MHz Processor (P4 based technology), 128MB DDR Memory, DVD only drive and 20GB Hard Disk.

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£786.08 Inc. VAT

Traveller P4-2000

As left but with:- Pentium 4 2000, 256MB DDR Memory and 30GB Hard Disk.

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Traveller P4-2400 256

As above but with:- 256MB DDR Memory, and 30GB Hard Disk.

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code: 10158
£985.83 Inc. VAT

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- 40GB Hard Disk
- CD-Rw CD-Rewriter/CD-copier Drive
- DVD-ROM Drive (combo)
- PowerNow! system to enhance battery life
- 56k V9x modem & Supanet internet access
- Built-in 10/100 Ethernet for ADSL router and networking
- 32MB AGP x 4 graphics & 3D wavetable sound
- USB 2.0 x4 ports and Firewire 1394 port
- TV-out port for large screen presentations
- Li-ion Long life 9 cell battery and A/C adaptor/charger
- Built-in microphone and twin stereo speakers plus ports for external speakers, microphone and analogue/digital Line Out devices
- Parallel printer, external SVGA, Infra Red IRDA
- Advanced keyboard and 2 button track pad
- Power DVD video software & CD 'burn' software
- Microsoft Windows XP
- 3.4Kg 310 x 265 x 40mm

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SXGA 15.1" TFT SCREEN | ATHLON XP 2000+ MOBILE | 512MB DDR RAM | 40GB HARD DISK | CD-Rw DRIVE | DVD ROM DRIVE (COMBO) | BUILT-IN ETHERNET BROADBAND READY | USB 2.0 and FIREWIRE

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15" CD-R Notebook

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256MB, 30GB. Rest of spec as above, with XGA (1024 x 768) screen

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code: 10133

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Mobile XP1800+ processor. Rest of spec as above, with XGA (1024 x 768) screen

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code: 10166

£898.88 Inc. VAT

Traveller DDR XP2200+

Mobile XP2200+ and 60GB Hard Disk. Rest of spec as above

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These Time DeskBooks are a powerful desktop replacement system and use advanced technology to offer the power of a desktop with the convenience of a notebook

Time DeskBooks

- AMD Athlon XP2100+ or XP2000+ Processor
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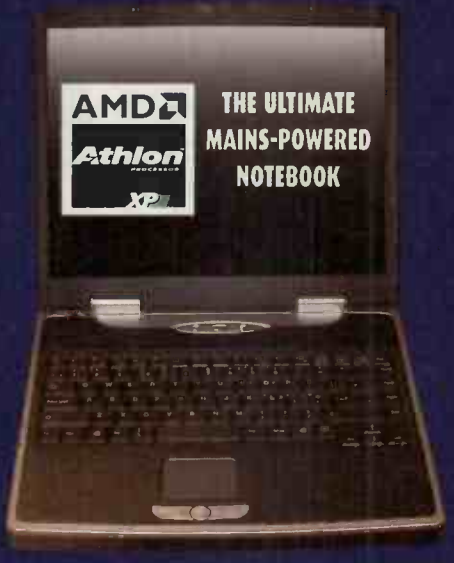
- 60GB or 40GB 2.5" Hard Disk
- CD-Rw CD-Rewriter/CD-copier Drive
- DVD-ROM Drive (combo)
- 56K V9x modem and Supanet internet access
- Built-in 10/100 Ethernet (RJ45) built-in for ADSL router and networking
- 64MB SiS 315 AGP x 4 graphics system with 256 bit 3D graphics engine
- TV-out port for large screen presentations
- Four USB 2.0 ports and 1394 Firewire port
- Built-in microphone and twin stereo speakers plus ports for external speakers, microphone and analogue /digital Line Out devices
- Parallel printer, external SVGA, Infra Red IRDA
- Advanced keyboard and 2 button track pad with 2 short-cut keys
- Advanced power management with suspend to RAM, Disk and Soft Off.
- AC adaptor, power cord and Driver CD
- Power DVD video software and CD 'burn' software
- Microsoft Windows XP
- 3.2Kg 332 x 281 x 39mm

AMD ATHLON XP2100+ | 15.1" TFT SCREEN | 512MB DDR RAM | 60GB HARD DISK | CD-Rw | DVD COMBO | 64MB GRAPHICS

TIME

XP 2100+ 15.1" DeskBook



DeskBook XP2000+

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code: 10163

£974.08 Inc. VAT

DeskBook XP2000+ Pro

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code: 10164

£1091.58 Inc. VAT

DeskBook XP2100+

With Athlon XP2100+, 512MB DDR RAM and 60GB Hard Disk

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"Solid performance and excellent component quality throughout" — Computer Shopper - Mar 2002

"The build quality is high, while accessibility for upgrades is excellent" — Computer Shopper - June 2002

	Alpha PC	Home PC	Pro PC	Evo PC	ELITE-DVDRW
Motherboard	Gigabyte 8GE667	ASUS A7N266-VM	Giagabyte GA7VA	Gigabyte 8PE667	ASUS A7V8X
Memory	256 MB DDR PC2100	256 MB DDR PC2100	256 MB DDR PC2100	256 MB DDR PC2100	512 MB DDR PC2700
Hard Drive	40 GB UDMA 100 7200 RPM	40 GB UDMA 100 7200 RPM	40 GB UDMA 100 7200 RPM	40 GB UDMA 100 7200 RPM	80 GB UDMA 100 7200 RPM
Graphics	Intel Extreme Graphics O/B	GeForce2 Graphics (nForce Chipset)	64MB GeForce4 MX440, TV-OUT	64MB GeForce4 MX440, TV-OUT	128MB GeForce4 Ti4200, 8x,TV-OUT, DVI
Multimedia	52x CD-ROM Drive	16x DVD-ROM Drive	16x DVD-ROM Drive	16x DVD-ROM Drive	16x DVD-ROM Drive
CD-RW	Option Available	Option Avallable	48x12x48 CD-ReWriter (BurnProof)	48x12x48 CD-ReWriter (BurnProof)	Ploneer 105 DVD-ReWriter
Sound	Sound O/B	Dolb Digital Sound O/B	6 Channel Sound	6 Channel Sound	6 Channel Sound
Modem	56K v.92 Modem & 10/100 Network Card	56K v.92 Modem & 10/100 Network Card	56K v.92 Modem	56K v.92 Modem	56K v.92 Modem
Monitor	17" Hansol 730E	17" Hansol 730E	17" Hansol 730E	17" Hansol 730E	19" Hansol 920P
Speakers	Desktop Speakers Microsoft Keyboard & Mouse	Desktop Speakers Microsoft Keyboard & Mouse	Subwoofer & 2 Satellites Microsoft Keyboard & Mouse	Subwoofer & 2 Satellites Microsoft Keyboard & Mouse	Creative 5.1 Inspire 5300 Microsoft Keyboard & Mouse
Extras	4 USB (2 UBS2.0) Ports 3.5" Floppy Disk Drive	6 USB Ports 3.5" Floppy Disk Drive	6 USB (2 USB2.0) Ports 3.5" Floppy Disk Drive	6 USB (2 USB2.0) Ports 3.5" Floppy Disk Drive	6 USB (4 USB2.0) Ports 3.5" Floppy Disk Drive
Warranty	12 Months On-Site Warranty	12 Months On-Site Warranty	12 Months On-Site Warranty	12 Months On-Site Warranty	12 Months On-Site Warranty
All Prices Include VAT	Pentium 4 2.4GHz £519 inc.VAT	AMD Athlon 1800+XP £435 inc.VAT	AMD Athlon 2000+XP £555 inc.VAT	Pentium 4 2.4GHz £645 inc.VAT	AMD Athlon 2400+XP £1080 inc.VAT
		AMD Athlon 2000+XP £445 inc.VAT	AMD Athlon 2200+XP £599 inc.VAT	Pentium 4 2.5GHz £685 inc.VAT	AMD Athlon 2600+XP £1125 inc.VAT

SYSTEM UPGRADES

- Upgd to 15" TFT Monitor £120
- Upgd to 17" TFT Monitor £255
- Upgd 256MB to 512MB DDR £50
- Upgd 40GB to 80GB (7200 PRM) £17
- Upgd MX440 to GF4 Ti4800, 128MB £125
- Upgd MX440 to ATI 9700 PRO,128MB £215
- Add Windows XP-Home £70
- For other upgrades visit website

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- 14.1" XGA TFT Colour Screen
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- 3.5" Floppy Drive
- Infra Red Port
- TV OUT Port, Smart Li-Ion Battery
- 1 Year Collect & Return Warranty

Intel Celeron 1.7GHz £715 inc.VAT

Pentium 4 2.4GHz £820 inc.VAT

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- 20GB Hard Drive
- DVD-ROM Drive
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- 2 USB2.0 Ports
- PCMCIA Type II Slot
- 3.5" Floppy Drive
- Infra Red Port
- TV OUT Port, Smart Li-Ion Battery
- 1 Year Collect & Return Warranty

Pentium 4 2.4GHz £865 inc.VAT

Pentium 4 2.5GHz £910 inc.VAT

Samsung have chosen to retain the Three Year Warranty offered to customers who purchase Samsung HDD's. You can now feel safe in the knowledge that Samsung's SpinPoint HDD's will be covered for three years with no extra charges (unlike some competitors) owing to the fact that the enhanced reliability and performance of Samsung's SpinPoint HDD has greatly improved the Drives level of quality.

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- Upgrade 256MB to 512MB DDR £45
- Upgd 20GB to 30GB Hard Drive £15
- Upgd 20GB to 40GB Hard Drive £50
- Add Windows XP-Home £70
- Add Carry Case £15

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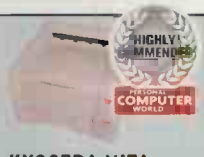
Table of features

Laser printers

MANUFACTURER	BROTHER	CANON	EPSON	HP
MODEL	**HL-1440**	**LASER SHOT LBP-1120**	**EPL-5900**	**LASERJET 1200**
Contact	0870 544 3028	0800 616 417	0800 220 546	08705 474 747
URL	www.brother.co.uk	www.canon.co.uk	www.epson.co.uk	www.hp-expo.com/uk/eng
Price inc VAT (ex VAT)	£219.99 (£187.23)	£179 (£152.34)	£304.33 (£259)	£266 (£226.38)
Price per page (five per cent coverage)	1.67p	1.88p	Not available*	2.196p
Supplied memory/maximum memory	2MB/34MB	512KB/512KB	2MB/13MB	8MB/72MB
Ports	USB, parallel	USB	USB, parallel	USB, parallel
Resolution	1,200 x 600dpi	600 x 600dpi	600 x 600dpi	1,200 x 1,200dpi
OPERATION				
Time to first page (seconds)	15	18 (face-down)/17 (face-up)	15	10
Maximum pages per month	15,000	2,500	15,000	10,000
Toner life **	6,000	2,500 or 5,000 toner saver mode	3,000 (small) or 6,000 (large)	2,500 (small) or 3,500 (large)
Drum life/engine life **	20,000/200,000	N/A/50,000	20,000/Not available*	20,000/120,000
Toner cartridge (price inc VAT)	£35.99	N/A	£84.49	£54.90
Image drum (price inc VAT)	£95	N/A	£62.13	Unavailable ***
Combined unit (price inc VAT)	N/A	£55.22	N/A	N/A
Windows 98/ME/NT/2000/XP/Mac OS/other	✓/✓/✓/✓/✓/✓/✓/x	✓/✓/✓/✓/✓/✓/x/x	✓/✓/✓/✓/✓/✓/✓/x	✓/✓/✓/✓/✓/✓/✓/x
Input tray capacity/output tray capacity (pages)	250/150	125/50	250/100	250/125
Maximum printable area	216 x 356mm	216 x 356mm	208 x 348mm	216 x 356mm
STAR RATING				
Output quality	★★★½☆	★★☆☆☆	★★★★★	★★★½☆
Speed	★★★★★	★★☆☆☆	★★★★½	★★★½☆
Features	★★★★½	★★☆☆☆	★★★½☆	★★★★½
Overall	★★★½☆	★★★½☆	★★★★½	★★★½☆

MANUFACTURER	KYOCERA MITA	LEXMARK	PANASONIC	SAMSUNG
				
MODEL	**FS-1010**	**E320**	**KX-P7100**	**ML-1450**
Contact	0845 710 3104	0870 727 2100	08700 100 464	0800 138 5182
URL	www.kyoceramita.co.uk	www.lexmark.co.uk	www.panasonic.co.uk	www.samsungelectronics.co.uk
Price inc VAT (ex VAT)	£240.87 (£205)	£217 (£185)	£199.99 (£170.20)	£234 (£199)
Price per page (five per cent coverage)	0.8p	3.18p	0.017p	0.01p
Supplied memory/maximum memory	16MB/144MB	4MB/64MB	2MB/No upgrade available	4MB/68MB
Ports	USB, parallel	USB, parallel	USB, parallel	USB, parallel
Resolution	1,200 x 600dpi	600 x 600dpi	600 x 600dpi	1,200 x 600dpi
OPERATION				
Time to first page (seconds)	12	<12	18	<15
Maximum pages per month	10,000	10,000	10,000	12,000
Toner life **	6,000	3,000 (small)/6,000 (large)	4,000	6,000
Drum life/engine life **	100,000/100,000	Not available*/Not available*	20,000/180,000	6,000/150,000
Toner cartridge (price inc VAT)	£49.34	£75	£49.95	N/A
Image drum (price inc VAT)	Unavailable ***	Unavailable ***	£99.95	N/A
Combined unit (price inc VAT)	N/A	N/A	N/A	£76.38
Windows 98/ME/NT/2000/XP/Mac OS/other	✓/✓/✓/✓/✓/✓/✓/✓	✓/✓/✓/✓/✓/✓/✓/x	✓/✓/✓/✓/✓/✓/x/✓	✓/✓/✓/✓/✓/✓/✓/✓
Input tray capacity/output tray capacity (pages)	250/150	150/100	250/150	550/250
Maximum printable area	206 x 287mm	210 x 297mm	201.6 x 288.6mm	215.9 x 355.6mm
STAR RATING				
Output quality	★★★★☆	★★★★★	★★★★☆	★★★★☆
Speed	★★★★★	★★★★★	★☆☆☆☆	★★★★½
Features	★★★★★	★★★½☆	★★★☆☆	★★★★★
Overall	★★★★½	★★★½☆	★★★☆☆	★★★☆☆

* Manufacturer declined to supply this information; ** Pages at five per cent coverage *** Not replaceable

How did the printers perform?

The four output-quality tests we ran in this group produced a range of results, with some printers coping better than others. Below, we've picked out examples of the output from each test to illustrate the variations that can occur in printer output. We have not necessarily picked the best and the worst results from every test, as in some cases this will boil down to personal preference.

In reproducing these samples we have often enlarged them, which exaggerates imperfections.

Below the picture of each printer on the reviews pages, we have reproduced a highly magnified sample of 6pt test produced by each printer. Bear in mind, though, that without looking very closely most users will not spot the differences.

Characters at 100pt

Panasonic

The Panasonic KX-P7100 produced some of the best characters in the entire group, through a range of typeface sizes. The curved edges of 100pt characters were smooth and clean.

Canon

While the Canon Laser Shot LBP-1120 produced characters in commonly used point sizes well, the rounded edges at 100pt were a little stepped, giving a slightly angular appearance.

Photo test output

Brother

Lexmark

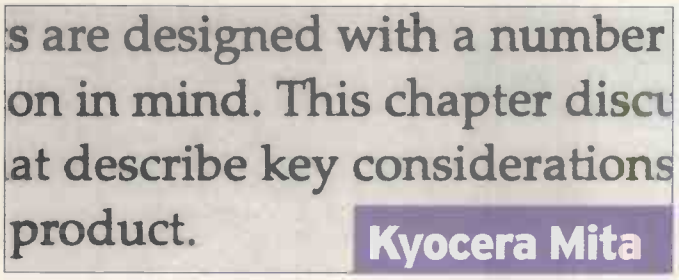
The 300dpi image produced by the Brother was badly posterised, with little tonal variation in the clouds. The Lexmark, on the other hand, reproduced greyscale gradations well, so the clouds here look far more realistic as a result.

The smooth tonal gradations in areas of sky on our test image are lost in the Brother output and fine detail in the foreground has been lost. In contrast, this has been well-rendered by the Lexmark and areas of tonal transition are smoothly reproduced.

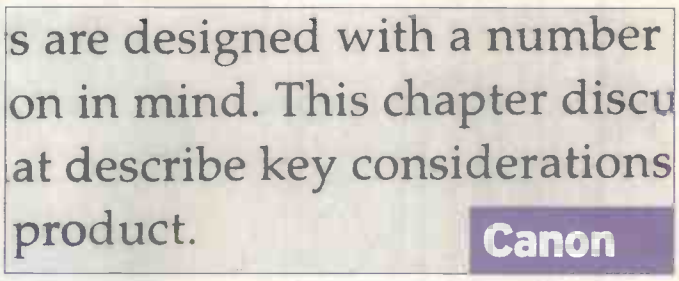
The limited range of greys produced by the Brother means that one shoulder of the male swimmer is barely visible. The Lexmark handled a wider range of greyscale tones and grey-on-grey outlines are clearly reproduced here.

Text styles

The Kyocera Mita FS-1010 produced consistently high-quality output. Fonts in our pdf were slightly darker and heavier than those produced by other printers here, although the merits of this will come down to personal choice.

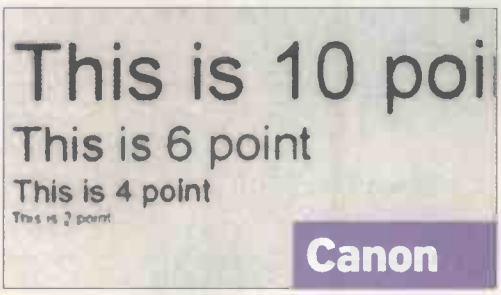


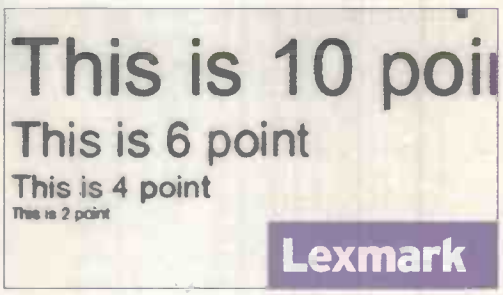
In contrast to the pdf text reproduced by the Kyocera, the Canon Laser Shot LBP-1120 produced much finer characters that verged on the spindly, when compared with the output of some of the competition.



Font sizes

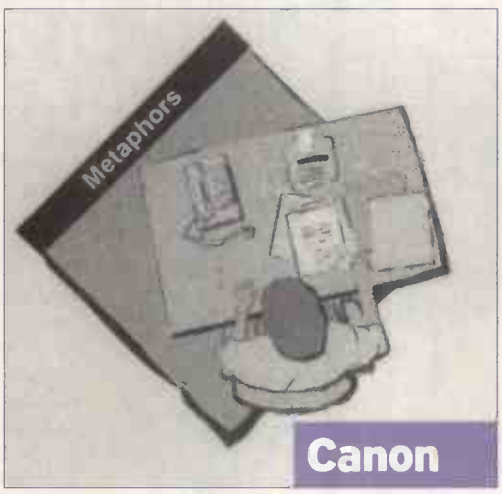
The Canon had some trouble with very large and very small characters. Text at 2pt was not clearly visible to the naked eye. The Lexmark, however, produced very high-quality textual output. Characters were crisp and clean and text was clearly readable down to 2pt.

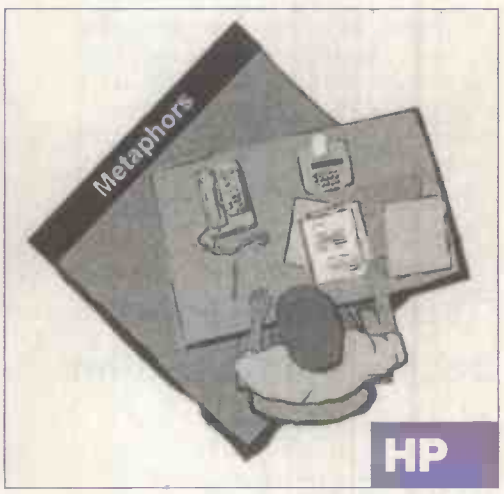




Pdf icons

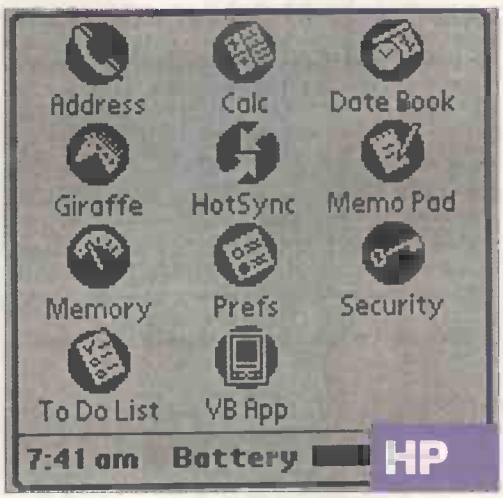
While the resolution of the Canon is 600 x 600dpi compared with the HP's 1,200 x 1,200dpi, the former actually produced a far smoother and tonally uniform icon in our pdf test. The HP did not always produce uniform tones, and here the pdf icon has a slightly blotchy, almost grainy appearance. This was also evident in the HP's output in our photo test.





Screenshot contrast test

The Canon picked out areas of contrast well. The black icons on the screenshot in our mixed-content test were crisp and easy to define against the grey background. The HP seemed to cope less well with areas of contrast in images in our tests. Here the edges to the black icons were not as smoothly rendered as those produced by the Canon and others in the group.



Editor's Choice

Any printer reviewer will have three essential pieces of equipment in their kitbag: a stopwatch, a magnifying glass and a substantial stash of printing paper. So-armed, we set about the lengthy process of testing the eight printers that arrived in our labs.

We carried out four main qualitative tests on each unit, assessing the overall print speed of each printer in each test, measured from when it started spooling to when the final page dropped into the output box, and the output quality of each. Our four selected tests comprised a 10-page pdf, 10-page mixed-content document, 10-page plain-text document and a one-page test photo.

We then set about judging how easy each was to set up and use, and probed the chassis to check for solidity and how easy it was to remove and install toner cartridges. We also took into account running costs and the price of consumables for each printer.

Choosing the winners meant taking into account all the factors and balancing these against price. While we set participating manufacturers a target price of £300 including VAT, there was quite a significant range in the prices of the units submitted. The Panasonic KX-P7100 weighs in at just £199.99 inc VAT, while the Epson just edged past the target price at £304.33.

'It didn't make the best first impression but the Epson proved us wrong'

The winners

Starting with the cream of this particular crop, our **Editor's Choice** award goes to the **Epson EPL-5900**. While it didn't make the best first impression when we unpacked it, the Epson went on to prove us wrong. It was consistently among the faster printers in this group and even made short work of our test photo, which arrived in the output box in just 22 seconds. Output quality was generally good, with crisp, solid characters at a range of typefaces and impressive photo output.

It only fell down slightly when it came to reproducing areas of shading, and images within the test pdf and mixed-content documents where banding was evident in the Epson's output.

Epson EPL-5900

Kyocera Mita FS-1010

Samsung ML-1450

Out of all the printers reviewed here, we felt that the Epson boasted the best software; it was easy to both install and use, and also gives access to a good range of controls. The toner cartridge was very easy to remove and replace, with a massive handle on the cartridge to make the job that little bit easier. Clearly a lot of thought had gone into ease of use which, for a piece of kit used in a small office, perhaps by less technical staff, is a good thing.

Next up is the **Kyocera Mita FS-1010**, which wins our first **Highly Commended** award. The environmentalist's choice, the FS-1010 features recyclable components. Paper handling capacity is good with a 250-sheet input tray and an output tray that will hold up to 150 (presumably also recycled) sheets of paper.

With a pricetag of just £240 including VAT, the Kyocera Mita offers good value for money. Textual output was of a very high quality, and it produced 100pt characters on a par with the Epson. Some fonts in our pdf were bolder than those produced by other printers here, but whether this is a problem depends on personal aesthetic taste.

Some detail was lost on the test photo but, as mono lasers are primarily used to print business documents such as pdfs and plain text, we can forgive the FS-1010 this hiccup. In terms of speed the Kyocera Mita also impressed, coming either first or second in all of our tests.

Our second and final **Highly Commended** award goes to the **Samsung ML-1450** which, as we said in our review, possessed a reassuring air of quality. It is expandable through the addition of an extra paper tray, making this a good choice for the growing office, and the accompanying software is well laid out.

Although it didn't fare so well on very large characters, it coped admirably with regular and very small point sizes, and we had little cause for complaint when it came to judging its performance in outputting our test photo. It was not the fastest printer in the group, but it was certainly far from a laggard, making it a safe choice for the user who values quality over speed.

While we have done enough testing, poking and printing to provide you with a guide to choosing the right printer, other factors must also be taken into account. Where the printer will sit in your home office and how much space you have are just as important factors to consider, along with output quality and speed. ■

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Choosing the best office suite to suit your needs can be tough, but we're here to help with our round-up of the top seven packages

Microsoft has dominated the office suite market for so long that it is hard to think that it has ever been otherwise. Back in the days of character-based Dos, the 'killer' applications that did so much to boost the sales of PCs were programs like the Wordperfect word processor or Lotus 1-2-3 spreadsheet. If you wanted database management, then you might have looked at Borland Paradox, and if you needed to produce presentations, then Harvard Graphics was the market leader.

Not only were all these completely unintegrated, each requiring their own fonts, screen and printer drivers, but a shopping expedition of this sort would have set you back well over £1,000.

The arrival of Windows opened up the market for a one-stop solution to business software. Whereas there had previously been several Dos-based integrated or 'Works' packages from Wordperfect, Lotus, Microsoft and other software houses, none of these were aimed at the power user.

Enter the office suite – a set of more-or-less integrated high-end business applications, comprising a word processor, spreadsheet, presentations and database and contact management, with other extras, such as mail and scheduling software thrown in.

In this group test we've looked at the main contenders in the suite markets, to help you decide which is the best for you. We've split the test into the five main applications provided by office suites to make it easier to compare them. If, for instance, you never use a database, then you're unlikely to want to choose a suite which scores highly in that area but not in others.

The seven suites we've reviewed in this group test are Ability Office 2002, Corel Wordperfect Office 2002 Pro, Lotus Smartsuite 9.8, Microsoft Office 11 Beta Professional, Microsoft Works Suite 2003, Openoffice's Open Office 1.01, and Sun's Star Office 6.

Whether you're purchasing for a big company, a small business or just for home use, you'll find our round-up indespensable.

Star Write (left) and Wordperfect (below) both offer page layout features such as text boxes and the ability to wrap text around pictures

Word processors

The word processor is the staple of most people's working day. They've developed from simple text editors to fully fledged multi-language layout tools.

Microsoft Word & Works Suite

The heir apparent to the word processor crown, Microsoft Word 11 Beta continues the tradition of innovation and feature enhancement. Over the years Microsoft has been first with on-the-fly spellchecking, automatic correction of common spelling mistakes, automatic formatting, XML and Unicode support, multiple clipboards, smart tags, animated paperclips and much more.

The best thing about Word is that it is infinitely customisable. Straight out of the box you get two toolbars: one for opening, saving, proofing, printing and so on, and one devoted to formatting tasks such as italicising, underlining, aligning, fonts and styles. By default these are laid side by side, so unless you have a 25in display, the first bit of customising is to place these on two rows.

In addition there are around 30 other toolbars available, many of which appear automatically. If you select an imported image, for example, then you'll get a toolbar of basic image-processing tools. Word has an impressive range of page layout features, including multiple columns, linked text boxes which flow text between them (useful for 'continued on page...' layouts in magazines), text wrapping around shaped graphics and a set of drawing tools. For those creating longer and more serious documents, there's automatic indexing and table of contents, as well as footnotes and endnotes.

Office XP introduced the Task Panel – a panel that slots in beside the current document to provide access to tasks such as starting new documents, formatting or accessing clip art. Version 11 adds a Research pane providing a common access point to off- and online information, such as the local dictionary, MSN Search, Encarta Encyclopaedia and stock quotes. There is also a new 'reading' view, with a simplified interface.

Two bad points in Word crop up when searching files or displaying multiple documents. It's a sobering thought that it is not only quicker to search the Internet for words or phrases than it is to search folders on your hard disk, but it is also considerably less cumbersome – especially if the folder you want to search is located several levels down the directory structure. Similarly, displaying two or more documents in the same window is something the Word programmers never got right, though version 11 does make a little more effort with a 'Compare side by side' feature.

We need not dwell too long on the word processing facilities in Microsoft's other entry into this group test, Works Suite 2003, as this is a full version of Word 10, as seen in Office XP, complete with task panes, smart tags and all the other comforts.

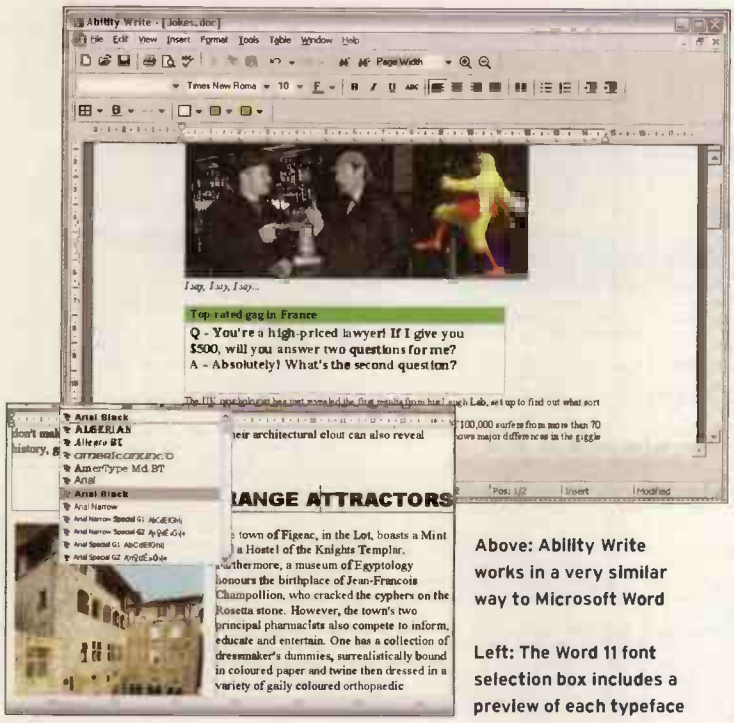
Corel Wordperfect

The former Dos champion, Corel Wordperfect, found in the Wordperfect Office 2002 Pro suite, is now in version 10. It looks similar to Word: augmented by an optional Word 97-style toolbar and a help file for converts from Word. The Perfect-expert is similar to the Word Task Panes and provides both help and access to commands. One long-time favourite is the 'Reveal codes' pane, which shows formatting codes embedded in the text. New in this version are 'variables' – you can insert place-holders at multiple locations in a document and fill them all in with a specific word or phrase.

There is no proper Unicode font support: instead of using this agreed world standard of encoding characters beyond the reach of Ansi, Wordperfect uses its own custom fonts. This has two disadvantages: the first being that you get a 'one style fits all' symbol for characters, such as the euro symbol instead of the glyph appropriate to the current font. Second, if you email someone a document containing custom font characters they will need to have the custom fonts installed to see it correctly. On the plus side, the Professional version has speech recognition software.

Lotus Word Pro

Lotus Word Pro started life as Samna Ami Pro, and if you're used to the Microsoft-led interface standard, then Word Pro, part of Lotus Smartsuite 9.8, comes as a refreshing change. Instead of the proliferation of toolbars, there is just one row of 'Smarticons', which change to suit the context. Other panes open for spellchecking or editing headers and footers, and shortcuts to formatting controls are at the bottom of the window. Word Pro comes with a set of 'Smartmaster' templates, for paper and web documents, with dummy text in 'Click here' boxes, making it easy for beginners to start with. Another unique feature is the use of tabbed dividers to access and re-order

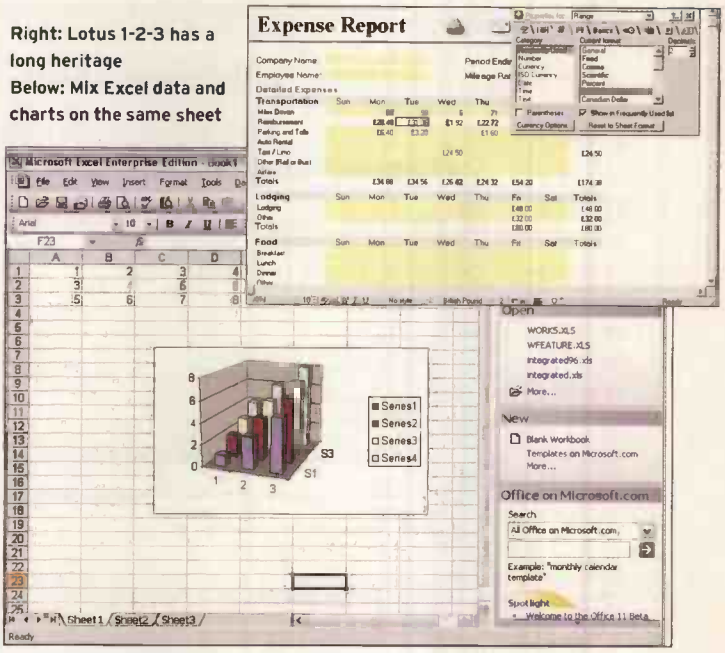


Above: Ability Write works in a very similar way to Microsoft Word

Left: The Word 11 font selection box includes a preview of each typeface

Right: Lotus 1-2-3 has a long heritage

Below: Mix Excel data and charts on the same sheet



Spreadsheets

The original 'killer application', the spreadsheet is said by many to have driven the widespread business adoption of PCs. Of course, machine costs fell too, which is perhaps little more than a happy coincidence.

Lotus 1-2-3

Lotus 1-2-3 is a veteran of the spreadsheet stakes and, like Lotus Word Pro, comes with a set of Smartmasters. Each of these contains formulae and scripts to set up common tasks such as calculating a loan or creating an expenses sheet. A row of tabs switches between sheets in a workbook, and cells in one sheet can reference data in another, giving a 3D view of data such as sales by item, month and region. Each sheet can have up to 65,536 rows and 256 columns of data, and you can populate these with a choice of 330 functions.

An outlining feature lets you collapse rows or columns of data – for example condensing or expanding monthly subtotals into yearly ones – and series autofill saves you the bother of typing in consecutive numbers or months – just type 'January', then drag the cell down or across to create the other months. As with Word Pro you get the very useful Infobox. This lets you access all the properties of a cell or range, including font, alignment, number or date style, protection for formulae or contents that you don't want overwritten, comments and version control.

The Team Mail and Review feature lets a group of colleagues share, amend and comment on documents. You can export a worksheet to HTML, and retain the formatting and colours, but, in addition, cell values are preserved, so numbers that have been formatted to display just two decimal places in a cell (3.14) will still have their true values (3.14159265358979) stored.

Microsoft Excel

Microsoft Excel also sports 65,536 rows and 256 columns per sheet, with up to 256 sheets in a workbook and over 250 functions. Microsoft has made it easy to use, with the comforts one would expect, such as autofilling of series, 'smart' summing, and collapsing and expanding of detail. There are other neat touches: for example, when you type in or select a function, a pop-up appears to prompt you with the type of parameters the function expects, which saves much trial and error or consultation of the help file. Similarly, when you

divisions of a document. On the minus side, there has been little innovation in the past few years – the help file still boasts that Word Pro is 'Year 2000 compliant'. Also, it is not Unicode-enabled, and IBM's speech-recognition package, Via Voice, is no longer included.

Sun Star Write & Open Office Write

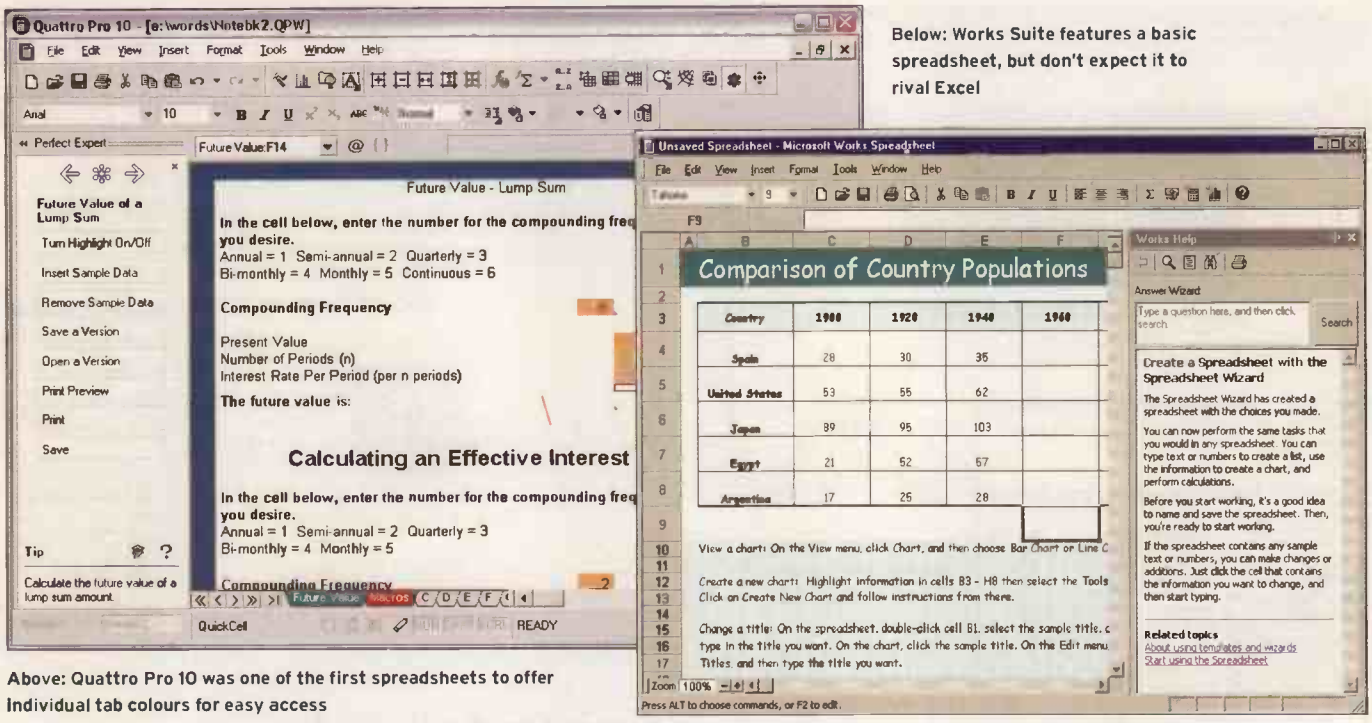
When Sun bought the German Star Division Corporation in 1999, it surprised everyone by giving away copies of the latter's office suite for free. Since then, there has been a split: Open Office is still a free download (or available on CD at a nominal charge) while Sun's Star Office 6 is a commercial – though inexpensive – product. Star Office has more templates, fonts and import/export filters than Open Office, but the word processors are functionally the same. There's not only cross-compatibility with Microsoft Word documents, but XML support as well. Unicode fonts are fully supported, an impressive feature set deals with Chinese, Japanese and Korean documents and a suite-wide programming language.

All the comforts you would expect are present, such as as-you-type spelling checks, autocorrection and click-and-type text placement. Page layout features include columns, tables, text boxes, text-wrap around graphics and rotated text. There's also a set of drawing tools and a clip art gallery. Authors of longer documents have a bibliography feature as well as contents and index. Minus points include having to dig into the document properties dialogue to get a word count, and the lack of a file searcher.

Ability Write

The word processor in Ability's Office 2002 suite, Write, bears an uncanny resemblance to Microsoft Word, with the same menu titles, similar toolbars and the overall 'flat button' look seen from Word 97 to Word XP.

Most of the features you'd expect are here: columns and frames, mail merge, tables and a text effects module. There's a macro language and you can also automate documents with fields. If you want to check spelling you'll have to do it the old-fashioned way, by running an explicit check, but many prefer this to the distractions of autocorrection and on-the-fly flagging of misspellings. You can import and export files in a wide variety of formats, including Word Pro, which Microsoft can't manage.



Above: Quattro Pro 10 was one of the first spreadsheets to offer individual tab colours for easy access

Below: Works Suite features a basic spreadsheet, but don't expect it to rival Excel

paste in a range, a smart tag appears offering formatting options, and there's also the formulaic equivalent of a spellchecker. You can slant the text in a cell, which is a good way of cramming in long column titles, and there's a huge range of chart options.

As with the rest of the Office package, Microsoft places great store on teamwork. Members of a Sharepoint team can export all or part of a workbook to a website: changes made to an original can be automatically updated on the website. The Shared Workspace task pane also lets team members update shared documents, contact other team members, assign tasks and schedule meetings.

Corel Quattro Pro

Corel Quattro Pro was originally written for Dos by Borland, before migrating to Windows and Corel. Like 1-2-3 and Excel, it has tabbed worksheets, but with macro code also having its own tab. A single workbook – or notebook as Corel calls it – sets the record for size, with one million rows, 18,278 columns and 18,278 sheets. Once again, the Perfectexpert is on hand to provide context-sensitive assistance. As with Excel, cells with comments attached are flagged with a small red triangle. As you hover over the cell the comment pops up. Unlike Excel, Quattro Pro flags formulae (with a blue triangle) making it easy to distinguish values that have been entered directly from those that have been calculated.

As in 1-2-3 and Excel, there is a bewildering selection of ways to display data visually, as graphs or charts. Quattro 10 comes with an 'Advisor' in the Chart Gallery, which makes an intelligent guess as to the best method of displaying the data. Power users also have 3D and lighting options for displaying charts, and another new feature lets you autoscroll through a worksheet using a standard two-button mouse.

Sun Star Calc & Open Office Calc

Once again, Sun's Star Calc and its Open Office equivalent are serious contenders to Excel. In version 6, Star has added over 90 new functions, ranging from asset depreciation to Bessel functions, in order to keep up Excel compatibility. The interface is also Excel-like with tabbed worksheets, in-cell editing and 'friendly' row and column names. Continuing the XML theme, Calc saves spreadsheets to an XML format by default, though you can override this and set the Star binary format, Excel or CSV as the default file type. There is also an Autopilot for batch converting Star or Microsoft files to XML format. Although you can export worksheets to HTML format, you can't link to update these, as you can with Excel, and there isn't the same degree of team emphasis. You can annotate cells, which are flagged with a red triangle, and there's a view option to distinguish values from formulae by text colour. Finally there's an Autopilot to help with entering formulae and functions, and another to create charts.

Microsoft Works Spreadsheet

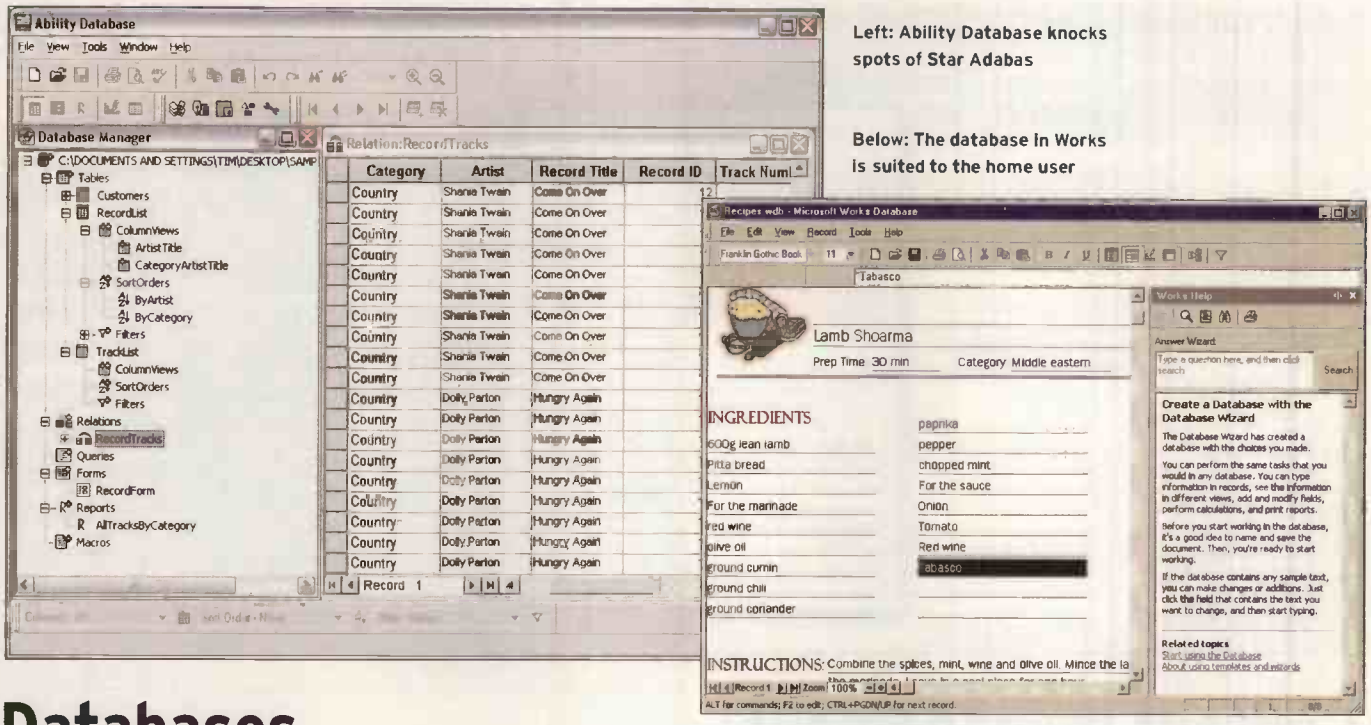
Although the Microsoft Works Spreadsheet will import and export Excel files (with limitations) it isn't a patch on the real thing. You can't have more than one worksheet to a file, so if you are trying to open a multi-sheet Excel workbook you will have to choose which sheet to open. You can't place a chart inside a Works spreadsheet, so embedded charts or other objects will be lost. You can, however, save charts as separate pages in a Works file.

Given its limitations, this spreadsheet is still powerful enough for small business, home, and educational use, with 75 financial, mathematical, statistical and other formulae, and plenty of wizards and templates to simplify tasks. You also get regulars such as auto-fill of series, smart summing that guesses the range you are trying to add, and an 'easy-calc' feature to help with using formulae.

Ability Spreadsheet

Ability's Spreadsheet bears a flattering resemblance to Excel, and incorporates many of the same conveniences, such as tabbed worksheets and in-cell editing. Like Excel you have 256 columns and 65,536 rows per sheet, and you can have up to 256 sheets per work book, all of which can reference other sheets for multidimensional models. There are over 200 built-in functions, including finance, trigonometry, arithmetic, logic, statistics and dates, as well as a wide range of chart types. In addition to the customary line, bar and pie charts these also include more specialised displays such as stock high-low-open-close.

One feature that you won't find in Excel is mail-merge. Fields in an Ability (or Microsoft Access) database can be accessed and inserted into a cell, and you can also use filters and queries already defined in the database – or create new queries – without leaving the spreadsheet.



Left: Ability Database knocks spots of Star Adabas

Below: The database in Works is suited to the home user

Databases

Often the most complex and confusing of all office components, the database, is also perhaps the most versatile, allowing for speedy organisation of data and powerful search capabilities.

Microsoft Access

Since its launch in 1992, Microsoft Access has stood out as a powerful and complex database management system made accessible through the use of wizards. For example, you can create a stock control table simply by picking fields such as 'Productname', 'SupplierID' and 'Unitsinstock' from a list. The wizard will then create a form to let you enter the data for each record or item. Like all 'grown-up' database managers, Access is relational. In other words you can relate tables – such as a stock list, order list or customer list – by common fields, such as a stock item or customer name.

As with Excel, you can create pivot tables and charts, which enable you to look at data in a variety of different ways – comparing, say, the volume of sales of a certain item from retail stores with those sold online. This version offers some minor improvements, notably on the XML and Sharepoint team fronts, and brings smart tags and an easier backup.

Corel Paradox

Paradox is relational and will manage standard SQL, Oracle or other ODBC data sources, as well as importing Access files up to version 97. Although not quite as easy for beginners as Access, it comes with Experts for creating tables, reports, queries and charts. It has its own object-based programming language, Objectpal. Using HTML and CSS this can produce web reports, and users can share tables over a network. If your data contains graphics, then Paradox supports the same large range of file formats as Wordperfect. It also imports images directly from a scanner or digital camera, but this requires some work with Objectpal. As well as using the Expert to construct queries, users can also query by providing an example of the information they want to retrieve or by using the Visual Query Builder.

Sun Star Adabas

Star Office comes with a third-party database manager, Adabas, which is restricted to a maximum of three concurrent users and is 100MB in size. The first challenge is in starting Adabas as it doesn't add any entries to the Windows Start menu. Instead you have to go via the Star Office View menu to access existing data – which defaults to the imported Star Office address book and a sample bibliography – or add new data sources from the Tools menu. Although there are some obvious sorting and filtering buttons in the toolbar, using the data is poorly explained in the help file. Creating new data sources is even more baffling, especially as the URL to the Adabas website, as given in the help file, is a dead end.

Lotus Approach

Approach treats the newcomer well, with Smartmasters ranging from music collections to employee records. Having chosen a Smartmaster, the screen opens with a main menu showing the available tables and buttons to create reports. The forms and tables are populated with sample data: this is a great help for finding your way around, but can be removed with a single click.

When viewing a table or form you can switch between browse and design mode: in the latter you can edit the appearance and add and remove fields. The status bar provides quick navigation between the forms and views, which you can also access from a set of tabs. Building new forms or tables is easy, as you drag fields from the source to the destination.

Microsoft Works Database

Unlike the Works Spreadsheet, which has (limited) rapport with Excel files, the Works database won't import Access files at all. It's a simple flat-file database, which is fine for storing details of recipes, a music collection or even a list of customer names and addresses, but you won't be able to relate tables such as a stock list and an order book.

Ability Database

The budget Ability Office Database is fully relational and will open and save Access MDB files as well as Dbase, Fox Pro and ODBC data formats. When you create a new database, you get a Manager window, with a tree structure showing tables, relations, queries, forms and macros, but these are initially unpopulated.

Although there are wizards to help create new tables and queries, you don't get the degree of handholding you do in Access or Approach – you are going to have to hit the help file to find out how to add your own fields, or create forms. Unlike Access, however, it will let you create simple queries and reports on-the-fly, making life easier for newcomers to data management.

Left: Outlook is considered by many to be king of the organisers

Below: The task organiser sticks Works Suite together

Contact management

Contact management is about more than just keeping a list of names and addresses. The online world encompasses communication, simple databasing and schedule management.

Microsoft Outlook

Outlook Express – the mail client bundled with Windows – probably handles more personal email than any other program. However, its senior sibling, Outlook, offers a lot more, with a central interface to contacts, email, personal calendar and group scheduling.

Outlook is clearly aimed at the corporate market, with no fewer than 10 ways of arranging a task list, including 'Next seven days', 'Overdue', 'By category' or 'By person responsible'. You can also create an automatic Journal, logging the files that you have been working on and, as with Outlook Express, create rules to sort your incoming mail into different folders depending on its origin or content.

This version has improved a lot. The redesigned layout makes far better use of space; the message preview window is larger; and legibility – particularly on notebook and tablet PCs – has been improved by a paper-like background and Ereader technologies similar to those in the Word 11 'reading' view. You can view multiple calendars side by side, making it easier to schedule meetings.

Unread mail messages are stored in a separate folder and you can also send messages to a 'follow-up' folder with a single click. In addition to the normal sorting, a 'Search folders' feature lets you create virtual folders – the messages remain in their original physical locations – and monitors the messagebase by user-defined categories such as author, subject or if they are tagged for follow-up.

There's an option to block external content in email – such as graphics stored on a remote server – eliminating unnecessary dial-ups and possible abuse by spammers. There have also been improvements in connectivity and synchronisation, with different optimisations for mobile users who alternate between working offline, on a Lan or via a dial-up connection.

Lotus Organizer

Acquired from Threadz in 1992 Organizer owed its initial success to the stylish interface, based on the then-ubiquitous Filofax ring binder. Personal data storage has moved on since then, and Organizer now has a distinctly retro look. You get a calendar, year planner, contact manager, phone dialler, notepad and to do lists. There is no built-in email client – clicking on the email button of a contact will launch your default Windows email application. You can access calendar and contacts more conveniently from the Smartcenter (see page 200).

Corel Central

Central creates eight Start Menu entries, for Address book, Alarms, Calendar, Card file, Day planner, Mail, Memos and Profile management, after that it gets complicated. When we started the Address book, it offered us the option to use an existing book or create a new one. Despite repeated attempts, the creation failed. We had a similar problem trying to set up a calendar, with an 'Error creating database' message. Setting up mail got a bit further, and Central created a digital ID to authenticate our mail messages. However, unlike Outlook, it took considerable digging into the options to persuade Central to talk to our mail server, as the 'Compact expert' assumed we had an Imap, rather than a POP3 mail server.

Having finally got connected, the mail looks very like Outlook Express, but, unlike the current version of the latter, it has no protection against potentially harmful attachments.

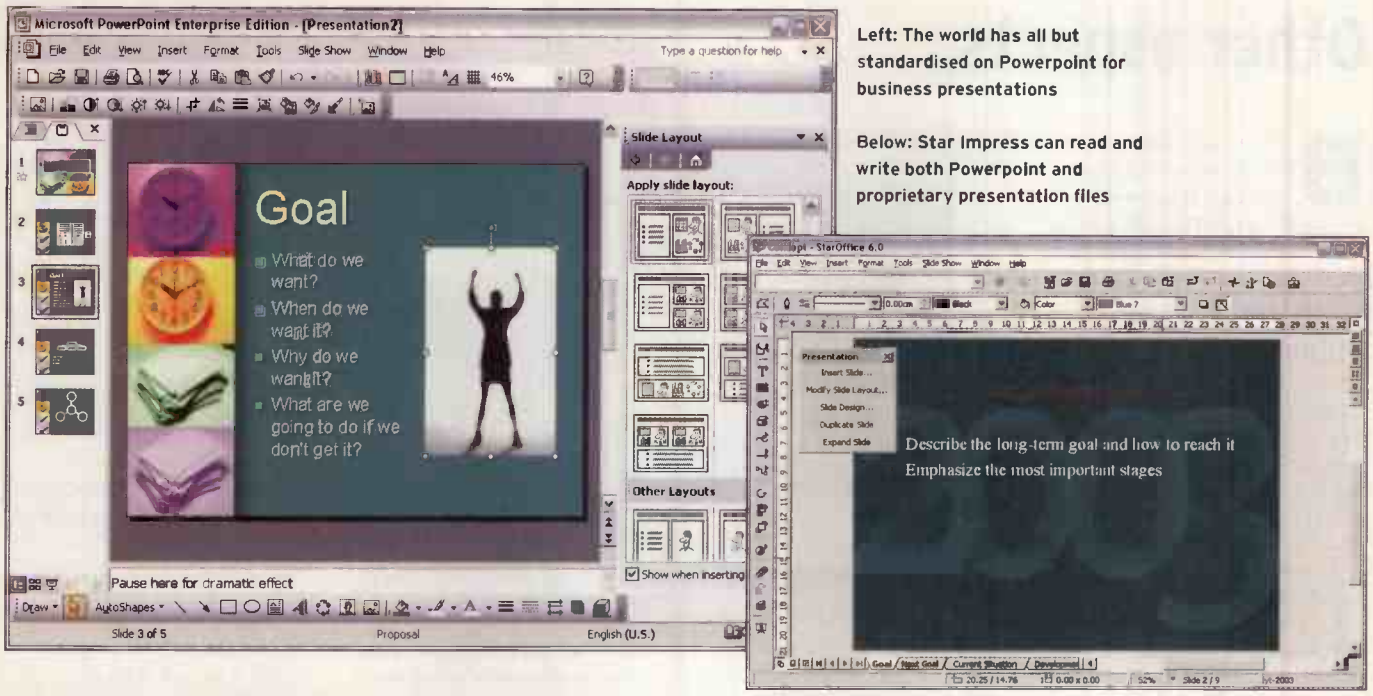
After searching the Corel website, we found that the problem creating the address book and calendar was a known issue in Windows XP, and could be solved by uninstalling Wordperfect Office, deleting all Corel-related folders and some Registry keys and exporting others, then reinstalling Corel Office, creating the Address book and Calendar, and finally re-importing the saved Registry keys. Since the article was dated April 2002, we weren't very impressed by Corel's failure to fix this in the shipped product.

The others

Microsoft's Works Suite doesn't replace the standard Windows address book or Outlook Express, but it does add a simple calendar in which you can schedule appointments and reminders: a clever touch here is that you can import birthdays from your address book.

Ability Office has no mail, contact or calendar facilities, but you could use the database or spreadsheet to create your own.

Finally, neither Star Office nor Open Office have any built-in email, contacts or calendaring, though they will use an existing Windows or Outlook address book as a source, and send documents as email using your default mail client.



Left: The world has all but standardised on Powerpoint for business presentations

Below: Star Impress can read and write both Powerpoint and proprietary presentation files

Presentation graphics

The days of the projector and transparent sheet are gone. Powerpoint may now be synonymous with digital presentations, but Lotus Freelance once ruled the roost. So, how does the market stand now, with almost every office suite offering something to help make smart, clean slides and, for the uninitiated, do they offer any pointers on good design?

Microsoft Powerpoint

The first impression of Powerpoint is that it is easy to use. After all, most people who have to create a presentation won't be trained graphic artists.

On starting, you can either plunge straight in, or use the Auto content wizard to choose a subject such as Business plan or Brainstorming session. You then choose an output – screen, web or transparency – followed by a title. A suggested outline is provided and you can replace the dummy text by your own points.

The Task pane allows access to a variety of design templates, animation and colour schemes – all of which can be applied to the whole presentation or just to selected slides. When you add a new slide the Task pane changes to show a variety of content layouts.

The workspace is also well thought-out – by default you get a panel to the left that will show either a text outline or slide thumbnails, a main slide area and a notes panel below. This way you don't have to keep switching between views. The same drawing and photo-editing toolbars as in the rest of the suite help embellish your slides, and there is a facility to package a presentation to CD-Rom.

Sun Star Impress & Open Office Impress

Moving on to Star Office, we have an Autopilot, rather than a wizard, and the choices are slightly more complex. You choose a presentation type, and follow this with a choice of background and output. Next you choose a default transition type and whether you want the presentation to change the slide automatically at set intervals.

Next, you fill in the company name, presentation title and any other points you want on the title page, and the final step is to choose which ready-made outline slides you want. Having completed the Autopilot, you can view your presentation in outline, slide sorter or slide design view.

Unlike Powerpoint, you can't combine views, but there is a current slide preview window available in sorter and outline, and a small Navigator window to page between slides in design view. You don't get the flexibility of Powerpoint's Task pane, but you do get the option to change background fills, and use a set of drawing and charting tools, including 3D effects.

The Openoffice.org variation of Impress has similar functionality, but you'll have to start from scratch on design and layout, as no templates are provided.

Lotus Freelance

This is another product with a long pedigree – 10 years ago, *PCW*'s Gordon Laing wrote: 'It feels great to find an application which is truly well designed and does the job it's supposed to do.'

The basic formatting tools are at the bottom of the screen, with a further toolbar at the top, and there is a set of tabs. In Freelance, however, these tabs don't move between pages or section but between page, slide sorter and outline view. There is plenty of help here: the Smartmasters offer not just loads of ready-made visual styles (all seem to date from 1999 or earlier) but also give advice on content, with detailed templates such as Marketing strategy and Product launch. A 'Guide me' button offers advice on common tasks such as adding a chart or graphic to a slide.

Corel Presentations

After Smartmasters, wizards and Autopilots, Corel brings us the Perfectexpert. This is a short process where you either decide on a subject, such as Budget report or Business plan, complete with a ready-made background, or choose to concentrate on the visual aspects by designing a set of slide masters.

Once the main program launches, you are taken to the slide design view, and the Perfectexpert slots in alongside offering a choice of context-sensitive actions, such as formatting text, adding graphics or changing the slide layout. Once again you can swap views from the tabs at the right of the screen and navigate through slides using tabs at the bottom.

Presentations is well-equipped for multimedia, supporting Flash, MP3 and WMA formats, and there's a facility to produce a standalone slideshow, complete with all necessary fonts for viewing on a non-Corel equipped PC.

The others

Ability features drawing and photo editing, rather than presentation applications. Similarly, Microsoft Works Suite offers Picture It, which is far better suited to the home user.

Other aspects

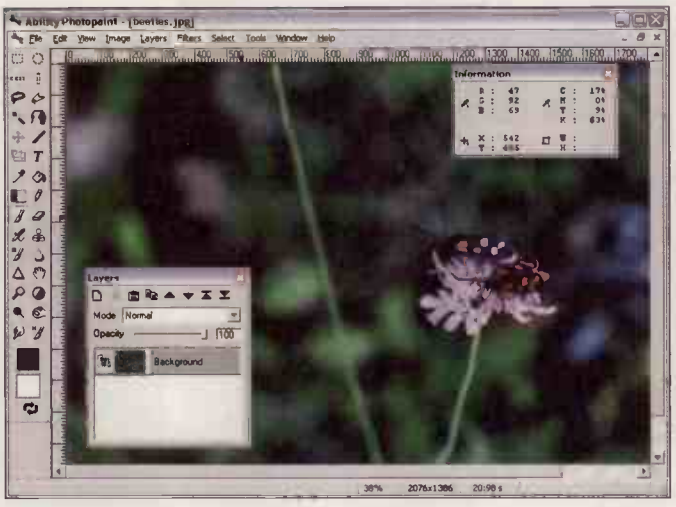
Beyond the features that we've picked out here, there are many applets in an office suite that can't be categorised – either because they are far from mainstream or are unique to just one or two suites.

Filing & image editing

Although we've covered the standard Office armoury of word processor, spreadsheet, presentations, database and mail/calendar/contacts, each of our contenders also has its own specialities.

Turning first to Lotus, the Smartcenter is a bar that sits at the top or bottom of the screen, with buttons to launch programs, access websites, contacts and calendar, store reminders, create new files from templates and consult the dictionary and thesaurus. Each button opens a 'drawer' and each drawer can contain folders, customisable by the user.

Lotus' Fastsite is a standalone app for creating websites from existing documents.



Ability Photopaint may be cheap but it offers some impressive features

Corel comes endowed with a set of utilities that include, among others, a quick file viewer, a multiple clipboard and a font manager. You'll certainly need the last item – Bitstream Font Navigator – as the suite comes equipped with 1,000 fonts and 12,000 clip art images.

Microsoft Office 11 Beta, shipped with Frontpage (website creation) and Publisher (desktop publishing) as well as Picture Library – an image management and correction utility.

Staying with Microsoft, Works Suite offers an impressive portfolio. In addition to the items previously mentioned, no fewer then five CDs contain a project manager, a clip art manager and a small clip art collection. Then there is a copy of Picture It, a photo-editing application rather better equipped than Office's Picture Library; Autoroute, for journey planning; Money, for personal finance management and the Encarta encyclopaedia.

Ability Office comes with both vector drawing and image-editing applications (Draw and Photopaint). The former is very basic – you can draw lines and shapes, add text and align or order objects, but you are limited to flat fills and no advanced features such as blending or 3D effects.

The image editor is much better: it has a full set of painting and retouching tools, uses layers, and offers a range of image enhancements and special effects.

Sun Star Office and Open Office have an excellent drawing module equipped with shading, 3D objects, shadow and lighting effects, cross-fading and text warping.

Table of features

Office suites

	ABILITY OFFICE 2002	COREL WORDPERFECT OFFICE 2002 PRO	LOTUS SMARTSUITE 9.8
Price inc VAT (ex VAT)	£50 (£42)	£334 (£285)	£184 (£156)
Sales telephone number	020 7231 6310	0800 581 028	01475 892 000
URL	www.uk.ability.com	www.corel.co.uk	www.lotus.com
Platforms	Windows 95, 98, ME, NT, 2000, XP	Windows 95b(OSR2), 98, ME, NT4 with SP6 or higher, 2000, XP	Windows 95, 98, ME, NT4, 2000, XP, OS/2 Warp
Memory/disk space (under Windows XP) for typical installation	32MB/40MB	32MB/340MB	128MB/290MB
Trial version	✓	✓	✗
Unicode support/XML support	✗/✗	✗/✓	✗/✗
pdf creation	✓	✓	✗
Proofing languages supplied/available	5/5	25/25	41/41
Group review/version control	✗	✗	✓
Software components	Ability Write, Ability Spreadsheet, Ability Database, Ability Photopaint, Ability Draw	Wordperfect, Quattro Pro, Presentations, Central (contact management), Paradox, Dragon Naturally Speaking	Wordpro, 1-2-3, Approach (database), Freelance (presentations), Organizer
SCORES			
Range of features	★★★★☆	★★★☆☆	★★☆☆☆
Ease of use	★★★☆☆	★★★☆☆	★★★☆☆
Value for money	★★★★★	★★☆☆☆	★★☆☆☆
Overall score	★★★★☆	★★★☆☆	★★☆☆☆

Lotus Fastsite helps you create websites from your documents

Scripting

All the products here offer some form of macro writing and automation. Microsoft Office comes with Visual Basic for Applications – a suite-wide development language that can be used for simple tasks such as arranging windows or for complex bespoke solutions in a company. You don't have to be a programming expert to start, as you can record a series of actions as a macro, then view and edit your code.

Microsoft also does well at maintenance, with a 'Detect and repair' feature that will replace missing or damaged system files. Works Suite doesn't have a suite-wide macro facility, but you can record and edit macros in Word, using the same VBA language as in the Office version.

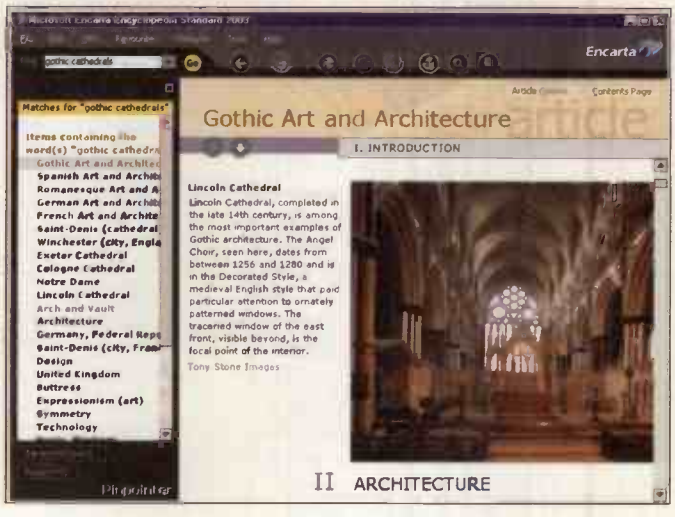
Lotus has a similar suite-wide facility, Lotus Script, which, like VBA comes with a dialogue box designer. This has a recording feature in all modules except Freelance Graphics, and can also be used with Lotus Notes.

Corel's Objectpal automates database management, but there's more. If you just want to use macros in Wordperfect itself, and store the macro in a document or library file, you can use the standard Wordperfect macros – there's a good range of samples included. If you want to involve Quattro Pro or Presentations, then you can create Perfectscript macros, which are stored in separate wcm files. If you want to go even further, Wordperfect Office, strange as this may seem, comes with Microsoft Visual Basic for Applications, which, unlike Perfectscript, can also interact with Paradox.

Ability Office has suite-wide macro capabilities using VB Script. This can be thought of as 'VBA Lite' and is an implementation of the scripting language that is used in Internet Explorer and the Windows Scripting Host. As such it works both ways – you can, for example, program Ability to fetch email addresses from its database, add text and then send them on to Outlook Express for mailing. Conversely, you can program Ability from other applications – such as the Windows Scripting Host. The drawback is that you can't record macros, so you will have to learn the language, but there are some well-commented sample macros to get you started.

Finally, Star Office and Open Office both have a macro language, or Integrated Development Environment, as they term it, and there's a good range of useful sample macros provided. As with the other suites, it's a Basic dialect and therefore not too hard to understand, but as with Ability, there is no way to record macros.

Microsoft Encarta – a font of knowledge



	MICROSOFT OFFICE 11 BETA PROFESSIONAL EDITION	MICROSOFT WORKS SUITE 2003	OPENOFFICE.ORG OPEN OFFICE 1.0.1	SUN STAR OFFICE 6
	TBA	£88 (£75)	Free	£32 (£27)
	08457 002 000	08457 002 000	N/A	0800 731 0 658
	www.microsoft.com/office	http://works.msn.com	www.openoffice.org	www.sun.com
	TBA	Windows 98, 98SE, ME, 2000 Pro with SP2 or higher, XP	Windows 95, 98, ME, NT, 2000, XP; Linux Kernel v2.2.13 or higher, glibc2 v2.1.2 or higher; Solaris 7/8/80E	Windows 95, 98, ME, NT, 2000, XP; Linux Kernel v2.2.13 or higher, glibc2 v2.1.2 or higher; Solaris 7/8/80E
	128MB/360MB	64MB/1.05GB	64MB/250MB	64MB/270MB
	✗	✗	✓	✗
	✓/✓	✓/✗	✓/✓	✓/✓
	✓	✗	✗	✗
	4/126	4/126	4/68	4/68
	✓	✗	✗	✗
	Word, Excel, Access, Powerpoint, Frontpage, Outlook, Publisher, Picture Library (NB subject to change)	Word 2002, Works 7.0, Picture It Photo 7.0, Encarta Encyclopedia Standard 2003, Money 2003 Standard, Autoroute 2003	Open Office Writer, Open Office Calc, Open Office Impress (presentations), Open Office Draw	Star Office Writer, Star Office Calc, Star Office Impress (presentations), Star Office Draw, Star Office Adabas
	★★★★★	★★★½☆	★★★★½	★★★★½
	★★★★★	★★★★★	★★★½☆	★★★½☆
	★★★½☆	★★★★★	★★★★★	★★★★★
	★★★★½	★★★★½	★★★★½	★★★★½

Editor's Choice

There can only be one winner, and by rights it should be Microsoft Office Beta 11 Professional edition. Not only do the individual components beat their rivals in each field, but the emphasis on teamwork and connectivity also makes it a natural choice for larger organisations. Sadly, though, as nobody outside Microsoft yet knows how close to the finished product this beta is, and how the released software may differ, we are unable to recommend it over and above the others reviewed here. However, we feel confident that once it is released to the general public Microsoft will retain its dominant position in the market.

It isn't just a matter of raw power and a multitude of features that makes us so firmly believe this: what makes Microsoft Office special is that, despite its complexity, it keeps things simple and usually helps the user in intuitive ways. However, we make one proviso: cost is no object. Although a price for the suite has yet to be announced, it's unlikely to be much different from the current XP Professional, which is around £475 inc VAT for the full version. All the prices here are for full, rather than upgrade versions. You may be able to get a better price if you qualify for an educational licence or are upgrading from a previous version or competing product. Although nobody does it better than Microsoft, several

'At under £50 Ability Office is excellent value and looks like a long-term competitor'

do it cheaper, so if you don't want to spend much money, read on for some alternatives.

Of those left we can't recommend Lotus Smartsuite 9.8. As well as looking distinctly behind the times, the lack of significant development in over three years seems to indicate that Lotus and its parent, IBM, have lost interest in the product. Even though it's available more cheaply than the £184 inc VAT quoted on the Lotus website, we feel that acquiring and learning an office suite should be an investment in the future, and that future doesn't look promising for Lotus users.

Corel Wordperfect 2002 is somewhat better, and the Professional version does come with voice recognition. However, it lags behind the times – any suite with multinational aspirations should be able to handle Unicode fonts. Despite the generous bundle of fonts and clip art, it doesn't look to be good value at around £334 inc VAT.

Ability Office 2002

Sun Star Office 6

This leaves four contenders for our awards. If you need heavyweight word processing, but lightweight number and data crunching, and you don't need to produce presentations, Microsoft Works Suite is ideal, and its value is enhanced by the inclusion of Encarta, Money and Autoroute. It's also something of a bargain: though the official Microsoft price for Word XP on its own is nearly £300, this entire suite retails at less than a third of that price. The only reason we don't give it an award is that it isn't aimed at the office environment, though it is an excellent choice for the home user or the self-employed.

The winners

As for the rest, it depends on your needs. If you want Microsoft compatibility – both in file format and interface, and you need a proper relational database, but don't want to create presentations, then take a look at **Ability Office**, which is a worthy winner of our **Editor's Choice** award.

At a whisker under £50, this British product is excellent value and looks like a long-term competitor. It also comes with unlimited free email support, and its modest system requirements mean it will run on older PCs. You can download a free 15-day trial from the Ability website. You can pick just the components you need if you feel you don't need the entire suite.

This leaves the choice for our only **Highly Commended** award between Star Office and Open Office. These are basically the same open-source product. Again you've got Microsoft file compatibility, but also XML and Unicode support, as well as cross-platform compatibility with Linux and Solaris. You get a presentations package, and – in Star Office – a database manager, though we concede that Ability beats the latter hands down. Of the two, for a business environment, we give the prize to **Sun Star Office**.

For a modest retail price of around £32, this comes with a printed manual, templates and clip art, 60 days of free technical support and a web-based training course. We think the time and effort this will save is well worth the price. You can download Open Office, or buy it for a nominal price on CD, and see how you like it.

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BJC50/70/80/85	(BC11E)	£24	
BJC50/70/80/85 Tanks 3's	(BCI11)	£9 ..	£12
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S200/S300 TWIN Pk	(BCI24BK/BCI24C)	£9 ..	£18
BJC2000/4000/5000 Series	(BC20E/21E)	£19 ..	£26
BJC2000/4000/5000 Series Tanks	(BCI21)	£5 ..	£12
BJC3000/S400	(BC33)		£35
BJC3/6000/S400 Tanks	(BCI3B/3C/3M/3Y)	£7 ..	£6
BJC6000/6100/6200/6500	(BC30/31)	£23 ..	£26
BJC7000/7100	(BC60/61)	£23 ..	£25
BJC7000/7100 Colour Ink Tank	(BCI61)		£16
BJC7000/7100 Photo Cart	(BC62)		£36
BJC7000/7100 . Photo Ink Tank	(BCI62)		£24
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Glossy Photo Cards 4x6	(20) (FM101)	£5	
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Compatible Cartridges

Compatible Inkjet Cartridges		Black	Colour
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Epson 800/1520	(JT108/JT089)	£6 ..	£8
Epson 440/640	(JT187/JT191)	£5 ..	£8
Epson 740	(JT189/JT191)	£6 ..	£8
Epson Photo/700/EX	(JT093/JT110)	£6 ..	£8
Epson 480/580/C20/40	(JT013/JT014)	£5 ..	£8
Epson 680	(JT017/JT018)	£9 ..	£12
Epson 880	(JT019/JT020)	£8 ..	£9
Epson 900/980	(JT003/JT005)	£9 ..	£11
Epson Scan 2000/2500	(JT189/JT191)	£6 ..	£8
Epson Photo 750	(JT187/JT193)	£5 ..	£8
Epson Photo 1200	(JT187/JT001)	£5 ..	£8
Epson P 790/870/75/90	(JT007/JT008)	£9 ..	£8
Epson Photo 1270/1290	(JT007/JT009)	£9 ..	£11
Epson Photo 810	(JT026/JT027)	£9 ..	£11
Epson Photo 2000P	(JT015/JT016)	£9 ..	£11
Epson C60	(JT028/JT029)	£9 ..	£11
Epson C70/80	(JT032140/C24/M34/Y44)	£14 ..	£7
Epson 3000 .	(JT118B/130C/126M/122Y)	£18CM	£18

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Deskjet 610/612/640	(6614D/49A)	£18 ..	£19
Deskjet 810/PSC500	(6615D/23D)	£18 ..	£21
Deskjet 816/825/840/845	(15D/6625A)	£18 ..	£20
Deskjet 920/940/V40/V45	(15D/6678D)	£18 ..	£22
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Deskjet 5550/PS7150	(6656A/57A)	£16 ..	£24
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Premium+ Photo Glossy	(6832A)	20 ..	£11
Premium+ Photo Matte	(6951A)	20 ..	£11
Premium+ 10x15cm Glossy	(7025A)	60 ..	£15
Premium+ 10x15cm Photo	(6945A)	20	£6
Professional Brochure & Flyer	(6818A)	50	£9
Premium HeavyWeight 2-Sided	(1853A)	100 .	£11
Photo Paper 2-Sided	(1847A)	20	£6
Photo Quality Paper	(6984A)	20	£5
Premium Glossy Paper	(3831A)	10	£7
Premium Transparency	(3832A)	20 ..	£13
Iron-On T-Shirt Media	(6050A)	10 ..	£11

HP A3/A4 Paper Media		A4	A3
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Premium Inkjet	(A4-200/A3-100)(51634/1856A)	£12 ..	£17
Premium Photo	(A4-15/A3-20)(6040/59A)	£6 ..	£24
Bright White	(A4 500/A3-200)(1825/1858A)	£7 ..	£15

HP A3+ Proofing Paper Media		Pack	Price
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Other Inkjet Supplies

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Apple S/Writer 1500	(8041/4609)	£15 ..	£19
Apple S/Writer 2200	(3308/3309)	£27 ..	£29
Apple S/Writer 2400/2500	(3240/3328)	£28 ..	£32
Apple S/Writer 24/2500 Tanks	(3330/29)	£5 ..	£12
Lexmark 150/1000/2000	(13400/13619)	£20 ..	£24
Lexmark 32/50/7000/Z11	(A1970/1980)	£20 ..	£24
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Olivetti JP150/170/350 Head +4 Refills		£32	
Olivetti JP170/190/360/450	Mono/Col	£18 ..	£28
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Apple LaserWriter 12/640PS	(4683) .	£85
Apple LaserWriter Pro 16/600/630/800	(2473)	£65
Apple LaserWriter Pro 810	(3602)	£259
Apple LaserWriter 8500	(5893)	£165
Apple Colour LaserWriter 12/600PS	(3756/7) .	£84 CM £84
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Brother HL820/1051/1060	(TN/DR300) .	£17 .... £89
Brother HL1240/50/70 Hi-Yield	(TN6600/DR6000) .	£49 .... £89
Brother HL2400 Colour Laser	(TN01-BK) .	£89 CM £75
Canon CLBP 360 PS ColourLaser	(EPH-BK) .	£65 CM £75
Epson EPL-5500/W	(S050005/51029) .	£35 .... £48
Epson EPL-5700/5800	(S050010/51055) .	£59 .... £48
Epson AcuLaser C1/2000	(50033/34Y/35M/36C) .	£44 CM £84
Epson AcuLaser C4000 ..	(50091/88Y/89M/90C) .	£32 CM £99

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HP Laserjet 5L / 6L / 3100 / 3150 ..	(C3906A) .	£39
HP Laserjet 5P / 5MP / 6P / 6MP ..	(C3903A) .	£49
HP Laserjet 1100 / 1100A	(C4092A) .	£39
HP Laserjet 1200 / 1220	(C7115X) .	£65
HP Laserjet 2100 / 2200 Series	(C4096A) .	£65
HP Laserjet 4 /4+/4M / 5/5N/5M	(92298A) .	£59 .. £149
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HP Laserjet 8100 / 8150/M320	(C4182X) .	£119
HP Color Laserjet 4500 ..	(4191A/92A/93A/) .	£58 CM £79
HP Color Laserjet 4500 Drum Kit ..	(C4195A) .	£58
HP Color 4500 Transfer/Fuser Kit	(C96A/98A)	£149 .. £165
HP Color Laserjet 4600 ..	(9720A/ /1A/ /23A)	£99 CM £139

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Stylus 800/850/1520	(108/089)	£15 ..	£15
Stylus 440/460/640/660/670	(187/191)	£14 ..	£15
Stylus 740/760/860/1160 ...	(189/191)	£15 ..	£15
Stylus 480/580/C20/C40 .	(T013/T014)	£10 ..	£13
Stylus 680	(T017/T018)	£19 ..	£16
Stylus 880	(T019/T020)	£19 ..	£16
Stylus 900/980	(T003/T005)	£19 ..	£23
Stylus Scan 2000/2500	(189/191)	£15 ..	£15
Stylus Photo 750	(187/193)	£14 ..	£12
Stylus Photo 1200	(187/T001)	£14 ..	£16
Stylus P 790/870/875/890	(T007/T008)	£14 ..	£11
Stylus Photo 1270/1290 ..	(T007/T009)	£14 ..	£16
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Stylus C70/80	(T321/C322/M323/Y324)	£22CM	£10
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Stylus 3000	(118B/130C/126M/122Y)	£36CM	£36
Stylus Pro5000	(118B/147C/143M/122Y)	£36CM	£36
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Stylus Pro7000	(All 6 Cols - Price Each)	£29CM	£29
Stylus Pro7500	(All 6 Cols - Price Each)	£36CM	£36
Stylus Pro9000	(All 6 Cols - Price Each)	£45CM	£45
Stylus Pro9500	(All 6 Cols - Price Each)	£58CM	£58

Epson Stylus Paper Media		Pack	Price
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Premium Semi-Gloss Roll 100mm .	(41330)	1x8m ..	£12
Premium Glossy PhotoRoll 210mm	(41377)	1x10m	£28
Premium Semi-Gloss Roll 210mm .	(41336)	1x10m	£30
Premium Glossy PhotoRoll 329mm	(41379)	1x10m	£40
Premium Semi-Gloss Roll 329mm .	(41338)	1x10m	£42
A4 Colorlife Photo	(41560)	20 ..	£14
A4 Premium Glossy	(41287)	20 ..	£10
A4 Premium Glossy	(41624)	50 ..	£22
A4 Premium Semi-Gloss	(41332)	20 ..	£10
A4 Glossy Photo Weight	(41349)	20	£9
A4 Glossy Film	(41071)	15 ..	£20
A4 Photo Glossy	(41126)	20	£7
A4 Photo Glossy	(41620)	50 ..	£14
A4 Photo Paper	(41140)	20	£9
A4 Photo Paper	(41622)	50 ..	£20
A4 Archival Matte Paper	(41342)	50 ..	£10
A4 Matte HeavyWeight	(41256)	50	£9
A4 720/1440 Dpi Photo Quality .	(41061)	100	£9
A4 Transparency	(41063)	30 ..	£34
A4 Colorlife Photo	(41561)	20 ..	£38
A3 Premium Glossy	(41315)	20 ..	£23
A3 Premium Semi-Gloss	(41334)	20 ..	£24
A3 Glossy Photo Weight	(41350)	20 ..	£22
A3 Glossy Film	(41073)	10 ..	£36
A3 Photo Glossy	(41125)	20 ..	£17
A3 Photo Paper	(41142)	20 ..	£20
A3 Archival Matte Paper	(41344)	50 ..	£22
A3 Matte HeavyWeight	(41261)	50 ..	£21
A3 720/1440 Dpi Photo Quality .	(41068)	100 ..	£23
A3 360 Dpi Inkjet Paper	(41065)	100 ..	£18
A3+ Water Colour Radiant White	(41561)	20 ..	£18
A3+ Colorlife Photo Paper	(41561)	20 ..	£37
A3+ Premium Glossy	(41316)	20 ..	£29
A3+ Premium Semi-Gloss	(41328)	20 ..	£30
A3+ Glossy Photo Weight	(41347)	20 ..	£27
A3+ Glossy Film	(41074)	10 ..	£45
A3+ Photo Glossy	(41133)	20 ..	£19
A3+ Photo Paper	(41143)	20 ..	£24
A3+ Archival Matte Paper	(41340)	50 ..	£28
A3+ Matte HeavyWeight	(41264)	50 ..	£27
A3+ 720/1440Dpi Photo Quality	(41069)	100 ..	£28
A3+ 360 Dpi Inkjet Paper	(41066)	100 ..	£21
A2 Photo Glossy	(41123)	20 ..	£33
A2 720/1440 Dpi Photo Quality .	(41079)	30 ..	£23
A2 360 Dpi Inkjet Paper	(41078)	30 ..	£18

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QMS MagicColor 330	£315
QMS MagicColor 2200/2210	£265
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QMS MagicColor 6100/6110	£495

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QMS MagicColor 2	(04B/03C/02M/) .	£89 CM	£89
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QMS MagicColor 2200	(01B/04C/03M/) .	£42 CM	£75
QMS MagicColor 3100	(01B/02C/03M/) ..	£32 CM	£89
QMS MagicColor 6100	(01B/02C/03M/)	£105 CM	£135
Samsung ML1210/1220/1250 ...	(ML1210) .	£39	
Samsung ML1650/1651	(ML1650) .	£79	
Samsung ML4500/ML4600	(ML4500) .	£45	
Samsung ML6000/6050/6100 ...	(ML6000) .	£65	
Samsung ML6040/6060	(ML6060) .	£65	

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PCW

Network

WRITTEN BY ALAN STEVENS

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United Linux OS

The United Linux group – made up of Conectiva, SCO, Suse and Turbolinux – has announced its first product, United Linux V1.0. This will enable the four companies to offer a common Linux implementation, based on a core engine certified to the same standards, with extensive hardware support.

United Linux is targeted at enterprises that might otherwise opt for a proprietary Unix solution or Red Hat's Advanced Server. The group boasts compliance with open standards and longer version stability compared to other Linux implementations, plus scalability and reliability enhancements.

An improved scheduler and asynchronous I/O support help to enhance performance and the new operating system will run on a variety of large SMP systems, including those based on AMD and Intel chips, IBM PowerPC and zSeries mainframes. Up to 64GB of memory can be addressed and there's full support for journalled file systems, including JFS, ReiserFS and ext3.

Vendors will add their own local language support together with other distinguishing value-add software.

Details of packaging and prices have yet to be released but anyone interested in previewing the product can download a beta copy from www.unitedlinux.com.

We're concentrating on safety this month with a feature on firewall technology and a group test on security appliances

High-capacity S-AIT drives released

Sony has begun shipping qualification units of its new S-AIT drive to library vendors and other OEMs. S-AIT (Super-Advanced Intelligent Tape) is a new concept in tape technology, combining the high data density of helical scan recording – as used by Sony in its existing 8mm AIT products – with the wider tape more normally associated with linear drives such as Ultrium from the LTO consortium and Quantum's SDLT.

The end result should be a mix of high capacity and performance in a familiar 5.25in, full-height drive format, which Sony says will allow the new drive to be incorporated easily and quickly into standard tape library products.

The first drives will offer a native capacity of 500GB, two and half times that of the latest Ultrium 2 products (200GB) and over three times what's currently possible with SDLT (160GB). Native transfer rate will be 30Mbytes/sec (the same as HP's latest Ultrium drive) with a choice of either Ultra160 SCSI or 2Gbits/sec Fibre Channel interfaces.

Finished products are expected later this year and, as with other tape technologies, Sony has a roadmap showing a doubling of capacity and throughput with every new generation, with S-AIT expected to support an ambitious 4TB per cartridge by the end of the decade.

Sony's new S-AIT drive will be able to store up to 500GB, uncompressed, on a single tape

IBM muscles in on the server act

Regarded of late as little more than an also ran in the industry-standard server market, IBM pulled up its bootstraps and achieved a couple of notable firsts last year. One was to become the leading vendor (by revenue at least) of eight-way Intel-based servers, beating HP into second place with Dell some way behind that. The other was the introduction of a new compact 16-way solution which began volume shipment in December while other vendors were still having trouble getting eight-way servers out the door.

An update to the Eserver x440, which was originally introduced at the start of 2002, the newest IBM server is built around a custom chipset for Intel Xeon MP processors and is the first to offer this level of scalability in a compact 8U (14in) rackmount format. Other 16-way Xeon servers are available but tend to be much larger; the Unisys ES7000 product, for example, takes up most of a rack.

IBM expects the x440 to be used for server consolidation, particularly compute-intensive application servers, where the 16-way scalability will be of most benefit. Pricing isn't a major issue in this market, which until recently was dominated by expensive Risc-based Unix solutions. It's just as well price is less important, because a bare Eserver x440 fitted with a full complement of 16 1.4GHz Xeon processors plus 8GB of memory and two 18GB SCSI hard disks will cost a shade under £88,000 ex VAT.

Up to 16 Xeon MP processors can now be specified to go in the 8U Eserver x440 from IBM

ENTERPRISE SERVER

Dell Poweredge 1600SC

Power and capacity at an affordable price in an entry-level tower server

Rackmount and blade servers tend to get the attention, but there's still a demand for conventional tower solutions for small company and departmental networks. Dell is addressing these areas with the Poweredge 1600SC, a server that provides a high level of performance and capacity at an affordable price.

The tower casing is large to accommodate everything that can be fitted inside. For example options such as a second power supply (£186 ex VAT) or a fixed backplane for hot-plug SCSI disks need a different chassis. And, although Dell claims tool-free maintenance, you may have to resort to a screwdriver as we did when fitting additional PCI adaptors and ordinary (non hot-swap) disks.

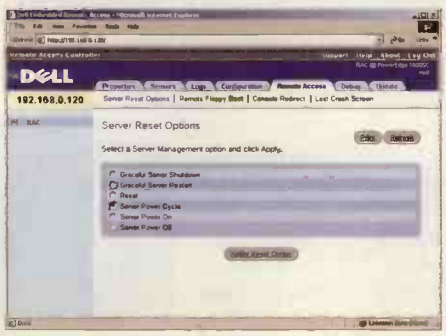
The 1600SC is very easy to set up and maintain, and for a low-cost system it can be highly specified. The motherboard features the latest Serverworks GC-SL chipset and sockets for two Intel Xeon processors clocked at 1.8-2.8GHz. That not only means a front-side bus (FSB) speed of 400MHz, but also support for Intel's Hyperthreading technology so, as far as our Windows 2000 software was concerned, the server appeared to have four (virtual) processors.

Four Dimm sockets are also provided, allowing memory to be expanded from 128KB to a whopping 4GB. However, this does add to the cost, with the 1600SC using PC2100 DDR SD-Ram with ECC (Error Checking and Correction) which, if you were to go for the maximum 4GB, would add £2,979 ex VAT to the base price. Ours had 512MB, costing a more modest £219 ex VAT and the good news is that even where the server is used to run applications you're unlikely to need anywhere near the full amount.

An embedded Broadcom Gigabit Ethernet controller comes as standard, leaving the six PCI expansion slots free. Two have standard 32bit/33MHz connectors, with two 64bit/66MHz slots and there are two connectors for 64bit/100MHz PCI-X adaptors.

On the storage front there's an integrated LSI Ultra320 SCSI controller as well as the usual ATA/100 EIDE interface provided by the chipset. Companies with an eye on economy should choose EIDE, where you can specify up to 480GB on four drives (120GB IDE disks cost £196 ex VAT each), while those looking for maximum performance need to go down the SCSI route. Maximum capacity then rises to an impressive 876GB, with a choice of 10,000 and 15,000rpm Ultra320 drives. These vary in price according to size; the three 18GB drives in the review system were £159 ex VAT each.

To support the maximum six internal disks the hot-swap backplane needs to be specified, otherwise the limit is four for both SCSI and IDE. Although hardware Raid support can be added in both instances, to enhance storage reliability and performance, some care is needed in specification. The Dell CERC IDE Raid adaptor (£206 ex VAT), for instance, still only supports four IDE disks and, as with all ATA solutions, doesn't allow for hot-plugging. SCSI users can hot-swap disks (if they specify the fixed backplane), but the associated PERC3/SC Raid controller (£316 ex VAT) has only one internal channel and is currently only Ultra160 compatible.



Add the Dell Remote Access Controller and you can remotely access and manage the 1600SC from a browser

Other features include monitors for temperature, voltage and fan speed, plus a host of security features, such as a physical case lock, chassis intrusion detection, and security anchors. Server management software is included, and the review system came with the optional Dell Remote Access Controller (£198 ex VAT) in one of the PCI slots. This allows for remote monitoring and management, including remote console access, using a dial-up modem or 10/100Mbits/sec Ethernet connection. It's easy to use, with everything done from a web browser and accessible even when the server OS has crashed.

The review system costs well over £3,000 because of the dual processors, SCSI Raid and remote access options. If you choose a single CPU and EIDE storage, prices start at just £699 ex VAT making the 1600SC attractive to even small businesses.

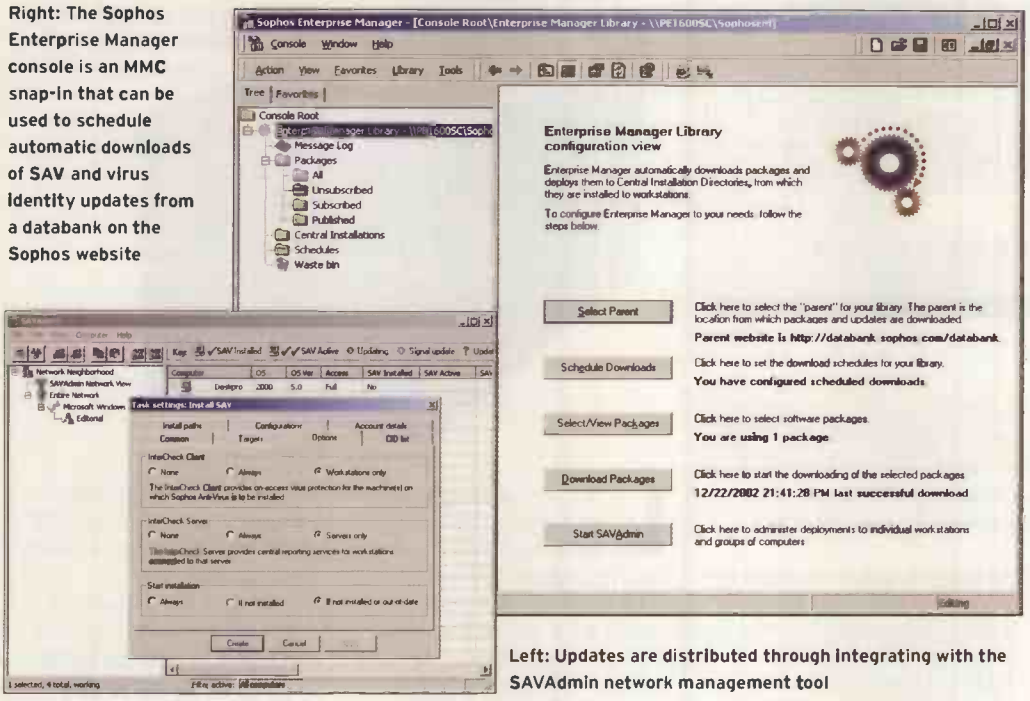
DETAILS

PRICE £3,754 (£3,195 ex VAT) as reviewed
CONTACT Dell Computers 0870 907 5664 www.dell.com
SPECIFICATIONS
Dual 2.4GHz Xeon CPUs • Serverworks GC-SL chipset with 400MHz FSB support • 512MB PC2100 ECC DDR memory • Integrated Ultra320 SCSI controller • PERC3/SC SCSI Raid card • 3 18GB SCSI disks • Integrated Gigabit Ethernet interface • 2 x 64bit/100MHz PCI-X, 2 x 64bit/66MHz & 2 x 32bit 33MHz PCI expansion slots • Integrated system monitoring • Remote access/management card • Windows 2000 (Red Hat Linux option)
PROS Dual Xeon capable; optional redundant power and hot-pluggable drives; Ultra320 SCSI; optional remote management controller
CONS Redundant power can't be added after purchase; SCSI Raid adaptor is Ultra160 only
VERDICT
A highly configurable and upgradable server with performance and availability options not normally found on this class of product
SCORE ★★★★★

ANTI-VIRUS SOFTWARE

Sophos Enterprise Manager

Stay protected with automatic updates for Sophos Anti-Virus



Right: The Sophos Enterprise Manager console is an MMC snap-in that can be used to schedule automatic downloads of SAV and virus identity updates from a databank on the Sophos website

Left: Updates are distributed through integrating with the SAVAdmin network management tool

Installing network anti-virus software is easy. Keeping it up to date and making sure that the latest software is distributed, where and when it's needed, is another matter entirely. Different applications tackle this in different ways, with Sophos Enterprise Manager designed to work hand in hand with the standard Sophos Anti-Virus (SAV) application and network management tool, SAVAdmin.

What Enterprise Manager does is add the ability to automatically retrieve the latest SAV updates and virus identity files from a central databank, held on the Sophos website. It can be used both with existing Sophos installations and where the software is being installed from scratch, requiring just a host server running either Windows NT4 (with SP6a loaded) or 2000. You also need the Microsoft Management Console (MMC) V1.2, as the Sophos console runs as an MMC snap-in. Internet Explorer 5 or above is also required, together with an Internet connection.

During the swift installation background services are configured and started. Next, the Enterprise Manager snap-in is set up and SAVAdmin installed. You then start the console, from the desktop shortcut provided, and begin the configuration process by creating an Enterprise Manager library – a central server share to which the SAV updates will be downloaded.

A wizard guides you through this, after which you identify the parent location from where the updates will be obtained. This will usually be the Sophos databank, and you'll need a valid account name and password for this, although other locations can be specified. This allows updates to be propagated throughout large organisations using multiple libraries running on several distributed servers. A secondary (backup) location can also be specified and, as well as manual updates, a schedule can be defined to check automatically for new packages.

Dial-up Internet connectivity can be supported here as can Internet access via a proxy server. Enterprise Manager can also be configured to poll the Sophos databank up to 24 times a day. To begin with, however, the connection to the parent site is simply interrogated to see what packages are available.

It's then just a matter of choosing or subscribing to the packages needed for the platforms on the Lan (Windows is the only supported operating system) and downloading the software. On a slow connection this can take some time, although for later updates only updated files will be transferred. The retrieval software will also calculate checksums before and after transfer to ensure that the data has been copied correctly.

SAVAdmin distributes the update to network servers and PCs, from central installation directories (CIDs) on Windows, Netware or Samba servers.

You've two choices here: work with an existing SAVAdmin setup or configure the software from scratch. A fair amount of setup work is required either way, primarily to tie together Enterprise Manager libraries and SAVAdmin CIDs. SAVAdmin isn't a particularly easy tool to get to grips with and Lan updates need to be separately scheduled, which does add to the confusion. However, the procedures involved are well documented and we had few problems arranging for updates to be distributed on our network.

Once configured the Sophos solution worked smoothly and, as licensed Enterprise Manager customers are the only users allowed access to the databank, performance shouldn't be a problem. Included in the price is 24-hour support, and a 30-day evaluation copy is available from Sophos.

The price you have to pay for the Sophos package will depend on the products you need and the number of users. Enterprise Manager can be included in all Sophos product offerings and the price quoted here (£20 ex VAT per user) is for a SAV Connect licence on a network with up to 199 users. That figure drops as the number of users rises.

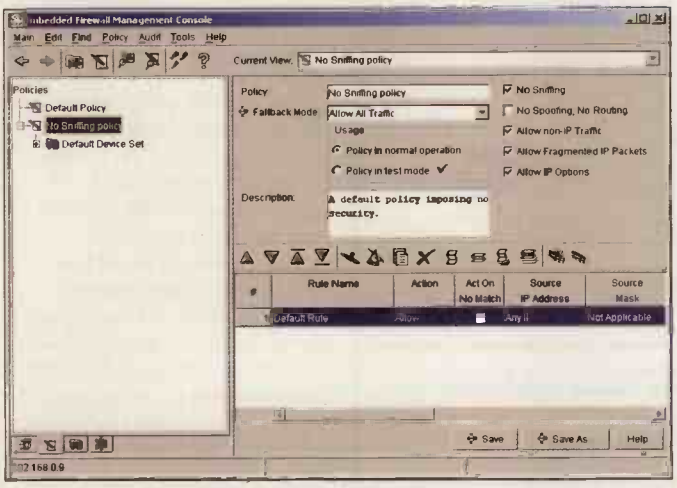
DETAILS

PRICE From £23.50 (£20 ex VAT) per user
CONTACT Sophos 01235 559 933 www.sophos.com
SYSTEM REQUIREMENTS Host server/PC running Windows NT4 (SP6a) or 2000, MMC V1.2, IE5 or above, dial-up or always-on Internet connection (proxy server connectivity supported)
PROS Works with standard Sophos Anti-Virus software; automatic download of updates up to 24 times a day; Lan distribution via SAVAdmin
CONS Windows only; integration with SAVAdmin can be confusing
VERDICT
For existing Sophos customers, this adds valuable automatic update facilities to existing Lan distribution tools. Those new to Sophos Anti-Virus will find it comprehensive and a lot easier to configure and use than some of the alternative solutions
SCORE ★★★★☆

FIREWALL PACKAGE

3Com Embedded Firewall

Distributed Lan security on the move



Firewall rules can be defined centrally and distributed over the Lan or Internet to the special 3Com adaptors fitted in desktop or notebook PCs

A firewall protects a network from Internet-borne threats. However, with users becoming ever more mobile and with an increasing variety of ways of connecting to the outside world, simple network perimeter defences may not be enough, but the Embedded Firewall pushes protection to each PC.

There are two parts to the Embedded Firewall: network interface cards (Nics), plus custom driver software and a Windows-based policy server.

The Nics come in various formats. Desktop PCs and servers can be fitted with 3Com PCI adaptors starting from £65 ex VAT, while mobile users can opt for the 3Com Firewall Card or Cardbus implementation, at around £126 ex VAT each, for which you get an onboard 100MHz Risc processor to enforce the firewall security rules defined by the policy server.

3Com claims a high level of tamper resistance for its Embedded Firewall, chiefly because the processor works independently of the host OS, and can't be turned off by a hacker or the local user. It even continues to work when the host PC is disconnected from the Lan and its perimeter defences.

The firewall rules are defined centrally and pushed out over the network transparently to the local user. There's very little impact on performance, with processing offloaded to the onboard security processor.

It takes a while to get to grips with the management interface, but it's fairly straightforward and we were quickly able to define a simple firewall policy and distribute it to a group of adaptors on our test Lan. Our only complaint is the lack of support for anything other than Windows-based clients.

DETAILS

PRICE £734.38 (£625 ex VAT) for policy server plus client adaptors
CONTACT 3Com 01442 438 000 www.3com.com
SYSTEM REQUIREMENTS
Host system running Windows NT4 (SP4 or above) or 2000 (Server or Advanced Server); 600MHz Pentium II; 128MB Ram; 150MB free disk space; client systems need compatible embedded firewall adaptor; client support for Windows 98, NT, 2000 or XP
PROS Enforced at the client; OS-independent; tamper resistant; no performance loss; central policy-based management
CONS Requires 3Com adaptors; Windows only
VERDICT
Addresses security shortcomings of perimeter firewalls, particularly for mobile users
SCORE ★★★★☆

NAS DEVICE

Linksys Etherfast Gigadrive

A storage device with expansion potential

The disk inside the Linksys Etherfast Instant Gigadrive can be upgraded and a second one added when space starts to run out

Lack of expandability is one drawback to some network attached storage (Nas) appliances. If you run out of space on one appliance you usually have to install another, which is straightforward but not always convenient. Not so with the Etherfast Instant Gigadrive from Linksys, where capacity can be expanded by swapping and adding disks.

Designed to be used by small businesses in place of a general-purpose file server, the Instant Gigadrive comes in a compact desktop case with a built-in power supply. The only other connectors are a 10/100Mbits/sec Ethernet port and a parallel port to attach a shared printer.

Inside, a Risc-based server loads and runs the Linux-based operating system from Flash memory, making for fast (15-second) start-up and a robust solution. Two bays are available for storage, with a single 80GB ATA disk supplied as standard. This can be upgraded and a second disk added to boost capacity to 240GB. Any ATA/33 or ATA/66 compatible disk up to 7,200rpm can be used.

To install you just plug in the appliance, then run the setup utility supplied to assign an IP address. Everything else is done from a browser, with facilities to assign the Gigadrive to a Windows workgroup, set up file and printer shares and manage users. There are also options to format disk drives and take backups, either to a remote PC or, if two disks are fitted, from one disk to another.

Users access the Gigadrive shares as though they were on a standard Windows file server, the only small niggle being a lack of support for domains. A built-in FTP server means Unix/Linux users can get at the data with browser-based IAS (Internet Attached Storage) access and support for IPP (Internet Printing Protocol). There's even a built-in user manual on this well-conceived and affordable small business Nas appliance.

DETAILS

PRICE £609.83 (£519 ex VAT)
CONTACT Linksys ww.linksys.com
SPECIFICATIONS
Mips processor • 64MB of Ram • Linux-based OS loaded from 16MB Flash memory • 80GB disk space, expandable to 240GB on two drives • Support for ATA/33 and ATA/66 disks at up to 7,200rpm • Frontload disk trays • Integrated parallel port and Windows print server • Web-based management • FTP server; support for IAS file sharing and IPP
PROS Expandable; integrated print server; FTP and web access; browser-based management
CONS No support for Windows domains; low-spec disk drives
VERDICT
Expansion and printer sharing facilities make this NAS stand out from the crowd
SCORE ★★★★☆

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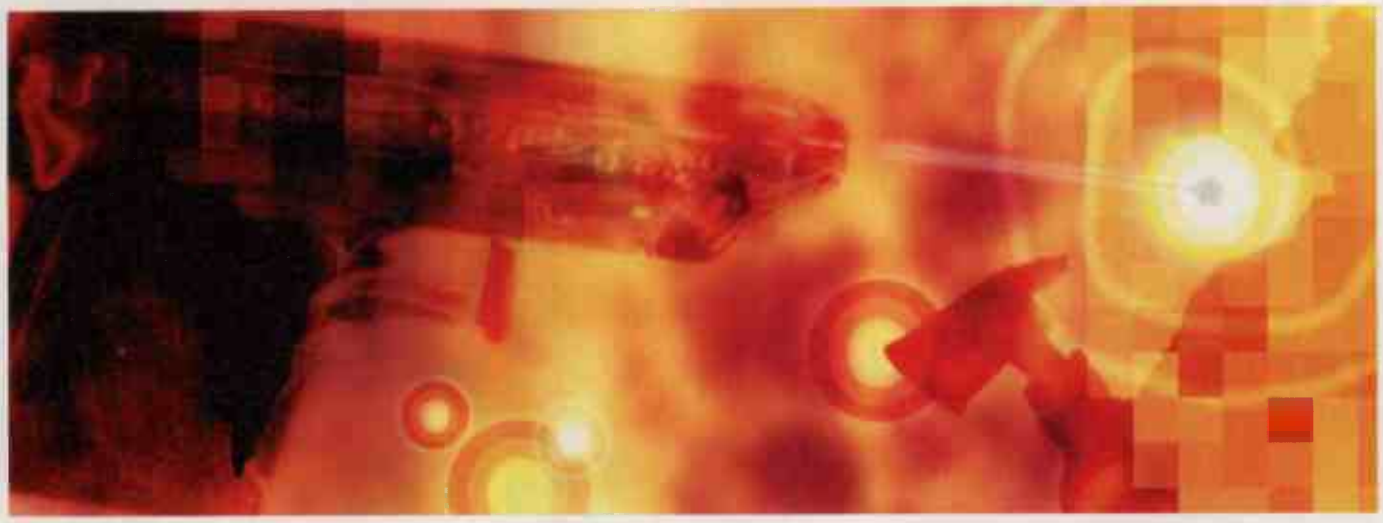


Effective firefighting

Growing security concerns make a firewall a must-have for any Internet-connected network. Alan Stevens looks at some of the pros and cons of the technologies on offer

It's pretty unusual to find a company that hasn't been the target of some kind of hacker activity, from a simple email-borne attack to full-scale hijacking of websites, databases and other vulnerable resources. While the statistics vary, there's general agreement that the problem is growing, both in scope and scale, making a firewall an essential component of any Internet-connected network.

Unfortunately, deciding on the best firewall for your business is far from easy, and there is a huge number of hardware and software products available, varying in price from just a few pounds to corporate solutions costing several thousands. However, regardless of format or price, firewalls can be broadly split into three types, and we'll take a look at each in turn.

Packet filtering

Most firewalls sit between a local area network (or a single PC in the case of a personal firewall) and links to the Internet or other networks. Traffic is, therefore, forced to pass across the firewall, where it can be either blocked or allowed through, according to pre-set rules. The simplest way of applying those rules is by examining each and every packet transmitted or received (packet filtering).

Simple packet filters were the first firewalls to be developed, able to work at high speed, and typically examining packet headers to determine who sent them and what they might be trying to do. Because they work at the network layer, packet filters can be implemented very efficiently in either hardware or software, but the only information they can use for filtering decisions will be things like source and destination address and port numbers. While that's enough to screen out known problem sites, it can't protect against some basic hacking techniques, such as Denial of Service (DoS) attacks, of the type that have been used against some major web retailers in the past.

In their favour, packet filters are very cheap and easy to produce. Consequently, you'll find them incorporated into lots of low-end products. Home and small business Internet gateways, for instance, often have packet filtering firewalls built in, along with Network Address Translation (NAT) features which translate Lan-side addresses to a single public Internet (IP) address. The end result is a basic level of protection that's very easy to deploy and, if you've no public-facing email or web servers, is likely to be sufficient protection for a small Lan.

Size matters

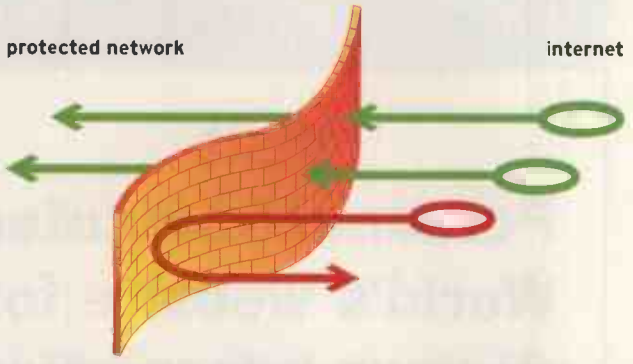
As well as the technology and the level of security, it's extremely important to get the right sized firewall for the job. All firewalls impose a degree of latency – a small delay on traffic – no matter what technology they're based on, so you need to make sure they can cope with both the bandwidth of the connections involved and the number of people you expect to be using them.

That's particularly important on an appliance-based solution. Software-based firewalls and those based on industry-standard server hardware are relatively easy to upgrade, by adding extra processors, more memory, faster network interfaces and so on. However, you could end up having to start again from scratch if any of these components proves to be a bottleneck in a dedicated firewall appliance.

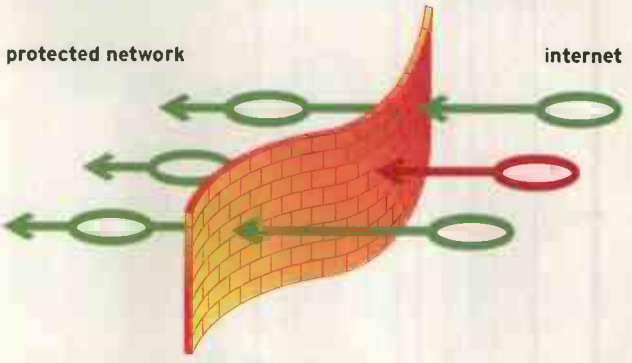
It's quite common, too, for manufacturers to impose artificial limits on their products. This is especially true of low-end solutions where a 10-user limit, for example, is likely to be a lot more than just a sizing guideline. In most cases it means that the firewall will only handle transmissions from 10 different IP addresses at a time – unless, that is, you pay for a licence upgrade which itself can add significantly to the costs involved.

Appliance-based firewalls can be difficult to upgrade and the manufacturers of low-end solutions often charge a lot extra to increase the number of simultaneous users that can be handled

Packet filtering and application proxy firewalls



A packet-filtering firewall looks at every packet and either allows or blocks its transmission based on simple address and port information



An application proxy firewall authenticates users and replaces standard applications with its own secure proxy implementations on the network

However, for larger networks or those running their own web servers, firewalls based on more advanced and flexible technologies should be considered.

Application proxies

One step up from the packet filtering firewalls are so-called application proxies, which look at a lot more than network-layer data. The diagram above illustrates the essential differences between packet-filtering and application proxy firewalls.

An application proxy firewall implements 'secure' proxy replacements for commonly used applications such as FTP, HTTP and so on, to carry out requested operations on the protected network. Access to these proxy applications can be more strictly controlled, with users authenticated before they are allowed access, using methods such as simple passwords, digital certificates and so on. There's no direct connection between the outside user and the inside network, making it harder for hackers to get at protected resources.

On the downside, an application proxy firewall needs to have proxies for every available application which, given the extent and pace of Internet development, simply isn't possible. Most get round this problem with some form of general or circuit (network-level) proxy for applications that aren't specifically supported, which is a potential weakness often exploited by would-be hackers.

Another consideration is that, because extra proxies may have to be added, most application firewalls are implemented in software, and that can have both security and performance implications.

Security can be compromised because, if it's run on a standard operating system, a software-based firewall is vulnerable to any weaknesses in the OS. And performance will be affected because a lot of processing power is needed to transfer information between server and proxy and back again.

Configuration and management can be quite complex too, especially when it comes to authenticating user and application access. So, although you can still get application proxy firewalls – and the introduction of web services is again making this type of approach popular – most vendors have now switched to a third technology, known as stateful inspection.

Stateful inspection

This technology was developed to match the speed of packet filtering while, at the same time, differentiating between applications and users more precisely. As with packet filtering, packets are intercepted at the network layer but a stateful inspection firewall doesn't have to process each and every one. Instead it builds up a state-table relating to a particular communication stream. The state table will include information such as the addresses and users that initiated a session, the ports requested and opened and so on (see diagram below right).

As a result, when an application requests access to protected resources, the stateful inspection firewall can determine whether or not it's as a result of a previously transmitted request, and allow or block the request, as appropriate.

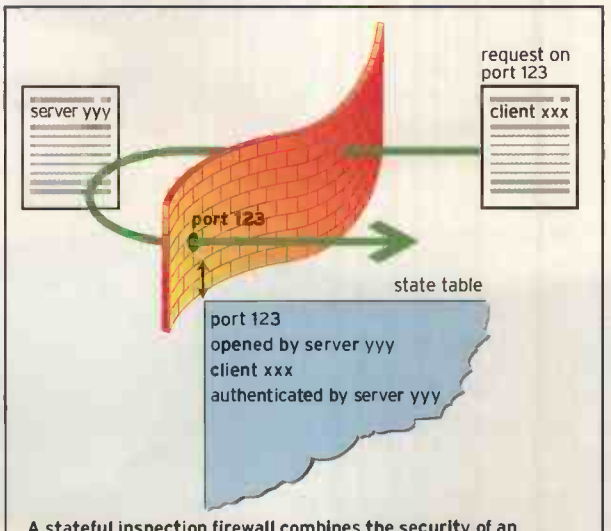
This approach makes it a lot easier to identify some of the common attack signatures associated with worms, DoS attempts and other threats. In addition the stateful inspection firewall can, where necessary, extract more detailed application and user information without the processing overheads associated with application proxies.

Originally only found in expensive enterprise firewalls, such as those from market leader Checkpoint Technologies, stateful inspection technology is now much more universal. Since it can be preconfigured to recognise and block common Internet threats, stateful inspection can provide instant protection with minimal effort and is increasingly popular in small business solutions from the likes of Sonicwall, Symantec, Watchguard and others.

It also lends itself readily to implementation in hardware, so most dedicated firewall appliances will be based on some kind of stateful inspection engine, often implemented in custom silicon for extra security.

No technology is perfect and the better firewalls will combine different techniques to improve the level of security they provide. They may also include other security features to cope with threats that a firewall can't usually handle: anti-virus scanning, intrusion detection inside the protected network and content filtering are common additional features.

All of them can also be added separately to your nework, if you prefer. We have reviewed a range of different solutions in our group test of security appliances, which follows this feature. ■



A stateful inspection firewall combines the security of an application proxy with the speed of a packet filter by maintaining a table of information related to each communication stream

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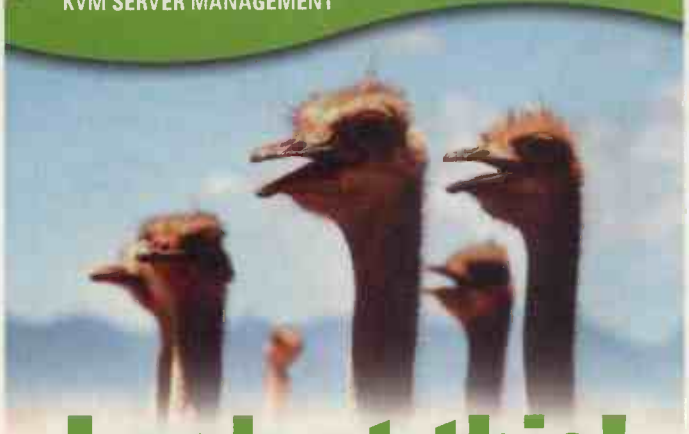

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Internet-connected Lans need more than just a firewall to stay secure. Here are six appliances that can provide network managers with peace of mind

Until recently all you needed was a firewall to shield network resources from Internet threats. However, that approach doesn't quite fit the bill for modern ebusiness applications and, with the advent of distributed web services, could even be counterproductive.

Far from wanting to protect network resources from prying eyes, the current trend is towards encouraging customers and others in to your servers. That means enforcing controls more flexibly to ensure you know exactly who your users are and can limit what they are able to do.

It's no longer adequate to provide virus protection only on potential targets such as servers and workstations. If you open the network to the outside world, trapping viruses at the gateways between the network and the Internet makes more sense, as does the use of appliances to do this job.

Sensible, too, is the use of dedicated servers or appliances to filter content, screen out application-level hacks, and handle encryption.

We've tested and reviewed six of the latest security appliances for this feature. Remember, however, that as security is such a broad subject, the devices don't all provide the same features, which means we can't make like-for-like comparisons. But they do have a lot in common.

Securing web-based applications, for example, is a common theme, with a move away from virtual private networking (VPN) technology to a combination of granular access controls, SSL (secure socket layer) encryption and the humble browser instead of VPN client software.

That combination of technologies can provide more general remote Lan access, added to which virus scanning and content screening are common options. In many cases these options can be mixed together and added to, depending on what the vendor believes to be important. Read on to find out more about securing your Lan.

The Array Pilot console (left) can be run from a remote web browser to both configure and monitor the activity of Array Networks appliances

The Array SP security appliance (below) acts as a secure proxy server for web applications and features a security hardened OS, hardware-based SSL acceleration and support for 32-way clustering

Array Networks Array SP

The SP in Array SP stands for Secure Proxy, which goes a long way to describing what this appliance is all about. That said, it's a lot more than just a proxy server; it provides a common interface for the secure delivery of web applications to both local and remote users over SSL (secure socket layer) encrypted connections. The SSL processing is all offloaded to the appliance, and the Array SP handles user authentication and access policies. It can transparently redirect URL requests to deliver a unified view of web services, whether being accessed locally on the corporate network or by external users.

The Array SP is built on a custom hardware platform delivered in a rugged and secure rackmount case. However, the appliance is sized not on normal hardware factors but by network bandwidth and the ability of the built-in SSL processors to handle multiple user sessions.

To this end the top-of-the-range 3U Array SP (reviewed here) can be configured with up to four Gigabit Ethernet interfaces (copper or fibre) and SSL acceleration hardware to support up to 32,000 concurrent user sessions. It can also be clustered up to 32-way for both redundancy and performance scalability on large enterprise networks, with a smaller 1U version available for companies with more modest requirements or for departmental use.

Both models run the same custom security-hardened software, ArrayOS, based on the Array Networks Application Networking Architecture (ANA). A major feature of the OS is its Speedstack technology, whereby network packets traverse the IP stack just once, regardless of the security measures applied, for maximum throughput. The SSL acceleration hardware and clustering facilities also enhance performance, and optional compression software is available as a £4,300 ex VAT upgrade, to reduce the physical amount of data transmitted.

Some initial configuration using a local console is required to get the appliance up and running. This includes assigning suitable interface and gateway addresses and so on, after which all further work is done from the graphical Array Pilot browser-based management console.

Using this it's possible to both monitor activity (from the Flight Deck display) and configure the ArrayOS software. The first step is to define a virtual host for each URL to be serviced by the Array SP and the type of user authentication technology associated with each one.

A built-in database can handle up to 10,000 users, with unlimited directory support using Ldap (Lightweight Directory Access Protocol), Radius (Remote Authentication Dial-In User Service) and Active Directory. There's support too for SecurID and PKI (Public Key Infrastructure) systems with the Array SP able to pass client-side certificates to back-end servers and enforce its own certificate revocation lists.

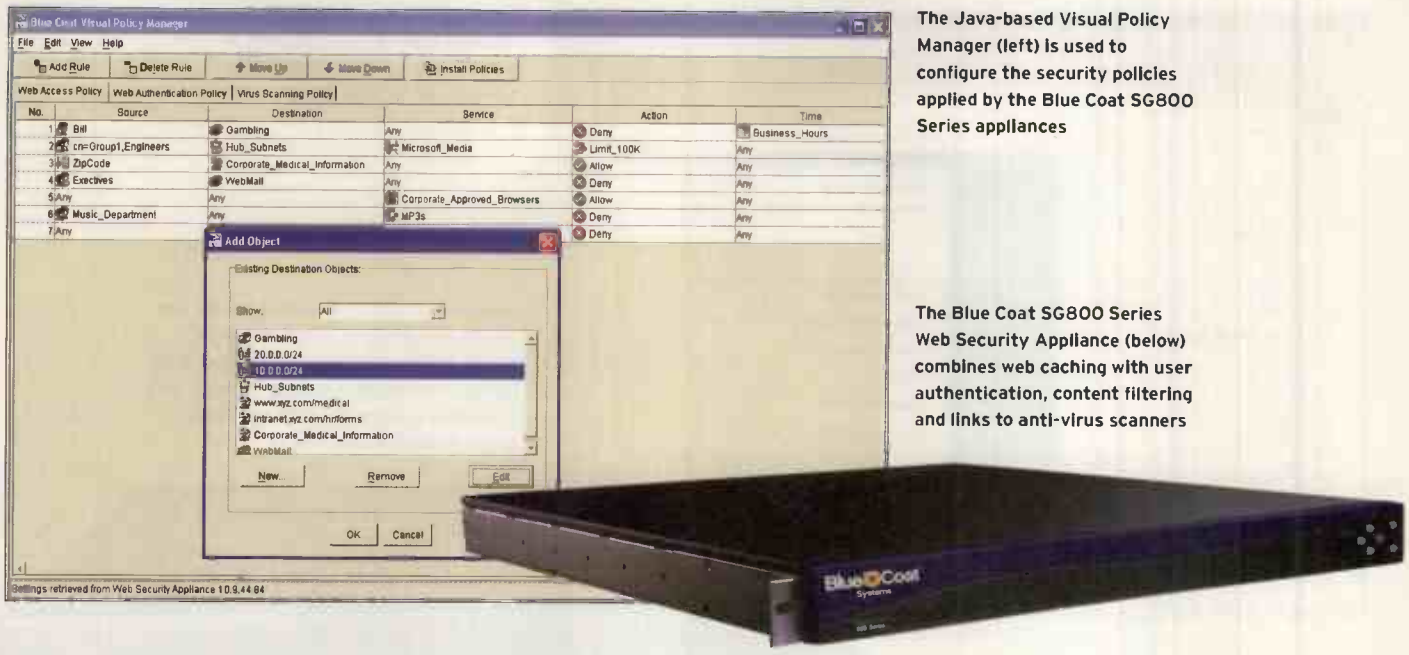
Comprehensive and very granular access controls can be set by user, user group or IP address from the Array Pilot console, but the web resource mapping, which redirects client URL requests, works more or less automatically. Similarly, it's easy to configure what Array calls one-time URLs with built-in timeouts to handle security issues associated with cached content, stolen cookies and other misappropriated tokens.

The security in ArrayOS is built around SSL so there's no need for special client software other than a standard web browser. From the client end very little changes, other than using the Array SP as a portal to access the protected web applications and services. Users can also be allowed access to Unix and Windows file shares, with support too for Outlook Web Access for web-based email. The lack of any integration with legacy (non-web) applications could be an issue for some organisations.

On the plus side, full logging of all transactions is standard and you get a system and administration toolkit with support for realtime alerting, remote user management, password recovery and so on. A basic stateful inspection firewall is built into the software to protect against common Internet threats and virus scanning can be added via ICAP (Internet Content Adaptation Protocol).

DETAILS

PRICE From £42,887.50 (£36,500 ex VAT)
CONTACT Array Networks +32 3 295 0955 (Belgium) **www.arraynetworks.net**
PROS Highly scalable with N+1 clustering; hardware-based SSL encryption/acceleration; flexible authentication; web resource mapping; granular access controls
CONS No native support for legacy (non-web) apps; can be expensive
VERDICT
A comprehensive and scalable SSL-based solution for large companies looking to protect web applications
SCORE ★★★★★



The Java-based Visual Policy Manager (left) is used to configure the security policies applied by the Blue Coat SG800 Series appliances

The Blue Coat SG800 Series Web Security Appliance (below) combines web caching with user authentication, content filtering and links to anti-virus scanners

Blue Coat Systems SG800 Series

Previously known as Cacheflow, Blue Coat Systems last year changed both name and product focus, to concentrate on security rather than caching technology. The company now offers a range of web security appliances, similar to those from Array Networks. Despite the change in emphasis, the caching is still there with the Blue Coat appliances all acting as high-speed proxy/caching servers. That in itself provides a degree of security protection, on top of which are a number of other useful facilities, including the ability to authenticate users, filter content, scan for viruses and strip out potentially harmful code as data is transmitted in and out of the protected network.

Designed to be deployed inside the firewall in large enterprises, the SG800 Series is delivered in a single rackmount case, with a choice of four models, to cope with increasing workloads. All run the same security-hardened SGOS software (derived from the CacheOS). The low-end Model 800-0 (reviewed here) has 768MB of Ram, a pair of Fast Ethernet Lan interfaces and two 18GB Ultra160 SCSI disk drives.

There's also a higher-end and more configurable SG6000 Series designed to compete with the likes of the Array SP from Array Networks.

All models provide the same set of security features and all are set up and managed in the same way – either through Telnet and a command-line interface or a browser-based management console.

The key tool here is a Java-based Visual Policy Manager through which security policies, made up of multiple access rules, can be defined and applied in much the same way as for a firewall. For example, rules can be applied based on source and destination address, type of application or service involved and the time of day. However, instead of simply blocking or allowing communication based on these rules, the Policy Processing Engine (PPE) in the SG800 can first authenticate users and apply other security and bandwidth management rules.

There's no built-in user database, but the SG800 can make use of a variety of external mechanisms using Ldap, Radius and Windows NTLM. Policies can also be applied based on the browser or media player being used, letting the SG800 identify and deal with vulnerabilities associated with particular versions of client software.

Among the various actions that can be taken by the PPE when rules are applied is the ability to screen and filter content, using either manually created URL lists or by reference to category-based subscription services from Secure Computing and Websense. Mime filtering is also supported, and it's possible to replace content headers, to prevent information about the local network being passed to the Internet.

Another basic option is the ability to screen all content for viruses, with the advantage that, once filtered and screened, cached information can be accessed without further worry. Blue Coat refers to this as 'scan once serve many' technology and, together with conventional caching capabilities, it helps to avoid bottlenecks. Indeed, the combination can even accelerate access.

However, there's no anti-virus scanner built in, the appliance relying on ICAP to link to external scanners, neither is there any hardware-based SSL acceleration.

As well as filtering static content, the PPE can transform and strip out active content, such as Java and ActiveX applets. The missing objects are replaced by customisable text warnings, with similar messages displayed when rules deny access. All activity is logged and basic reporting facilities are also provided, with a separate Blue Coat Director application to manage multiple appliances in a large organisation.

A degree of basic firewall functionality is built into the SG800 with, for example, DoS protection provided as standard. That, though, doesn't do away with the need for a separate firewall, although the SG800 does add valuable extra security features which will be of interest to any company with an Internet-connected Lan to protect.

DETAILS

PRICE From £5,875 (£5,000 ex VAT)
CONTACT Blue Coat Systems 0800 085 2356 www.bluecoat.com
PROS Integrated caching; 'scan once serve many' technology; virus and content filtering; user authentication
CONS No clustering; external scanner required for anti-virus protection; no legacy application support; no file system access
VERDICT
Combines a good set of security features to protect web-based applications, but not as scalable as some of the competition
SCORE ★★★☆☆

The latest release of the Interdo software features wizards (left) to help configure secure application tunnels and security pipes

Available as both an appliance (below) and as software to run on a Windows 2000 server, Interdo acts as an application-level firewall, intercepting possibly harmful code embedded in ordinary HTTP and other application-level requests

Kavado Interdo

The best way of describing Interdo from Israel-based Kavado is as an application-level firewall. Application protocols such as HTTP, HTTPS, Webdav and Soap are mostly transmitted unhindered by ordinary firewalls, which block access primarily at the network level. However, such protocols can still be manipulated by hackers to tamper with cookie data, manipulate URLs and alter embedded SQL strings. Interdo addresses these threats.

There are two ways of implementing Interdo, either as a ready-to-run appliance, reviewed here, or in software form (from £10,000 ex VAT) on an industry-standard Intel server. The appliance we looked at was a rackmount system with a 900MHz Pentium III processor, 128MB of memory and two Fast Ethernet network interfaces. However, you can change this configuration, even on the appliance, as the software runs under Windows 2000. One drawback though is that the Windows platform could be attacked, making it important to apply the latest service packs and hot-fixes as they're released.

Interdo uses Kavado's Protected Path technology to set up a series of secure application tunnels, linking the Interdo server with the web applications it is to serve. This is achieved, along with other configuration and management work, using a custom Java-based console.

A number of new wizards have been added in the latest release (2.5), greatly simplifying the setup procedure, although it isn't that difficult to follow.

The first step is to define the tunnels by specifying both the external IP addresses and ports to monitor and the internal addresses and ports to connect them to. Then the web applications are identified, using the paths to the server directories involved. Multiple paths can be configured here, with any not specified covered by a catch-all default security policy.

Finally, 'security pipes' are attached to the applications, specifying the checks to be made on data passing through the tunnels. It's these pipes that intercept and examine HTTP, Webdav and other application protocols, allowing or denying their passage across the tunnel according to what they contain.

There are several security pipes to choose from, such as Allowlist which simply limits the directories users can access. The Cookies pipe stops cookies from being misappropriated, while the Database pipe checks to make sure there are no embedded SQL commands that might be used to manipulate internal databases. Other predefined pipes prevent URLs being manipulated and HTTPS, Soap and web services message exploitation. There's also a specific pipe to handle known web server and application vulnerabilities which can be customised to deal with new threats as they arise.

There are several actions that can be taken when a possible threat is detected. Access can be blocked, with or without returning a warning message, or the request redirected to another location, with support for email and network alerts and SNMP traps to advise the system administrators. In addition, pre-emptive action can be taken when hacking attempts are detected, including closing off access using an Opsec-compatible firewall, such as Checkpoint's Firewall-1.

Comprehensive monitoring and logging facilities are provided, with graphical tools to filter and analyse the collected data. Logs can be exported using a variety of formats including, in the latest release, ODBC which allows the information to be stored using SQL databases.

Client and server-side certificates are both supported, but there's no real authentication of users or any policy-based access controls. That's left up to the application – the Interdo software merely inspects the traffic passing between users and applications for potentially harmful content.

As with most security products, Interdo isn't a complete solution – a firewall is still essential and you might want to centralise user authentication and access controls. Nor does it provide protection for legacy applications directly. But as an innovative way of protecting modern web applications, deployed as an appliance or as software, it's worth considering.

DETAILS

PRICE £14,100 (£12,000 ex VAT)
CONTACT Kavado 020 7397 3450 www.kavado.com
PROS Platform/application independent; applies security at application level; runs on industry-standard server hardware
CONS Windows potentially vulnerable to attack; no support for legacy applications; no user authentication or remote access to file system shares
VERDICT
Takes a unique firewall-like approach to protecting applications. However, it's a far from complete security solution
SCORE ★★★★★

A straightforward, browser-based, management interface (left) makes light work of configuring the Neoteris Instant Virtual Extranet appliance

The Neoteris Instant Virtual Extranet appliance (below) can protect legacy client server applications as well as web-based programs, it also secures thin clients and general Windows and Unix file-share access

Neoteris Instant Virtual Extranet

Instant Virtual Extranet (IVE) from Neoteris offers the same kind of web application security as appliances from rivals Array Networks and Blue Coat, although the emphasis is more on secure remote Lan access than on protecting web applications. To this end, IVE takes the same SSL approach as the competition, but also secures remote file shares, Windows thin client and legacy client/server applications such as Exchange and Lotus Notes.

IVE appliances are based on industry-standard Intel server hardware. For this group test we looked at an IVE Partner Access 1000 appliance, based on a 1U Pentium III server with dual processors. However, the company has recently revamped and extended its product line to suit a wider range of customers.

At the top, the Neoteris Access 5000 Series is designed to address the needs of large enterprises with multi-way load balancing and failover clustering support, and the ability to apply access controls at group as well as user level. The low-end Access 1000 Series is for companies looking for secure employee access to resources.

All run the same security-hardened Linux operating system, derived from the Red Hat implementation. On top of this is a custom SSL web server written to act both as a proxy and a portal to applications protected by the appliance. This, in turn, is supported by three components that give the IVE its unique mix of functionality, starting with a set of client request handlers.

The request handlers reject any user connection that's not SSL-encrypted, then authenticate the user concerned and apply associated access policies. Valid requests are then passed to the core content transformation software which provides for, among other features, automatic redirection of URLs, allowing applications to run unaltered even though being accessed indirectly. Finally, Lan-side protocol connectors enable requests to be passed to resources on the protected network using native protocols – the magic bit that lets users access file shares and run legacy, as well as web-based, applications.

Installation is straightforward. The unit is simply connected to the Lan inside a firewall, then assigned an IP address via the built-in console port. The remaining configuration work is all done using a browser-based management interface.

User authentication is one of the first options that needs to be set up. As well as an internal database, there's support for external authentication using Ldap, Radius, Unix NIS and either Windows NT Domains or Active Directory. Physical authentication systems, such as SecureID, are also supported.

Resources are then identified using bookmarks. These are links to specific URLs made available to users via the IVE portal interface, to which they connect using a standard SSL-enabled browser. Users can be authorised to create bookmarks, or they can just type in the URL required as normal.

Bookmarks can be configured to provide access to Windows and Unix file shares, again via a browser, with the normal Lan access rights respected. Remote documents and files can then be opened and edited on the local PC, although to make changes to the originals the files have to be saved locally and uploaded to the remote server. Alternatively, the IVE software can be configured to handle Windows Terminal Services and other thin clients. Users can then remotely access their normal Windows desktop, files and applications via the IVE appliance.

Finally, it's possible to configure bookmarks that point to non-web applications such as Microsoft Exchange, Lotus Notes or any other client/server application that uses standard IP ports for communication. A readily available Java applet is needed for this to work, to handle the port redirection.

We found the Neoteris very easy to install and configure and were impressed by the mix of security features on offer. In many respects it competes against the Array SP, but lacks some of the scalability features, and scores more highly when it comes to general remote Lan access. It offers a much simpler, easy-to-use and potentially more secure alternative to conventional VPN encryption.

DETAILS

PRICE From £27,289.38 (£23,225 ex VAT)
CONTACT Neoteris 01344 742 842 www.neoteris.com
PROS Remote web access to Windows/Unix file shares; support for legacy client/server applications
CONS No anti-virus or content scanning
VERDICT
Secure remote access is the focus here, and in this respect the Instant Virtual Extranet scores well in supporting legacy as well as web-based applications, thin clients and remote file access
SCORE ★★★★☆

The McAfee Webshield e500 provides big company anti-virus and content screening software on an easy-to-use, Linux-based server appliance

McAfee Webshield e500

As soon as you see McAfee in the name you know that the Webshield e500 is going to offer some kind of virus protection in the appliance.

In fact this is a complete anti-virus solution, based on a Linux implementation of the Network Associates McAfee software. It's delivered in a ready-to-deploy appliance format that can be scaled to protect large networks with thousands of users.

However, it doesn't just screen out viruses in the network traffic coming off the web; it also offers comprehensive content filtering, anti-spam and anti-relay facilities.

The hardware on which the Webshield e500 is based is an industry-standard single-unit rackmount server. The exact specification can vary, but the review model that we looked at here had dual Pentium III processors and 256MB of memory, plus a pair of mirrored 17.4GB SCSI hard disks and two Fast Ethernet ports.

A custom implementation of Red Hat Linux and the McAfee security software was preinstalled, and it came with a bootable recovery CD-Rom should the server ever need to be rebuilt. The machine included a user-friendly browser-based interface for management.

There are two ways of deploying the e500: either as a proxy server for web and email servers on the protected network, or as a transparent bridge. The latter is the easiest approach, as no changes are needed to either server applications or at the client end.

Virus scanning can be performed on SMTP, POP3, HTTP and FTP data streams, with the Webshield e500 capable of scanning up to 100,000 emails per hour or 1MB of HTTP traffic per second.

Incoming and outgoing emails can be scanned for offensive and confidential material and there are also controls to limit the type, size and number of attachments that can be included. It can also insert standard disclaimers for legal protection. The content filtering facilities can be used to block spam messages, and the software also supports the use of DNS-based black hole lists.

Comprehensive logging, reporting and alerting facilities are available, and management of the appliance can be integrated with other Network Associates' products using the McAfee Epolicy Orchestrator. The price includes automatic updates for the anti-virus signatures and support.

DETAILS

PRICE From £13,324.50 (£11,340 ex VAT) for up to 500 nodes
CONTACT Network Associates 01753 217 920 www.nai.com
PROS Content filtering and anti-virus protection at the Internet gateway; transparent bridging; automatic updates
CONS No user authentication or web application security features
VERDICT
If virus protection is your main concern, the e500 is a good solution, with content scanning also provided. But it lacks other security features
SCORE ★★★★★

Symantec's Linux-based Gateway Security appliance provides comprehensive firewall, VPN and intrusion detection facilities, as well as anti-virus and content filtering capabilities

Symantec Gateway Security

Symantec's Gateway Security appliance provides both anti-virus and content scanning facilities. In addition, however, you get a comprehensive firewall and optional Ipsec virtual private network functionality, intrusion detection, failover and load balancing capabilities.

The hardware used is based on the popular Sun Cobalt appliance, equipped with four Fast Ethernet ports, which will enable accessible public-facing 'demilitarised' zones to be set up, if required.

The software is based on a security-hardened Red Hat Linux kernel, on top of which the appliance runs Symantec's Norton anti-virus and Raptor firewall software.

The Raptor firewall is based on a combination of stateful inspection and application proxy technologies. Intrusion detection software also comes as standard, with the appliance monitoring web and email traffic for suspicious activity and providing facilities that can be activated to apply immediate counter-measures when problems are suspected.

On the downside, content filtering is by URL only, not keyword, and you have to pay extra to activate the Ipsec-based VPN functionality.

That said, if you do add the VPN support it can be used to support both branch office and direct client tunnelling, using a range of authentication methods including digital certificates, Windows NT domains, Ldap and Radius.

A front LCD panel is used to assign an initial IP address to the Gateway Security appliance and to specify a secure remote system for management. The PC then configures and manages the appliance using a plug-in to the Microsoft Management Console (MMC), called the Symantec Raptor Management Console. In our tests we found the management interface a bit daunting to use.

Three models of the Symantec Gateway Security device are available, all aimed at medium to large-sized businesses, as the price would indicate. The smallest of these, the 5110 is designed to protect networks with up to 50 nodes, followed by the 5200 model, for up to 250, and the most expensive 5300 – which we looked at here – for up to 1,000 nodes.

Further scaling is possible by clustering up to eight appliances together, with all of them updated automatically using the same Live Update technology as employed by other Symantec products.

DETAILS

PRICE £29,846 (£25,417 ex VAT) Model 5300 (1,000 nodes)
CONTACT Symantec 020 7744 0367 www.symantec.com
PROS Proven Sun Cobalt appliance platform; Norton anti-virus protection; Raptor firewall; optional Ipsec VPN support
CONS Management interface daunting; content filtering by URL
VERDICT
A good multifunction security solution for the medium-sized business, but those with web apps will need extra protection
SCORE ★★★★★

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Table of features

MANUFACTURER	ARRAY NETWORKS	BLUE COAT SYSTEMS	KAVADO	NEOTERIS	NETWORK ASSOCIATES	SYMANTEC
PRODUCT	**ARRAY SP**	**SG800 SERIES**	**INTERDO**	**INSTANT VIRTUAL EXTRANET**	**MCAFEE WEBSHIELD E500**	**GATEWAY SECURITY**
Price inc VAT (ex VAT)	£42,887.50 (£36,500)	£5,875 (£5,000)	£14,100 (£12,000)	£27,289.38 (£23,225)	£13,324.50 (£11,340)	£29,846.18 (£25,417)
Model priced	Array SP (unlimited seat licence)	Model 800-0	Interdo appliance	IVE Partner Access 1000	Webshield e500 (500 nodes)	Model 5300 (1,000 nodes)
Manufacturer URL	www.arraynetworks.net	www.bluecoat.com	www.kavado.com	www.neoteris.com	www.nai.com	www.symantec.com
Principal focus	Web application security	Web application security	Application-level firewall	Secure remote Lan access	Virus and content scanning	Firewall, VPN and virus protection
APPLIANCE PLATFORM						
Type	Custom hardware	Custom hardware	Industry-standard server	Custom hardware	Industry-standard server	Sun Cobalt appliance
Rack units	3	1	1	1	1	1
Network interfaces	2-4	2	2 (upgradable)	2	2	4
Fast Ethernet	✓	✓	✓	✓	✓	✓
Gigabit Ethernet	✓	✓	✓	✗	✗	✗
Host operating system	ArrayOS	SGOS	Windows 2000	Linux	Linux	Linux
APPLICATION SECURITY						
Custom portal to applications	✓	✓	N/A	✓	N/A	N/A
URL redirection	✓	✗	N/A	✓	N/A	N/A
Application changes required	✗	✗	✗	✗	N/A	✗
SSL support/SSL acceleration	✓/✓	✓/✗	✓/✓	✓/✗	N/A/N/A	N/A/✗
Support for legacy applications	✗	✗	✗	✓	N/A	✓*
Client software required	✗	✗	✗	For legacy applications	N/A	✓*
USER AUTHENTICATION						
Internal database	✓	✗	N/A	✓	N/A	✓*
Ldap/Radius	✓/✓	✓/✓	N/A/N/A	✓/✓	N/A/N/A	✓*/✓*
Windows domains	✓	✓	N/A	✓	N/A	✓*
Digital certificates	✓	✓	N/A	✓	N/A	✓*
REMOTE LAN ACCESS						
Windows file shares	✓	✗	N/A	✓	N/A	✓*
Unix file shares	✓	✗	N/A	✓	N/A	✓*
Thin client support	✗	✗	✗	✓	N/A	✓
NETWORK FIREWALL						
Firewall included/technology	✓/Stateful inspection	✓/Stateful inspection	✗/N/A	✗/N/A	✗/N/A	✓/Stateful inspection and application proxy
Separate network firewall recommended	✗	✓	✓ (Opsec Integration)	✓	✓	✗
Virus scanner	External	External	✗	✗	McAfee	Norton
Auto virus signature updates	N/A	N/A	N/A	N/A	✓	✓
Static/active content filtering	✓/✗	✓/✓	✓/✓	✗/✗	✓/✓	✓ (URL only)/✓
Management interface	Browser	Browser	Browser	Browser	Browser	Windows MMC
Logging/reporting/alerting	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓
CLUSTERING						
Failover	✓	✓	✓	✓	✗	✓
Load balancing	✓	✓	✗	✓	✗	✓
SCORE						
Overall scores	★★★★½	★★★½☆	★★★☆☆	★★★★☆	★★★½☆	★★★★½

* When VPN option is licensed

Editor's Choice

It's very difficult to performance test security products, especially when they offer such diverse feature sets as those tested here. However, it is possible to compare them on factors such as the functionality provided, the way in which that functionality is implemented and the ease with which each appliance can be configured and managed. So although we didn't think it appropriate to have an overall Editor's Choice, we reward some of the systems with *PCW*'s Highly Commended status.

In order to do this, and to understand better what the appliances featured here have to offer, we've split them into three broad categories, with a number of the products slotting into two or all of these.

Application security

The biggest group is concerned primarily with protecting web applications, and here we would include the Array SP from Array Networks, the Blue Coat SG800 Series and the Neoteris Instant Virtual Extranet (IVE) solution. Symantec's Gateway Security could, arguably, also be included in this category, although strictly it is a conventional firewall/VPN device, while the others apply security using SSL encryption and user-based access policies. Similarly, although the Interdo solution is very much concerned with application security, it doesn't authenticate users or manage their access like most of the others, providing instead application-level firewall protection.

Array Networks Array SP

Neoteris Instant Virtual Extranet

'The Array SP impresses with hardware-based SSL acceleration, performance clustering and other scalability features'

In this group **Array Networks' Array SP** stands out and receives a **Highly Commended** award because of its hardware-based SSL acceleration, performance clustering and other scalability features. It also impressed us when it came to the range of authentication options supported, its digital certificate handling features and the ease with which it could be set up and managed, despite the relative complexity of the technology involved.

The Neoteris IVE works in much the same way and supports legacy as well as web applications. It does, though, lack some of the scalability options of the Array SP with, for instance, load balancing clustering only just having been added as an option in the latest version. That said, the Neoteris IVE did shine when it came to our second category, where the emphasis is on providing secure remote Lan access.

Symantec Gateway Security

Secure remote Lan access

We decided on this second grouping because Neoteris positions its products against conventional VPN solutions, such as that provided by the Symantec Gateway Security appliance. Both use encryption to protect network resources, but the extranet approach of the IVE offers granular access controls whereas VPN access is much more all or nothing, making it easier to circumvent. The extranet approach of the IVE is also much easier to Implement and manage than a conventional VPN product. It's also far simpler from the end user viewpoint and requires nothing more than an SSL-enabled web browser to work.

The Array SP, too, fits the secure remote Lan access category, giving users access to remote file shares via a web browser, just as with the Neoteris IVE. However, we found the Neoteris software a lot more flexible, and it can also be used to support general thin client access and specific access to legacy applications such as Microsoft Exchange, which is another bonus.

Hence it's the **Neoteris IVE** solution that gets the **Highly Commended** award in our second category – appliances for secure remote Lan access.

Anti-virus protection

Finally, several of the appliances also feature virus protection. Some support this by calling upon external scanners, but the McAfee Webshield e500 and the Symantec Gateway Security appliances stand out from the crowd by virtue of using their own, local, anti-virus software.

Both products provide protection at the Internet gateway, which is the ideal location, and both use well-respected and supported software from leading vendors. Both can be integrated with those other products and use the same update mechanisms. We felt, however, that the Symantec appliance had the edge since it offered additional firewall and VPN functionality on the same platform.

We did have a few reservations about the management interface, but the **Symantec Gateway Security** is a very usable appliance with lots to recommend it beyond virus protection, so it too gets a **Highly Commended** award.

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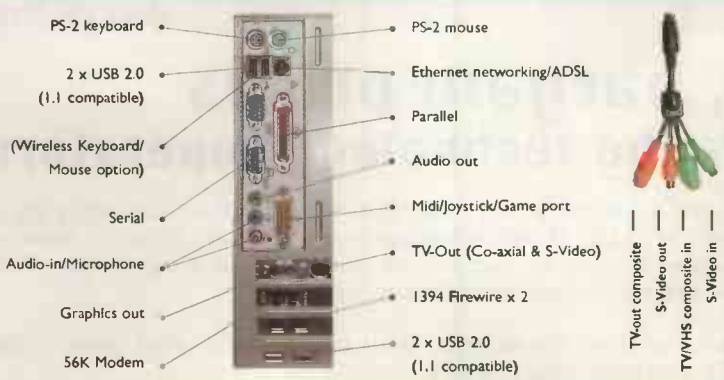

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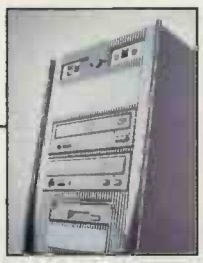

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Hands on

EDITED BY NIGEL WHITFIELD

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Guy Kewney kicks off his first Mobile computing column with the truth about smart displays

Welcome to April's Hands on section. This month you'll find several changes, which we hope will make the section even more enjoyable and indispensable for you, including two brand new columns.

In the first of these, Ken McMahon looks at the world of digital imaging. His new monthly column will investigate issues surrounding editing video on your PC, as well as continue to look at image editing and many of the topics you'll be familiar with from his previous Hands on Graphics and DTP column.

We also welcome Guy Kewney to the distinguished ranks of our Hands On team of experts. Guy's new column will focus on mobile computing and PDAs, starting this month with a look at some of the new technologies that will be appearing over the next few months.

And, of course, you'll find answers to some of your problems in Question time, and the other columns that you expect in Hands on. This month, for example, Tim Anderson looks at benchmarks and how you can increase the speed of your programs; Niall Magennis explores the limitations of Windows Sound Recorder; and Stephen Wells goes off the wall and onto the floor, planning a new kitchen with a spreadsheet.

In the hydra-headed world of Windows, Tim Nott provides help with partitioning disks under Windows 9x. He also looks at updating a system clock from the Internet and shutdown woes in XP, providing a wealth of tips and tricks along the way. Over in our Windows 2000 department, Terence Green explains the intricacies of ACPI and how it can affect plug and play.

Mark Whitehorn has been exploring Olap databases, Gordon Laing's been adding an LCD to his PC, and Barry Shilliday's been souping up Red Hat 8 with media players for Linux.

In his Networks column Alan Stevens explains how to share a network connection; and Tim Nott gives help on tables and activation for Word users. And there's more PHP scripting in Web development and ecommerce.

Whether you read one column, or all of them, Hands on is where we help you – so please use the email addresses at the end of each column to keep in touch, and let us know what you want to read about in future.

Nigel Whitfield

Advice from our experts

Our Hands on experts answer your questions and solve your problems

Hardware

Q I have a 400MHz Celeron system with a 6GB hard disk which is now getting pretty full. I would like to fit a second disk to store my ever-increasing collection of digital photos and MP3s, and have successfully connected disks up to 8GB in the past, but a new 40GB model I've bought refuses to be recognised by my system.

Paul Prior

A Not recognising a larger disk is a limitation of your motherboard Bios. Updates to the Bios often allow larger disks to be recognised, so it's worth checking your motherboard manufacturer's website to see if there's an appropriate update for your model. That said, updates normally only offer small enhancements and we suspect if 8GB was the limit before, then you're unlikely to find an update supporting disks measuring 40GB and higher. Your only course of action then is to fit a newer hard disk controller that can recognise larger and faster disks. Promise offers several models that fit into PCI slots – see www.promise.com. Consider the UltraATA 100 TX2 model which supports up to four hard disks for around £30 ex VAT.

Q What should I be looking to upgrade in my system if I want to handle digital photos faster?

Neil Mossey

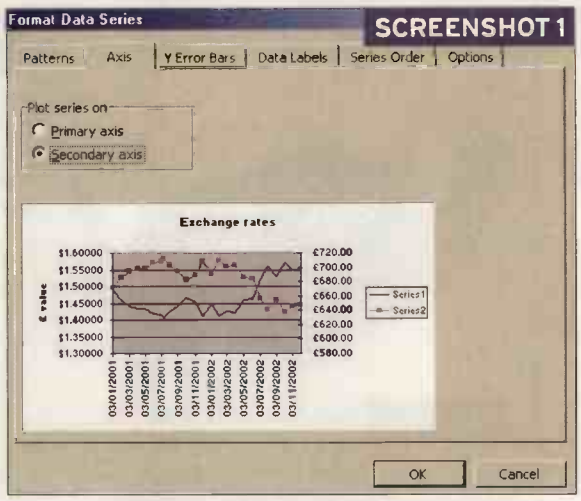
A Big hard disks are essential for storing lots of digital images, but if you want your PC to handle them faster, extra memory is the key. Upgrading to 256, 512 or even 1GB of Ram makes a huge difference when opening, manipulating or printing digital images, especially if you're working on several at the same time.

Q I recently upgraded my CD-Rom drive to a DVD-Rom, but when I watch movies they often look a bit jerky. I currently have a 400MHz Celeron system with onboard graphics. What do I need to upgrade to ensure smooth playback? The CPU, memory or graphics?

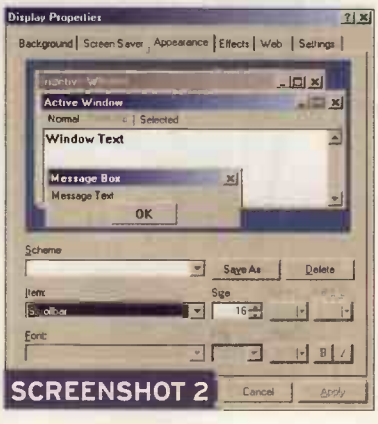
Sanjay Mehta

A Smooth DVD movie playback on modern PCs is achieved by hardware decoding performed by the graphics chipset. The onboard graphics of your Celeron system sound like they don't have this feature, so the most obvious upgrade would be a new graphics card – every model offers hardware DVD decoding. When fitting a new card, you'll need to disable your onboard graphics though, normally by using a jumper on the motherboard surface or a setting in the Bios – see the motherboard manual for more details. Of course, you'll also need an AGP slot on your motherboard to fit a new graphics card, and sadly some models with onboard graphics don't have one.

While you could begin a search for a suitable PCI graphics card, a better alternative for superior DVD playback is to buy a dedicated PCI hardware decoder card, such as Sigma Design's Realmagic X-Card for about £90 (www.sigmadesigns.com/products/xcard.htm). At this point though you may find a domestic standalone DVD player could be a more sensible bet, especially as they're now available under £100.



It's easy to add a second y-axis to an Excel line chart



You can miniaturise worksheet tabs in the Display section of Control Panel

Spreadsheets

Q I have an Excel line chart with monthly dates along the x-axis and £/$ exchange rates on the y-axis. How can I add a second y-axis which would show the value of $1,000 in sterling at each date?

Oonagh McGrath

A On the Chart menu select Add Data. Click the little red arrow and then highlight the range in your table which lists the calculated values to be added. Click the arrow to go back and then OK. Click the new line added to your chart and on the Format menu choose Selected Data Series.

In the Format Data Series dialogue box choose the Axis tab and then choose Plot Series on Secondary axis. Click OK. From there on you can right-click on the new line, and on the new y-axis labels, and fine-tune the formatting (see screenshot 1).

Q Is there any way of displaying Excel worksheet tabs in two or more rows?

Simon Lovatt

A The quickest way is to choose New Window on the Window menu, and then Arrange, Horizontal. Slide the vertical bar (to the left of the horizontal sliding bar) to the right-hand side of the screen and see more tabs. You can also get more tabs on the screen by writing shorter sheet names. Outside of Excel, you can make the tabs much smaller and thus display a few more of them. Go to Control Panel and choose Display. Under the Appearance tab, find Scrollbar in the Item list, and reduce the size (see screenshot 2).

Q How can I keep customer names and other column headings in Excel visible all the time when scrolling down into the next pages?

BS Chaggar

A Click in cell A2. Then go to the Window menu and choose Freeze panes.

Q I've compiled in Excel 2000 an index of music tracks listing CD title, song title, artist, track number, etc. Many tracks are repeated on several CDs. Is there any way that Excel can be configured so any item

in one row can be compared to the corresponding item in the row above and if both are identical delete the lower row?

Bob Bate

A If your index of CD tracks follows the rules of an Excel list (rows for records; columns for fields) you can use the built-in macro. Choose Data, Filter, Advanced Filter. Choose Filter the list, in-place, and check Unique records only. If necessary, you can always follow a filter on one field with one on another field to further reduce the list. To resurrect the original list choose Data, Filter, Show All.

Q In Excel 2000 when I want to enter a range, say 3-5, whatever I do, it always turns itself into a date, like 3rd of May. Can you help me?

Thomas Hirsch

A If you're going to make a lot of entries like this, format the cells first as text. If it's just one entry, precede it with an apostrophe like, '3-5.

Q Do you know of a procedure for counting the number of discrete entries in a list? I have a spreadsheet where users can enter a client reference more than once and I would like to be able to keep a tally of the number of different clients on the list.

Andy Hill

A I suggest you use Advanced Filter under Filter on the Data menu. For Action, choose Copy to another location. In the List range box, click the column letter for the client reference numbers. Leave the Criteria range blank. In the Copy to box, enter a cell address, like G1. Check Unique records only and click OK. In the cell where you want to know the net number of clients enter =COUNTA(G2:G7) if that is where the shortened list of client reference numbers now is (see screenshot 3).

Word processing

Q I use Word 97 SR-1 and often want to use text colours and table backgrounds other than the basic 16. However, I cannot find a 'more colours' option, although I can find more colours to use as web page backgrounds.

Joseph Williams

A This is a limitation of Word 97: although you can have any custom colour for page backgrounds or drawing objects, you only have the basic 16 for normal text and the same 16 plus a range of greys for table backgrounds.

For short pieces of text, you could use the Wordart tool, which permits any colour, and you could also place a coloured rectangle behind a table for a custom background. Word XP and 2000 let you use any colour text and table backgrounds (see screenshot 4).

Q With my old computer (Windows 95 with Word) I used to be able to get characters such as accented letters by pressing Alt and a four-digit code, eg 0244. This method does not seem to work with my new machine with Windows XP and the latest version of Word. Do you know why not?

Also is there any list available of the uses to which the function keys are put in Microsoft software? I would like to have the complete Greek alphabet available with a function key and the nearest English letter, but I cannot find out which F keys might already be dedicated.

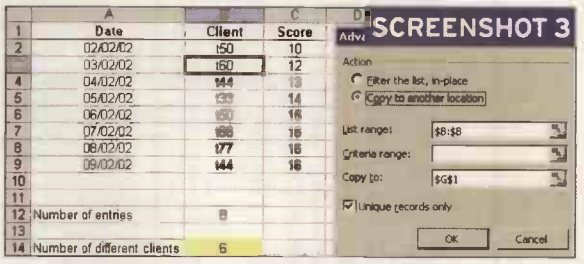
Anthony North

A In answer to your first query, you need to turn on Num Lock to use the Alt & number feature. In answer to the second we covered the Word function keys in detail in last October's column, but briefly, if you go to Tools, Customise, Toolbars and tick 'Function Key Display' this will display a toolbar showing what they do in their natural and shifted states. You could probably spare F12, for instance, which is assigned to 'Save as...' and use it as a prefix to an 'Insert Symbol' shortcut (see screenshot 5).

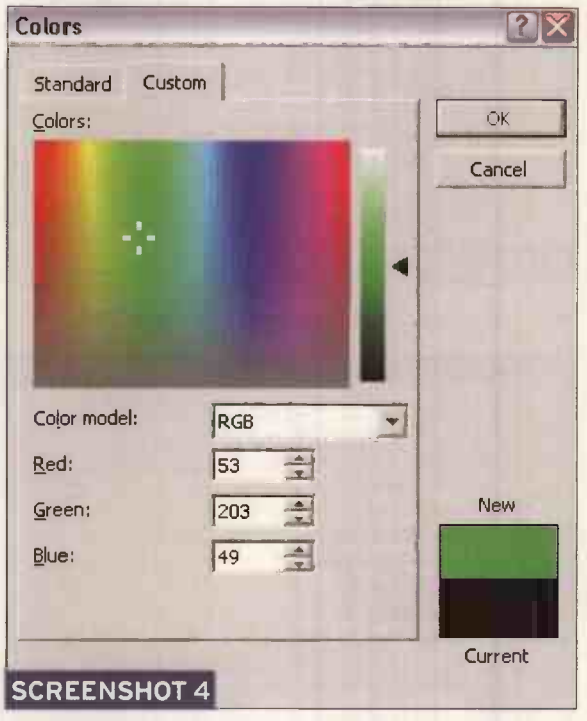
Q The smallest font size available in the dropdown box in Word 2000 is eight, whereas I frequently have a need for six or even four. I know that these sizes can be obtained by overwriting the size in the box but I have to do this many times within a single document so it would be more convenient if they were already present. Is there any way that they can be added to the list permanently?

Sidney T Payne

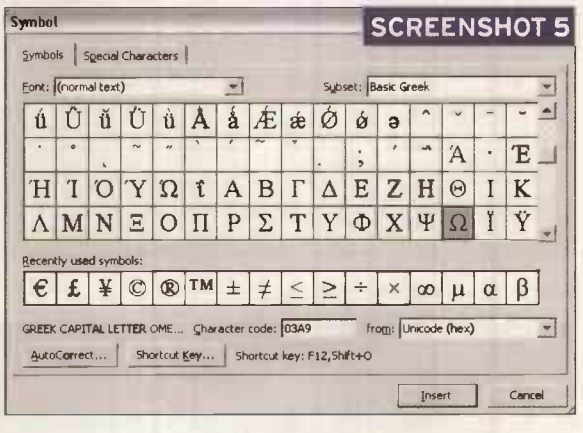
A You don't write those end-user licence agreements for software companies by any chance? You can't add to the list of sizes in the Formatting toolbar or Font dialogue. What you can do – and what is generally good practice – is create a style using the desired font sizes, which will then be available from the style list on the Formatting toolbar.



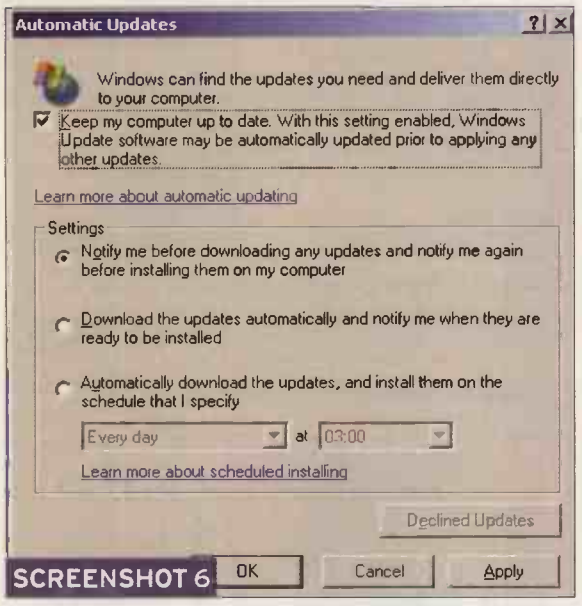
Counting the number of unique client reference numbers in a list



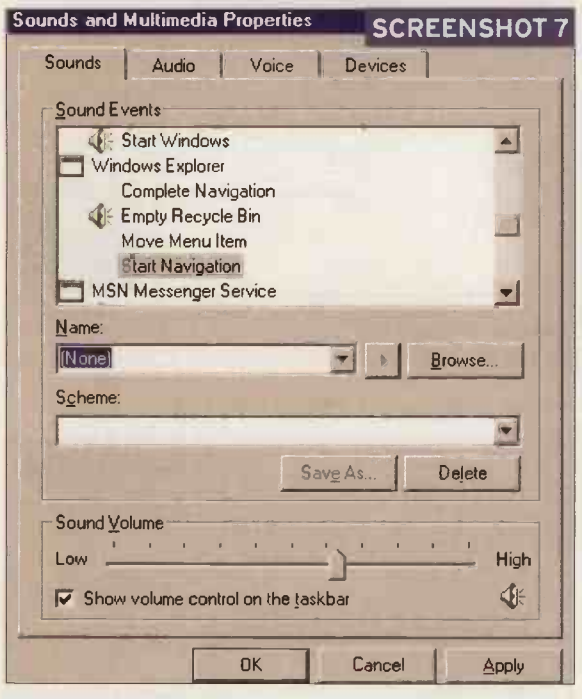
Any text colour you want – but not in Word 97



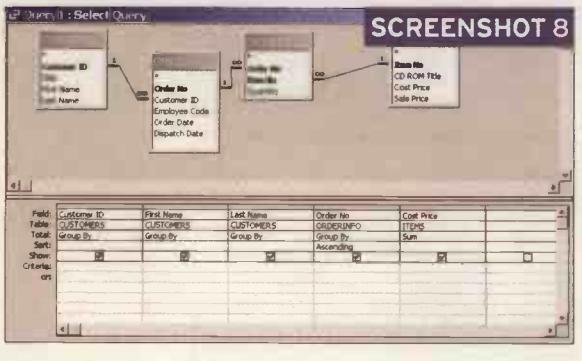
Using a function key as a symbol prefix



Switch off Automatic Updates with the AUN control panel



Get rid of that annoying click



The first Group by query...

Digital imaging

Q Using a Sony TRV110E camcorder, which has DV-out plus an enabler for DV-in, together with Pinnacle's Studio 7 we have successfully edited our video film for playback on our PC monitor. However, when the film is recorded back to the camera the titles and transitions cause the picture to break up – very briefly, just one or two frames, but we can't seem to fix the problem. Any suggestions?

N & N Corstorphine

A Troubleshooting video-editing problems is a question of eliminating all the possible culprits. You don't say anything about your hardware, but the following should help you to isolate the problem.

It's an obvious thing to say but does your PC meet the recommended system requirements? If it's borderline, installing more Ram or a bigger, faster hard drive may help.

Make sure you're using DirectX 8 or later and the most recent version of the Pinnacle drivers. DirectX can be downloaded from **www.microsoft.com/windows/directX** while the latest Studio 7 drivers, patches and a a list of compatible camcorders can be found at **www.pinnaclesys.com**. Unfortunately Pinnacle doesn't test camcorders that have DV-in disabled, though the NTSC version of the TRV110E gets a clean bill of health.

Check your hard disk. A nearly full, or badly fragmented drive can cause output and capture problems. Once you've defragged the drive, you should also check the HD data rates, for advice on how to do this go to **www.pinnaclesys.com/support/faq/ViewFAQ_US.asp?id=2861&lge_id=1**.

Make sure there are no other programs running during the recording process. Press Ctrl & Alt & Del and in the Task manager to close all of the running tasks except for Explorer and Systray. If your project is very long it may help to break it into smaller clips and write them individually to tape Also, make sure your camcorder is running off the mains adaptor and not the battery.

Windows 2000

Q How do I disable Windows 2000's automatic search for updates when I'm on the Internet? It started after installing Service Pack 3 and slows down my surfing no end.

Lars Larsen

A Service Pack 3 for Windows 2000 installs the Automatic Update Notification (AUN) client which will, if you let it, download and install updates while you are connected to the Internet and otherwise occupied. By design it uses no more than 20 per cent of the available bandwidth and is supposed to run unobtrusively in the background, so it should not really have a noticeable effect on your surfing. The component that manages the downloads is a new Windows 2000 service called the Background Intelligent Transfer Service (BITS). The AUN client in turn is a service that alerts you to the presence of updates and allows you to configure how updates are downloaded and installed. The AUN interface is a Control Panel applet called 'Automatic Updates'. Open this and select the 'Notify me before downloading' option to stop automatic downloading (see screenshot 6).

Or, you can entirely disable the service. Deselect the 'Keep my computer up to date' option to stop the automatic collection, reporting, and installation of updates. Then, open Computer Management (right-click on My Computer, select Manage) and navigate the tree to Services and Applications/Services. Select AUN and BITS in turn and set their Startup option to 'Disabled'. Then stop both services. Having done this you should manually check Windows update frequently or subscribe to Microsoft's security notification service at **www.microsoft.com/technet/security/bulletin/notify.asp**. Ignore the invitation at the top of the page to subscribe via the Microsoft Profile Center unless you actually want to sign up for a Microsoft Passport. Instead, scroll down to the bottom of the page and follow the instructions for 'Other ways to subscribe' which begin with sending email to securbas@microsoft.com.

Windows

Q I have recently bought a new PC that came with Windows XP. I thought that the idea of proper user names was great as it would be easy to keep different settings for myself and my wife. I am using Outlook for my email, and my wife Outlook Express. Every time I use Outlook I am asked if I want Outlook to be the default email program. If I say yes, it's fine until my wife (under a different user name) uses the PC. She is asked if she wants Outlook Express to be default, and if she says yes, then I am asked when I log in... I tried setting my wife's account as a non-root user, but then her account cannot set the default email program.

Antonis Papanestis

A The answer to your question, strange though it seems, is that that's the way Microsoft designed it. The default mail program setting is stored in the HKEY_CLASSES_ROOT branch of the Windows Registry, which is common to all users of the PC. Note that this only affects things such as 'mailto:' on web pages and programs that make Mapi calls. You can still use your respective applications with shortcuts set up on a per-user basis.

Q I found your article in December's *PCW* on Windows XP very interesting and, being anxious to follow your good advice, dug out my CD of Windows XP to install the Recovery Console. However, I do not have the directory you quote (winnt32) and a search of the disc failed to reveal the file cmdcons. I have the Windows XP pro upgrade.

Barrie Mellars

A You seem to have your slashes confused, Barrie. Winnt32.exe is a file, not a folder, and cmdcons is a switch, not a file. If you type what you see in the screenshot at the bottom of page 182 of the December issue, the Recovery Console installation routine will launch. Note that there is a space and a forward slash after 'exe', and you will need to replace the initial 'G' with your own CD-Rom drive letter.

Q I responded to an email virus warning by deleting the file jdbgmgr.exe. I am now told that the warning was a hoax and that the file is part of Windows 98. Is this true, and if so how can I get it back?

Ken Wallace

A The file is the Java Debug Manager and a genuine part of Windows – though it can be infected by a virus. You can find it in win98_41.cab on the Windows 98 CD – or replace it using the System File Checker in the System Information program.

Q Could Question time please help me to turn off that annoying clicking in Internet Explorer every time it accesses a page or different pop-ups? I use IE6. Thanks for a great read, cheers!

Terry Lack

A Go to Control Panel, Sounds. In Windows ME and XP this is called 'Sounds and Multimedia' or 'Sounds and Audio Devices' respectively and you may have to switch to 'View all...' (ME) or 'Classic View' (XP) to find it. On the 'Sounds' tab (98 users may rejoin here) scroll down to the Windows Explorer section, select 'Start Navigation' and you'll find you can change the sound from the list in the box below. You'll find the very popular 'None' at the top of the list (see screenshot 7).

Q Is Qbasic tucked away somewhere in Windows ME, and if so, how do I access it, please? And what about Windows XP?

FR Umpleby

A For the benefit of younger readers, Qbasic is an MS-Dos-based application for creating and running programs written in a dialect of the Basic (Beginner's All-purpose Symbolic Instruction Code) programming language. In Windows ME – as with Windows 98 – you'll find Qbasic.exe and Qbasic.hlp on the CD in the tools\oldmsdos folder. In Windows 95 it's under other\oldmsdos. It isn't included with Windows XP, but seems to work all right.

If you want the sample .bas files, which include a personal finance manager and a very exciting game where two gorillas hurl exploding bananas at each other, you'll have to dig out those old Dos 6.22 floppies.

Databases

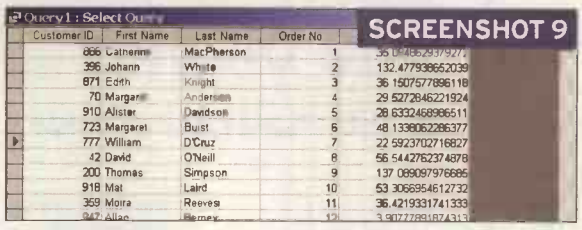
Q I want to add up the amount that all my customers spend with me. I can find all the sales for a particular customer readily enough and I can then add them up, but I want to do this automatically and for all my customers at the same time. How can I do this?

Greg Moss

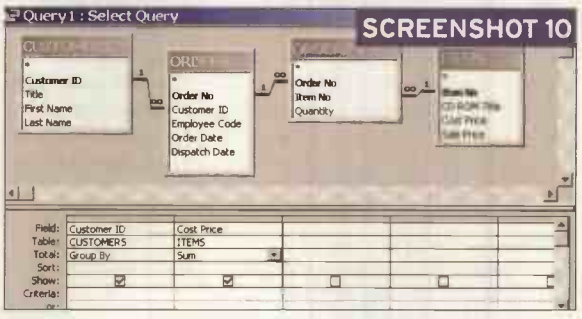
A What you need here is a Group by query. If you create a query like the one in screenshot 8, then Access will show you the totals for each order (see screenshot 9). True, this isn't what you asked for, but it is still very useful and may help other people.

You create a Group by query by selecting the tables and fields as normal and then clicking on the Sum button in the query toolbar, whereupon the words Group By appear in the Total line of the query. I have then modified that to read Sum under the Cost Price field as shown.

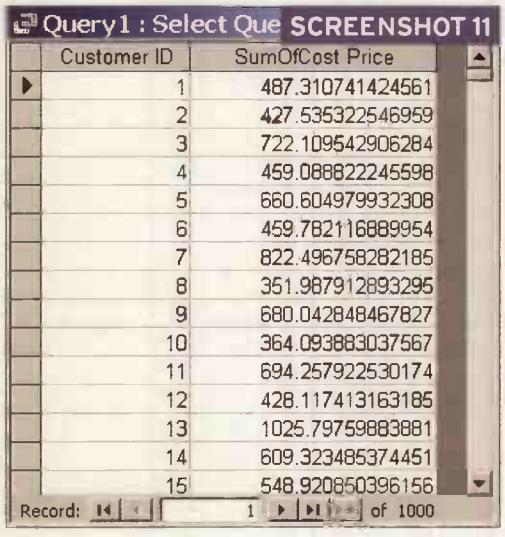
To provide the answer that you did want, simply take out the Order No field and the two Customer Name fields, and the Group by query will sum the sales to each customer (see screenshots 10 and 11).



...finds the totals for each order



By taking out the Order No field and the Customer Name fields...



...the Group by query will sum the sales to each customer

CONTACTS

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Networks:	networks@pcw.co.uk
Sound:	sound@pcw.co.uk
Spreadsheets:	spreadsheets@pcw.co.uk
Linux/Unix:	linux@pcw.co.uk
Mobile computing:	mobilecomputing@pcw.co.uk
Visual programming:	visual@pcw.co.uk
Web development & ecommerce:	webdev@pcw.co.uk
Windows:	win@pcw.co.uk
Windows 2000:	win2000@pcw.co.uk
Windows XP:	xp@pcw.co.uk
Word processing:	wp@pcw.co.uk

Please do not send unsolicited fileattachments.

Gordon Laing
has been a hardware enthusiast ever since his first Sinclair ZX80 and, as a 10-year contributor and former editor of *PCW*, what he doesn't know about technology isn't worth knowing

Pay and display

An LCD or VFD display can provide a useful source of system information

In a world dominated by faceless beige boxes, an increasing number of enthusiasts are turning to custom modifications to make their systems stand out. Many mods are purely visual, employing case windows and internal neon lighting, or fitting traditional components into unusual cases, from bread bins to cigar boxes.

Other mods are more practical, delivering useful features or information in an unconventional manner – for PCs anyway. In this month's Hands on Hardware, we're looking at probably the most useful accessories of all to the PC modder, which will also delight more traditional owners. Indeed as PCs handle more and more multimedia files, these could end up being standard fittings.

We're talking about none other than the small LCD panels employed by countless domestic appliances to indicate everything from playing times to washing cycles. Fit one to a PC, and it too can display similar data, along with much more besides.

With a little instruction, a single display could alternate between delivering playing times, title information, web-based weather or news reports, ammunition or health scores in a game, not to mention vital CPU and system temperatures. Such displays are useful for normal systems and invaluable to home-theatre or in-car-hifi PCs, which are designed to operate without a conventional monitor.

The Matrix Orbital BLC-2021-WB is a 2 x 20 character LCD with white text on a rather soothing blue backlit background, pictured here in a bezel which fits in a 5.25in drive bay

Types of displays

There are many different display technologies, but the two most dominant in this arena are Liquid Crystal Displays (LCDs) and Vacuum Fluorescent Displays (VFDs). LCDs normally display black text on a light background, while VFDs employ glowing characters on a dark background.

The cheapest LCD displays rely on ambient light for illumination, but for indoor use you really need a model with a backlight. The most common backlights are a greeny-yellow colour, although others are available. Additionally it's possible to have an inverse LCD design, where light characters are displayed on a coloured background. The most common of these use white characters on a blue background (pictured above), although again other variations exist.

VFDs feature glowing characters on a dark background and as such normally look a little clearer than their LCD counterparts. The most common VFDs employ greeny-blue characters, although they're bright enough to allow coloured filters to be placed in front (pictured below). VFDs can cost up to 50 per cent more than an LCD with the same configuration of lines and characters.

The most basic displays using either technology normally offer two lines of eight characters. More useful are wider two-line displays with 16 or 20 characters per line. Beyond this, you'll find four-line displays with up to 40 characters on each. Graphical displays are described by their number of pixels, which typically range from 122 x 32 up to 230 x 64 pixels. The visible display sizes normally range from 35 x 15mm to 147 x 30mm, depending on the number of lines and characters.

While bare display panels are available, you'll need a soldering iron and a fair amount of electronic knowledge to proceed any further. Much more useful are preassembled displays, which come mounted on circuit boards with the appropriate controllers and familiar connectivity.

Dedicated DIY-ers could then physically drill the appropriate holes and windows in their cases to mount and view their displays. Those less handy with power tools could alternatively buy ready-made bezels for various displays which simply screw into spare 5.25in drive bays. Before you lament the loss of a whole 5.25in drive bay just for a thin display, there's normally sufficient room behind the package to accommodate a 3.5in disk.

The circuit boards on larger displays may demand a bezel which occupies two 5.25in drive bays (pictured right).

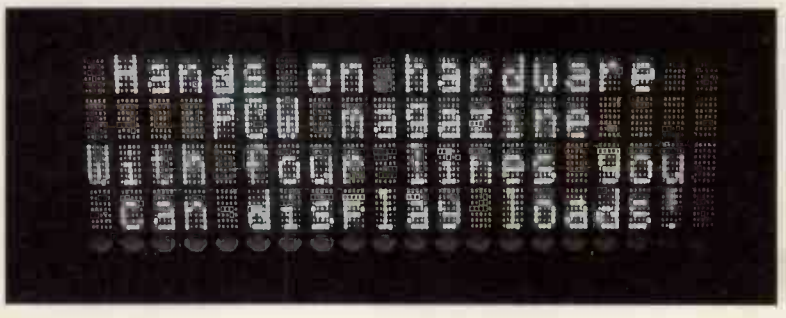
Connections

Powering LCDs and VFDs is pretty straightforward, as those built for PC use normally have standard drive power plugs, or come with an adaptor that fits onto one. Getting data to the display is, however, slightly more complicated.

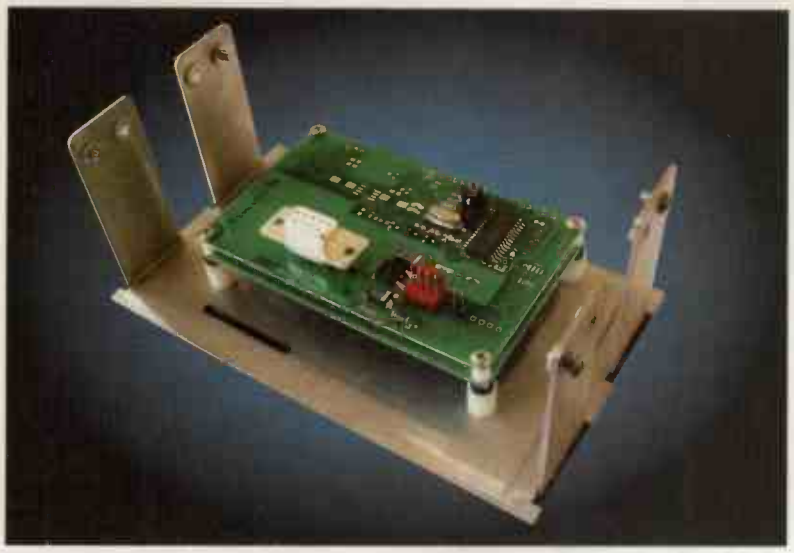
The vast majority of pre-assembled LCDs and VFDs use standard serial or parallel ports, which sounds perfectly reasonable until you remember most PCs house these connectors on the back of their cases. Consequently, most users will need to feed their display's serial or parallel cable out of a hole in the rear of their case, just to plug it into the required port.

It all sounds a bit inconvenient, but some panel manufacturers have attempted to make the process a little neater. A popular option is to use flat ribbon cables that can be squeezed out of most gaps in the back of the case. Alternatively the display's serial port could be mounted onto a blanking plate, thereby only requiring a short cable between it and the main port on the back of the PC.

An internal solution is of course much more preferable, but sadly few



For those who want more information on their display, consider Matrix Orbital's BVF-2041-BK, a 4 x 20 character Vacuum Fluorescent Display with bright green characters, pictured here in a bezel requiring two 5.25in drive bays



Matrix Orbital's BVF-2041-BK pictured from the rear. Note the nine-pin serial port, power connector and brackets for mounting the display in a pair of 5.25in drive bays. Smaller displays will fit in a single 5.25in bay, or could even squeeze out of a 3.5in window if you're willing to do a little DIY

motherboards feature internal headers for conventional serial or parallel ports. The exceptions are motherboards with onboard graphics, which normally sacrifice one of the external nine-pin serial ports to make room for the VGA monitor port. The missing nine-pin serial port is then normally made available via an internal header, which could be connected directly to a serial display.

Of course this entire process could be made easier still by equipping displays with a USB interface instead, as most modern motherboards feature at least one internal USB header going spare. Sadly USB displays are thin on the ground, but new models are expected by the time you read this. Until USB interfaces become the norm though, most users of today's LCDs or VFDs will have to put up with feeding a serial or parallel cable out of the back of their cases.

More than a display

There's no reason for the data connection to a display to be hogged for just characters and graphics. Several models are available with a selection of buttons around the screen, which can be trained through software to control various actions. These could switch between applications, adjust the volume, or select tracks on a CD or DVD. This may seem a bit pointless to owners of normal PCs, but could prove invaluable for anyone building a system designed to operate without a keyboard or mouse.

Better still, some displays also feature General Purpose Outputs (GPOs), which can be used to drive lights, fans or other devices. Again you have to look beyond standard PC configurations and consider models designed to operate with little user intervention.

Cost and suppliers

The two biggest players in pre-assembled LCDs and VFDs for PC use are Matrix Orbital (**www.matrixorbital.com**) and Crystalfontz (**www.crystalfontz.com**). Both offer a large range of displays, although Matrix Orbital is generally accepted to have broader support for keypads and device control. Crystalfontz was first out with a USB model, but Matrix Orbital is expected to offer them by the time you read this.

You can buy Matrix Orbital and Crystalfontz displays directly from their respective websites, although since both are based in North America, you're looking at international shipping costs and customs charges.

Prices for basic backlit LCDs with two lines of eight characters start at around £30 excluding shipping. Larger displays with more characters rapidly increase in price to around £50 for a backlit 2 x 20 character LCD or £70 for one employing a VFD. Four-line displays or those designed for graphical use can easily cost over £100 each.

Matrix Orbital displays are also sold in the UK through Kustom PCs, **www.kustompcs.co.uk**. Prices start at £73.19 ex VAT for a 2 x 20 backlit LCD, complete with a serial cable and black bezel for easy mounting into a 5.25in drive bay. A 4 x 20 VFD with cable and mounting bezel costs £114.89 ex VAT.

Software

Once you've gone to the effort of rerouting serial cables and maybe even custom-mounting an LCD or VFD, it's a little annoying not to find a wealth of data appearing the instant your PC powers up. In fact, if you do nothing at all, you'll get no more than the manufacturer's logo or a plain flashing cursor. LCDs and VFDs need to be told what to display, from which application and at what times. In practice you set up a number of rules that kick in under certain conditions, such as telling the display to show the track time and artist's name every time you run Winamp. You could then arrange for the display to show the CPU temperature and fan RPM, or perhaps rolling web news and weather reports at all other times.

The trouble is that each application outputs its information in different ways, so the display must know where to find what it's looking for. Display support for specific applications, such as Winamp or Motherboard Monitor, is normally delivered by a series of plug-ins. Sometimes a plug-in is available to automatically drive a display directly from the application in question – handy if you just want to see some information on what music you're listening to. If you're after greater control and information from multiple programs, then you'll need to use a general display utility and install the relevant plug-ins for all the required applications.

Some display manufacturers supply software, but most rely on third-party support, normally written by enthusiasts. Many of the favourites are free or shareware, while others have grown to become commercial, but still affordable products. The more popular utilities enjoy an almost cult online following, ensuring there's plenty of support and help across numerous forums. It's pretty safe to say someone else has been there before and can help you troubleshoot almost any problem.

Three of the best display applications for Windows are Matthew Augier's LCDC (**http://lcdc.planetdps.com**) (see screenshot 1 overleaf), Ryan Myers' LCDriver (**http://lcdriver.pointofnoreturn.org**) and BasieP's LCD Smartie (**www.rendo.dekooi.nl/~fjbgp/smartie**).

Linux users should check out LCDproc by William W Ferrell, Scott Scriven and other contributors at **http://lcdproc.omnipotent.net**. Each has a wide range of plug-ins for popular applications along with FAQs and guides for getting everything working.

Testing

To see what's involved in getting a display working we tested two Matrix Orbital models, supplied by Kustom PCs. The first was the BLC-2021-WB, a 2 x 20 character LCD with white text on a backlit blue background.

Kustom PCs sells this pre-mounted in a black 5.25in bezel complete with a flat ribbon nine-pin serial cable for £77.45 ex VAT. The second display was the BVF-2041-BK, a 4 x 20 character VFD with bright green text on a black background. Once again this was supplied with a serial cable and a black bezel, although the larger screen size meant two 5.25in drive bays were required for mounting. Kustom PCs sells this model for £114.89 ex VAT.

Physically installing the displays was easy enough, from screwing the bezels into spare drive bays to feeding the ribbon serial cable out the back of the PC. Those fussier about neatness should look into getting one of the blanking plate serial options, or better still, a USB model designed to connect straight onto a spare internal header.

Both Matrix Orbital and Kustom PCs believe LCDC is the best software to drive these displays, so we downloaded the latest version 1.02.22, measuring 3.8MB and costing £11 for a single-user licence.

Upon first startup, LCDC offered to automatically search for a display. Our version found the BLC-2021-WB straight away, but had no luck when we switched to the BVF-2041-BK; fortunately this and other popular Matrix Orbital models can be manually selected from a pulldown list, so we were still up and running fairly quickly. We did have to modify a couple of additional settings to prevent flickering and line skipping on this VFD, but both were known issues on the LCDC FAQ.

If you're setting up a display for the first time, we highly recommend going through LCDC's tutorial which guides you through the basics. Plug-ins available to download from the LCDC website include those which extract data from Winamp 2 and 3, Motherboard Monitor 5, Zoom Player, Seti@home, along with Rich Site Summary, which can take rolling reports from supporting websites. Third-party plug-ins are also available and the LCDC program itself can also be set up to monitor up to five email accounts.

Once the plug-ins are configured, you can get down to the nitty gritty of telling your display what you'd like and when you'd like it. This is done using LCDC's screen builder, where you literally tell it what you'd like displayed on each line of the display and under which circumstances.

For instance, you could use the Winamp plug-in to extract the track time and artist name, then display them on separate lines, perhaps with the former centred neatly and the latter scrolling across the display. Then again, you could go for a variety of other playing statistics or even animated VU meters.

Clearly there's only a limited amount of information a single display can show at one time, but LCDC can switch between different types of data at predefined intervals. Data can also be displayed from multiple applications in turn, so you could show the track details from Winamp for a few seconds, followed by your CPU statistics from Motherboard Monitor, then the latest weather predictions accessed via an appropriate website, before returning to the music data.

Individually formatting each line for every application obviously takes time, but it's possible to have basic data on the screen in just a few minutes. The only downside when playing with LCDs and VFDs is you may not find ready-made plug-ins for your chosen display utility and favourite applications.

It's an indication of Winamp's popularity and, of course, its suitability for this kind of thing, that every utility we came across supported it without a hitch. Judging by the availability of other plug-ins, the next most popular thing people want to see on their displays is information on their system temperatures, followed by various rolling news and weather reports from the web.

Annoyingly, though, you may not find native support for specific applications. No-one's written a Power DVD plug-in for LCDC yet, although we did find an LCD plug-in for Girder (www.girder.nl) which would do the trick. You may end up using multiple utilities with a fair amount of tweaking to get the exact results you desire.

Setting up one of these displays currently involves considerably more work than installing your average brand-name peripheral, and is probably not advisable for beginners or those who don't like getting their hands dirty. Indeed after routing cables, finding the right software then configuring it all, you may wonder whether it's worth the effort at all.

While only you can decide for yourself, we certainly found displays gave a new lease of life to a jaded system. There's something quite magical about seeing even the most basic information scrolling across a little screen and, once you've seen a decent Winamp implementation in action, you'll understand why it's the most supported program for such displays.

On the surface displays may seem like a novelty, but they're genuinely useful. A quick glance at your case can reveal essential system statistics faster than perusing Task Manager. This is wonderful for anyone monitoring servers, or for systems which may not be connected to a traditional monitor.

In the future we hope USB connectors and native support in popular applications will make displays much easier to use, but in the meantime, we'd say for certain projects and users they're well worth the effort.

SCREENSHOT 1

LCDC is a great utility for controlling Matrix Orbital displays. With a little work you can get it to display almost any information on the screen

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Gordon Laing welcomes your comments on the Hardware column. Email him at: hardware@pcw.co.uk. Please do not send unsolicited file attachments.

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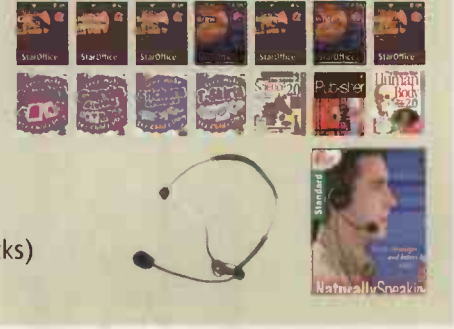

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Tim Nott
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Wiping the slate clean

Reinstalling your OS needn't be a chore if you partition and back up your hard drive first

Last month we looked at how cruft (clutter) accumulates on a PC: this month, as promised, we'll take a look at getting rid of it. It has always been true of Windows that every so often you really need to make a clean break and reinstall your operating system and applications from scratch, to get rid of accumulated bloat and to restore things that have stopped working. Though this is not a step to be taken lightly, and will involve some time and effort, it needn't be a nightmare. Please note that the information given here is for Windows ME, 98 and (up to a point) 95 users only.

Preparation is all important, and here a lot depends on whether you have partitioned your hard disk or not. We've covered this extensively in the past, so I'll briefly recap. It can be a good idea to partition your hard disk: that is split it into two or more 'logical' drives, each of which has its own drive letter. This divide and rule technique offers several advantages. In no particular order of merit, you can save time defragmenting by keeping data that frequently changes – such as your documents and media files – away from fixed data, such as program files. You use disk space more efficiently with smaller 'clusters': the minimum chunk of space that can be assigned to a file. You can improve performance by giving the swap file a partition of its own, and you can reformat a problem partition without affecting the other partitions.

How you arrange your partitions depends on what sort of work you do on your PC. My personal scheme is to keep a 5GB partition (C:) just for Windows and a few essential utilities in Program Files. Major applications, such as office suites and graphics programs go on D: (15GB), documents and other personal data on E: (5GB) and the swap file on F: (1GB). This worked for me for some time, as my work data is mostly Word documents and screenshots, neither of which takes up a lot of space. Recently, I added a second hard disk to cope with video and multiple versions of windows stored as Virtual PCs. Your needs may be very different, so plan accordingly.

If you haven't partitioned and decide you want to – or you have partitioned and you want to change the sizes – then, if you're planning to reinstall Windows from scratch, this would be an excellent time to do it.

There are two approaches to partitioning. First is to use the MS-Dos fdisk utility supplied with Windows, which is available on a boot (startup) disk. This will destroy all data on the drive, so you will need to back this up first. Again, we've covered the use of this recently (February 2003 and June 2002) and you can get a blow-by-blow account from Microsoft Knowledgebase article 255867: print this out for future reference. If you go to **http://search.support.microsoft.com/kb/c.asp**, and then follow the instructions on 'How to Search for a KB Article by ID Number', you'll save yourself a lot of URL typing.

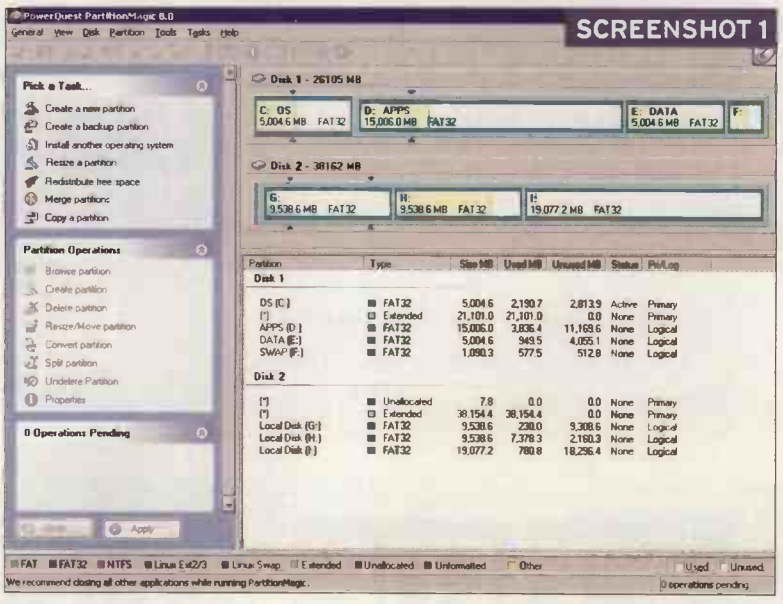
Alternatively, you can repartition using a utility such as Partition Magic. This can change partition sizes, and create new ones in free space non-destructively: existing data is not overwritten. Nevertheless, it would still be rash not to back up your data first (see screenshot 1).

What do you need?

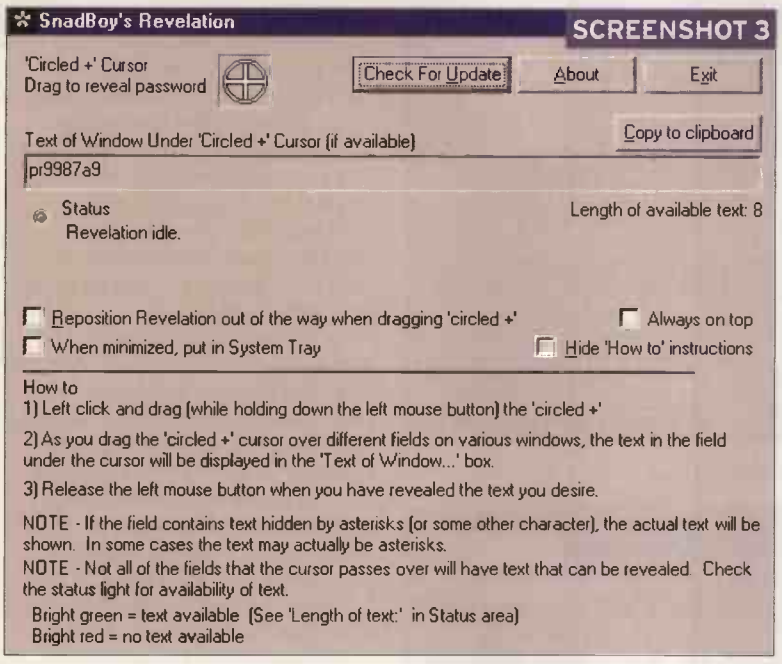
First a boot disk. You've probably got one tucked away somewhere, but make sure first that you can find it, and second, that it works. If not, make a new one: you'll find a tab devoted to this in Control Panel, Add/Remove (see screenshot 2). Having done this check again that it works – you should be able to boot to an MS-Dos prompt and access your drives, folders and CD-Rom. You change drives by typing the letter followed by a colon followed by Enter, and you'll notice you have an extra drive – a Ram drive held in memory – containing useful tools that are stored in compressed files on the boot floppy.

If your PC still boots to Windows, then you need to enter the Bios (usually by holding down the Delete key at boot time) and change the boot seek order to floppy before hard disk. If you have Windows 95, the boot disk may not load the drivers necessary to access the CD-Rom drive. See Microsoft KB article 135174 for details of how to overcome this.

Make a boot disk then check that it works



User-friendly partitioning with Partition Magic from Powerquest



Decipher the stars for forgotten, stored passwords

Later versions include generic CD-Rom drivers on the boot disk.

Next you need your Windows 95, 98 or ME CD and its Product Key – usually printed on a yellow sticker on the CD case. If this is an upgrade version, then you will also need the CD (or floppy disks) of the OS it was upgraded from: Windows will check for a 'qualifying product' during installation, and if it can't find this on your hard drive it will prompt for the installation media.

Note also that if your PC manufacturer has provided you with a 'recovery CD' rather than a full Microsoft Windows installation CD, you will have to check with the manufacturer that you will be able to reinstall Windows to a blank system from this: sorry, but we can't provide make/model-specific instructions here. However, if you have a folder on your hard disk containing the installation .cab files, you may be able to reinstall from there, without using the CD-Rom.

What to back up?

I'm a firm unbeliever in backup software that uses proprietary formats, and that includes the various varieties of Windows backup. I like to have my backed-up data accessible on a per-file basis, though I would not draw the line at using Winzip or the Windows ME compressed folders feature, both of which will let you see individual files and folders. Bear in mind, however, that some data, such as audio, video or jpg pictures is already compressed, and you won't get much space saved from zipping it. Decide on a medium on which to back up. A second physical hard disk is the easiest, or you may have a removable – eg Zip – drive or a CD-Rom burner. In any event do take a close look at what you've backed up – check folder sizes and perform spot checks on important files.

The second point is what to back up. Obviously your documents, spreadsheets, picture and audio files, all of which you hopefully keep under 'My Documents'. Then there's your mail and addresses. Microsoft, in its Infinite wisdom, tends to spread data around, but fortunately most of it can be forced into a subfolder of 'My Documents', for those running Windows 98 or ME. As we saw last December, Outlook Express mail folders can be relocated by going to Tools, Options, Maintenance, Store Folder.

The Address Book can also be relocated, as we saw last month, but this requires a Registry hack, so you may be more comfortable in either backing up the .wab file or opening the Address Book (not just Outlook Express) and exporting it, from the File menu, to another backup location. You can move your 'Favorites' folder simply by dragging it to another location.

If you use the 'Remember this password' feature then back up your .pwl file (and that of other users, if applicable). You might also want to make a printed or filed copy of your passwords, in the likely event that you have forgotten them.

Although password dialogue boxes show a row of blobs or asterisks in the password field, you can see the real thing if you download Revelation from www.snadboy.com (see screenshot 3). The most important thing is to back up everything you need to connect to the Internet and access your email. For this you'll need the dial-up connection number for your ISP, the username and password, the username and password of the mailbox, if different, or those of other mail accounts. You'll also need the POP and SMTP server addresses for your mail, which you can find in Outlook Express, Tools, Accounts.

Safe driving

This would also be a good time to check that you have all the driver disks for printers, sound and display cards and other peripherals. You might also want to look on the manufacturers' websites to check that you have the latest version for your combination of hardware and operating system.

After that, it's largely application-specific stuff. If you're using MS Office, then make sure your templates and custom dictionaries are backed up. Again, you can – and should – relocate these to a subfolder of 'My Documents' so they get backed up regularly with the rest of your work and personal files. You can do this from Word's Tools, Options, File Locations dialogue. One thing you can't shift is the Autocorrect file so if you've added custom entries to this, search your disk for *.acl files and back those up – noting where they were located.

With regard to applications, then you are almost certainly going to have to reinstall these, even if you don't delete the Program Files folder, as the relevant Registry entries will need to be rewritten. If you've devoted considerable time to setting up the interface of a program, then you may be able to preserve this by exporting the relevant branch of the Registry to a .reg file. For example, Paint Shop keeps all its settings at HKEY_CURRENT_USER\Software\Jasc. So if you export the branch, then having reinstalled Paint Shop, you'll be able to reinstate these settings by merging the saved .reg file. This, however, is definitely one for power users, so do make sure you know what you are doing.

Usually you can reinstall applications over themselves, but if you want to make a clean break and delete everything – or reinstall to a different location – check the program's folder for any customised features, saved files and other data you may need. And don't forget to back up your 'saved games' if applicable. Make sure you have all

the software installation disks and any necessary serial numbers. If you've saved updates to your operating system or applications (see below) make sure that those are backed up and to hand. Finally, you may want to back up non-Microsoft fonts, custom wallpaper, sounds and other ephemera you have added to the Windows folder.

You should now be almost ready for the big event. If you are going to repartition or reformat your disk, then make sure you have the previously mentioned Microsoft Knowledgebase article 255867 printed out. If you are going to stick with the existing partitioning, then copy the file Deltree.exe from C:\Windows\Command to C:\.

Stick the boot disk in the floppy drive, and restart the PC. Make sure that you can see the CD-Rom drive with the Windows installation CD in it. If you are going to partition the drive, then follow the instructions in article 255867. If not, type C: <enter> to change the current Dos drive to C:. If the prompt says anything other than C:\> (C:\Windows> for example) type cd\ <enter> to change to the root folder of the C: drive. Next, type deltree C:\windows. This – when you've confirmed that you really want to do it – will delete the Windows folder and all its contents. You can then run Setup.exe from the CD-Rom to install a squeaky-clean version of Windows.

Follow the prompts, and when Windows is installed you'll probably have to spend some time installing drivers. Windows should auto-detect most devices and prompt you either to install its own drivers or provide a source to others: if you have updated device drivers, choose the latter. You should then be in a position to reinstall your applications.

You'll need to do a little juggling to get your Favorites, mail, address book and Office templates/dictionaries back. For the first three, the easiest thing is to copy or import the contents of the backed-up items into their default locations. You can then, should you wish, relocate them as described above.

For the Office templates and custom dictionaries, you need to revisit Tools, Options, File Locations as described above, and then copy the saved .acl files back to the default location.

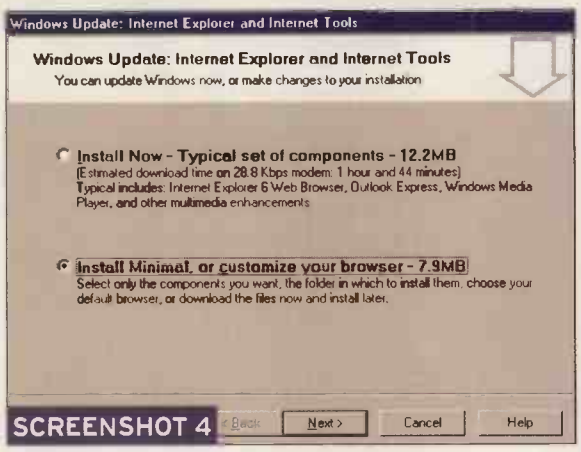
Keeping your update

In January's column I mentioned that there seemed to be no way of downloading and keeping Windows ME updates if, for example, you wanted to install them on multiple PCs, or keep in case of having to reinstall Windows ME. Not so, wrote Jim Tavendale, Paul Berry and Mel Sage. Go to the Windows Update site at **http://v4.windowsupdate.microsoft.com/en**. In the left menu click the 'Personalize Windows Update' button. This will produce an option in the right pane to 'Display the link to the Windows Update Catalog under See Also'. Click the option button for this, and then click the 'Save Settings' button above. If 'Windows Update Catalog' still doesn't appear in the left menu under 'See Also' then you need to refresh the page (F5 or the Toolbar button). Click on 'Windows Update Catalog' for a full list of updates and patches that can be downloaded and kept as normal files. Mel also pointed out – as did Richard Quadling and Howard Millman – that it is possible to download and keep IE6 SP1, though Microsoft keeps this option well hidden.

Go to **www.microsoft.com/windows/ie/downloads** and follow the links to download. This will initially download a 479KB file, for which you have the usual choice of saving or opening. Save this to the Desktop, as it is just the installer (you didn't really believe you could get away with a mere 479KB, did you?) and then run it. Choose the 'minimal or customize' option (note that this is not available if you are running Windows 2000 or XP) (see screenshot 4).

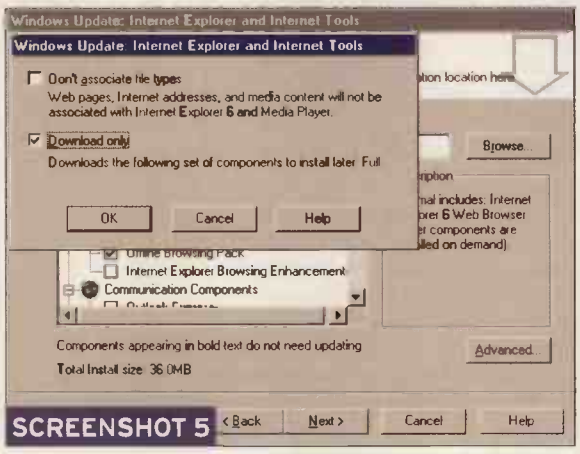
In the next screen, don't bother selecting any components or specifying a path – just click on the 'Advanced' button, then choose 'Download only' from the dialogue that appears (see screenshot 5). OK this then click 'Next', the following screen will ask you which versions of Windows you want the update for, and where you want them (see screenshot 6).

When the download has finished – which may be some time as it can be tens of megabytes – you will be able to copy the target folder and its contents to another PC, and run the IE6setup.exe program from within the copied folder.



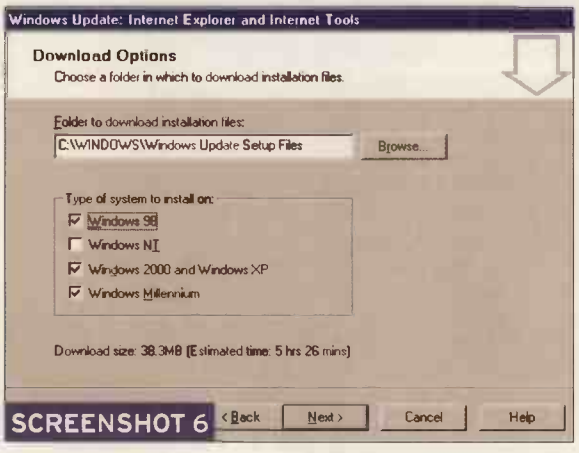
SCREENSHOT 4

Download and keep IE6 SP1: step one...



SCREENSHOT 5

...then step two



SCREENSHOT 6

You can download updates for other versions of Windows

Kiosk view

Finally, Dave Spathaky sent us an interesting tip from Ireland. If you hold down the Control key and click the Maximise button in Explorer, you jump to 'Kiosk' view. Not only is the window maximised, but the Windows Taskbar disappears, as does the Explorer menu bar and all toolbars save the standard one. Pressing the Restore button gets things back to normal, and pressing the Window key summons the Start menu as usual. This tip also works in Internet Explorer, so it's a good way of getting the most of the available screen space when viewing large web pages.

CONTACTS

Tim Nott welcomes your comments on the Windows column. Email him at: win@pcw.co.uk. Please do not send unsolicited file attachments.

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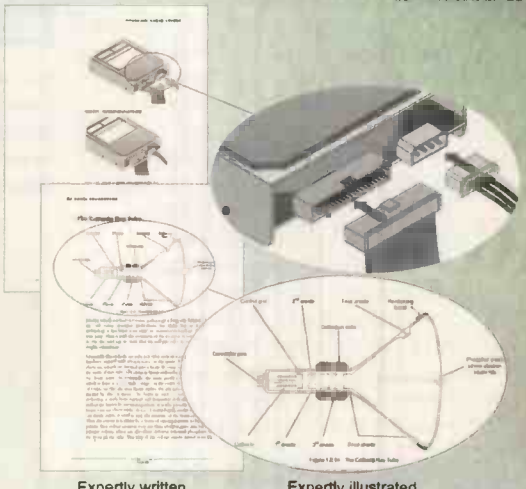

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Tim Nott
Is a full-time freelance journalist. When he's not writing about Windows and word processing, he tackles many other diverse subjects. He currently lives in France with his wife and family

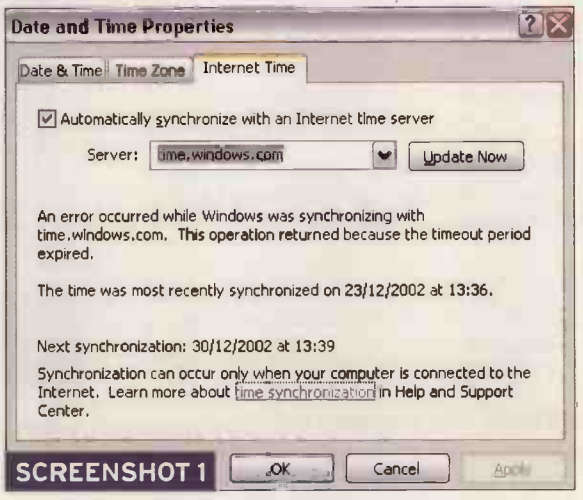
Time for making changes

Fiddling with time and coping with the shutdown blues are all on this month's XP agenda

Although there exist many utilities for synchronising your PC's clock to a web-based atomic clock server, Windows XP has this facility built in. If you go to Control Panel, Date and Time, then turn to the Internet Time tab, you'll find that you can either synchronise on demand, or leave Windows to take care of it at weekly intervals (see screenshot 1). At the risk of stating the obvious, you will need to be connected to the Internet to do this.

If your PC clock – like many – is wildly inaccurate, you can shorten the update period, but this takes a small Registry hack. Having taken the usual Registry backup or System Restore precautions, run Regedit, and go to HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\TimeProviders\NtpClient\SpecialPollInterval. There you'll see the Value Data for this is 93a80 hex or 604800 decimal.

A little arithmetic shows that this is the number of seconds in a week. If you change this to 15180 hex (86400 decimal), then your PC will update its clock daily. You will need to restart the computer to see the change reflected in Control Panel.



SCREENSHOT 1

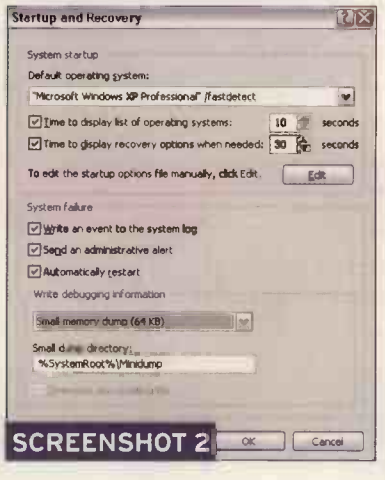
Your weekly timecheck can be made more frequent with a Registry hack

Non-peripheral vision

An interesting mail came this month from a reader who was looking to buy a full copy of Windows XP Pro. Currently this retails for around £230, but our reader tracked down a copy on Ebay for half that price. On checking with the company's website, it transpired that this was an OEM version. And, on checking with Microsoft, he was told that it was 'illegal' to purchase an OEM version of Windows without purchasing 'non-peripheral' hardware as well.

OEM stands for original equipment manufacturer – in other words a firm that assembles components manufactured elsewhere into their computer cases, adds a keyboard, monitor and mouse, installs an operating system, and sells the lot to the general public. Microsoft, in turn, offers reduced prices to OEMs for operating systems and software that is to be bundled with the new PCs.

Assuming the company is selling the genuine article, then it is not illegal to purchase an OEM version without a full-blown PC. At the time of writing, the laws of the United Kingdom were still determined by Parliament, not Microsoft. Furthermore, the buyer will hold a valid licence to use the product. However, the vendors will be in breach of their agreement with Microsoft if they supply an OEM version without also supplying non-peripheral hardware. As to what constitutes 'non-peripheral', I quote Microsoft: 'a "non-peripheral computer hardware component" is a hardware component that is not a peripheral but essential to a computer system that you build. Microsoft prefers to leave the determination of what is essential to a computer system to the discretion of our system builder customers, whom we consider to be experts on computer system hardware. Though examples of non-peripheral components include internal disk drives, memory, keyboards and mice'. The vendor mentioned on Ebay was offering a free mouse with each copy of Windows, so Microsoft can't really complain. Bear in mind, however, that an OEM licence for Windows XP cannot be transferred to another PC. So it's likely that if you upgrade to another PC you will not be able to activate a transferred OEM version of Windows XP.



SCREENSHOT 2

You can easily disable the Automatically restart (on failure) feature in XP

Shutdown woes

One thing Microsoft has been failing to conquer since Windows 95 is the reluctance of the operating system to shut down properly. The 'shut down blues' has been a regular feature of the Hands on Windows columns for over seven years, and the list of shutdown problems with XP makes for depressing, though familiar, reading.

One very common problem reported with XP is that the PC restarts instead of shutting down. Under Windows 98 and ME this could often be cured by disabling the Fast Shutdown feature, but in XP this is probably a symptom of greater ills, as the default behaviour after an XP system failure is to restart the PC.

You can change this by simply going to the Advanced tab of System Properties, clicking on the Startup and Recovery Settings button and then unticking the Automatically restart option (see screenshot 2). Doing this may later let you see an error message that gives a clue to the shutdown problem.

A phrase that is often encountered in the context of XP shutdown problems is 'Easy CD Creator'. If you are using this packet-writing software under Windows XP, then you need to update its drivers from Roxio's website (www.roxio.com). There's more information in the Microsoft Knowledgebase (article 311806).

Many of the causes of shutdown problems seen in Windows 95 onwards (such as a damaged exit sound file) also apply to XP, and I am not going to dwell on this problem further, except to give you the good news that the maestro of Windows shutdown problems, James Eshelman, now has an XP-specific page at his website. You can find this at www.aumha.org/a/shtdwnxp.htm.

Bad Language solved

Here's the answer to another common little XP mystery: the case of the persistent Language Bar. Many users

have reported that this appears on their Taskbar, and when they try to hide it by right-clicking the Taskbar and unticking its entry from the Toolbars list, it still reappears when they reboot. Moreover, clicking on Settings reveals a property sheet where the Preferences are greyed out.

The solution to this is somewhat surreal: you need to add another language. If you add, say, the English (United States) language and the US Keyboard, then click Apply, the Preferences buttons will spring into life (see screenshot 3).

You'll then be able to click on the Language Bar button and disable the 'Show the Language bar...' option permanently. Having done that, you can remove the extra language. The Preference buttons will grey out again but the Language Bar will not return.

Inside My Documents

The My Documents feature was introduced in Windows 98, and is generally one of Microsoft's better ideas. Instead of having to navigate around when opening or saving files, My Documents provides a default root location for all your documents and other saved files. It's a discipline that many of us have practised since long before Windows 98, but the My Documents feature certainly makes it easier. However, Microsoft seems to have got carried away with the idea.

Since the original My Documents folder was introduced, we've seen the addition of My Music, My Pictures, My Recent Documents and My Ebooks (no, before you ask, I don't have any either). Several readers have written to me in bafflement at the profusion of these folders, for which Windows XP seems to break all records.

One reader, whose real name is not Fred Bloggs, wrote to say that with the folder pane activated in Windows XP Explorer, there was a copy of My Documents right at the top of the tree, below Desktop. There was another one under C:\, and, near the bottom of the tree, was a folder named Fred Bloggs' Documents. All of these appeared to have the same contents, and deleting a file from one also deleted it from the others.

In fact Fred appears to have missed a few others: there may also be C:\Documents and Settings\Fred Bloggs\My Documents, and there is probably a My Documents folder on the Desktop and another on the Start Menu. However, with the possible exception of the one under Documents and Settings these are all references to the same folder: the files are not duplicated.

You don't have to have My Documents on the Start menu or on the Desktop. If you right-click on the Start button, then choose Properties, then click on the Start Menu tab, then on the Customize button and finally on the Advanced tab, you'll find a set of options. These allow you to display several items – including My Computer, My Documents, My Pictures and so on – either as links which open the folders, or in a menu cascading from the Start Menu, or not at all. The Desktop copy can also be hidden from Display Properties, Desktop, Customize Desktop.

Now it gets a little more complicated and a lot more flexible. You do not have to use the physical folder provided by Microsoft to store your files. Nor does this folder – or most references to it – have to be named My Documents. Try right-clicking on the My Documents icon on the Desktop and renaming it to something less annoying.

I've just renamed mine to Bazonka for the sake of illustration (see screenshot 4). If you do likewise, you'll find you have Bazonka not just on the Desktop, but at the top of the tree in Explorer, in the Start Menu and in the common Open/Save dialogue boxes (see screenshot 5).

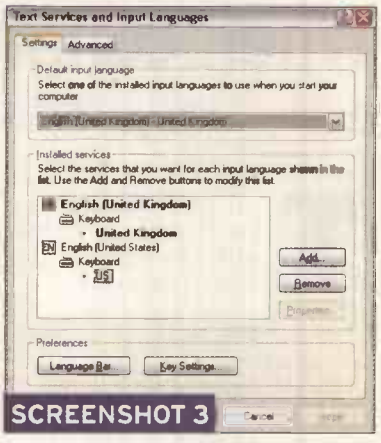
SCREENSHOT 4

What's yours called? It doesn't have to be named My Documents...

SCREENSHOT 5

...and it will appear in the common Open and Save dialogue boxes

More is less: the key to getting rid of the Language Bar



SCREENSHOT 3

But opening any of these still shows the contents of the folder C:\Documents and Settings\Fred Bloggs\My Documents. So, next try right-clicking on Bazonka – either the Desktop or Explorer copy – and selecting Properties. You'll now find you can change the target folder. You can either type this straight into the Target box – Windows will create a folder if it doesn't already exist, or use the Move button. In either case Windows will offer to move the contents of the old location. If you don't accept this offer, then the old folder will live on, with its current content: if you do, it will be removed after the content has been moved.

As well as hiding the Bazonka Desktop Icon and Start Menu entry, you can also delete it from the top level of Explorer. This will not delete the files in the target folder, though if you are going to experiment with this do point it at a dummy location without copying the files first, just in case something goes wrong. It will, however, remove both the top-level Explorer entry and the Desktop icon, and experiments here show that both can be restored from the Desktop Display settings. Again, if you are going to experiment with this, make a System Restore point first.

Once these icons have been removed in this way, you will still find the files under Fred Bloggs' Documents (if that's your name) and their physical location on your hard disk. You'll also see Bazonka in the File Open/Save dialogues, where it will function as expected. Note, however, that these name and target changes aren't reflected everywhere: the Start Menu and Desktop property sheets will still refer to My Documents.

CONTACTS

Tim Nott welcomes your comments onTim Nott welcomes your comments on the Windows XP column. Email him at: xp@pcw.co.uk. Please do not send unsolicited file attachments.

Terence Green
has tussled with computers ever since starting as an IBM mainframe operator in 1979. Since 1981 he has documented the gap between what PCs claim to do and the reality

When conflict is on the cards

Understanding and sorting out IRQ conflicts is often the key to peripheral misbehaviour

The way Windows 2000 (and Windows XP for that matter) handles interrupt requests often causes confusion because it seems to conflict with traditional methods of dealing with hardware conflicts.

We've touched on the subject of peripherals that cause conflicts several times over the years. But it's worth revisiting now in order to throw some light on a frequently suggested workaround for Windows 2000 hardware conflicts that isn't what it seems.

Reader, interrupted

A reader with a Hauppauge WinTV-PCI-FM card has just such a hardware problem. The Hauppauge card is supposed to deliver FM radio and TV but niggling problems began from the time it was first installed.

Through email support, Hauppauge diagnosed an IRQ (interrupt request) conflict and suggested remedies including checking the Bios settings and physically moving the card into a different slot. The support effort was good but didn't solve the problem.

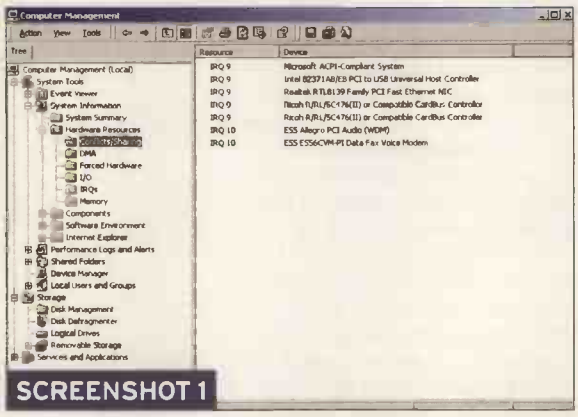
Eventually Hauppauge suggested disabling ACPI (the Advanced Configuration and Power Interface) in order to manage IRQs manually. This involves a reinstall of Windows or an in-place upgrade that preserves your existing files and settings.

People say you can switch from ACPI by changing the Computer type in Device Manager (from ACPI to Standard) and rebooting, but they're misinformed.

With the in-place upgrade you must remember to disable ACPI in the Bios when the system first reboots. Then, as the Windows 2000 setup starts, a message – 'Press F5 if you want to add SCSI drivers' – is displayed. Press F6 instead to display a list of PC types.

Select the Standard PC option and allow setup to complete. This hamstrung Windows 2000 may or may not work but the real problem almost certainly lies elsewhere.

The reason people suggest disabling ACPI is because Windows 2000 reports IRQ allocations in a deceptive way. The poorly named 'Conflicts/Sharing' list which you can reach at Start/Settings/Control Panel/Administrative Tools / Computer Management/System Tools/System Information/Hardware Resources/ apparently shows ACPI allocating the same physical IRQ to a whole bunch of peripherals (see screenshot 1).



SCREENSHOT 1

Windows 2000 working as it was designed, smoothly sharing IRQs between different peripherals

In our reader's case, the Computer Management file shows IRQ 11 hosting seven different peripherals, including Soundblaster Audio, Promise storage, network, and Hauppauge PCI cards. Despite appearances this isn't physically happening – it's only Windows being obtuse. All this apparent madness means that ACPI, which allows the operating system complete control over hardware configuration and power management, is working as designed with the Windows 2000 operating system.

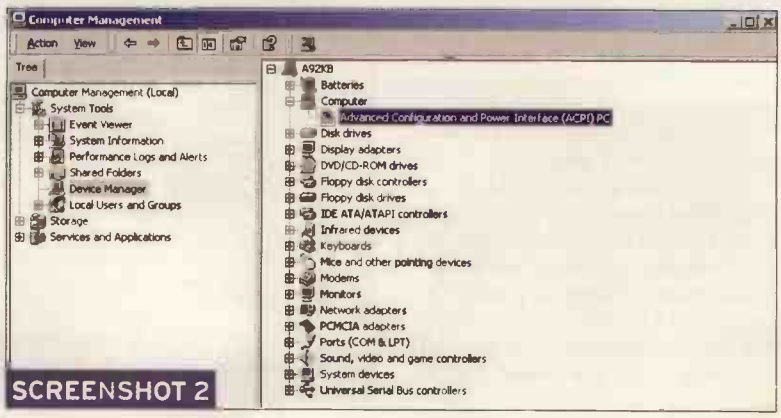
Windows 2000 automatically enables ACPI at installation time if possible. Check the Computer entry of Device Manager in Computer Management (right-click on My Computer, Manage). If it says 'Standard PC', then ACPI support *hasn't* been installed (see screenshot 2). If the entry mentions ACPI, then it is enabled and the IRQ conflicts/sharing list is a logical display rather than a physical representation. This means that IRQ lines are not being shared, they're being managed by Windows 2000 along with all the other hardware.

To understand why disabling ACPI may not be the best workaround we need a little background knowledge.

A history lesson

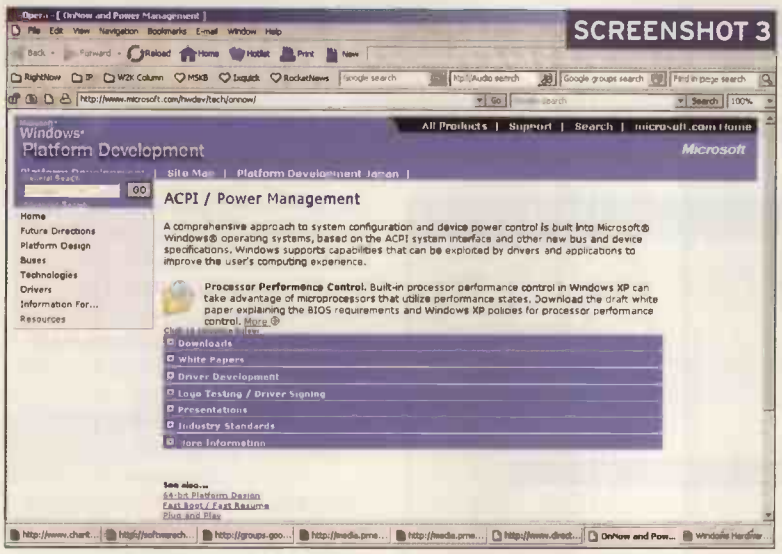
Many peripherals including hard and floppy drive adaptors, display adaptors, video capture cards and, most especially, sound cards, use IRQ lines to alert the operating system when they need to interact with it. Each interrupt-driven peripheral had to have its own unique IRQ in the bad old days of ISA (Industry Standard Architecture) which preceded the PCI (Peripheral Component Interconnect) standard that now prevails. With ISA, the PC's Bios allocates predefined IRQs to standard components – IRQ 12 for a PS/2 mouse, IRQ 6 for the floppy drive, and so forth. Cards which require IRQs but don't fit into the standard scheme must take one of the available remaining IRQs. Under ISA this entails setting jumpers on cards to ensure that each has access to a unique IRQ line.

PCI changed all this by working with the PC Bios to allocate resources automatically. Backwards compatibility with ISA meant older cards could still be supported by manually setting jumpers if necessary. Most motherboards still have a mix of PCI and ISA slots to support older ISA peripherals. PCI slots are white, ISA slots are larger and brown in colour. In general, PCI cards can be autoconfigured by the PC Bios if the Bios 'Plug and Play OS' option is set to 'Yes'.



SCREENSHOT 2

Check the computer type in Device Manager to see if ACPI is enabled



There's a mine of ACPI information on the Microsoft website

ACPI combines PCI Plug and Play with enhanced power management and makes this entire configuration available to the OS (read more at **www.microsoft.com/hwdev/tech/onnow** – see screenshot 3). ACPI-enabled Windows 2000 takes total control of hardware configuration, completely bypassing the PC Bios hardware configuration stage.

For this to work, the PC, its Bios, all peripherals, and the operating system must fully support ACPI. A few older PCs don't support ACPI at all, although some will with a Bios upgrade, but most PCs under three years old should support ACPI just fine. A few Bios settings may need changing. The Plug and Play OS should be set to 'No' to stop the PC Bios from trying to arrange resources, leaving all the configuration to Windows 2000.

You should also change the 'Delay Transaction' setting in the Bios to 'Enabled'. This is required for compatibility with the PCI 2.1 specification supported by Windows 2000. This setting, which appears in the 'Advanced' or 'Chipset' menu, may also be called 'PCI 2.1 Support'.

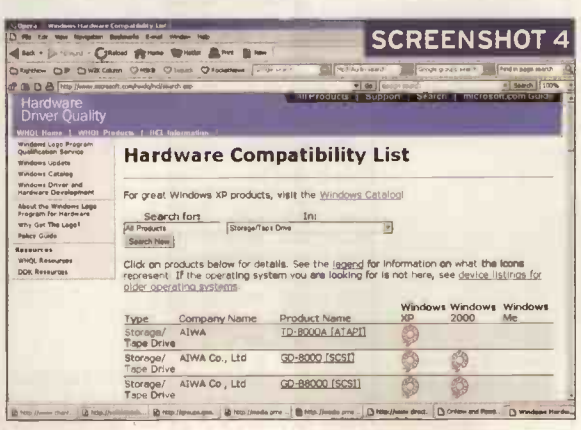
In this state Windows 2000 is perfectly capable of resolving all resource conflicts even if some of the peripheral cards are older non-Plug and Play ISA cards, provided they are correctly jumpered. This is the only instance in which any manual IRQ configuration is ever appropriate when Windows 2000 is ACPI-enabled. PCI cards, provided they fully support the PCI 2.1 specification should just work.

The trouble is some don't. Our reader's Hauppauge card refuses to be well behaved even though his system is entirely PCI and he has followed all the instructions from Hauppauge to enable PCI in the Bios, to resolve any resource conflicts listed in Device Manager, and to try the card in other PCI slots. There is always a reason for such behaviour and, as is usual with PCs and Windows, the real problem may not be where the symptoms are exhibited.

Although PCI enables Plug and Play for hardware, a peripheral is actually a combination of the hardware and a software driver. Our reader had already followed Hauppauge's advice to remove older drivers and install newer ones. Newer drivers are no guarantee; they can be buggy too. It's best to check both the peripheral hardware supplier's website as well as the Hardware compatibility list on the Microsoft website, as that may have a link to Microsoft-certified drivers for your device. Again there's no absolute guarantee, but it's all about eliminating potential problems (see screenshot 4).

If you've checked all the above, as our reader had, and still the problems persist, it's time to start moving peripherals around to see if they're happier in a different slot. The reasoning for this is that some cards, even though they purport to support PCI 2.1, don't quite do it right. And, even though PCI Plug and Play effectively gives the operating system hundreds of virtual IRQs to allocate, they all boil down to (on average) four physical IRQ lines on the motherboard. These are PCI IRQs, and Windows 2000 with ACPI can handle this perfectly well, but some cards don't play ball and can throw the system out of kilter.

Are you on the HCL? Are there certified drivers?



Mission statement

Your job is to find the offender. The task is complicated because the card exhibiting symptoms may be responding to an aggressive out-of-spec card or interacting with a motherboard component that shares one of the PCI IRQs. It may also be in the wrong slot if it is a 'bus mastering' card.

In order to match cards to slots effectively you need as much information about your motherboard as possible. Some motherboard and PC suppliers, Abit for example, provide information on slots that share PCI IRQs, slots which don't share IRQs, and slots which support bus mastering. If you can't find this information on your supplier's website try a Google Groups search (**groups.google.com**) as someone will have been there before you and documented it. With this information you should be able to relocate your cards so that they're all happy. Along the way you may identify the misbehaving card. Placing this in a PCI slot that doesn't share a PCI IRQ may finally solve the problem.

There are two other possibilities that can throw a spanner in the works, both exhibited by our reader's computer. Its processor is a 1.4GHz AMD Athlon which implies a Via chipset. In this case we would suggest downloading and installing the latest Via 4-in-1 drivers from **www.viahardware.com** to eliminate some configuration issues.

Finally, there's a Soundblaster card installed. Older Soundblaster cards are frequently implicated in conflicts. If you can give the Soundblaster a free PCI slot that doesn't share a PCI IRQ you may be lucky. If not, do as many others have and replace the Soundblaster with a card that does behave itself, like the Videologic Sonic Fury. This card is a Turtle Beach Santa Cruz rebadged card for sale outside the US.

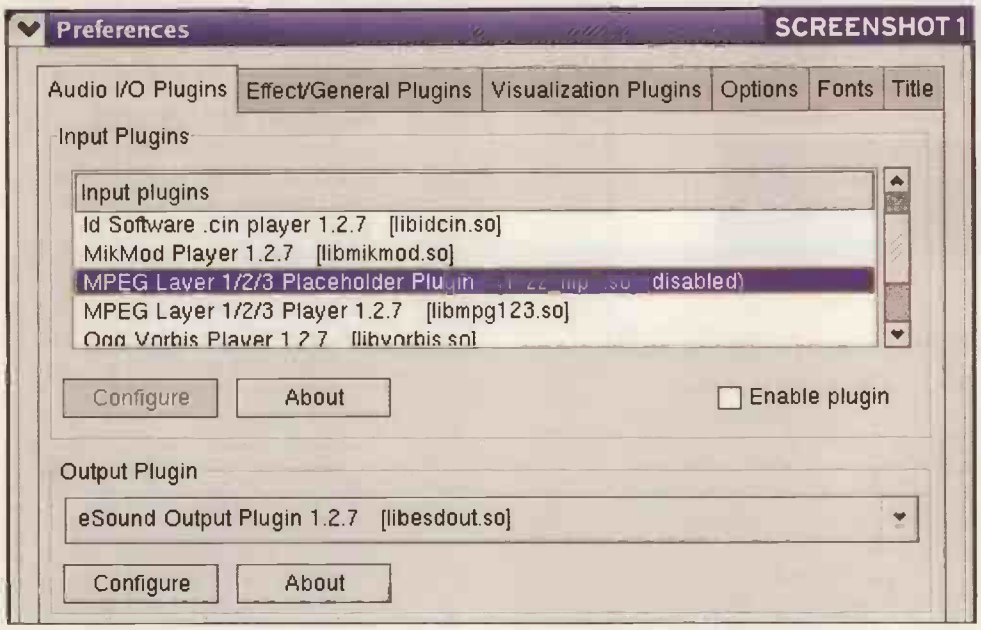
CONTACTS

Terence Green welcomes your comments on the Windows 2000 column. Email him at: win2000@pcw.co.uk. Please do not send unsolicited file attachments.

Barry Shilliday
has worked with computers for almost two decades. By day, he is a Linux and Unix consultant, but in his free time prefers to travel the world – and snap it with his camera

Linux gets a multimedia make-over

How to add MP3 support, CD ripping and DVD features to a basic Red Hat 8 distribution



Disable Red Hat's placeholder plug-in or XMMS will not play MP3 files

Last month, we started to make changes to a base Red Hat Linux 8 installation, in order to add and improve multimedia features. That included installing the Microsoft web fonts, the Macromedia Flash plug-in, and Java support (both the plug-in and the virtual machine).

There's still some more to be done before the system is really ready for the desktop, so this month we will enhance the capabilities of the operating system further. As before, all of these changes should also apply to any recent Linux distribution, although not all will be necessary.

First up is something easy, MP3 support. As explained last month, MP3 functionality is now totally removed from Red Hat Linux. The reason for this is patenting: although many organisations own patents that relate to MP3 audio compression, Thomson Multimedia alone has decided to pursue financial gain from its patent. Until recently, there was a charge only for software encoders (applications that create MP3 files), but now Thomson is charging for decoding software as well.

The result is no MP3 support. Software patenting isn't something that the European Union has (yet) implemented, so in Europe we can add support back into the system. The free software world isn't a place where this sort of thing goes down well, and most people in the US (where the patent does apply) are ignoring it anyway.

MP3 playback

A good application supplied with the operating system is XMMS, the X Multimedia System. If you've used Winamp before you'll be familiar with its style. XMMS plays sound file formats including Ogg Vorbis and Microsoft's .wav format. Like Winamp, it uses plug-ins to control its functionality. An input plug-in normally provided with it enables MP3 playback, but Red Hat has removed it from the XMMS it supplies.

A couple of options exist to fix this problem. The easiest one, by some way, is to download the appropriate plug-in from the XMMS website, www.xmms.org. A precompiled RPM file specifically for Red Hat Linux 8 can be found at http://staff.xmms.org/priv/redhat8. Download the file and install, as root, in the normal way:

```
# rpm -Uvh xmms-mpg123-↙
1.2.7-13.i386.rpm
```

(Key: ↙ code string continues)

The filename might differ slightly if the package has recently been updated. Make sure that you have XMMS installed if you have problems with the command above. You can check XMMS with a command like:

```
# rpm -qa | grep xmms
```

If no output appears, XMMS needs to be installed.

The alternative solution isn't much more difficult, and feels a bit cleaner. Download the source RPM file from the website above, and compile and install it yourself. You'll need the rpmbuild command (part of the rpmbuild package) to do this:

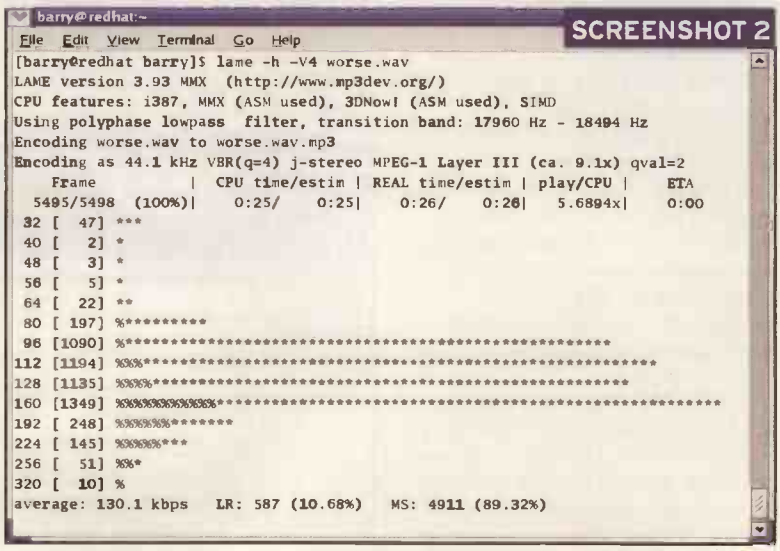
```
# rpmbuild --rebuild xmms↙
-1.2.7-13.src.rpm
```

After a couple of minutes, rpmbuild will create some freshly compiled RPMs in the directory /usr/src/redhat/RPMS/i386/, and you can install them as follows:

```
# rpm -Uvh --force /usr/↙
src/redhat/RPMS/i386/xmms*
```

The --force option ensures that the installation proceeds even if you have the same numbered version of XMMS on the system already.

If you use this method, you'll need to turn off the dummy MP3 plug-in



Histogram showing a wave file encoded to MP3

FIG 1

x86 processor types

-march=
pentium
i686
pentium2
athlon
pentium3
athlon-tbird
pentium4
athlon-xp

that Red Hat created but seemed to forget to put into the supplied version. Go into the preferences and disable the plug-in as shown in screenshot 1.

MP3 encoding

If you want to create MP3 files in addition to playing them, some sort of encoder is needed. We will use the popular open-source encoder Lame (**http://lame.sourceforge.net**). The name originally stood for 'Lame Ain't an MP3 Encoder'. Confusingly, now it is an MP3 encoder, but its name remains the same.

Download the latest Lame archive from **http://lame.sourceforge.net/download/download.html** and extract it into a temporary directory, then:

```
# tar xfvz lame-3.93.1.tar.gz
# cd lame-3.93.1
```

Now run the configure script to do the hard work for you:

```
# ./configure --enable-nasm --enable-expopt
```

One big benefit of installing Lame from the source code here is that the software will be optimised for the particular CPU architecture it runs on. MP3 encoding is highly CPU-intensive, making this particularly important. The --enable-nasm and --enable-expopt options allow the compiler to use any special enhancements for the CPU, like MMX or 3DNow.

You can also specify the type of CPU, improving performance further. This can cause the compiler to generate code that doesn't run on other types of processor, so it's not enabled by default.

For example, to set the processor type to an AMD Athlon XP, run configure as follows:

```
# CFLAGS="-march=athlon-xp" ./configure --enable-nasm --enable-expopt
```

See figure 1 above for a list of common processor types. If you're not sure which processor is in use, run the configure command above.

Once the configure script has finished, compile the source code and install the software:

```
# make
# make install
```

The Lame binary will now be sitting in /usr/local/bin. Now try converting a .wav file – for example, using:

```
$ lame -h -V4 music.wav music.mp3
```

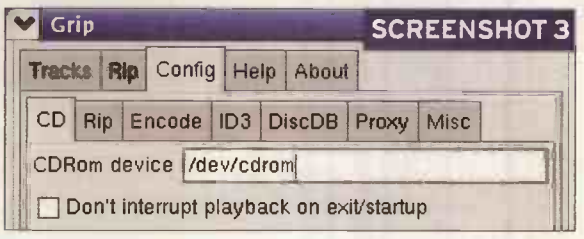
The -h option ensures high-quality encoding, while -V4 uses variable bit rate (VBR) encoding with a quality setting of 4. This value can range from zero (highest) to nine (lowest), and four tends to generate an average of 140-160Kbits/sec, a reasonably good bit rate setting.

The final argument is the output file, which is not essential, although if you don't include it Lame will just stick a .mp3 extension on to the end of the original filename, resulting in a file ending in .wav.mp3. For a typical encoding example see screenshot 2.

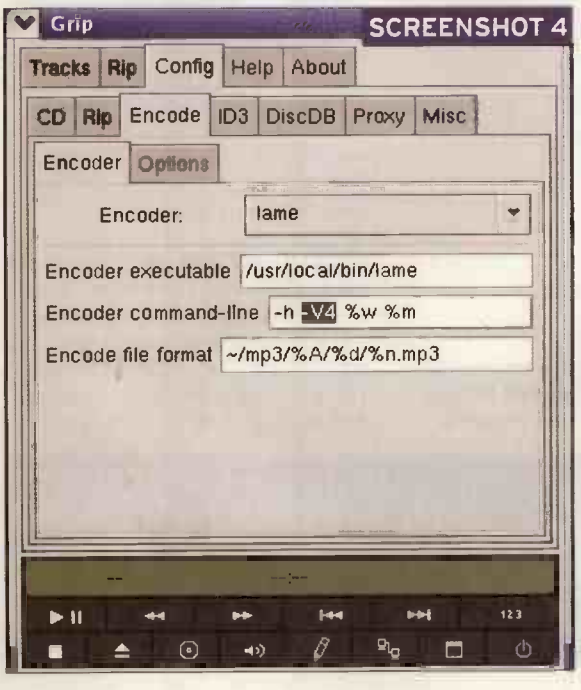
CD ripping

Red Hat Linux 8 comes with a good graphical front end to Lame and Oggenc in the form of Grip (**http://nostatic.org/grip**). This is a Gnome (GTK) application that can rip audio tracks from CDs into .wav files, and encode them to MP3 or Ogg Vorbis, using the respective tools. It can also act as a simple CD player, and will connect to a CDDB database to find the track titles for the disc.

As installed, Grip is ready to use with Lame. Check that the CD device is correctly listed (see screenshot 3) and that Lame is selected as the encoder. You may want to change the field reading '-b %b' to '-V4'(as shown in screenshot 4), otherwise the MP3 encoding will all be done at a constant bit rate.



Grip will use the device listed here to rip audio CDs



Grip automatically finds the Lame binary and sets some sensible options. The highlighted change fixes the encoding bit rate to variable quality 4

DVDs and video

For DVD playback, there's a bit more work required. As installed, Red Hat Linux 8 has no software to build upon in order to get DVD support going, so it's necessary to start from scratch. Despite this, you shouldn't run into many problems and it's a relatively straightforward exercise.

A good piece of free software to play most video formats is Xine (**http://xine.sourceforge.net/**). Xine is released under the GNU Public Licence and has support for .avi and .mpg files, as well as lots of the audio formats XMMS supports. Again, it's important that Xine is optimised for the host CPU; video playback is another CPU-intensive process.

Xine is modular in nature and, like XMMS, it can be enhanced with plug-ins. The application consists of two parts: the core engine and the user interface (UI).

You can download the latest versions of these from the Xine website – you'll find them under 'Releases' in the download section. At the time of writing, the latest versions were xine-lib-0.9.13 and xine-ui-0.9.13. The version numbers must be the same for both parts.

As you have probably guessed, the Xine core libraries have to be installed before the user interface, so first extract the archive to a temporary directory:

```
# tar xfvz xine-lib-0.9.13.tar.gz
# cd xine-lib-0.9.13
```

then run the configure script:

```
# ./configure
```

The configure script is clever enough to detect the best compiler flags for your hardware, though you still might want to specify the CPU architecture itself, as with Lame. For example:

```
# CFLAGS="pentium4" ./configure
```

To compile and install the core libraries, run the 'make' and 'make install' commands as before.

Since we are installing software into /usr/local/, we need to make sure the system can find any new libraries put there. Edit the file /etc/ld.so.conf, and if not already present, add this line to the file:

```
/usr/local/lib
```

Next, run the ldconfig command to refresh the system's list of shared libraries. With the core Xine libraries now in place, extract the xine-ui archive and follow the same procedure. If you get an error reporting that the xine-libs are not present, make sure that you've run ldconfig and have added the right directory to /etc/ld.so.conf.

A few more steps need performing before Xine is ready to run. Create a link from /dev/dvd to the DVD drive's device, usually /dev/hdc or /dev/hdd. If you're not certain what it is, run the 'dmesg' command (as shown in screenshot 5). In this instance, /dev/hdd is the device. Create the link as follows:

```
# ln -s /dev/hdd /dev/dvd
```

It's important to make sure DMA is enabled for the DVD drive. Red Hat Linux 8 defaults to disabling DMA for CD and DVD drives, but it's easy to change. Edit /etc/modules.conf and add the line:

```
options ide-cd dma=1
```

Next, run 'rmmod ide-cd' to force the kernel to reload the IDE CD driver and enable DMA on the drive.

Once this is all done, run the 'xine-check' script supplied with Xine to run a few health checks. The output should be similar to that shown in screenshot 6. However, if the script reports DMA as disabled after changing /etc/modules.conf, a reboot might be necessary.

Finally, run Xine. A large window with an ugly logo should first appear with the configuration screen displaying a few seconds after that. If you have any mpeg video files, try loading a few and they should work fine. DVDs, however, won't get very far. Xine's built-in DVD plug-in is next to useless and you'll need to install another.

DVDNav

DVDNav is a third-party plug-in for Xine that provides the features the native plug-in does not. It consists of two parts like Xine itself: libdvdnav and xine-dvdnav. These rely on an underlying library, however, called libdvdread. Download this library from www.dtek.chalmers.se/groups/dvd/dist, and extract and compile it in the normal way, as per the following code:

Find out where your DVD drive is located using the dmesg command

SCREENSHOT 5

```
root@redhat:~
File Edit View Terminal Go Help
[root@redhat root]# dmesg | grep DVD
hdc: YAMAHA CRW3200E, ATAPI CD/DVD-ROM drive
hdd: Pioneer DVD-ROM ATAPIModel DVD-106S 012, ATAPI CD/DVD-ROM drive
hdd: ATAPI 40X DVD-ROM drive, 256kB Cache, UDMA(66)
[root@redhat root]#
```

```
# tar xfvz libdvdread-0.9.3.tar.gz
# cd libdvdread-0.9.3
# CFLAGS="-march=<cpu> -O3" ./configure
# make
# make install
# ldconfig
```

Now it's possible to install libdvdnav and xine-dvdnav, in that order. Download them both from http://unc.dl.sourceforge.net/sourceforge/dvd, and install them in the same way as for libdvdread above.

Xine provides a useful script to make sure everything's working fine

SCREENSHOT 6

```
barry@redhat:~
File Edit View Terminal Go Help
[barry@redhat barry]$ xine-check
Please be patient, this script may take a while to run...
[ good ] you're using Linux, doing specific tests
[ good ] looks like you have a /proc filesystem mounted.
[ good ] You seem to have a reasonable kernel version (2.4.18-17.8.0)
[ good ] intel compatible processor, checking MTRR support
[ good ] you have MTRR support and there are some ranges set.
[ good ] found the player at /opt/xine/bin/xine
[ good ] /opt/xine/bin/xine is in your PATH
[ good ] found /opt/xine/bin/xine-config in your PATH
[ good ] plugin directory /opt/xine/lib/xine/plugins exists.
[ good ] found input plugins
[ good ] found demux plugins
[ good ] found decoder plugins
[ good ] found video_out plugins
[ good ] found audio_out plugins
[ good ] skin directory /opt/xine/share/xine/skins exists.
[ good ] found logo in /opt/xine/share/xine/skins
[ good ] I even found some skins.
[ good ] /dev/cdrom points to /dev/hdd
[ good ] /dev/dvd points to /dev/hdd
[ good ] DMA is enabled for your DVD drive
[ good ] found xvinfo: X-Video Extension version 2.2
[ good ] your Xv extension supports YUV overlays (improves MPEG performance)
[ good ] your Xv extension supports packed YUV overlays
[ good ] Xv ports:  YUY2 YV12 UYVY I420 YUY2 YV12 UYVY I420
[barry@redhat barry]$
```

After the compilation is complete, run Xine again and you will see there is an extra button on the interface labelled 'Nav', as seen in screenshot 7. If you click this button and try playing a DVD, you might find it partially works before giving up and freezing. The problem now is that the DVD is encrypted, but the DVDNav plug-in has no way to decrypt it.

DVD decryption

Most commercial DVD videos use a weak encryption system known as CSS (Content Scrambling System), supported by the US film industry. These DVDs can't be played without first decrypting them, and industry-approved players are licensed to do this. It wasn't at all long before the encryption was broken (by a 15-year-old Norwegian lad) and the 'DECSS' program he created was distributed all over the Internet, making IT news worldwide. See www.theregus.com/content/archive/23633.html for some further information.

Since DECSS was unleashed, many other utilities have appeared to decrypt DVDs. But the legality of the whole situation is completely unclear (see also Straight talking page 47), so most companies do not distribute any of these utilities. Few people believe that watching a DVD they've purchased – and are therefore legally entitled to watch – is either illegal or is bringing the US film business down, and quite happily do so. Earlier this year in Oslo, the court case against the Norwegian teenager ruled in his favour, giving DVD 'hackers' another ray of hope.

The Xine website states: 'No-one knows exactly if it is actually illegal anywhere in the world to write, own and use software for viewing encrypted DVDs. But as this is an unclear topic (that seems potentially very dangerous), xine does not contain any specific code for decrypting DVDs. It seems, however, that third parties are working on such extensions.'

Indeed they are! The DVDNav plug-in will search for the 'libdvdcss' library at runtime to decrypt DVDs. You can find this library's source code at www.videolan.org/libdvdcss/download.html. Download and extract the archive, and run the configure script as shown:

```
# CFLAGS="-march=<cpu> -O3 -fomit-frame-pointer" ./configure
# make
# make install
```

Run Xine again and watch your DVDs. Check the Xine website for documentation and performance tips.

Check out this month's cover disc for six Linux utilities, including some mentioned in this column.

The Xine interface with the DVDNav plug-in enabled

SCREENSHOT 7

CONTACTS

Barry Shilliday welcomes your comments on the Linux/Unix column. Email him at: linux@pcw.co.uk. Please do not send unsolicited file attachments.

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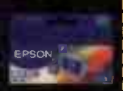

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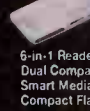

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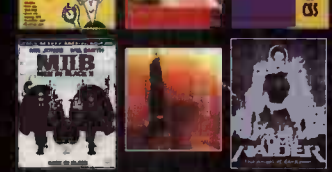

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Tim Nott
is a full-time freelance journalist. When he's not writing about Windows and word processing, he tackles many other diverse subjects. He currently lives in France with his wife and family

Getting active

Get to grips with activation, and polish up your table manners

If you are using Office XP, then unless you're a very new user or your company buys volume licences, you will have 'activated' the product, either online or by a telephone call. You don't have to do this immediately after installation, as you have 50 launches before Office goes into what Microsoft coyly refers to as 'Reduced-Functionality Mode' (RFM). This might more frankly be described as 'Bleeding Useless Mode', as it prevents you from creating new documents or saving changes to existing ones.

Activation does not require you to provide any personal information – though you can voluntarily register the product in order to 'receive information about product updates and special offers directly from Microsoft'. The company states that 'No information is ever loaned or sold to third parties.' All in all, activation is generally painless, but there have been some horror stories, including that of the user whose laptop went into RFM on a long-haul flight.

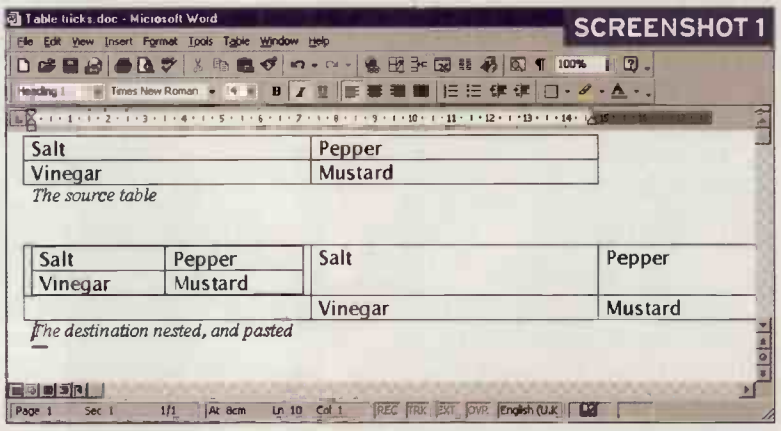
The purpose of product activation is to stop casual copying, by taking a 'snapshot' of the hardware on which the product is installed. So if you change your PC, or even make substantial upgrades to your existing one you will have to reactivate.

There are a couple of relevant points here. If you have bought a retail copy of Office XP then you are allowed to install it on your desktop PC and on one laptop computer. You can't, however, do this with a pre-installed (OEM) copy of Office XP, or with Windows XP.

The question of 'substantial upgrades' is also rather complex. You can, for example, add a second hard disk, more memory or change your display card without having to reactivate. The hardware identification key works on a points system: there must be seven matching points in order to avoid reactivation. To further complicate matters, a network card for example, counts for three points, so only four other components need to match. Microsoft relaxed the hardware conditions somewhat – and tightened up elsewhere – in last October's Product Activation Update, available as part of Service Pack 1 or as a standalone.

If you reinstall Office XP to the same PC, then you shouldn't need to reactivate, unless you have wiped the hard disk. If you are planning to do the latter, then you can avoid reactivation by backing up the file C:\Documents and Settings\All Users\Application Data\MicrosoftOffice\Data\data.dat, and then copying it back after reinstallation.

Extend or nest tables in Word



Using graphics in tables

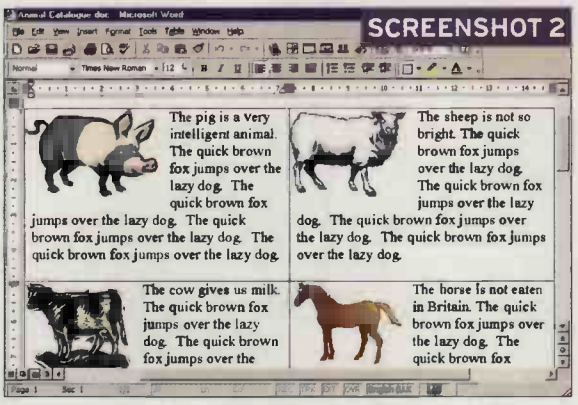


Table manners

Here are a few neat tricks you can use in tables. You probably know that you can sort a table by any column, in a variety of alphabetical or numerical ways. If you get a message that the table can't be sorted as 'all the rows are table headings' then you need to turn off 'heading rows repeat' from the table menu. This has no effect on the contents of the table, but in Print Layout view or the printed page the column headings repeat on each new page.

If you want to move a single row up or down, there's a much easier way than selecting and dragging it. Put the cursor anywhere in the row you want moved, hold down the Shift and Alt keys, and use the up and down arrow keys to move the entire row. Note that this doesn't work for columns, as the Shift & Alt & sideways arrow keys are used elsewhere for demoting and promoting outline levels.

Copying and pasting between tables can be a tricky business, but here's how it seems to work in XP and 2000. Let's say you have copied a 4 x 4 block of cells to the clipboard, and you want to insert them into a second table. If you then place the insertion point in a cell in another table and press Control & V, then the four cells will be pasted. These will overwrite the contents of the cells immediately to the right and below. If the destination cell is at the right or bottom of the table, then new cells will be created to hold the clipboard contents.

If you select, for example, two horizontally adjacent cells in the target before pasting, then only the top two cells will be pasted in. If you select a single cell, then a 'nested' table will be inserted into the selected cell (see screenshot 1). You can also use the 'Paste as nested table' on the right-click menu.

Finally, don't forget you can insert graphics into tables, and wrap text around them just as with regular text, which can be used in everything from illustrated catalogues to teaching aids (see screenshot 2).

CONTACTS

Tim Nott welcomes your comments on the Word processing column. Email him at: wp@pcw.co.uk. Please do not send unsolicited file attachments.

Stephen Wells
is a freelance journalist and a regular contributor to computer magazines. He's been writing *PCW*'s Spreadsheets column for many years. A US citizen, he now resides on the Essex coast

Making plans

How to calculate budgets in Excel in preparation for some room renovation

At this time of year, when the daffodils are shooting up from below, and the leaves are sprouting in the trees above, the typical homeowner may be totalling budgets on a spreadsheet with a view to a little renovation.

What is not always obvious is that Excel, Lotus 1-2-3 or Quattro Pro are quite well suited for running off a handy graph sheet for room planning. All you need is for the cells to be squares. If each square is considered to be 10 sq cm, you're off and running.

Creating the squares is particularly easy in Excel. Point between the column letters and row numbers and the width of the columns, and the height of the rows are fortuitously shown in pixels.

Select Options, View on the Tools menu and you can choose to have the gridlines printed and select their colour. One metre squares can be added under the Border tab of the Format, Cells dialogue box. Once you've taken a few measurements in the room itself, walls can be faithfully indicated by formatting the background of cells under the Patterns tab. Doors and windows can then be drawn in with the Line tool on the Drawing toolbar. Kitchens are particularly easy to plan because they invariably use rectangular modular units in standard sizes, as shown in screenshot 1.

Where each appliance is intended to be is indicated here in the compact font, Gill Sans MT Condensed. You can doodle around until you have what you want and then print out your floor plan.

Readers' tips

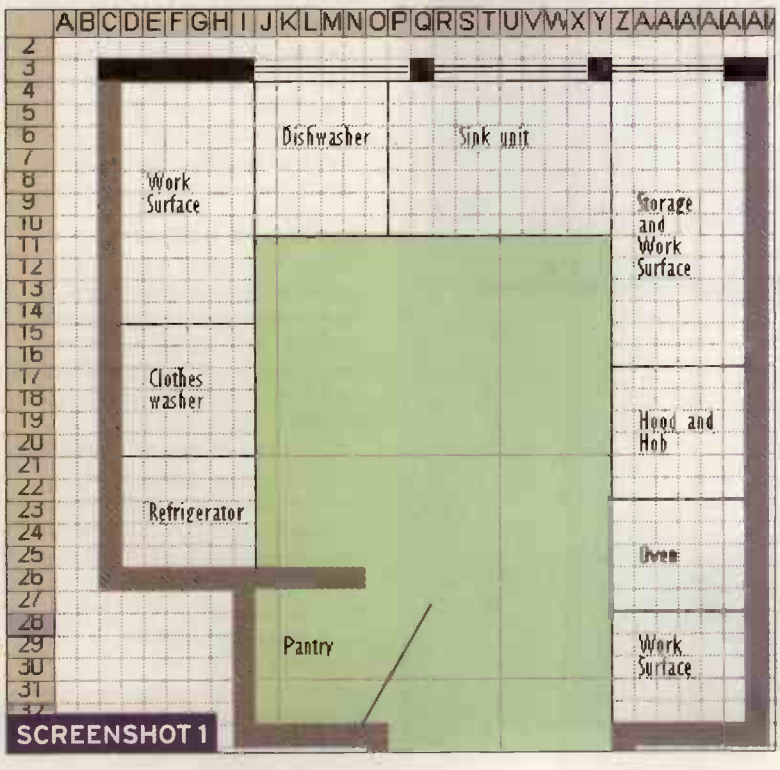
Chris Rudd points out that if you have a formula in Excel which refers to another file, pressing Ctrl & [(left square bracket) will open the source file and highlight the exact cell. Actually, to expand on this shortcut, supposing you have the formula =SUM('D:\Accounts\[Exps2003.xls] Sept Exp'!AI53,Z1) in a cell then Ctrl & [opens the file Exps2003.xls and goes to cell AI53 on worksheet Sept Exp. But if instead you press Ctrl & Shift & [, the focus will jump to cell Z1 on the current worksheet.

Other readers have mentioned these helpful features of Excel. If you want to quickly create a column of weekdays only (meaning a series of dates without Saturdays and Sundays), enter the starting date in a cell, hover the mouse pointer over the bottom right-hand corner of the cell until it changes to a cross, right-click and drag across the row, or down the column. When you let go, a short menu will appear, and one of the options is Fill Weekdays. Choose that and the job's done. Incidentally, Excel calls that little black cross the Fill Handle.

If you have a column of entries which has some empty cells in it, it's easy to fill in the blanks with the entry immediately above. The column can be of numbers, or text or mixed. There might be individual empty cells or several consecutive rows but this will still work. Click the column letter – this highlights the column, then press Ctrl & G. Choose Special, check the Blanks option, then click OK. Then in individual actions enter = (the equals sign), the up arrow and then Ctrl & Enter.

When I have wanted to replace a formula with the calculated value I have always right-clicked on the cell and chosen Copy, right-clicked again and chosen Paste Special and then Values. However, a nimble-fingered reader has suggested choosing the cell or range with the formulas, then hovering the pointer over any border until the mouse pointer changes to an arrow. Right-click and drag to the next cell, then, still holding the right mouse button down, drag back to where you started and release. Select, Copy here as values only. If you're deft you won't end up with the values in the wrong cells.

Normally if you want to hide a Comment you choose Tools, Options, View, Comments, None. But one reader suggests using the undocumented N() function. Its purpose is to make Excel compatible with other spreadsheets which don't automatically convert values to numbers. So you can include notes in a formula like =SUM(D1:F1,N("Last year's Sales")). If you turn off in-cell editing under Tools, Options, Edit, Settings the reminder can only be read in the Formula Bar – and that can be concealed via the View Menu.



SCREENSHOT 1

A spreadsheet creates natural graph paper on which you can draw a kitchen floor plan

CONTACTS

Stephen Wells welcomes your comments on the Spreadsheets column. Email hims at: spreadsheets@pcw.co .uk. Please do not send unsolicited file attachments.

Ken McMahon
became a freelance journalist after he experimented with graphics on a Commodore 64. In 1987 he bought an Apple Mac Plus before founding Pelican Graphics, and hasn't looked back since

Eye lands in the stream

Ken McMahon plunges into the deep but extremely refreshing waters of video streaming

Starting this month, what used to be the Hands on Graphics and DTP column is taking a new name and direction. In addition to all things digital in the imaging sphere, I'll also be covering digital video.

It's an interesting time for digital video and the potential for doing exciting things with moving images is fast being realised. It's also a technical minefield, with potential pitfalls every step of the way. What are the recommended system specifications for DV capture? What's the best option for realtime DV editing? What's the best Codec to use for web video? In future columns I'll be answering these and other questions, as well as looking at all aspects of DV editing from a practical perspective.

In the coming months I'm going to be having a whale of a time, sorry, hard at work capturing digital and analogue video from a variety of sources, checking out realtime editing hardware like the Matrox RT.X10 and Pinnacle Pro One, finding out the best options for authoring DVDs, and looking at every aspect of digital video editing and production.

It wouldn't be Hands on without your feedback. Over the past few months the Hands on mailbox has seen a steady increase in DV-related questions, so keep them coming and if you have any suggestions for things you'd like to see covered in the column, let's hear them.

Stream it

This month I'm going to kick off with a look at encoding video for web delivery. I've been experimenting with the Release Candidate version of Microsoft's Windows Media Encoder 9 and have been quite impressed with the results, more of which later.

Of course, there's no reason you can't encode video clips in any format you like and upload them to an HTTP server. Provided visitors to the site have software that supports playback of the files, they can download and play them locally.

But there are many advantages to using a codec designed specifically for web delivery, not the least of which is the ability to stream files to the client machine thereby enhancing the speed of playback.

As well as enabling playback during download, streaming provides scalability and adjustment of playback quality depending on the bandwidth of the connection. The streaming media market is currently a three-horse race between Microsoft, with Windows Media, Apple's Quicktime and Real Networks.

All three technologies provide intelligent streaming, which constantly monitors the connection and switches video streams to take account of changing network conditions, providing the best quality video and audio at any given moment. When things get really bad and the connection is incapable of supporting even the lowest quality stream, video frames are dropped to improve performance.

All three technologies require a dedicated streaming server to support realtime streaming. In Microsoft's case it's Windows Media Server; Real Networks Realvideo streaming uses Real's new Helix platform; and Quicktime utilises Apple's Quicktime Streaming Server (QTSS). Apple distributes an open-source version of QTSS called Darwin Streaming Server, which runs on Linux, Solaris and Windows as well as MacOS X, and Real provides a free download of the Basic version of its Helix Universal server, which has a capacity throughput limit of 1Mbit/sec. There is some cross-platform support – Helix, for example, can deliver Quicktime and Windows in addition to its native formats.

You can deliver all three formats from an HTTP server, but you'll get none of the benefits of streaming, though both Windows Media and Quicktime offer good progressive features. If you're restricted to an HTTP server then Quicktime is your best bet. Quicktime progressive streaming uses alternate video files and delivers the most appropriate, depending on settings in the user's Quicktime settings control panel.

The use of alternates is not confined to connection speed: you can also specify alternates for language, platform, CPU speed and Quicktime versions, as well as a fallback movie or still image that displays in the event of none of the requirements being met for playback of any of the alternates. For example, if all of your alternates are Quicktime 6, the fallback image might be a jpeg with a message that the user needs to download the Quicktime 6 player to view the movie.

Cleaner EZ does a disappearing trick – but though it's gone, it's not forgotten

Software options

Viewers for all three formats are free and tools for producing streaming video are becoming just as readily available. Both Microsoft and Real Networks offer encoding tools as free downloads and Apple's upgrade to Quicktime Pro is only £25.

Most of the budget DVD authoring packages on the market provide presets to create files in all three formats, though none provides the kind of encoding control you need to take advantage of the best features of realtime streaming.

It's a bit early in the day to say what kind of impact mpeg4 is going to have on the streaming market. Apple has been making much of the fact that mpeg4 is based on the

Quicktime format, and is hoping that the mpeg4 standard will help give it the edge over Microsoft in the battle for the streaming video market.

One of the big attractions of mpeg4 is that, unlike its predecessors, it supports a huge variety of specifications and features, making it suitable for content delivery on all kinds of devices from mobile phones to the web, DVD and HDTV.

The release of Quicktime 6 was held up early last year because of uncertainties over licensing terms. MPEG-LA, the group of mpeg4 patent holders responsible for the terms, was proposing uncapped fees on either a per-subscriber or per-hour of content basis for service providers streaming mpeg4 content.

In the event, MPEG-LA capped the fees at $1m per year and scrapped them altogether for services with fewer than 50,000 subscribers and Apple released the final version of Quicktime 6 in July last year. In any case, these fees only apply to webcasters earning revenue from subscriptions, pay-per-view or advertising – so those who merely want to upload a modest quantity of video or who aren't charging viewing fees need not worry.

There are also quality issues with mpeg4. The results so far suggest that there's some work yet to do if mpeg4 is to match the quality of output that can be achieved using existing proprietary codecs and, unless you're already committed to Quicktime, wait-and-see is the policy I suggest you adopt.

Keeping it clean

Adobe Premiere 6 included the Cleaner EZ plug-in, a cut-down version of Discreet's Cleaner 5, which is a must for anyone who wants to encode video in all three streaming formats (see screenshot 1).

The Cleaner EZ plug-in allows export directly from the Premiere timeline, so you can export only the work area or an entire project. It's as good a way as any to prepare video for emailing as well as web delivery.

Windows Media Encoder's wizard makes the whole video-encoding process a breeze

Cleaner EZ has a wizard-based interface that provides presets for encoding in all three streaming formats. However, on installing Premiere 6.5 I was dismayed to discover it has disappeared from the export menu.

Discreet has discontinued Cleaner EZ and Adobe has likewise quietly dropped it from version 6.5 of Premiere. In desperation I installed the Cleaner plug-in in the Premiere 6.5 plug-ins folder, but it hung on launching, which means I have to revert to using Premiere 6.0 if I want to hang on to EZ – not a very satisfactory state of affairs.

One option is to upgrade to the full version of Cleaner 5, which in any case provides much greater control over the encoding process. Cleaner 5 costs £526.35 inc VAT, an investment that only those with more than a casual involvement with streaming media are likely to consider justified. But if you plan to encode a lot of streamed content and deliver in more than one format, Cleaner provides everything you're likely to need in one box. You can download a 30-day trial from **www.discreet.com**.

Windows Media Encoder

There are less expensive alternatives. You can download Windows Media Encoder 9 Series Release Candidate from the Microsoft website at **www.microsoft.com/windows/windowsmedia/9series/encoder**.

One of the broader claims that Microsoft makes for the new codecs is that they give a 15-50 per cent improvement in quality over wmv 8. New features include surround-sound support, Variable Bit Rate (VBR) audio, an improved codec for screen capture and a new mixed-mode voice and music codec optimised for low data-rate streaming.

Windows Media Encoder is certainly easy to use. As well as the conversion of existing files it also has a DV-capture module, so you can capture and encode in one fell swoop. Wizards are provided for these tasks and other likely streaming scenarios, such as a live broadcast or screen capture (see screenshot 2).

On finishing the wizard you can launch straight into the encoding process or review and edit your choices in the encoder's tabbed panel interface.

The first thing you need to do is change the video format to Pal in the options panel, or all of the template sizes and frame rates default to NTSC. The wizard first offers a variety of content distribution profiles including direct playback from the hard drive, CD and DVD, streaming download from a Windows Media Server and progressive download from an HTTP server. You're then given further quality options for both audio and video, some of which provide more bit-rate setting options.

For example, the progressive download category provides seven video-quality settings ranging from

high definition through DVD and VHS, and including screen capture, full screen and film content options. If you choose the DVD quality option with CD quality audio there are two further bit-rate options of 2,073Kbits/sec and 1,073Kbits/sec, both at 25fps (frames per second) and, oddly, 768 x 576 resolution.

Given that there are few people with a connection capable of sustaining 1Mbit/sec transfer rates, the more conservative VHS-quality video with CD-quality audio would be more suited to an ADSL connection. This offers 300 and 400Kbits/sec options at a resolution of 384 x 288 (changed to 360 x 288) and 25fps (see screenshot 3).

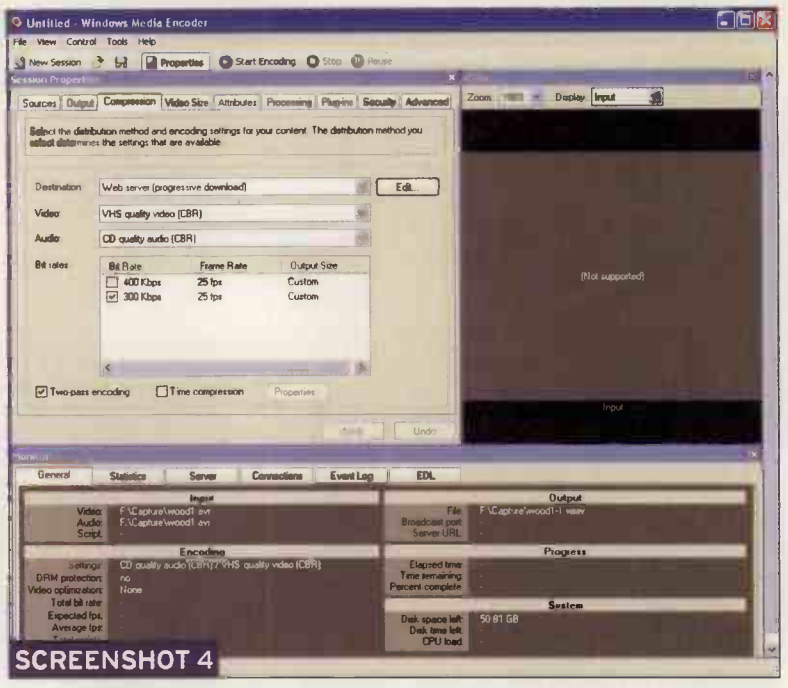
Having finished the wizard you can tweak the settings in the Properties tab of the Media Encoder interface. Encoding is far from swift, with a 12-second clip taking one minute 42 seconds to encode – eight times real time, though to be fair this was on a 750MHz Sony Vaio notebook.

Comparing what I've encoded so far with previous wmv files encoded with Cleaner EZ, I'd say that there's a definite improvement in quality for same-sized files. In general I keep clips short – around a minute or so in length. Using the progressive option with a target bit rate of 300Kbits/sec, 12 test files of 12 seconds duration were compressed from 44MB to around 600KB, which works out at around 3MB per minute for half-sized video (see screenshot 4).

In quality terms, video produced at these settings is not perfect, but surprisingly good and it stands up to comparison with content produced using professional codecs such as Sorensen's SV3 two-pass variable bit rate Quicktime codec, which has been the standard to beat for more than a year now.

Windows Media Encoder 9 is so good I'm beginning to get over the loss of Cleaner EZ, though it doesn't

Windows Media Encoder compression options vary according to the distribution method chosen



SCREENSHOT 4

provide the means for encoding in either Quicktime or Real formats. Quicktime 6 Pro is a small investment for anyone who wants to take advantage of Quicktime's superior progressive streaming features as well as new features like 'instant on', which provides immediate playback as well as realtime timeline scrubbing.

Like Windows Media Encoder, Real Networks' Helix Producer Plus offers Firewire live capture, file-to-server live broadcast, surround-sound support, batch processing and templates with customised encoding parameters. At around £125 ex VAT ($199.95) it's the most expensive of the three, but there is a basic version available as a free download from www.realnetworks.com.

Motherboard upgrade

Over the course of the next month, with a little help from my Hands on mate Gordon Laing, I'll be upgrading a PC that will serve as my realtime video-editing platform for the foreseeable future. I've finally decided that I can't live without realtime DV editing for a moment longer – well no longer than it takes to remove the Abit KT7 motherboard and replace it with one that's compatible with Matrox's RT.X10 realtime card.

Both the RT.X10 and its big brother the RT.X100 don't like the Via KT133A chipset on my current motherboard. So, if you're thinking of buying a Matrox realtime card it's worth checking out www.matrox.com/video/support/rtx10/rec to confirm system compatibility.

In addition to the new processor and motherboard, I'll take the opportunity to replace Windows 98SE – the first Windows OS to support Firewire capture, but now looking rather long in the tooth – with XP. I'll also be reformatting the hard drives to NTFS so I'll no longer need to worry about the Fat 32 4GB file size limit, taking advantage of rock-bottom memory prices to go for some serious Ram expansion and investing in a DVD rewriter, possibly the Sony DRU-500A reviewed by Gordon in the January issue. Come to think of it, about the only thing I won't be replacing is the power supply. I'm hoping that it will be an enlightening experience and one you can all share.

If you want to learn more about video editing and get some hands on experience of realtime hardware in action, Matrox and Adobe are currently running day-long DV master classes at Adobe's UK HQ in Stockley Park, near Heathrow airport.

The classes cover planning, shooting, pre-production, editing and output to the web and DVD (a lot to fit in a day) and are aimed at those with a little previous experience of DV editing. The cost is £99 ex VAT. There's also a half-day course for beginners, covering capture, editing, titling and output, which is free. Find out more at www.matrox.com/video/academy.

Results of playback in actual size (360 x 288, 25fps) at 300Kbits/sec in Windows Media Player 9

SCREENSHOT 3

CONTACTS

Ken McMahon welcomes your comments on the Digital imaging & video column. Email him at: digitalimaging@pcw.co.uk. Please do not send unsolicited file attachments.

Guy Kewney
has been reporting on all aspects of IT since long before the first personal computers arrived on the scene. He now believes the wireless revolution will change the world

Moved to tears by not so smart displays

Will smart displays be all the rage soon? And how fast do you think a 54g device will go?

Nothing in IT is as interesting, exciting, or as likely to change the world, as the mobile revolution. It is the revolution which many of us dreamed about at the start of the personal computer era, whereby we would get computing power, and data storage, and communications, wherever we went.

Words that mean things today are about to become meaningless. 'Storage', for example – today it means disk space. In a decade, it won't mean a thing because you simply won't know where any of your data is held. It might be in a handheld device, an Internet cache, or on a hard disk at your house or office or bank. When you access your data, you won't be able to tell where it comes from. There will just be 'data' – including music, films, security checks, money and identity.

It's going to be an exciting few years ahead in mobile computing, and I aim to tell you what excites me about it, through this column. In return, I hope you'll write back and tell me what you find interesting, or puzzling, or mad, or dangerous. But it will all be based on real things; things you can buy, or build, or assemble, or hire, or use. Above all, I hope, we're going to have fun!

Smart displays

Look at the following scenario from Microsoft's point of view. You're thinking of buying a flat-panel TFT display for your PC. You had decided to do so because that old CRT just takes up too much space. So why not go for a top-of-range smart display that Microsoft and partners have developed? They're not just neat and flash, but portable, too!

Yes, you can now carry your main computer display around the house. When you're fed up with sitting on your own in your spare room, you can join the family. Perch on the sofa, watching the latest soap shocker, pretending to be one of the gang, secretly swapping notes over Yahoo Messenger with a friend, discussing how naff it is.

Inside the smart display, now available from several suppliers (ranging from Viewsonic to Philips) you have, in effect, a Pocket PC. It has an Intel Xscale processor or equivalent ARM chip, with a fair bit of Ram and the ability to drive a high-resolution display. It is essentially a Windows CE device.

Viewsonic's Airpanel V150 gives you mobility within the home via a Wifi connection to your XP machine

But what appears on its display isn't generated from local software. Instead, the display uses the Remote Display Protocol (RDP) built into Windows XP. It's a sort of descendent of PC Anywhere or Laplink, and essentially a remote control system.

Normally, the RDP output from your PC would be sent over a wire across the Lan to the controlling system. Here, it goes over Wifi wireless to the display on your lap. A pen enables you to select things. You can browse the web, and even (everybody at Microsoft says this) take it into the kitchen and look up recipes. Whatever you do, what you see on the screen is what you would see on the primary display.

This is where the smart display idea currently falls down. If you're sitting at your desktop PC, trying to get some work done, and your partner decides to consult a recipe, one of you is going to have to give up control. Two people can't use the same machine at the same time.

The reason for this isn't technical, it's Microsoft wearing copy-protection blinkers. When you buy XP Professional, you get one user licence. So if two people try to use the PC at the same time, you break the licence, so Microsoft won't let you.

You can carry smart displays around the house but are they as clever as they seem?

These smart displays aren't cheap either. You're looking at around £625 for a pretty ordinary 800 x 600 10in display. Viewsonic's Airpanel V150 (pictured) comes in at over £800. You can easily pay twice that for something like the Philips device, with a portable (wireless) keyboard. So ask yourself: if you were buying a TFT display, say at around £400, and you were paying twice that, or more, for a smart display wouldn't you expect, at the very least, a second licence for XP? What would it cost Microsoft? How many sales of Win XP would be 'lost'?

And what makes it worse, is that the mobile screen won't do a lot of things which it could do, if Microsoft had used a different protocol.

For example, if you're watching a DVD on your PC, RDP can't transfer the images to your smart display. If you want to play a game with fast video – or any video for that matter – you won't be able to.

When people discover that their smart display can simply go dead, without warning, because someone wants to use the primary display, there will be cries of rage. For the sort of money you can pay for a smart display, you may just as well get a really powerful notebook computer. For an extra couple of hundred quid, you can get a Tablet PC. It will do everything the smart display does, but it will also be capable of functioning when you get it out the door of the house. And it will also run the amazing Tablet Journal software.

Microsoft must know this: it is now working on a version of smart display that is functional on its own. It will have Pocket PC Phone edition software on it, with data storage, synchronisation with the main PC, diary, phone book, and so on. This simply underlines how useless the current one is.

Using an Airpanel V150

In action, there are a couple of little niggles with the design of the V150. In theory, the wireless just uses a spare channel on 802.11b. In practice, it can get a bit more complex.

Using the V150 as the primary display for a standalone PC, there is pretty much nothing to go wrong. The display sits in its cradle and the

cradle plugs into the standard graphics port on your PC.

When you want to start carrying it around, you plug in a USB adaptor, which allows you to place the antenna wherever reception is best. Then you run the setup software, which finds the wireless unit in the display, and establishes a link with it. Take the display out of its stand, and you'll be given the opportunity of logging onto the PC remotely. An on-screen keyboard appears so you can type in passwords.

However, at this point you have to make a choice, because what happens if you stick a wireless adaptor onto a PC? Well, if you're running Windows XP, it will look for any wireless Lan (Wlan) in the area.

Once the software detects that, you have the option of setting up a different link between computer and display. Instead of the PC talking direct to the screen, you can communicate across the WLan.

But, of course, you may not want the PC to connect to the Lan by wireless – you may well want to connect it to your ADSL router, by cable. There is a trap sitting here for the unwary: make sure you don't accidentally trigger the Internet Connection wizard, because it will assume that you want to use ICS (Internet Connection Sharing) and start issuing IP addresses to other PCs on the Lan. Normally, your ADSL router will issue the addresses, but if it sees another DHCP server on the network, it will stop doing DHCP (Dynamic Host Configuration Protocol) itself. The resulting mess of conflicting IP addresses could take a fair bit of unscrambling.

Smart displays work surprisingly well, but the price is way too high for mass market adoption, and Microsoft has to solve the problem of users who want to run two displays.

Newer, faster 11g

Fancy a five-times faster wireless network? A network running at 54Mbits/sec? No, we aren't talking about the official successor to Wifi, the Wifi 5 standard of 802.11a.

In January, several wireless equipment makers moved into their own version of the next era with a standard called 802.11g. Officially, it runs at 54Mbits/sec, compared with the 11Mbits/sec of Wifi. Yet reality, as so often, is going to be disappointing.

The 11g standard itself is unlikely to be ratified before the equipment appears. Not to put too fine a point on it, the Wifi Alliance won't start certifying 11g-compliant products for another year.

Check out the 54g promotional organisation

However, one chip maker – Broadcom – has jumped the gun, and will be very quickly followed by all the others. It has enough customers that it reckons it can turn its chip into a standard of its own.

The new 11g standard has been dubbed 54g and now has its own promotional organisation (www.54g.org) and its own logo (see screenshot 1). A Frequently Asked Questions (FAQs) list has also been published on my mobile campaign site (www.newswireless.net/articles/021218-logo.html) to attempt to inform and reassure buyers.

Backward compatibility

The advantage of 54g is simple: faster networking today, on a worldwide frequency standard. Best of all, your current Wifi equipment doesn't need to be thrown out – 54g works exactly the same as Wifi. So if you have a laptop, say, with wireless built into the motherboard, it just carries on working with the new 54g access point. Any new 54g equipment will run at the higher speed.

'Smart displays work surprisingly well, but the price is way to high'

The drawback is that it isn't yet classified as a standard, and it may not run as fast as people think it will.

Theoretically, Wifi runs at 11Mbits/sec. But it's a shared-medium networking system, and there are control protocols and packet headers. Consequently, you will never get more than 5Mbits/sec useful throughput out of it. By the same token, 54g will never allow you to transmit or receive data faster than about 22Mbits/sec – less than half the promise its name would suggest.

And that's on a good day, standing right next to the access point! With the access point upstairs, a couple of Bluetooth devices in the area, and an ordinary Wifi system sharing the network, it all changes.

Whenever an ordinary Wifi device is using the network, the whole network slows down to 11Mbits/sec. The 54g system can't run at both speeds simultaneously. Of course, the Wifi device may well not be broadcasting all the time – if it leaves air-time free, the 54g network will speed up for a short burst of 54Mbits/sec data. But if you are streaming music over the network to your Wifi-equipped notebook, then the whole network will run at around 5Mbits/sec, not 54Mbits/sec as you may have been dreaming.

That isn't the end of the bad news, either. The Wifi Alliance hasn't yet approved a standard for inter-working for 54g devices, and won't do so until the 802.11g standard is finally ratified by the IEEE.

Broadcom is pretty optimistic that this isn't a problem. The answer it gives to the question 'Is 54g certified by the Wifi Alliance?' is both no and yes. '54g is certifiable by the Wifi Alliance as an 802.11b-compliant product' is the first point. That's true enough – 54g devices look, behave, and appear to be perfectly ordinary 802.11b products when used with an 802.11b Wifi product.

Broadcom adds: 'Ultimately we expect it will be certified as an 802.11g product as well.' That, frankly, is a pious hope. It may be true; it may not be. The Wifi Alliance will wait for the next annual test cycle after the 802.11g standard process is completed before certifying interoperability.

In Broadcom's favour, it is promising to upgrade customers who go for 54g, if the Wifi standard has significant differences.

And the 54g alliance has all the big players, who are determined to have a working product in place, with first products shipping in the coming months – which means that they can be pretty sure that any quibbles from the Wifi Alliance will be irrelevant in the real world.

So you probably aren't going to take a big risk by buying 54g products now, instead of waiting for approval. But there is a risk, and there are drawbacks. Take them into account before spending money.

CONTACTS

Guy Kewney welcomes your comments on the Mobile computing column. Email him at: mobilecomputing@pcw.co.uk. Please do not send unsolicited file attachments.

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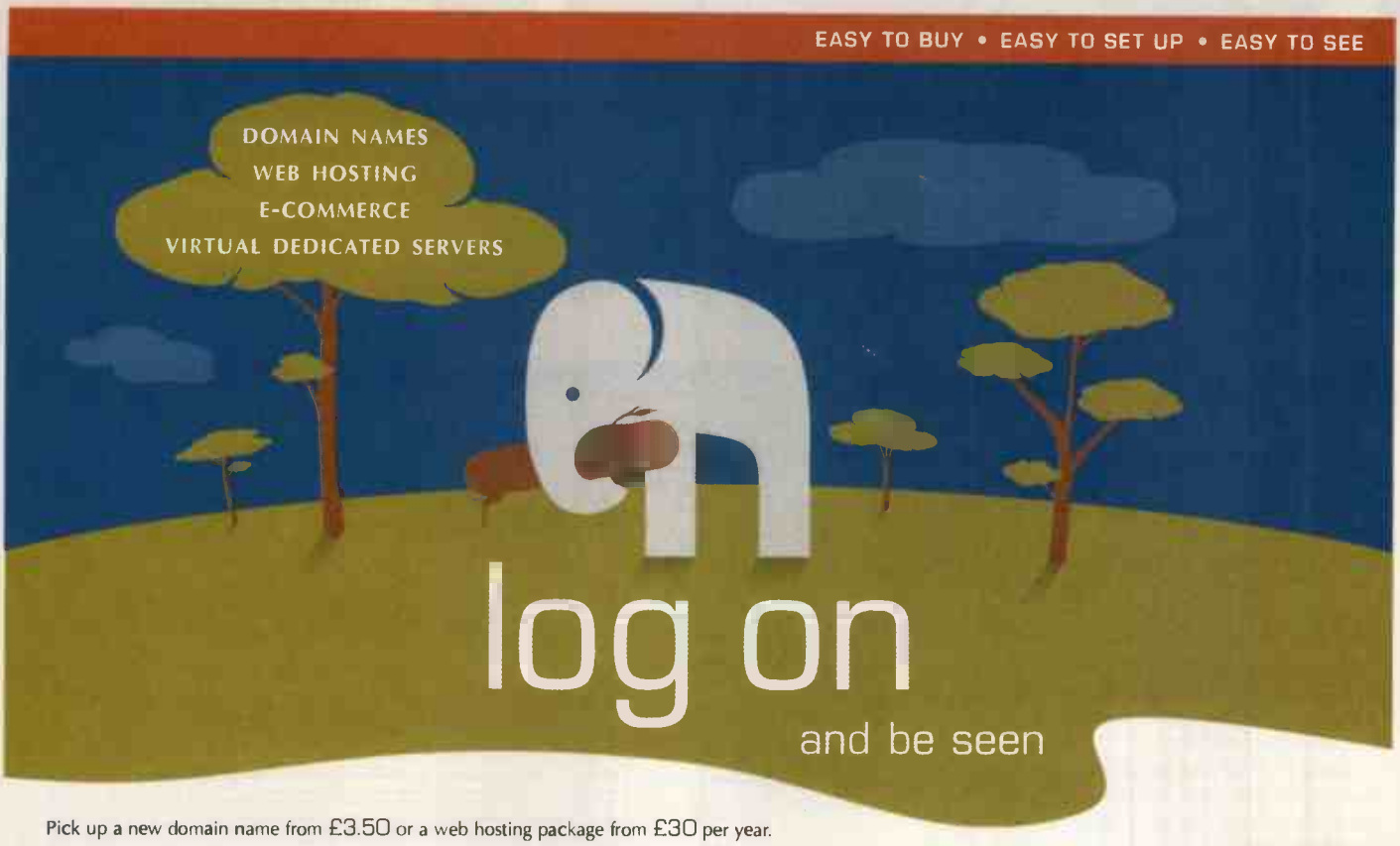

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Niall Magennis
has been dabbling in Midi and digital audio since the days of the Atari ST. He writes on a freelance basis for a number of music magazines and lives in London in a flat overrun with music equipment

Chopping and changing

The free and easy route to recording and editing music on to your hard drive

We get tons and tons of complaints here at *PCW* about poor Windows Sound Recorder and its limitation of only allowing you to record 60 seconds of audio before it stops dead in its tracks. Most of the people who want to record longer sections of audio shouldn't even be thinking of using Sound Recorder, so this month we're going to look at how to record as much audio as your hard drive can cope with, and then how to edit out the bits you don't want.

Audio files take up a relatively large amount of disk space so Microsoft probably limited Sound Recorder to 60-second snippets of audio to prevent people from leaving the recording function running for really long periods of time and unwittingly filling up their hard drive with huge files.

You can get around Sound Recorder's limit with a bit of lateral thinking. Start by muting your microphone input and then click Record and let sound recorder run for 60 seconds. After Sound Recorder stops recording, click Save as on the File menu, and name the file silence.wav. Now to increase the maximum recording time click Insert File on the Edit menu, and insert the silence.wav file that you've saved on your hard drive. When you do this the maximum recording time is increased by 60 seconds.

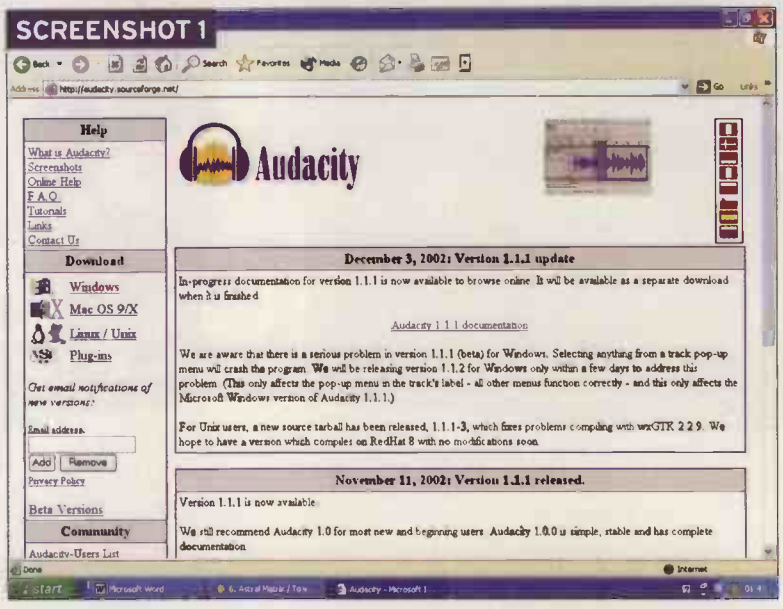
You can repeat this step once for each extra minute of recording time that you want to add. For example, to get 10 minutes of recording time insert the silence.wav file 10 times. Easy peasy. Well no, not really. It's all a bit of a hassle and once you've got your long and cumbersome wav file you have no real way of editing it to trim silence from the start or the end.

You see there's another reason Microsoft doesn't want you to use Sound Recorder for longer audio files, and that's because it doesn't have the tools needed to cope with large audio files properly. For that you're going to have to get your hands on a real audio editor.

'What, more software,' you say, 'I wanted to use Sound Recorder because it was free!' Well, don't worry: there are tons of absolutely free audio editors available for download on the Internet, ranging from advanced packages with extremely in-depth features to very simple editing packages that are designed for those who just want to record some songs off CD, tape or radio and trim out unwanted speech or hiss at the start and end of the file.

Audacity is available free on the web and is regularly updated

SCREENSHOT 1



Audacity

If all you're after is something to top and tail audio recordings then one of the best downloads is Audacity. This is a completely free piece of software created by the open-source community (see screenshot 1). It's got lots of features but the interface is very clear and simple, so the software is ideal for those new to audio editing. You can grab it from **http://audacity.sourceforge.net**.

SCREENSHOT 2

When you hit the Record button, the waveform for the recorded audio will gradually appear on screen

Audacity is regularly updated and new features are being added all the time, but it already has loads of really useful tools built in as standard. It's only a 1.6MB file so it doesn't take too long to download even on a 56K modem. Once you've downloaded the file it's simply a matter of clicking on it and following the install prompts to get it up and running on your system.

Now you've got the software installed we can begin by looking at how you record an audio file using Audacity. First of all we need to change some default settings. Audacity is set by default to record mono files. Of course if you're trying to grab audio from CD or a radio connected to your computer's sound card you'll really want to record in glorious stereo.

This default can be easily changed by going to the File Menu and then selecting Preferences. Click on the Audio I/O tab if it's not already shown and tick the box marked 'Record in Stereo' and then click OK to return to the main screen.

As well as recording in either mono or stereo, Audacity also has the ability to record at different bit rates. Basically bit rates are different levels of recording quality. Normal audio CDs are recorded at a bit rate of 44.1KHz, so if you think of 44.1KHz as CD quality and then work downwards, 22.2KHz is half CD quality and sounds a bit like AM radio and 8KHz is about the quality of a

SCREENSHOT 3

You'll probably find that your audio file has some silence at the start and end that you'll want to top and tail

telephone call. Higher bit rates contain more audio information – that's why they sound better – but they also take up more disk space. For the vast majority of recordings you'll want to record at 44.1KHz.

However, if you want to make smaller sized recordings for a web page and don't want to use a compression scheme such as MP3 or Real Audio then it's generally a good idea to drop the bit rate to reduce the overall file size. At the bottom left-hand corner of the main Audacity screen you'll see a box marked Project Rate. Clicking on this box allows you to select different bit rates for your recording, but for our purposes we want to leave this at 44.1KHz to record at CD quality.

You can start recording at any time by just clicking on the big red recording button. It's that simple. As sound is being recorded you'll see the waveform for the audio gradually appear piece by piece in front of your eyes (see screenshot 2). When you want the recording to stop just click on the yellow Stop button and the recording will end immediately. To play back what you've recorded press the green Play button.

You'll notice that there are no fast forward or rewind buttons. This is because they are not really needed. Audio editing using software such as Audacity is referred to as non-linear editing.

All this means is that you can quickly jump to, or edit, any point in a recording without having to wait for the audio to be fast forwarded or rewound to that point. Instead you can just place the cursor in the right spot and click play. This is all very simple and quite intuitive, so let's move on to editing the audio file.

SCREENSHOT 4

To cut out silence at the start and end of your file, simply select the silence and use the delete function

Making changes

First of all, it's likely that you have some blank space at the start and end of your recording. Naturally you'll want to top and tail the file so it only contains the audio you wanted to record (see screenshot 3).

Use the scroll bar at the bottom of the screen to move the waveform view back to the start of your audio file. You'll be able to see the silence at the start of the waveform because it will show up as a flat line before the waveform starts to climb as the music kicks in. In the waveform window click the cursor at the very beginning of the file and then drag it to just before the start of the waveform that signifies where the music begins. We just want to perform a simple edit to delete this silence, so click on the Edit menu and select Delete (see screenshot 4). Now use the scroll bar at the bottom of the screen to move to the end of the file and delete the silence there using the same method.

If you want to see the waveform in more detail then use the zoom function; click on the magnifying glass and click on the left button to zoom in. You can zoom back out again by clicking on the right mouse button. If you find you've zoomed in too far and can't seem to zoom back out quickly enough just go to the view menu and select 'Fit in window' to see the whole of the wave form on screen. Also, if you make a mistake with your edit, don't worry, you can just click on Edit and then Undo to reverse changes you've made.

Let's look at another simple edit we can perform. Sometimes you might want your music to gradually fade out rather than ending abruptly. This is especially true if you're editing music to fit over the end titles of a home movie.

Start by using the scroll bar at the bottom of the screen to move to the end of the audio file. Now using the standard selection cursor click somewhere towards the end of the file and then drag right to the end of the file. Next click on the Effect menu and select Fade out.

The audio will be gradually faded to silence from the first point in your selection to the end of your selection. You can increase the fade-out length by starting your selection further from the end of the music (see screenshot 5).

Naturally Audacity has lots of other more advanced edit functions such as noise removal and effects like echo, phasing and wah wah, which are great for creating special effects. They all work in much the same way as the edits we've performed, so play around and have fun getting to know some of the more advanced features.

SCREENSHOT 5

The fade function can be useful for editing music to play over your home movies

CONTACTS

Niall Magennis welcomes your comments on the Sound column. Email him at: sound@pcw.co.uk. Please do not send unsolicited file attachments.

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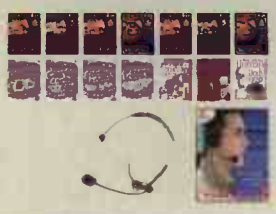

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Nigel Whitfield
edited computer magazines before going freelance in 1995. A specialist in Internet and consumer issues, he has a degree in Computing Science from Imperial College

History in the making

Nigel Whitfield leads the way when it comes to letting your website's users backtrack

Last month, we looked at ways of authenticating users, and creating session variables, making it easier to be sure which of your users is looking at a particular page on your site.

There are plenty of other things you can do to 'improve the user experience'. A useful technique for many sites, especially those that include a lot of products, or perhaps lots of categories of information, might be to include a mini-history list on each page, so that people can backtrack simply.

That sort of thing can be particularly useful if you're using frames on your site, which can often make the action of the Back button in the browser confusing – and, of course, using Back is also fiddly when many pages are created on the fly, especially with form input data that might not be available. You can see the sort of thing we're talking about on sites like Amazon and Ebay, where a list at the bottom of the page lets you return to recently viewed items.

A little list

There are a few different aspects to creating this sort of list on your site. First, you need to decide what form your list will take – how much detail it will include, and so on. You need to decide which pages will be included in the list, and you also need to decide how much information you want to persist between sessions.

For example, if your site is primarily concerned with shopping, you might decide that the only things you want to appear in the list are product information pages themselves, since there'll always be buttons around for things like the checkout. And you might decide that there's no need to save this information between sessions.

On the other hand, if you have a research-based site – for example, one client has a database of tax information for countries around the world – you might want to list major headings instead. In the client example, that might be a list of recently visited country sections, or it could be the most recent countries, and a list of the five most recent pages in the most recent country.

There are probably about as many combinations as there are different types of site. But there are common things you'll need to do to maintain the list.

Pulling it together

The best solution is probably to put all the functions that you need to manage the list into a single PHP file, which you can 'require' in all the pages where the facility is required. You could include it with the rest of your site, or as a separate module, so that you can use the same code on other sites (see screenshot 1).

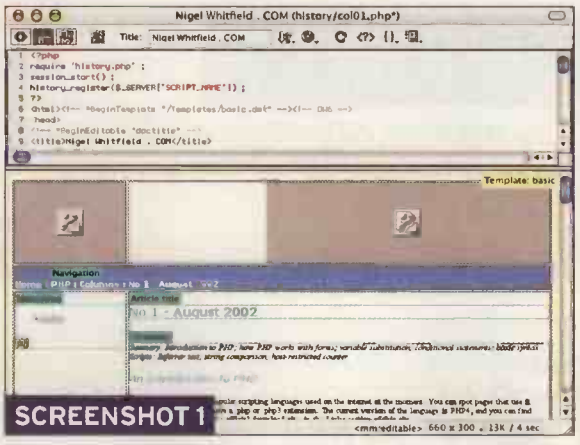
You'll need two main functions, which we'll call history_display and history_register. The first will display the current contents of the history list, in whatever way you feel appropriate, and the second will be called on each page that you want to appear in the list.

You might also decide to add a history_save function, that will save the list when a user ends their session by clicking on a log-out button on your site.

That's the simple bit; actually deciding how to approach things is a little trickier. We'll look at the simple solution first, assuming that your site's pages have static URLs, eg mysite.com/products/prod001.html, prod002.html and so on; the pages themselves don't need to be static – they can call up information from a database and, as long as a URL doesn't contain random information (such as a session id string), it can even be a URL like mysite.com/products/getproduct.php?pid=7337.

The important thing is that we want to be able to save a simple URL that will always take a user back to the appropriate page. More complicated URLs can be managed, but if your site relies on them to generate pages, you'll have to think more carefully about how you store a history list.

First write your library, then a simple line in each page can add it to the history list



SCREENSHOT 1

We're going to start simply here, and use a PHP session to store an array variable called history_list. So, if your history functions are in a file called history.inc, your pages will need to start with something like:

```
<?php
@require ↙
'/usr/local/lib/sites/↙
history.inc' ) ;
session_start( ) ;

// now, let's save this ↙
page in the history list

history_register('/↙
productrange.html') ;

?>
```

(Key: ↙ code string continues)

This assumes that productrange.html is the page that you want to add to the history list. And remember that you can use the same code on each page, by referencing the server variable SCRIPT_NAME, ie

```
history_register($_SERVER↙
['SCRIPT_NAME']) ;
```

to avoid having to code each page individually.

Now, what about that history_register function itself? Well, that needs a variable registered in the session, like this:

```
<?php

function history_register↙
( $newpage ) {
        global ↙
$history_list ;

        $history_list[] = ↙
$newpage ;
        if ( ! ↙
session_is_registered↙
('history_list') ) {

session_register↙
('history_list') ;
        }

}
?>
```

We've made history_list a global variable, so it can be tinkered with elsewhere – including in the history_display function that we'll come to later. You also need to make it global so that PHP's session management will work properly.

The crucial next line of the code simply appends the value passed to the function to the history array, adding a new element onto the end. Of course, that will put it on the end of the list, if you print out the array in order, and there's nothing to stop the list becoming far too long.

If you decide that you want only the five most recently added entries to be stored, you might add the code below, using the array_slice function, which allows you to extract a certain number of values from the middle of an array – you specify the starting element to copy, and the number of elements. Since the first entry will be $history_list[0], this is what we need to say:

```
if ( sizeof($history_list) == 6 ) {
        $history_list = array_slice( $history_list, 1, 5 ) ;
}
```

Displaying the list

Displaying the history list is the other important function that you need to consider. In our examples, we've simply saved a path, presumably from the root of the web server, to the current page. So each entry in the history list can be considered a path on the server. So, we need a way to tell the history_display function the rest of the URL; that could be a simple URL parameter, or perhaps you'll want a session variable that you can use with a function to initialise the history system. We'll take the first option here, so that pages will contain a call like

```
<?php history_display('www.mycompany.com') ?>
```

and then the display function will prefix the text with http:// and append the actual path to the file that was registered. Of course, if your history functions are only being used on one site, you can skip that, and hard code URLs into the function.

But what exactly are we going to save? We've used our history_register function to save just a path, but people would rather see something more meaningful in the list, like 'Superwidget software v 3.0', so we need a way to provide those names.

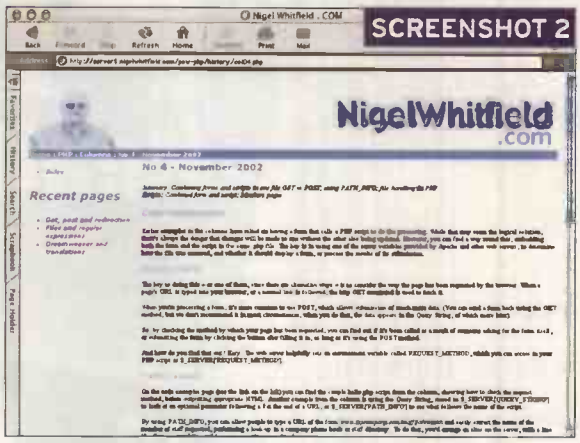
We can either do that by extending our register function so that we pass a name that will be used for the link, or by looking up names when it's time to display the list. Here, we're going to opt for that latter approach.

That means we need some way of looking up what each page that's likely to be registered actually is, and the best way of doing that will depend on the type of site you have.

If it's a small, fairly static site – like our tax information example – you might simply create an associative array, containing entries to match URLs to titles, like this:

```
$pagename['/taxinfo/tt.html'] = 'Trinidad and Tobago' ;
$pagename['/taxinfo/bvi.html'] = 'British Virgin Islands' ;
$pagename['/taxinfo/guernsey.html'] = 'Guernsey' ;
```

and so on. You could put this information in a file that can be included, and you'll have to update it each time you make changes – but for a small site that's OK.



SCREENSHOT 2

Want to backtrack? Now the site can remember which sections you've visited

Size matters

For a large site, it's not going to be so simple. You could use a similar solution to the one above, but storing the information in a MySQL database. Again, you'll have to ensure that this information is kept in sync. Or you could try and find a way to read the HTML files specified, and extract the TITLE information from them, but that will impose a considerable load on the server, processing multiple files each time.

Another approach might be to avoid storing the URLs themselves, and simply store an ID in the history list, corresponding to the product ID of each page visited. Since, presumably, your site will be based on a database, you can look up the product name on the fly, and generate the appropriate link.

While we've created a function in figure 1 to generate a list of clickable URLs, remember that there are other ways you could do it too. If you were using MySQL to store the history list, for example, you could construct an SQL query to retrieve the information and insert the recordset into one of Dreamweaver's repeated regions – you can see an example of that on the website at www.nigelwhitfield.com. That approach allows you to minimise the amount of coding you have to do – you only need to create the history_register function, and leave Dreamweaver to do the work of creating and displaying the query for you (see screenshot 2).

Displaying the history list

FIG 1

This is our simple function to display the current history list, along with page names. The included file, pagenames.inc, contains an associative array, like the one described in the text.

```
function history_display( $siteurl ) {
global $history_list ;

        require( 'pagenames.inc' ) ;

        if ( session_is_registered('history_list')) {
        // at least one entry must have been made

        // iterate over the array
                print '<H3>Recent pages</H3><UL>' ;

                foreach( array_reverse($history_list) as $page ) {
                        $target= 'http://' . $siteurl . $page ;
                        printf('<LI><A HREF="%s">%s</A>', $target, $pagename[$page] ) ;
                }
                print '</UL>' ;
        }
}
```

(Key: ↙ code string continues)

We've introduced one new function here – printf, which is similar to the function you'll find in Perl and C; the %s in the first argument will be replaced by the matching variable listed following the format.

CONTACTS

Nigel Whitfield welcomes your comments on the Web development & ecommerce column. Email him at: webdev@pcw.co.uk. Please do not send unsolicited file attachments.

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Alan Stevens
has been implementing and supporting networks for over 25 years, working for IT vendors, systems integrators and customers. He now mostly researches and writes about networking matters

Internet routers needn't be scary

It's easy to share an Internet connection on a small network - here's how

One of the most common reasons home users and small businesses invest in a network is to share an Internet connection. This could be an analogue or ISDN line used to dial in to an ISP or, increasingly, an always-on broadband ADSL or cable service. Whatever the technology, however, sharing the Internet connection across the network usually boils down to one of two choices. Either software, such as the Internet sharing facilities built into Windows, or dedicated hardware in the form of an Internet router.

A lot of people plump for software for no other reason than it does away with the need to get to grips with what, for many, is new and 'scary' router hardware. It's also seen as a cheaper option, although in practice a router can end up costing far less.

Basic ADSL routers, for example, can be bought for under £100 ex VAT and most will include the necessary modem you'd otherwise need to connect to the Internet, plus an integrated Ethernet hub/switch also needed to build the network. You might also get a security firewall and Network Address Translation (NAT) facilities as standard, along with, in many cases, content filtering, anti-virus and other useful options.

Another advantage is that dedicated hardware tends to make for a much more convenient solution. A router, for instance, is a quiet little box that consumes very little power and can be left turned on all the time. With modem sharing and software-based routers, the Internet connection is only available when the host PC is switched on which, especially at home, may not always be the case.

Apple Macs and Linux PCs can also share a router and reliability is enhanced as you're dealing with a solid-state device not a PC, with no operating system or hard disk to crash. So much so that you can leave a router to get on with its work for months on end and, if problems do arise, a flick of the power switch normally sorts things out.

A hardware based router, such as the DG814 Platinum ADSL Router from Netgear, is a cheap and easy way of sharing a single connection to the Internet on a home or small business Lan

The 3Com Officeconnect Lan Modem comes with either an analogue or ISDN interface; both have a four-port Ethernet hub

You can even get routers with wireless interfaces, leaving just the setup and installation to worry about, which is what tends to put most people off. In reality, however, routers are really very simple to configure, as the following couple of examples will show.

The ISDN route

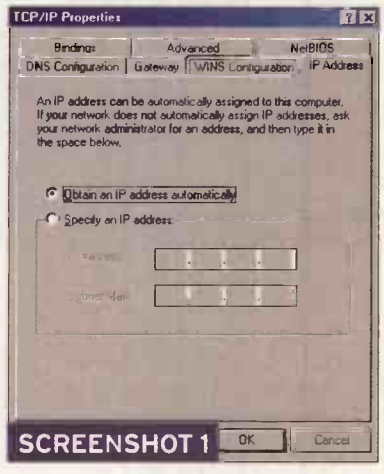
We'll kick off with what's involved in installing and configuring a router sharing an ISDN Internet connection. Not a first choice in the broadband era perhaps, but a good alternative if you can't get ADSL or cable.

The product involved is a 3Com Officeconnect Lan Modem (pictured above), which sells for around £169 ex VAT and can be used with any standard ISDN line, including BT's Home and Business Highway products. It comes in a small plastic case and can be wall-mounted. Power is supplied from an external AC adaptor, and as well as the connector for the ISDN line, there's a built-in four-port Ethernet hub and a couple of jacks to enable telephone handsets to share the ISDN connection.

Installation is just a matter of plugging the Lan modem into the ISDN wall socket using the cable supplied, then attaching the network PCs and servers to the integrated hub. And if you've more than four computers, an extra hub or switch can be plugged into the end port with support for up to 25 users on this device.

Get ready for a router

As with most Internet routers 3Com's Lan Modem has a built-in DHCP (Dynamic Host Configuration Protocol) server which, by default, will be turned on. So, all you have to do is configure the PCs on the Lan to obtain their addresses using DHCP (see screenshot 1).



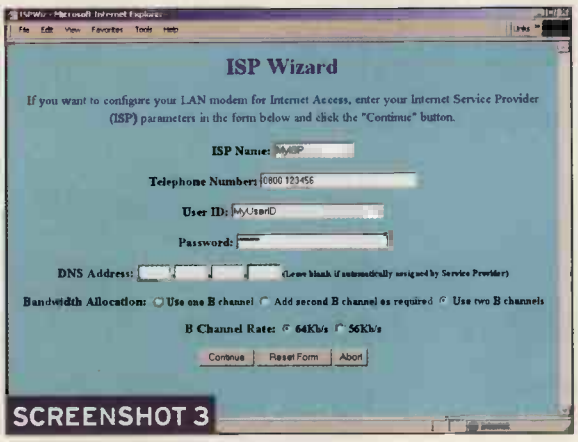
Windows and other PCs on the network should be configured to use DHCP to obtain an IP address from the Internet router - as shown here on a Windows 98 system

Each time a system boots it will then broadcast a request for an address which will be supplied by the router, together with a suitable sub-net mask. Moreover, the DHCP server will configure each PC to use the router as its default gateway when communicating with the Internet. All you have to do is make sure Internet Explorer (or whatever browser is being used) has been configured to use the Lan for this purpose, something the Internet connection wizard in Windows can do for you (see screenshot 2).

Of course you still have to configure the router itself to work with your ISP, but to do that all you have to do is type its IP address into a browser (the Lan Modem is set to 192.168.1.1 by default, but this can be changed). You then run the ISP wizard which will take you through the very simple steps required.

Very little information is needed here (see screenshot 3), the wizard prompting first for the phone number to call and an account name and password to use, just as if

When using an Internet router make sure that you configure client PCs to connect to the Internet using the Lan, rather than a locally attached modem



SCREENSHOT 3

All you need to configure an ISDN router, like 3Com's Officeconnect Lan Modem, is a phone number, account name and password

you were dialling in directly using a modem. It also asks for the address of a DNS server, although in most cases you can leave this blank as virtually all ISPs dynamically assign this address.

Finally, because it's using ISDN, the router can be configured to use both 64Kbits/sec data channels to provide a combined 128Kbits/sec of bandwidth. This can happen either straight away or when the volume of traffic requires it, although check with the ISP first, as not all support this option and you may have to pay extra to get it.

Finally, the wizard will attempt to connect to the ISP using the information you've provided and, if that works, you can start using the router in earnest. Further configuration is also possible, to set up other ISPs and tweak the DHCP settings, but for most small networks nothing else is needed.

How the router works

When everything has been set up any workstation wanting to access the Internet, whether to browse the web or send/receive emails, will direct its requests to the default gateway address. That's the address of the router which, in turn, will dial the specified ISP (if not already connected), handle DNS address lookups and transmit the data packets being sent by the workstation. Other systems on the network can also do the same at the same time, the router sorting out which system sent what requests and routing back the results to the correct address.

In fact once you've configured the router you can more or less forget it's there. And there's no need to worry about call charges as routers can be used with unmetered services (where you pay the same fixed amount each month), and if no activity is detected for two minutes the 3Com router will automatically drop the connection. The paranoid can even reduce this timeout value, although reduce it by too much and you could experience a lot of service interruptions.

A broadband router

It's much the same story when configuring a broadband router, such as the Netgear DG814 DSL Modem Internet Gateway, which costs a remarkable £99.99 ex VAT. Just as with the 3Com Lan Modem, the Netgear router is housed in a small plastic case and gets its power from an external AC adaptor.

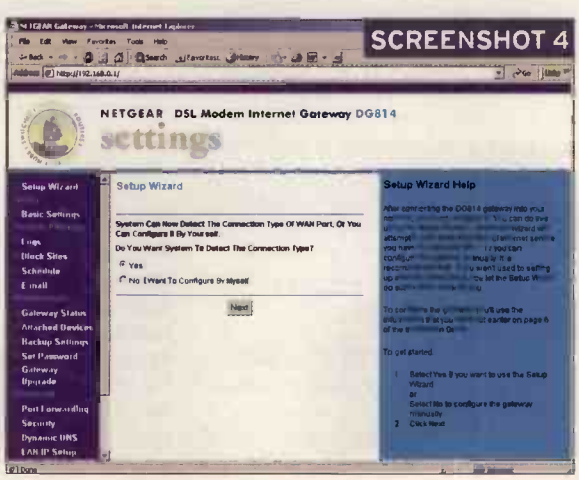
An integrated four-port Ethernet switch again makes for easy Lan deployment, added to which there's a built-in ADSL modem, ready to plug into an ordinary BT phone socket. There's even an analogue filter to enable a phone to use the line without the need for additional hardware.

Installation is just a matter of plugging the cables supplied into the correct sockets. An ordinary telephone wall jack is all you get with most self-install or DIY ADSL services. However, if you've been supplied with an ADSL modem as part of the package you need to make one of two choices. Either discard it and use the modem in the router, or buy a router to make use of the modem you already have, although you won't save much if you opt for the latter.

A DHCP server is again built into the Netgear router making it easy to set up client PCs, and the device itself is configured using a browser. The default address here is 192.168.0.1 and, just as with the 3Com hardware a wizard is provided to take you through the basic setup procedure (see screenshot 4).

You don't need a dial-up number for ADSL – it's an always-on service – but the router will need to know what kind of ADSL encapsulation to use, as this differs from country to country. Fortunately the Netgear wizard can work out much of what it needs automatically, by probing the connection. So all you have to supply is a login name and password, which will be provided by the ISP.

The setup wizard built into the Netgear DG814 takes care of the hard things, such as working out what kind of ADSL encapsulation to use



SCREENSHOT 4

The ISP will also provide details of the type of IP addressing to use. Some supply a fixed, or static address, but most assign addresses automatically using NAT, which can be a problem if you want to host your own web or email server. However, there are ways round this with the Netgear router, for example, supporting the use of dynamic DNS services, which can get round most NAT issues.

You may also have to supply the address of a DNS server, again, depending on whether this is dynamically assigned or not. But that's about it. The router should now be ready to connect to the ISP using the parameters supplied, giving every PC on the network always-on access to the Internet. Moreover, just as with the Lan Modem you don't really have to do much else to manage the setup, other than leave the router switched on all the time.

However, you can, if you want, take advantage of some of the other features in the Netgear router, such as content filtering (based on URLs and keywords) and time-of-day usage limits. The router can also log activity and issue email alerts when, for example, a user tries to access a blocked site.

It really is that easy

The bottom line here is that, although routers are complex bits of hardware the workings of which are a mystery to most mortals, they're not that difficult to use. Gone are the days when you had to attach a console and master a tortuous command-line interface.

Browser-based setup and easy-to-use wizards are now the order of the day, such that it really shouldn't take more than a few minutes to get the average ISDN or broadband router up and running.

Software-based sharing can be a lot harder and, more than that, a dedicated router provides benefits software simply can't match. All of which go to make a router a must-have for any home or small business network looking to share a dial-up or broadband Internet connection.

CONTACTS

Alan Stevens welcomes your comments on the Networks column. Email him at: networks@pcw.co.uk. Please do not send unsolicited file attachments.

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vnu business publications

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

A brief journey into multidimensions

Dimensional database modelling offers fast querying of vast amounts of information

This column is all about databases and, for many people, the word 'database' equates to Access. That's fine, Access is one of my favourite databases as well so, while I try to pick subjects for the column that are applicable to many database engines, I often use Access to demonstrate the solutions. But this month, for one month only, as a special offer, we are going to look at a type of databasing that Access can't do – namely Olap (also known as Online Analytical Processing).

This has been prompted by a question from reader Gordon Wilson who is using Olap, in fact the Olap that is offered by Analysis Services (part of SQL Server). This offers him a choice of three different flavours of Olap – Rolap, Holap and Molap (which sounds like a range of Scandinavian pickled herrings, but isn't). As Gordon says: 'I barely understand Olap; how am I supposed to make an informed choice here?'

Fair enough. But first let's look at Olap in general before investigating the three varieties on offer.

All about Olap

The relational database model (the one that Access uses) is one we know and love. All the data is stored in tables and we try to ensure that each table only contains information about one 'thing'. So, all the data about employees is in the Employee table, all the information about customers is in the Customer table, and so on.

Of course, if you have to work with database geeks, you have to be sure that you aren't out-jargoned. So replace the word 'thing' in the sentence above with the term 'entity'. Oh, and the process of ensuring that the correct data is in the correct table is called 'normalisation'.

It turns out that the relational model is excellent for databases where the data is often inserted and/or updated – so-called operational databases. Since the data in most databases is subject to change in this way, most databases are operational and hence most are built as relational databases.

However, the relational model has its drawbacks. By splitting up the data into all these separate tables, we make it relatively slow to query. Not for 'small' queries (such as finding the current state of a particular account) but for big queries that hit a large number of records that are stored in lots of different tables.

There is, however, an alternative to Relational modelling known as Dimensional modelling. The good news is that it has an excellent query response time; the bad is that it is not well suited to data that is constantly inserted and changed. In other words, it is not of any practical use for operational databases.

But many companies have operational databases that they fervently wish to query. What we do in these cases is to store the operational data in a relational database and allow the users to add to it and modify it to their hearts' content. Every so often (for argument's sake, once every weekend) we can take a copy of the data, restructure it as dimensional data and then run the big queries against that data. That dimensional copy is very fast to query (something like a thousand times faster). True, as the week ambles by, the data in this database slowly drifts out of date (until it is rebuilt the next weekend). However, by a wonderful twist of fate, the big questions are generally those that tend to be time insensitive.

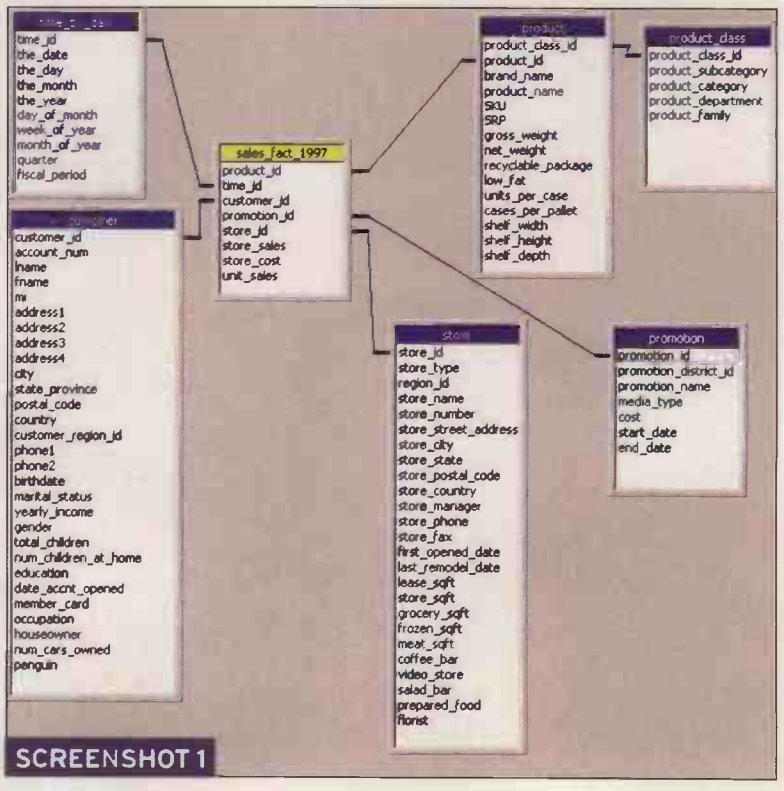
'It offers three flavours of Olap, which sound like a range of Swedish herrings'

I realise that this sounds too convenient to be true, but think about a question like 'Show me how the sales of herring in Cambridge have altered month by month over the last two years.' This query may have to hit thousands or millions of rows and will involve multiple aggregations, but you tend to ask questions like this in order to see trends. For trend analysis it often doesn't really matter if the data from the last three days is not included.

This, as you may have guessed, is Olap. A single Olap structure is called an Olap cube (for reasons not yet apparent, but coming soon).

'Tell me, Mark, how do you build an Olap cube?' I'm glad you asked!

The basic structure that we need is called a 'star schema', which consists of a set of tables. In the centre is a table that holds all the core facts (also knows as measures) that we want to



A star schema in all its glory

SCREENSHOT 1

analyse. These are typically numerical values, such as 'units sold' and 'price paid'. Surrounding the fact table are the dimension tables. These essentially spell out how the data in the star schema can be queried. For example, in screenshot 1 you can see that one of the dimensions is time (time_by_day to be precise), another is customer and a third is product.

The customers can be analysed individually, or they can be grouped together by City, State and/or County. This grouping is perfectly reasonable and reflects the fact that humans often like to group data hierarchically for analysis purposes. So, for example, the products are also grouped into several different levels of product groupings.

All of which means that we can, for example, see the unit sales of a particular product group (drink) to all the customers in a particular city (Burbank) over a specified period of time (see screenshot 2).

Now, given that the original data is about the sales of individual products to individual customers, it is clear that the values shown in this screenshot must be aggregations of the original data. (Aggregation is Olap speak for 'adding up'). Given that we have a great deal of original data and that we have 12 different dimensions, each with several hierarchical levels, it turns out there is a very large number of possible aggregations. The figure, in fact, is jaw-dropping.

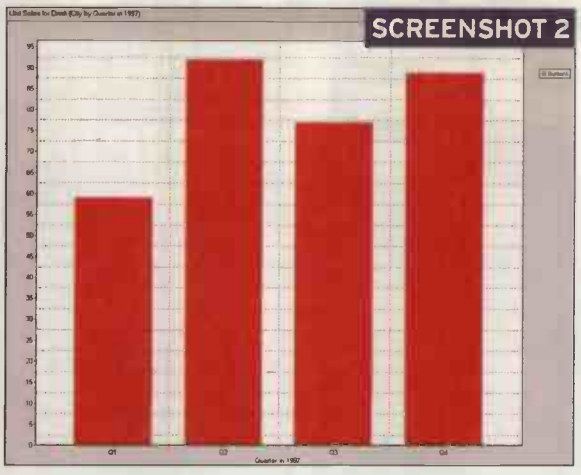
Think of it this way. The customer dimension has about 10,000 customers, grouped into about 100 cities, in 13 states in three countries. That's three hierarchical levels above the base data with a total of (100+13+3=) 116 members.

There are about 1,500 products, grouped into 500 brand names, 100 product sub-categories, 50 product categories, 25 departments and three product families – that's five additional levels with a total of (500+100+50+25+3=) 678 members. Thus, given just these two dimensions, the number of possible aggregations we could ask to see is 116 x 678 = 78,648.

If we add just one more dimension with, say, 500 members in the hierarchy, the number of possible aggregations jumps to approximately 78,000 x 500 = 39 million.

That's with three dimensions – this cube has 12! Lots of lots, indeed!

You may think at this point that I seem to be becoming obsessed with aggregations, but there is reason in my madness. The aggregations (together with the base data) are the answers to the questions that you can ask an Olap cube. Calculate all of the aggregations and you have calculated the answers to all of the questions that could possibly be asked. In other words, the answer to any question would then be simply a 'fetch' operation away.



The unit sales of a drink to all the customers in Burbank, shown quarter by quarter

Calculating all the aggregations is, as we have seen, a daunting undertaking and it must be done when the cube is first constructed, before your users can start to use it to answer their queries. However, if you calculate just a proportion of the aggregations, then those that haven't been pre-calculated can be calculated as required on-the-fly. To help us decide which type of Olap suits a given situation, let's now look at them individually.

Relational Olap

How do we store the base data and the aggregations? Well, if we store the original fact and dimension tables as relational tables held by a relational database engine, that takes care of the base data. We can create a raft of extra tables that hold the aggregations. This is known as Rolap (Relational Olap) and it turns out to be horrendously difficult to manage if you do it by hand (you have to decide how to direct the correct query to the appropriate tables) but software can do much of this for you.

Multidimensional Olap

Molap (Multidimensional Olap) is more radical. It faces up to the fact that dimensional modelling is all about multidimensional data and that trying to store that data as a set of two-dimensional tables is essentially the wrong approach. What we need here is a whole new type of database engine that isn't relational at all, but is designed right from the start to create, store and manipulate multidimensional data. When you tell a multidimensional database engine to process a star schema, it creates a single, huge, multidimensional data set and stores it to disk. Mixed up in that data set is all the base data, together with the generated aggregations.

Hybrid Olap

As the name suggests, Holap is a hybrid between the other two types. Essentially the base data is stored in the relational tables (managed by a relational database) and the aggregations are stored as multi-dimensional data that is managed by a multidimensional database engine. It sounds like the worst of all possible options, but there are advantages in Holap (which finally brings us back to Gordon's original question).

Molap gives undoubtedly the best overall query performance – if you feel the need for speed, then go for Molap. In addition, multi-dimensional database engines are very efficient at calculating the aggregations, so the preprocessing time for a Molap cube is almost as low as possible. The down side is that Molap cubes tend to be very large, so expect Molap to soak up your disk space like there is no tomorrow.

Rolap has the worst query performance of the three, because the queries are running against relational tables. As if this wasn't bad enough, Rolap has the worst processing times, so creating all the aggregations takes forever. Worse still, Rolap puts a very heavy load on the server during querying, because the tables have to be manipulated to get at the answer. The only point in Rolap's favour is that it is frugal with disk space.

Holap tends to be a middle of the road option – neither veering too far to the left, nor to the right. The querying is much faster than Rolap, but still slower than Molap and, as you might well guess, the disk space utilisation is also between the two. The only place where Holap scores an outright victory is in terms of preprocessing – the aggregations are calculated in record time.

Clearly these three options are there for a reason – they give you the choice to optimise your storage selection for your particular business needs. Having said that, given that disk space prices are falling faster than Xbox prices, Molap is often the best option. Storage is a cheap commodity; time is of the essence.

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Tim Anderson
is both 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

What a performance!

We present some tips on using optimisation tests to maximise code performance

Late last year, a message posted to one of the Java newsgroups contained performance comparisons between several languages and compilers, including Visual Basic 6.0, Visual Basic .Net and Java.

Surprisingly, the figures showed that on a particular test application, VB 6.0 took around 25 per cent longer than Java, while VB.Net took more than three times as long. The figures were surprising because one would think that Microsoft's compilers, which only target Windows, would have an advantage over Java. On these figures, it was only Visual C++ that outperformed Java.

These kinds of tests are always interesting, but it's wise to inspect them closely. The difficulty with performance testing is that it's hard to compare like with like. Here's a closer look at a couple of the tests. One was some code to populate a combo box many times, similar to the following (note that it uses the API call GetTickCount to do the timing):

```
starttime = GetTickCount
 For i = 1 To 1000
 Combo1.Clear
  For j = 1 To 500
  Combo1.AddItem ↙
"Hands On"
  Next
 Next
 endtime = GetTickCount
 totaltime = endtime - ↙
starttime
 Label1.Caption = ↙
"Time taken: " & ↙
Str(totaltime / 1000)
```

(Key: ↙ code string continues)

I'm not going to quote exact figures, since the licence forbids it, but if you run the code you will find it to be extremely slow. Fortunately, there's a lot you can do to speed it up. First, it turns out that VB's AddItem method for a combo box is a poor performer. You can get dramatically better performance by using an API call, SendMessage, to add items to the combo box. You need to use the API viewer to add the declarations for SendMessage and the CB_ADDSTRING message. Then you can replace the call to AddItem like this:

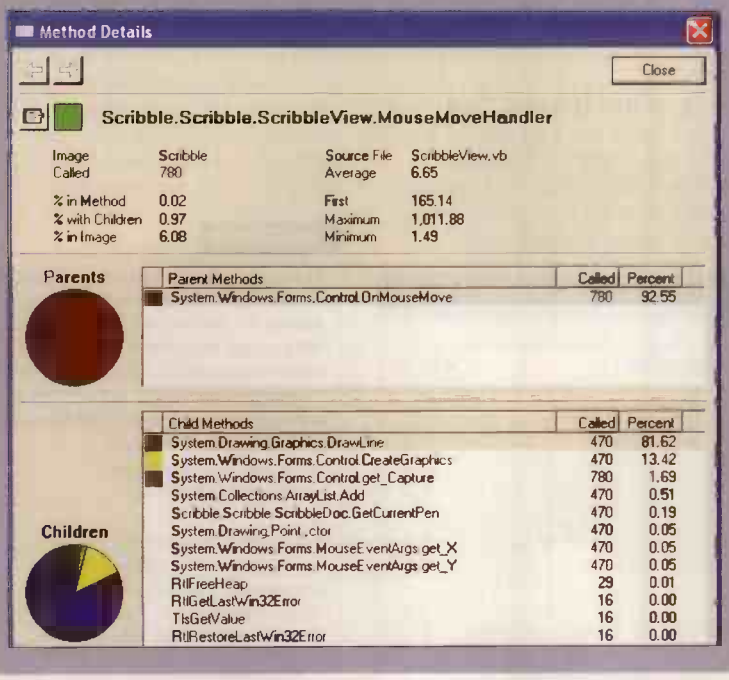
```
s_item = "Hands On"
iRetVal = SendMessage↙
(Combo1.hwnd, ↙
CB_ADDSTRING, 0&, ↙
ByVal s_item)
```

On the test system, this expedient chops the wait by nearly two-thirds. However, if you really want speed there's another API trick available. The reason loading the combo box is slow is that Windows does some unnecessary calculations each time an item is added. You can tell Windows not to bother until you're done adding items. To do this, you need to send a WM_SETREDRAW message to the listbox to turn drawing off. The snag is that a combo box is not a listbox – however, it does include a listbox, and it's possible to retrieve its Window handle. The new code looks like this:

```
Dim h_cbo As Long
h_cbo = GetComboList↙
Handle(Combo1)

'set redraw off
iRetVal = SendMessage↙
(h_cbo, WM_SETREDRAW,↙
 0, 0)

'code to add items goes↙
here

'set redraw on
iRetVal = SendMessage↙
(h_cbo, WM_SETREDRAW, 1, 0)
```

The source for GetComboListHandle is noted at the end of this column. With this modification, the time taken shows another huge improvement.

But what about VB.Net? It turns out that VB.Net is smarter than VB 6.0 when it comes to loading combo boxes, and turns in a respectable result without any optimisation. Instead of messing about with WM_SETREDRAW, you can get a further improvement in speed by



Using a profiler

A profiler is a tool that analyses an application to see how long each line of code takes to execute. A good example is the profiler in Compuware's Devpartner. The company has generously made the .Net version a free download, which is a great offer. The profiler installs into Visual Studio .Net.

To use it, simply enable the profiler from the Tools menu and choose 'Start without debugging' from the Debug menu. Try out your application in the normal way. It runs very slowly, because the profiler is timing and recording every call. When you exit, the session analysis appears as a document window. The screenshot (left) shows an example from the VB.Net Scribble sample application.

The method shown is the Mousemovehandler, which does the actual drawing in Scribble. If you look at the list of child methods, you can see that 80 per cent of the time in Mousemovehandler is spent in just one line of code, a call to System.Drawing.Graphics.Drawline. A good way to speed up Scribble would be to replace this with a GDI call using Platform Invoke. The great thing about using a profiler is that you don't waste time optimising code that is already fast enough.

Use a profiler (left) to see how you can speed up your code

surrounding the code with calls to ComboBox.BeginUpdate() and ComboBox.EndUpdate(). With this added, VB.Net is significantly faster than VB 6.0.

The Java angle

Over to Java, and .Net enthusiasts might be disappointed to find that a Swing combo box can run similar code even faster. Does that mean Swing GUIs are faster than VB 6.0 or .Net? Not necessarily. It's all to do with what actually happens when you add an item to a combo box.

In Windows, the data gets loaded into the listbox portion of the combo, whereas Swing separates the display of a component from its data, which is a Model object. There's no need for the combo box to populate its listbox until the user actually drops it down. I would guess that Swing is being smarter about avoiding unnecessary code. That makes a big difference in benchmarks, but in most applications it would matter less.

Another part of the test covered integer arithmetic, with VB.Net performing particularly badly. There is a good reason for this. If you look at the Project Properties in a VB.Net application, you will notice that integer overflow checks are enabled by default (see screenshot 1 below). That may well be sensible, but it makes a dramatic difference to a benchmark test of integer arithmetic. On the other hand, real-world applications are unlikely to have this as a bottleneck, so you may hardly notice the change.

Performance tips

Performance testing is difficult. As the above example shows, small changes to the code can have dramatic effects. It's worth noting that all of today's most popular development tools compile to native code, either at build time, or with Java and .Net at runtime using JIT (just-in-time) compilation. There will still be differences in the quality of the generated machine code, but you would expect number crunching and string manipulation to yield similar results in each case. The performance of GUI components and graphics is more variable. For example, drawing on a Java Graphics surface is often faster than using the equivalent GDI+ methods in C# or VB.Net, because, unlike GDI+, Java makes use of hardware acceleration. On the other hand, graphics performance in C++ or Delphi should be faster than Java, and the new .Net Managed DirectX classes are also very fast. Some still believe that Java is always slow, or that C++ is the only high-performance language. A few trials should convince anyone otherwise.

Test algorithms

If you want to run your own tests, useful algorithms are those that generate prime numbers or calculate Pi; these tests are better than simply incrementing or multiplying numbers, since they make it hard for the compiler to take short cuts.

Raw speed is only one of the factors in development, and not the most important. Although sluggish software is annoying, it's more often other things that slow you down. Bugs are far more costly. In addition, slow code can be made faster, whereas buggy code can be hard to fix. It's better to write good, slow code and then optimise it, rather than writing fast, buggy code and then trying to make it reliable.

There are usually only a few performance-critical code blocks, and by focusing on those you can transform the perceived performance. For example, in .Net you can replace GDI+ calls with GDI calls through Platform Invoke, gaining a large improvement. The bottom line is that you can choose the development language you want to use, rather than being driven by performance worries.

DirectX comes to .Net

Late last year, Microsoft released DirectX 9.0, the latest version of its games and multimedia API. Traditionally DirectX has been used mainly from C++, but version 9.0 comes with a set of managed classes, for use with VB.Net and C#. The drawing classes in .Net are not hardware-accelerated, so the arrival of DirectX support is great news.

DirectX comes to .Net: this example shows the DirectX teapot rendered in C#

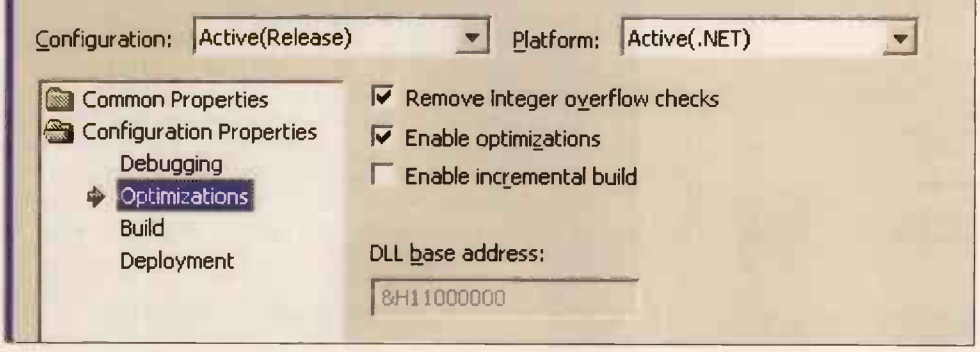
Unfortunately the managed classes only cover a subset of the DirectX API. Two significant APIs are missing: Directshow and Directmusic. Directshow is the API for multimedia capture and playback, while Directmusic handles Midi, wav and native Directmusic Producer files. Still, you can play music in managed code using Directsound and video using the new Audiovideoplayback classes.

Other parts of DirectX are comprehensively covered, including Direct3D and Directdraw for graphics, Directinput for input devices such as game controllers, and Directplay for multiplayer games or chat applications. It is now feasible to program games using managed code, with only around a five per cent performance loss according to Microsoft's development team.

The news is not so good for VB 6.0 developers. The VB-friendly wrapper, which is part of the DirectX 8.x SDK, has not been updated, so it is VB.Net or nothing.

By default, VB.Net's integer overflow checks are enabled. Disable them for faster performance

WindowsApplication6 Property Pages — **SCREENSHOT 1**



CONTACTS

Examples from this column are posted at: www.itwriting.com/pcw.
Source for GetComboListHandle is at: www.mvps.org/vbnet/index.html?code/comboapi/combohwnd98.htm
Source for algorithms to calculate Pi: www.tempest-sw.com/benchmark/
Devpartner Profiler is at: www.compuware.com/products/devpartner/

Tim Anderson welcomes your comments on the Visual programming column. Email him at: visual@pcw.co.uk. Please do not send unsolicited file attachments.

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S530	15" LCD	£240	£282.00
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Vaio PCG-NV105 TFTCDRW	P4	1.6Ghz	30Gb	256Mb	£1199	£1408.83
Vaio PCG-VX71P DVD/CDRW	PIII	950Mhz	30Gb	256Mb	£1449	£1702.58
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P10XTD DVD TFT	P4	1.7Ghz	20Gb	256Mb	£1199	£1408.83
P10XTC DVD TFT	P4	1.9Ghz	30Gb	256Mb	£1379	£1620.33

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CRW 201040 IDE CD Writer	£130	£152.75
CRW 161040 SCSI CD Writer Ext	£135	£158.63

FREECOM

	Ex VAT	Inc VAT
Burnproof IDE 16x10x32	£60	£70.50
CD Writer USB Ext 4x4x24	£109	£128.08
CD Writer/DVD Combo 6x4x24x4	£125	£146.88

HEWLETT PACKARD

	Ex VAT	Inc VAT
CD 12ri 32x12x10 IDE Drive	£99	£116.33
CD 9710i 40x16x10 IDE Drive	£122	£143.35
CD 8230e 6x4x4 Ext USB Drive	£135	£158.63
CD 9600SI 32x12x8 Int SCSI	£155	£182.13

tape drives

HEWLETT PACKARD

	Ex VAT	Inc VAT
Colorado 14Gb Int Kit	£165	£193.88
Colorado 14Gb Ext Kit	£195	£229.13
SureStore DAT 8Gb Int Kit	£449	£527.58
SureStore DAT 8Gb Ext Kit	£509	£598.08
SureStore DAT 24 Gb Int Kit	£599	£703.83
SureStore DAT 24 Gb Ext Kit	£669	£786.08

IOMEGA

	Ex VAT	Inc VAT
Zip 100 Mb USB External	£50	£58.75
Zip 100 USB Starter Kit	£61	£71.68
Zip 250 Mb External SCSI	£110	£129.25
Zip 250 Pro Kit Parallel	£111	£130.43
Zip 250 Mb External USB	£115	£135.13
Click PC Card Drive	£75	£88.13

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- DVD & CDRW Rom Drive
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- V90 56K Flex Modem
- Sony VAIO World Software; Microsoft Works V6.0
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- Microsoft Windows XP Home Edition
- Warranty: 1 Year (Extendable to 3 Years)

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- Intel Pentium 4 2.4Ghz
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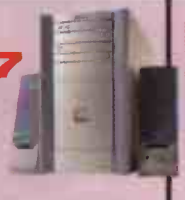
- Multimedia: External Speakers
- 4 USB 2.0 Ports & 2 USB 1.1 Ports,, 4 Pin i.link Port & Memory Stick Slot
- V90 56K Flex Modem
- Sony VAIO World Software; Microsoft Works V6.0
- Dimensions Main Unit (W x H x D): 203 x 306 x 371mm
- Microsoft Windows XP Home Edition
- Warranty: 1 Year (Extendable to 3 Years)

PCV RX407

SONY



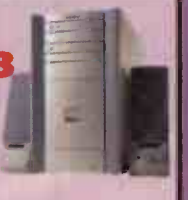
- Intel Pentium 4 2.53Ghz
- 512MB DDR SDRAM
- 120 GB Hard Disc Drive
- NVIDIA GeForce4 MX460 64Mb VRAM Graphics
- DVD & CDRW Rom Drive
- Multimedia: External Speakers
- 6 USB 2.0 Ports, 4 Pin i.link Port & Memory Stick Slot
- V90 56K Flex Modem
- Sony VAIO World Software; GigaPocket TV System
- Dimensions Main Unit (W x H x D): 203 x 306 x 371mm
- Microsoft Windows XP Home Edition: Microsoft Works Version 6.0
- Warranty: 1 Year (Extendable to 3 Years)

£1099.00 ex VAT

£1291.33 inc VAT

PCV RX408

SONY



- Intel Pentium 4 2.66Ghz
- 512MB DDR SDRAM
- 160 GB Hard Disc Drive
- NVIDIA GeForce4 MX460 64Mb VRAM Graphics
- DVD & CDRW Rom Drive
- Multimedia: External Speakers
- 6 USB 2.0 Ports, 4 Pin i.link Port & Memory Stick Slot
- V90 56K Flex Modem
- Sony VAIO World Software; GigaPocket TV System
- Dimensions Main Unit (W x H x D): 203 x 306 x 371mm
- Microsoft Windows XP Home Edition: Microsoft Works Version 6.0
- Warranty: 1 Year (Extendable to 3 Years)

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i550

NEW!

- 4800 x 1220 dpi resolution
- Print speeds up to 18ppm in mono and 11ppm in colour
- Advanced Microfine Droplet Technolog
- Single Ink technology providing superb cost efficiency
- High Colour inks: greater colour range & high optical density
- Vivid Photo ensures optimum colour reproduction
- Exif Print via Easy Photo Print for improved picture quality
- Vivid Photo ensures optimum colour reproduction
- USB and Parallel connectivity
- Borderless printing - A4 & 4" x 6"
- Networkable via Pricom C-700 and C-5100 network adapters

£92.00 ex VAT
£108.10 inc VAT

S200X

The high quality colour printer for the home

- 2880 x 720 dpi resolution
- Print speeds up to 5ppm in mono and 3ppm in colour
- High speed auto sheet feeder system with relay feeding
- Ink Low/Ink out detection
- High Colour inks: greater colour range & high optical density
- Vivid Photo allows the printer to produce a wider range of colours, ensuring optimum colour reproduction
- Suitable for all popular computer platforms - easy connection via USB

£46.00 ex VAT
£54.05 inc VAT

S330 Photo

'Can I have photo quality at an affordable price?'

- 2440 x 1220 dpi resolution
- Print speeds up to 14ppm in mono and 10ppm in colour
- Advanced Microfine Droplet Technology for higher quality print
- High Colour inks give greater colour range & high optical density
- Exif Print via Easy Photo Print, improves quality of Exif 2.2 compliant digital images
- Adobe PhotoShop Elements included in the box
- Borderless printing
- Ink Low/Ink out detection
- Suitable for all popular computer platforms - easy connection via USB

£54.00 ex VAT
£63.45 inc VAT

S300

The professional qualityprinter for home users

- 2400 x 1200 dpi resolution
- Print speeds up to 11ppm in mono and 7.5ppm in colour
- Outstanding print quality through the use of Microfine Droplet Technology
- Ink Low/Ink out detection
- High speed auto sheet feeder system
- Suitable for all popular computer platforms - easy connection via USB
- High Colour inks

£61.00 ex VAT
£71.68 inc VAT

i850

NEW!

The ultimate colour printer for speed and quality

- 4800 x 1220 dpi resolution
- Fast print speeds up to 22ppm in mono and 14ppm in colour
- Advanced Microfine Droplet Technolog
- Single Ink technology providing superb cost efficiency
- High Colour inks: greater colour range & high optical density
- Precision Colour Distribution Technology
- Exif Print via Easy Photo Print for improved picture quality
- Vivid Photo ensures optimum colour reproduction
- USB and Parallel connectivity
- Borderless printing - A4 & 4" x 6"

£CALL ex VAT
£CALL inc VAT

S530D

'Can I have a direct photo printer for all my printing needs?'

- Photo direct/PC, card slot
- 2440 x 1220 dpi resolution
- Print speeds up to 14ppm in mono and 10ppm in colour
- Single Ink technology provides superb cost efficiency
- High Colour inks for greater colour range and high optical density
- Exif Print via Easy Photo Print, improves quality of Exif 2.2 compliant digital images
- Suitable for all popular computer platforms - easy connection via USB
- Borderless printing
- Ink Low/Ink out detection

£193.00 ex VAT
£226.78 inc VAT

LBP1210

'Can I have a direct photo printer for all my printing needs?'

- Quick Start Up & quiet operation
- Impressive output (600dpi, up to 2400 x 600 dpi with AIR)
- CAPT - Canon Advanced Printing Technology
- Stylish, compact design
- Flexible paper handling
- Direct network connection
- All-in-One cartridge technology
- AIR - Automatic Image Refinement

£194.00 ex VAT
£227.95 inc VAT

S830D

'Can I print directly from my digital camera?'

- Photo direct/PC, card slot
- 2440 x 1220 dpi resolution
- Print speeds up to 4ppm in mono and 4ppm in colour
- Single Ink technology provides superb cost efficiency
- High Colour inks which offer greater colour range and high optical density
- Exif Print via Easy Photo Print, improves quality of Exif 2.2 compliant digital images
- Borderless printing
- Ink Low/Ink out detection
- Suitable for all popular computer platforms - easy connection via USB
- 1/6 density photo inks

£224.00 ex VAT
£263.20 inc VAT

S820D

The direct photo printer for digital photography

- Photo direct/PC card slot
- 2440 x 1220 dpi resolution
- Print speeds up to 4ppm in mono and 4ppm in colour
- Advanced Microfine Droplet Technology
- High Colour inks, greater colour range & high optical density
- 1/6 density photo inks
- Vivid Photo ensures optimum colour reproduction
- Borderless printing
- Ink Low/Ink out detection
- Easy connection via USB

£232.00 ex VAT
£272.60 inc VAT

i950

The state of the art photo printer

NEW!

- 4800 x 1220 dpi resolution
- High photo print speeds up to 7ppm in mono & 7ppm in colour
- 2400dpi A4 borderless photo in approx. 1 min
- Advanced Microfine Droplet Technolog
- Single ink technology providing superb cost efficiency
- 1/6 density photo inks
- Exif Print via Easy Photo Print for improved picture quality
- Vivid Photo ensures optimum colour reproduction
- Easy connection by USB
- Borderless printing - A4 & 4" x 6"

£CALL ex VAT
£CALL inc VAT

S9000

The professional photo printer for wide format printing

- 2440 x 1220 dpi resolution
- Print speeds up to 6ppm in mono and 6ppm in colour
- Advanced Microfine Droplet Technolog
- Single Ink technology provides superb cost efficiency
- High Colour inks: greater colour range & high optical density
- 1/6 density photo inks
- Vivid Photo ensures optimum colour reproduction
- Borderless printing
- Ink Low/Ink out detection
- Easy connection via USB

£349.00 ex VAT
£410.08 inc VAT

POWERSHOTA30

£160.00 ex VAT
£188.00 inc VAT

- 1.2 mega pixel CD
- 3 x optical zoom (35–105mm equivalent)
- 2 x digital zoom
- 3 point AiAF, single centre point
- Optical & LCD viewfinder
- Selectable metering modes, exposure controls & white balancing modes
- Movie capture mode
- Operates on AA batteries

POWERSHOTA40

£185.00 ex VAT
£217.38 inc VAT

- 2.0 mega pixel CD
- 3 x optical zoom (35–105mmm equivalent)
- 2.5 x digital zoom
- 3 point AiAF, single centre point
- Optical & LCD viewfinder
- Selectable metering modes, exposure controls & white balancing modes
- Movie capture mode with sound
- Operates on AA batteries

POWERSHOTG3

£499.00 ex VAT
£586.33 inc VAT

- High res CCD - 4.0 million pixels
- High performannce 4 x optical zoom with fast f/2.0 aperture
- New FlexiZone AF/AE for precise focus and exposure point control
- 12 shooting and 3 Af modes
- Vari-angle LCD monitor
- Compact Flash Type I & II
- Compatible with full range of Speedlite flash and lens units

DIGITALIXUSV2

£239.00 ex VAT
£280.83 inc VAT

- Ultra compact classic design
- 2.11 mega pixel CCD - superb detail
- 35-70mm F2.8 - 4.0 2 x zoom
- 2.5 Digital Zoom
- Movie mode with sound capture
- 3 point intelligent autofocus ensures great shots every time
- 1.5" LCD TFT screen provides review and payback facility
- USB interface for rapid image transfer

IXUS330

£255.00 ex VAT
£299.63 inc VAT

- Stylish design and ultra-compact 3x optical zoom lens (35-105)
- High image quality - 2.11 pixel CCD
- Maximum image quality
- Superior features and ease of use
- Long battery life
- System accessories extend camera capabilities
- Compatible with Windows 98, 2000, Windows ME & Mac

SCANTASTIC!

LiDE 20

£46.00 ex VAT
£54.05 inc VAT

- Compact Stylish Design
- 600 x 1200 dpi LiDE sensor
- 48 bit internal colour depth for accurate colour recognition
- USB 1.1 Full Speed interface, for single cable connection for both power and data transfer
- 3 one touch EZ scanning buttons - scan, copy, e-mail
- QARE - Quality Automatic Retouching & Enhancement
- One Pass Multi Photo Mode scans multiple photos collectively

LiDE 30

£62.00 ex VAT
£72.85 inc VAT

- Compact Stylish Design
- 1200 x 2400 dpi LiDE sensor
- 48 bit internal colour depth for accurate colour recognition
- USB 1.1 Full Speed interface, for single cable connection for both power and data transfer
- 3 one touch EZ scanning buttons - scan, copy, e-mail
- QARE - Quality Automatic Retouching & Enhancement
- One Pass Multi Photo Mode scans multiple photos collectively

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cameras

MINOLTA	VAT	Inc VAT
Dimage S304	£289	£339.58
Dimage X	£239	£280.83
Dimage 5	£439	£515.83

SONY	VAT	Inc VAT
MVC FD77	£285	£334.88
MVC FD200	£287	£337.23
Cybershot P31	£149	£175.08
Cybershot P51	£189	£222.08
Cybershot P71	£222	£260.85
Cybershot DSC-S77	£289	£339.58
DCR-TR7 Camcorder	£929	£1091.58

OLYMPUS	VAT	Inc VAT
C-100	£115	£135.13
C-120	£129	£151.58
C-220	£155	£182.13
C-700	£330	£387.75
C-3020	£369	£433.58
C-40	£449	£527.58

EPSON	VAT	Inc VAT
PhotoPC 210OZ	£270	£317.25
PhotoPC 310OZ	£415	£487.63

FUJI	VAT	Inc VAT
FinePix A202	£109	£128.08
FinePix A203	£181	£212.68
FinePix A204	£160	£188.00
FinePix A303	£226	£265.55
FinePix F401	£269	£316.08
FinePix S304	£289	£339.58
FinePix F601	£349	£410.08
FinePix S602	£469	£551.08

NIKON	VAT	Inc VAT
Coolpix 2000	£150	£176.25
Coolpix 775	£239	£280.83
Coolpix 2500	£227	£266.73
Coolpix 4300	£342	£401.85
Coolpix 4500	£459	£539.33
Coolpix 5000	£609	£715.58

KODAK	VAT	Inc VAT
DX 4230	£150	£176.25
DX 4330	£219	£257.33
DX 3215	£139	£163.33
DX 3500	£140	£164.50
DX 3600	£179	£210.33
DX 3700	£205	£240.88
DX 3900	£259	£304.33

CANON	VAT	Inc VAT
Powershot A30	£160	£188.00
Powershot A40	£185	£217.38
Digital IXUS V2	£239	£280.83
Digital IXUS 330	£255	£299.63
IXUS V3	£299	£351.33
Powershot S30	£329	£386.58
Powershot S45	£399	£468.83
Powershot G3	£499	£586.33
MV500	£465	£663.88
MV550i	£599	£703.83

printers

HEWLETT PACKARD	Ex VAT	Inc VAT
Deskjet 350C	£136	£159.80
Deskjet 350CBi	£154	£180.95
Deskjet 450C	£149	£175.08
Deskjet 3325C	£38	£44.65
Deskjet 3420C	£55	£64.63
Deskjet 3820	£80	£94.00
Deskjet 5550C	£115	£135.13
Deskjet 6122	£119	£139.83
Deskjet 6127	£165	£193.88
Deskjet CP1160	£200	£235.00
Deskjet CP1700	£281	£330.18
Deskjet 1220C	£203	£238.53
Business 2230	£203	£238.53
Business 2280	£322	£378.35
PhotoSmart P7150	£124	£145.70
PhotoSmart P7350	£155	£182.13
PhotoSmart P7550	£228	£267.90
Laserjet 1000W	£120	£141.00
Laserjet 1200	£219	£257.33
Laserjet 1200N	£339	£398.33
Laserjet 2200D	£464	£545.20
Laserjet 2200DT	£556	£653.30
Laserjet 4100	£692	£818.98
Laserjet 4100N	£895	£1051.63
Laserjet 4100TN	£957	£1124.48
Laserjet 4100DTN	£1139	£1338.33
Laserjet 5100	£965	£1133.88
Laserjet 5100TN	£1349	£1585.08
Laserjet 5100DTN	£1549	£1820.08
Laserjet 8150	£1489	£1749.58
PSC 750XI	£85	£99.88
Officejet V40	£135	£158.63
PSC 950	£191	£224.43
Officejet K80	£199	£233.83
Laserjet 3300	£360	£423.00

OKI	Ex VAT	Inc VAT
ML280	£192	£225.60
ML320	£321	£377.18
ML321	£384	£451.20
ML380	£225	£264.38
ML390F	£579	£680.33
ML3320	£289	£339.58
Okipage 8P Plus Laser Printer	£199	£233.83
Okipage 14ex LED Printer	£213	£250.28
Okipage 14exs LED Printer	£245	£287.88
Okipage 14i/n LED Printer	£330	£387.75
Okipage 20+ LED Printer	£569	£668.58

KYOCERA	Ex VAT	Inc VAT
FS1010	£198	£232.65
FS1050	£287	£337.23
FS1900	£402	£472.35
FS1900N	£455	£534.63
FS3800	£680	£799.00
FS3800N	£829	£974.08

CANON	Ex VAT	Inc VAT
BJC 55	£202	£237.35
BJC 85	£169	£198.58
S200X	£46	£54.05
S300	£60	£71.68
I550	£92	£108.10
S750	£108	£126.90
S330 Photo	£54	£63.45
S530D	£193	£226.78
S830D	£224	£263.20
S6300	£271	£318.43
S900	£255	£299.63
S9000	£349	£410.08
S820	£116	£136.30
S820D	£232	£272.60
BJC5500 Inkjet	£380	£446.50
LBP810 Laser	£129	£151.58
LBP1120 Laser	£140	£164.50
LBP1210 Laser	£194	£227.95

TEKTRONIX	Ex VAT	Inc VAT
Phaser 750N	£699	£821.33
Phaser 750P	£749	£880.08
Phaser 860N	£1689	£1984.58
Phaser 860DP	£2699	£3171.33
Phaser 2135N	£2979	£3500.33
Phaser 2135DT	£4099	£4816.33

EPSON	Ex VAT	Inc VAT
LX300+	£97	£113.98
FX880	£261	£306.68
FX980	£314	£368.95
FX1170	£202	£237.35
FX1180	£314	£368.95
FX2180	£384	£451.20
LQ300	£112	£131.60
LQ580	£216	£253.80
LQ680	£224	£263.20
LQ870	£366	£430.05
LQ2080	£336	£394.80
LQ2180	£479	£562.83
DLQ3500+	£830	£975.25
DFX5000+	£1229	£1444.08
DFX8500	£1799	£2113.83
Stylus Color C42UX	£43	£50.53
Stylus Color C62	£59	£69.33
Stylus Color C70+	£75	£88.13
Stylus Color C82	£92	£108.10
Stylus Photo 830	£74	£86.95
Stylus Photo 890	£115	£135.13
Stylus Photo 915	£133	£156.28
Stylus Photo 925	£185	£217.38
Stylus Photo 950	£281	£330.18
Stylus Photo 1290	£259	£304.33
Stylus Photo 2100P	£444	£521.70
Stylus Color 1160	£192	£225.60
Stylus Colour 1520	£315	£370.13
Stylus Colour 3000	£744	£874.20
Stylus Pro 5000	£957	£1124.48
EPL-5900L	£125	£146.88
EPL-5900	£196	£230.30
EPL-5900N	£249	£292.58
EPL-5900 PS	£294	£345.45
EPL-6100	£224	£263.20
EPL-N2050+	£564	£662.70
EPL-N2750	£1139	£1338.33

BROTHER	Ex VAT	Inc VAT
HL1230	£153	£179.78
HL1440	£185	£217.38
HL1450	£209	£245.58
HL1470N	£317	£372.48
HL1650	£389	£457.08
HL1870N	£499	£586.33
HL3260N	£1379	£1620.33
HL3260ND	£1699	£1996.33
HL3450CN Laser	£1969	£2313.58

QMS	Ex VAT	Inc VAT
PagePro 120DW	£140	£164.50
PagePro 1250E	£235	£276.13
PagePro 9100	£899	£1074.08
Magicolor 2210GN	£839	£985.83
Magicolor 3100	£1529	£1796.58

LEXMARK	Ex VAT	Inc VAT
Jetprinter Z25	£38	£44.65
Jetprinter Z35	£45	£52.88
Jetprinter X73	£80	£94.00
Jetprinter X85	£98	£115.15
E320 Laser	£181	£212.68
Optra T620	£679	£793.13
Optra T622	£939	£1103.33
Optra W810	£1519	£1784.83
Optra C720	£859	£1009.33
Optra C750	£1429	£1679.08

PANASONIC	Ex VAT	Inc VAT
KX-P1131 Impact Printer	£110	£129.25
KX-P3200 Impact Printer	£158	£185.65
KX-P3696 Impact Printer	£288	£338.40
KX-P3626 Impact Printer	£288	£338.40
KX-P7105 Laser	£180	£211.50
KX-P7110 Laser	£255	£299.63
KX-P8415 Colour Laser	£799	£938.83

XEROX	Ex VAT	Inc VAT
6200B Colour	£1435	£1686.13
6200N Colour	£1619	£1902.33
6200DP Colour	£1759	£2066.83
6200DX Colour	£2699	£3171.33
Phaser 7300B Colour	£2319	£2724.83
Phaser 7300N Colour	£2539	£2983.33

scanners

HEWLETT PACKARD	Ex VAT	Inc VAT
Scanjet 2300C	£50	£58.75
Scanjet 4400	£74	£86.95
Scanjet 4500C	£118	£138.65
Scanjet 4570C	£155	£182.13
Scanjet 7400C	£291	£341.93
Scanjet 7450C	£359	£421.83
Scanjet 7490C	£510	£599.25

MICROTEK	Ex VAT	Inc VAT
ScanMaker 3800	£57	£66.98
ScanMaker 4800U	£85	£99.88
ScanMaker 5600	£149	£175.08
ScanMaker 5700	£279	£327.83
ScanMaker X12USL	£175	£205.63
Filmscan 35	£121	£142.18
ScanMaker 8700	£539	£633.33
ScanMaker 9600XL	£799	£938.83

EPSON	Ex VAT	Inc VAT
Perfection 1260U	£60	£71.68
Perfection 1260U Photo	£78	£91.65
Perfection 2400 Photo	£149	£175.08
Perfection 1640SU	£185	£217.38
Perfection 1660U Photo	£128	£150.40
Perfection 2450 Photo	£224	£263.20
Expression 1680 Scanner	£489	£574.58
Expression 1680 Pro	£645	£757.88

CANON	Ex VAT	Inc VAT
Canon Lide20	£46	£54.05
Canon Lide30	£62	£72.85
Canon N1250U2	£70	£82.25
Canon N1250UF	£116	£136.30
Canon 5000F	£145	£170.38
CanonoScan D2400UF	£171	£200.93
CanonScan FS2710	£349	£410.08
CanonScan FS4000	£505	£593.38

AGFA	Ex VAT	Inc VAT
Snapscan e20	£59	£69.33
Snapscan e25	£77	£90.48
Snapscan e40	£126	£148.05
Snapscan e50	£145	£170.38
Arcus 1200	£455	£534.63

UMAX	Ex VAT	Inc VAT
Astra 3400U	£51.05	£59.98
Astra 3450U	£76.59	£89.99
Astra 5400U	£85	£99.88
Astra 5450U	£127	£149.23
Astra 6400F	£170	£199.75
Powerlook 1100 Graphic	£749	£880.08
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The Ipaq wallet (pictured left) will fit all models.

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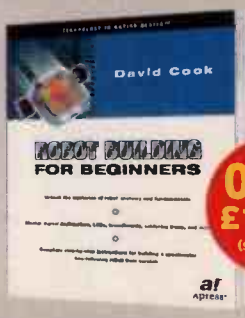

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"Caligari is pleased to be able to offer readers of Personal Computer World magazine a chance to upgrade to the full boxed version of the soon-to-be-released trueSpace6.5, which normally retails at £485, for the very special price of only £249! Never before has access to such high end features been so affordable, and trueSpace6.5 will let you work faster and smarter than you thought possible.

You can experience the power of trueSpace6.0 on the cover CD demo, to see for yourself why trueSpace is one of the world's most widely used 3D applications (source, "2001 Roncarelli Report on the Computer Animation Industry").

trueSpace6.5 (so new that the demo isn't out yet!) expands upon that, with emphasis on animation. New clip editing makes it easy to mix and blend animation sequences, and the physics has been improved (eg, let trueSpace6.5 automatically calculate leaves swirling in the wake of a car!).

Inverse Kinematics have been improved, and sound can now be exported directly with the animation, while animations can be played back in real time faster or slower (dependent upon the graphics card's capabilities).

It's easier than ever to keep your work organised and accessible, using the improved libraries. You can save on repetitive tasks with the ability to paint copies of objects onto any surface (Geometry Paint), and replace objects throughout an entire scene with a single click, adding to the array and copy tools from trueSpace6.0.

Of course, all the features of trueSpace6.0 remain - powerful modelling is available through NURBS, Subdivision Surfaces, and an unrivalled set of point editing tools for polygon modelling, so that you can create everything from the streamlined curves of a car, to low-poly game models.

Use the mirror tool to cut your modelling time in half; then manipulate objects with the powerful shell, bend, taper and skew tools, while rounding out their edges with fillets and chamfers.

There's support for a wide range of import and export formats. trueSpace6.5 extends those, with improved .X and .DXF handling for your game models, Viewpoint format support for animation triggers and baked textures, and DWG format for Autocad compatibility.

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The Journey from OneOs to HyperOs

From PC1x to PC21x

Like the Chinese Philospher Confucius once said: The journey of 1,000 miles starts with a single step.

This is why we have introduced System doubler. OK, 21 Windows systems seems a bit excessive, I mean after all we are not Americans, we are British, we are reserved. Perhaps we could start with two systems. Then we have a fall back position if one system goes wrong. We have a test system to expriment with. We have doubled our PCs capabilities. We have converted a PC1X into a PC2X. All sorts of new possibilities open up for us in this new world. The first and most important is that the balance of power and hence of fear has changed. You control Windows now, it no longer controls you. If your country has only one supplier of anything, such as Telephone lines or Cars, then you are a victim of this supplier because you cannot buy from anyone else. Likewise if you have only one Windows system, you are a victim of this system. But once you have two suppliers of anything, you can start playing one off against the other. This is the principle behind free market competition. It is rather ironic that Microsoft who have a virtual monopoly on PC operating systems, produce Windows, which itself creates a monopoly in your PC, by becoming the one and only mediator between you and your hardware. It is almost as if the father created the son in its own image!

But look! If you get two Windows systems, then the monopoly has gone. You can talk to HyperOs, and HyperOs can talk to both of your two Windows systems and you can play one off against the other. HyperOs is almost entirely a passive command line and GUI interface OS. It does not have a Kernel, it cannot crash. What is the point in buying a power PC and then just giving the control of all of that power to Windows?

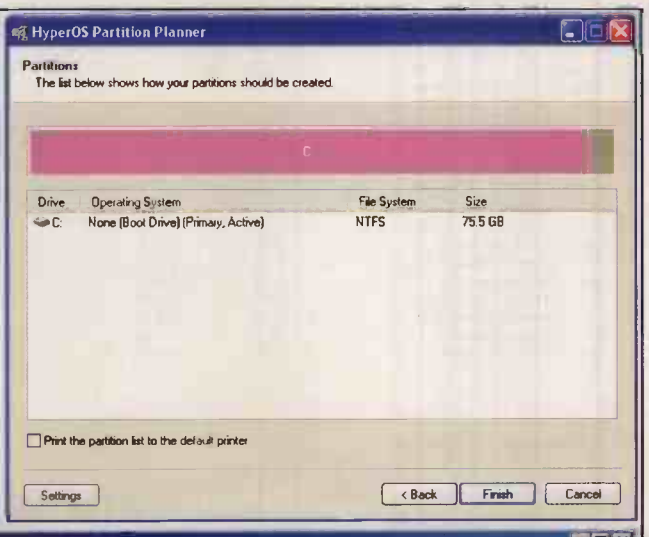
"Do you buy a power PC for yourself or for one copy of one OS?"

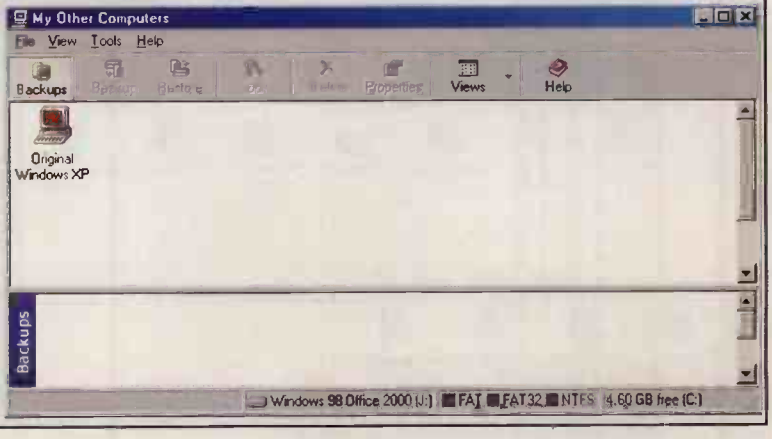
The next 4 pages will take you on the journey from oneOS to FifteenOS, from a PC1X to a PC15X, through the various useful intermediate stages. You can go on that journey with your mind through the pages of this magazine, but of course your wallet does not have to complete the entire marathon, and neither does your hard disk!!

But for £99 you can get up to ElevenOs, and for £199 you can reach the final destination of TwentyoneOS or PC21X. All you require for 21 systems is a large hard disk, say 80GB

OneOs - PC1X

- Can safely run 2-4GB of software at most.
- Safely runs between 10 and 30 applications at best.
- Can suffer upto 40% performance degradation at max software load.
- Not suitable as a platform for testing interesting software.
- If it crashes and if you personally can't fix Windows, then it's game-over.
- Windows has control. You are its victim.
- Suffers from software and hardware conflicts.
- All your eggs are in one basket. If any applicatrion corrupts Windows you can no longer send or receive emails, or access any of your data or doccuments.
- Way too precarious and no second chance!





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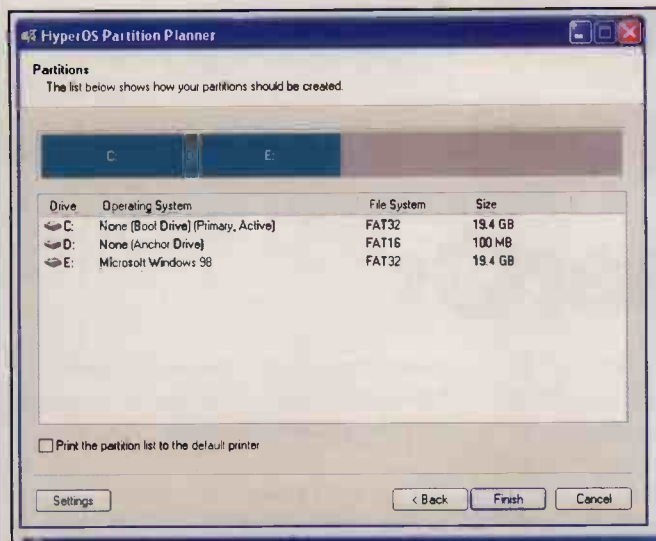
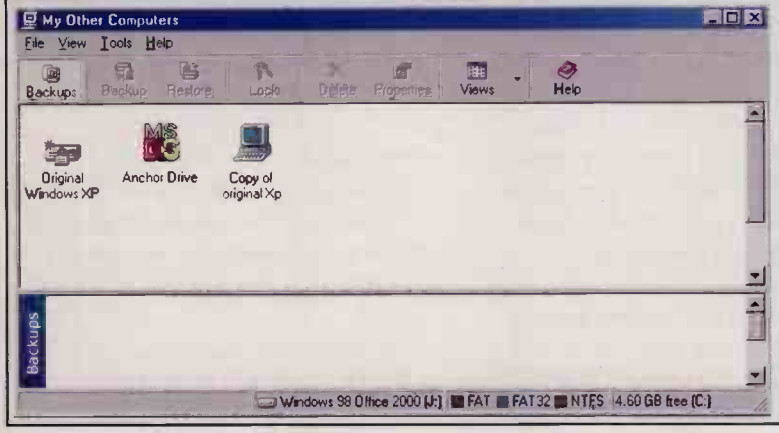
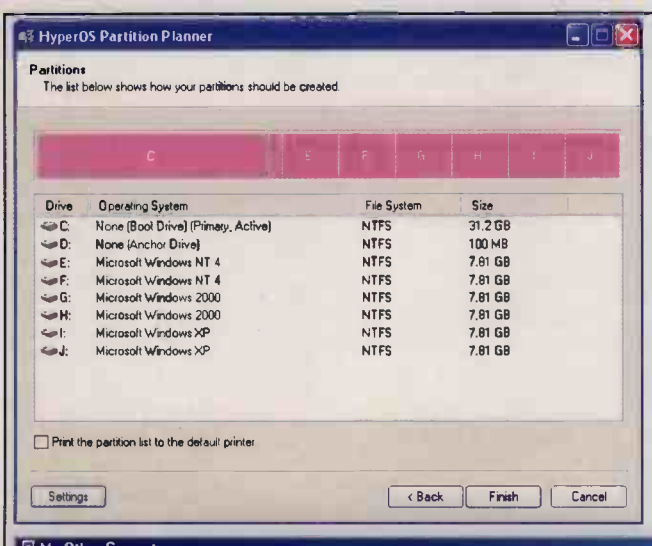


System Doubler - PC2X

- Can safely run 4-8GB of software at most.
- Safely runs between 20 and 60 applications at best.
- Can suffer upto 40% performance degradation at max software load. Less likely to reach that max.
- One system can now be used to test competing new software titles, to find the one that best suits your needs, without risking your mission critical system.
- If one Windows system crashes and you personally can't fix Windows switch to the other system.



- You have gained some control. You have leveled the playing field.
- Software and hardware conflicts can be resolved by splitting the conflicting items between your two Windows systems.
- Put your internet in one system and the rest of your work in a second system. Then you can't loose everything at once.



Corporate System PC7X

- Can safely run 14-28GB of software applications.
- Safely runs between 70 and 210 applications.
- Can suffer upto 40% performance degradation at max software load. Much less likely to reach that max.
- Several systems can now be used to test competing new software titles, to find the one that best suits your needs, without risking your mission critical systems.
- If one Windows system crashes and you personally can't fix it, then switch to any of your other systems.

- You have complete control. Windows is now your victim.
- Software and hardware conflicts can be resolved by splitting the conflicting items between two Windows systems.
- Your Mission critical business system can remain static without incapacitating the rest of your PC. Load new apps into secondary systems.

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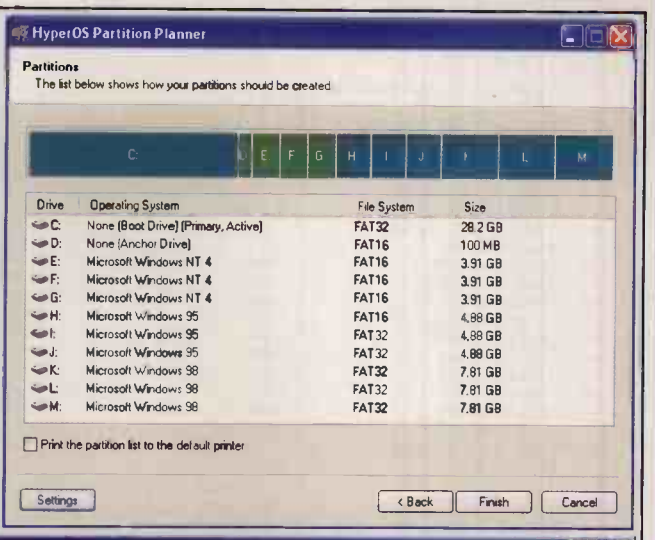
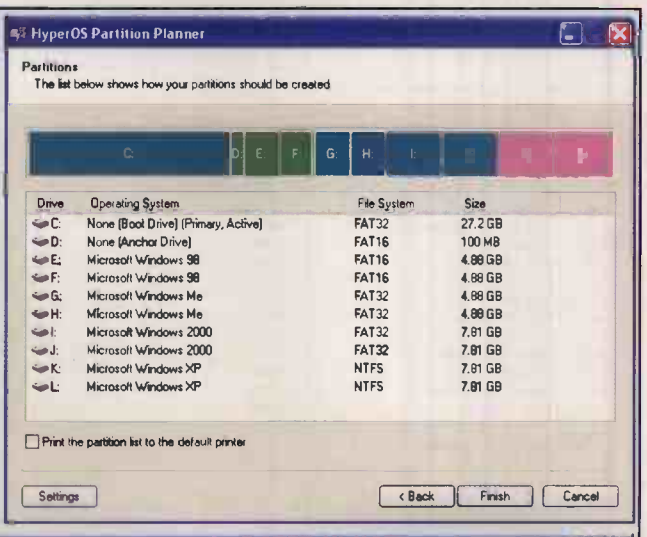
Retro System PC10X

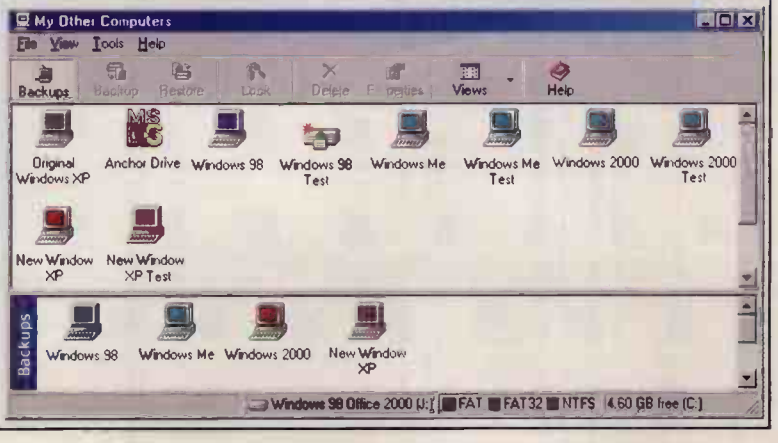
- Can safely run 20-30GB of software applications.
- Safely runs between 100 and 200 applications.
- Can suffer upto 40% performance degradation at max software load. Unlikely to reach that max.
- Several systems can now be used to test competing new software titles, to find the one that best suits your needs, without risking your critically useful systems.
- If one Windows system crashes and you personally can't fix it, then switch to any of your other systems.
- You have complete control. Windows is now your victim.
- Software and hardware conflicts can be resolved by splitting the conflicting items between two Windows systems.
- Your critically useful systems can remain static without incapacitating the rest of your PC. Load new apps into secondary systems.



Serious System PC9X

- Can safely run 18-36GB of software applications.
- Safely runs between 90 and 270 applications.
- Can suffer upto 40% performance degradation at max software load. Unlikely to reach that max.
- Several systems can now be used to test competing new software titles, to find the one that best suits your needs, without risking your mission critical systems.
- If one Windows system crashes and you personally can't fix it, then switch to any of your other systems.
- You have complete control. Windows is now your victim.
- Software and hardware conflicts can be resolved by splitting the conflicting items between two Windows systems.
- Your Mission critical systems can remain static without incapacitating the rest of your PC. Load new apps into secondary systems.





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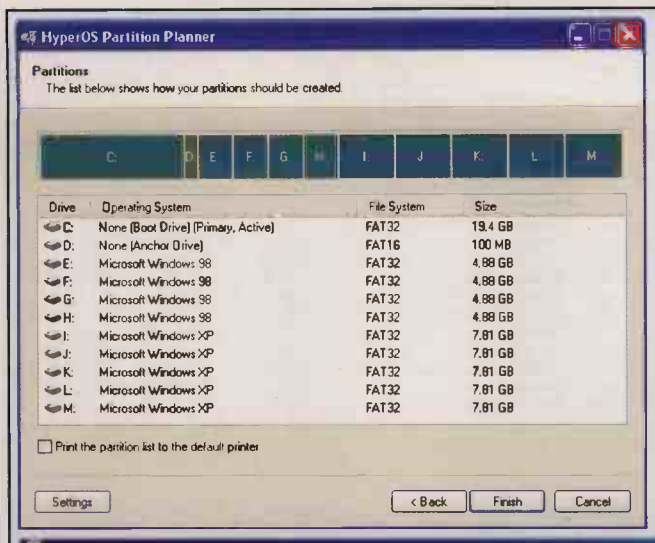
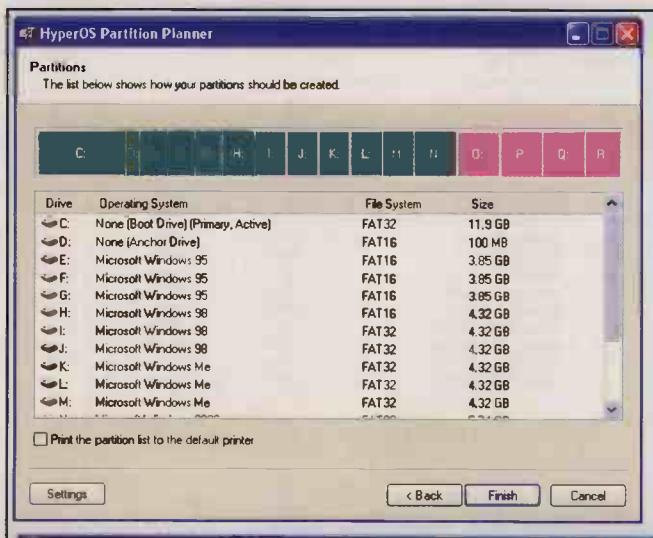
Family System PC10X



- Can safely run 20-40GB of software applications.
- Safely runs between 100 and 300 applications.
- Can suffer upto 40% performance degradation at max software load. Unlikely to reach that max.
- Several systems can now be used to test competing new software titles, to find the one that best suits your needs, without risking your mission critical systems.
- If one Windows system crashes and you personally can't fix it, then switch to any of your other systems.
- You have complete control. Windows is now your victim.
- Software and hardware conflicts can be resolved by splitting the conflicting items between two Windows systems.
- Each family member can have a main PC and a secondary PC, and they can choose between 98 Me 2K and XP.

Power System PC15X



- Can safely run 30-60GB of software applications.
- Safely runs between 150 and 450 applications (powerful or what?)
- Can suffer upto 40% performance degradation at max software load. Very unlikely to reach that max.
- Several systems can now be used to test competing new software titles, to find the one that best suits your needs, without risking your mission critical systems.
- If one Windows system crashes and you personally can't fix it, then switch to any other system.
- You have complete control. Every version of Windows is now your victim.
- You can have every Windows OS, every Browser, even 3 or 4 different sound cards if you like. Total Freedom - I'll have the lot!

This is a far as HyperOs can take you today!

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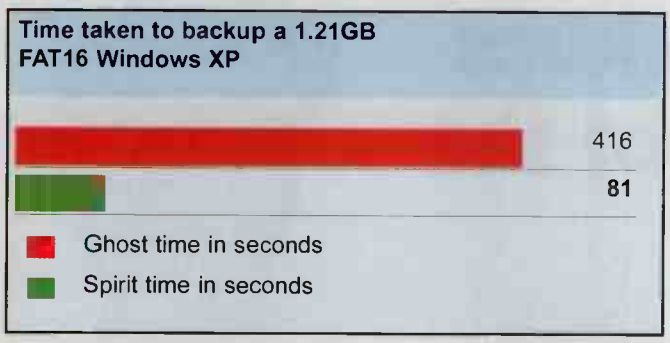
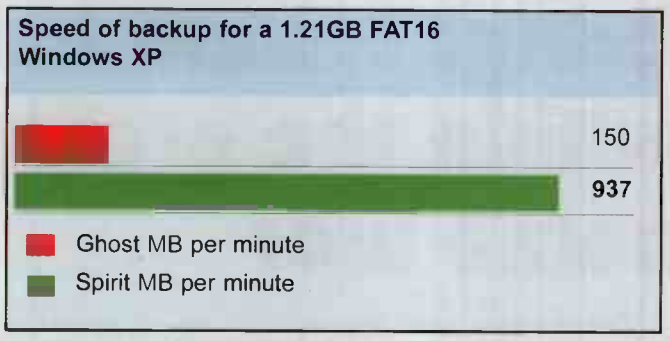
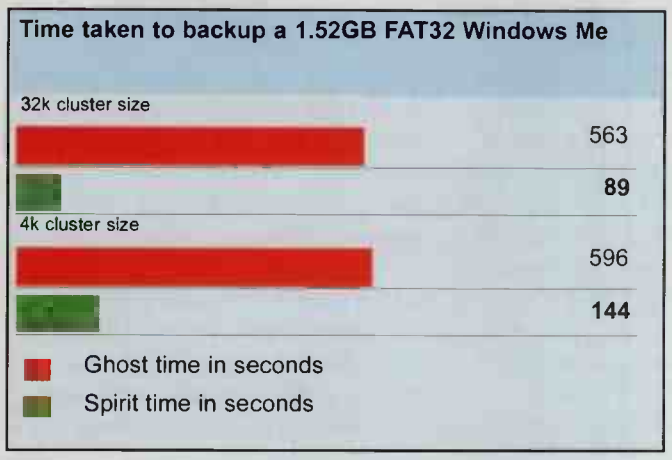
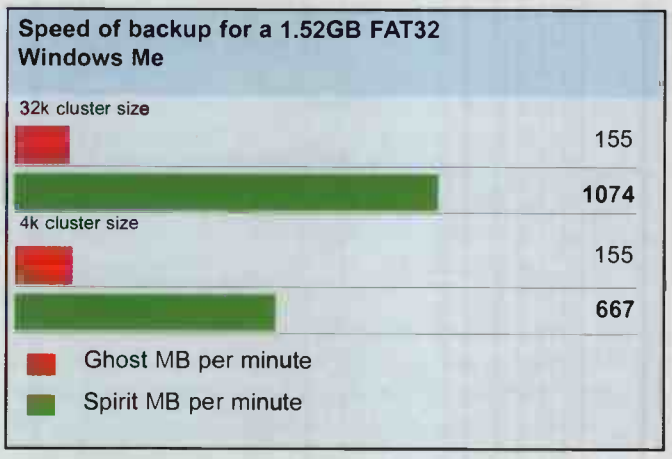
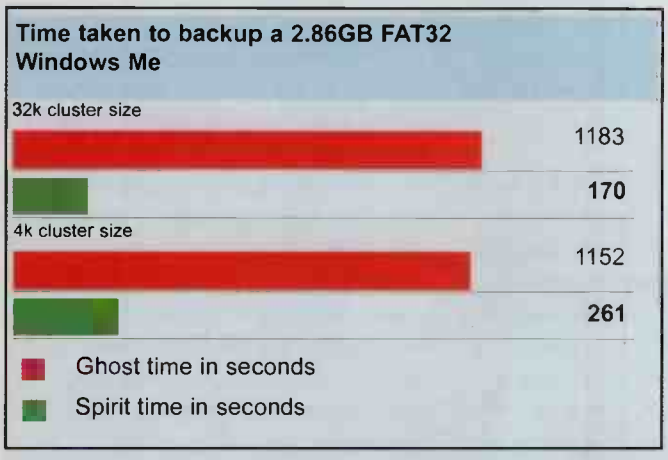
Norton Ghost vs HyperOs Spirit

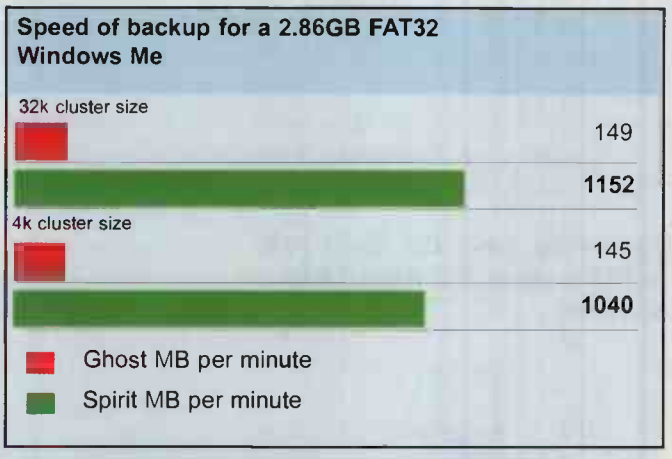


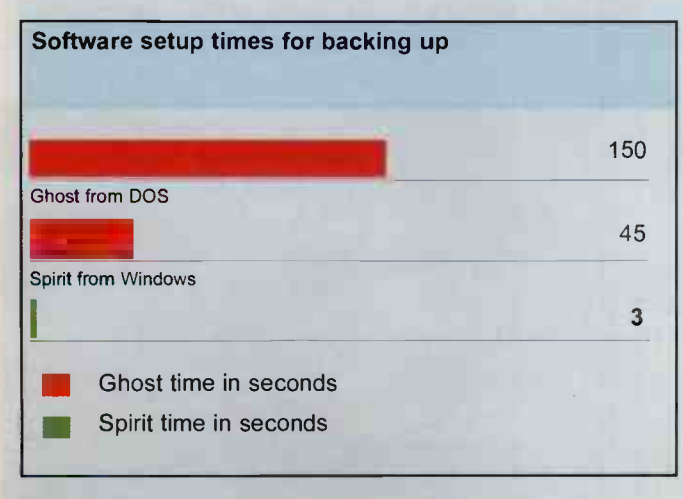












The results examined

The test machine for the Ghost vs. Spirit contest was an Advent machine purchased from PC World 2 years ago. It had an Athlon 550MHz CPU and 64MB of RAM running on the AMD 751 Southbridge and 756 Northbridge. We used the latest Bus Master IDE drivers for the Southbridge, which were available from the AMD website. With larger partitions, Ghost stops after backing up 2047MB (this is the 2GB DOS file size limit). You either have to watch the whole process and immediately start it off again, or as is more often the case, you will lose a few minutes before you realise that it has stopped and therefore restart it. Spirit does not have this problem, because it runs in Windows rather than DOS. Spirit performs over 4 times faster than Ghost with a small cluster size partition, and over 6 times faster than Ghost with a large cluster size partition.

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HyperOs Systems

The speed and ease of use of HyperOs Spirit finally brings system backups within the grasp of the home user

Let us face it. Most PC users cannot be bothered to back up Windows using the traditional Norton Ghost software. This is why Microsoft are indefinitely introducing improved automatic backup solutions for Windows such as System Restore. This is because people in general don't back up their systems with standard back up software often enough. This is why System Restore is billed as an XP top 10 feature.

The reason that one does not back up Windows regularly is that the typical system with System Restore and Hibernate and the paging file and some data on one drive might be 3GB in size. And all industry backup software runs in DOS in PIO mode at a maximum of 100MB per minute. So we are talking about 30 minutes to back up a normal Windows system. And the user has to reboot to DOS and then use a DOS interface to set the backup going.

HyperOs can do this job in 90 seconds and this is how:

Firstly with HyperOs there is always another Windows system available to backup your first system with. So that rather than your hard disk operating in PIO mode in DOS it is operating in UMDA 4 or 5 mode in Windows.

Secondly HyperOs backs up systems using HyperOs Spirit, which employs an intermediate RAM buffer, and an algorithm which reads data from the source drive in 6.4 MB chunks into RAM, in such a way that it can be written out linearly to the target drive. In this way write times are much speeded up, because the writing head does not have to jump around all over the disk. HyperOs spirit will back up and restore data at around 1000 MB per minute on an IBM120GXP hard disk (which is a very fast IDE hard disk - a fantastic piece of IBM technology).

Thirdly, HyperOs disables Hibernate and System Restore, because the former is incredibly space inefficient (taking 12% of your hard disk space or more if it can get it), and is only useful with a very slow to start up and overloaded Windows, and because the latter is performed better by the very process we are currently describing.

Fourthly, HyperOs setup moves your swap file and paging file to the C: drive. There is no need to back up these huge files, when you back up Windows. Windows will recreate them when you restore it. So what was a 3GB system on a one Windows PC will be between a 1GB and 2GB system on a HyperOs multi Windows PC (because your paging file/swap file and your hibernate file and your system restore folder generally take up more than 1GB between them.

So Spirit can back it up in between 1 and 2 minutes or typically in 90 seconds. As regards to NT, since it only takes up 120 MB when configured as above, for HyperOs, it will get backed up in 7 seconds at 1000 MB per minute. So it is not an exaggeration to say that what other backup and restore packages do in 30 minutes, HyperOs Spirit does in 90 seconds. This differential applies on all typical consumer PCs where the hard disk runs off the motherboard IDE socket. PCs with RAID and other fast SCSI hard disk controller will perform better in DOS and so the difference will not be so marked.

But that is not the best bit. The best bit, is that to back up a system with HyperOs, all you do is drag the system icon to the backups window of HyperOs's My Other Computers window and drop it there. It is a drag and a drop, that is it.

The difference between a 30 minute backup setup by an excursion into DOS perhaps after booting from a floppy disk, and a 90 second backup setup by a drag and drop from within Windows is monumental. This is one of the huge advantages of HyperOs over Multi Booting or Virtual PC software. With HyperOs, you can manipulate one Windows system from another Windows system. With Multi Booting you cannot even see any other Windows systems, and with Virtual PC software you can see them but you cannot access their data due to virtualisation and due to the fact that all these systems are being used at once.

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HyperOs Systems

Testing Windows to destruction

Last month we loaded in MSOffice, Photoshop, Quark Express and Corel Draw and then 1,2 and 3 complete cover disks into 98, ME, 2K, and XP. The result was that all 4 operating systems failed to function at various differing levels of application loading. We got many calls from readers fascinated by the results. Some suggested that, in the case of XP, which only failed completely at the 3rd CD, the problem may not have been the fault of the Windows XP operating system, but may simply have been that one of the cover disk CD's had a fault on it or a fault on one of the applications in it and this was cause of the failures. To determine whether or not this was the case, we conducted the whole test again in reverse order. We loaded the cover disks into the 4 Windows Operating Systems in the order 3,2,1 rather than the order 1,2,3 which we used in the previous months tests. We never got as far as loading in Corel Draw, Quark Express, Photoshop and MSOffice in reverse order, because all 4 versions of Windows had given up by then.
We ran the tests again, on the same PC, the 'Systemax Venture 3148', a P4 2GHz, 256MB DDR RAM machine with a 40GB hard drive.

The new tests were therefore carried out as follows:

Bare System – We simply installed the operating system, with all necessary Northbridge and Southbridge and Graphics drivers. There were absolutely no other applications loaded in to the Windows operating system, except for Business Winstone 2002, which was installed in order that we might run the tests. We then installed the First PC Advisor Feb 2003 CD (CD3 - 10 apps). We then installed the PC Pro Jan 2003 cover disk CD (CD2 - 20 selected apps). We then installed the Second PC Advisor Feb 2003 CD (CD1 - 10 apps).

Bare System Performance

All of our tests show that 2K is faster than XP and that 98 is faster than ME. 2K, ME and 98 are consistent in their performance but XP is not. We were initially very concerned about the discrepancy between the XP bare system results last month (24.6) and the results this month (21.1). The XP installation that we ran last month was just the Systemax pre-installed copy of XP. The installation that we ran this month was the result of running the Systemax recovery CD. It is hard to see where the difference lies. So we ran a series of tests on separate XP installations on a second PC, this time using a Microsoft XP disc. The result was an even larger discrepancy between the performances of the two separate installations (20%). At this point we wondered whether we were looking at a fragmentation problem. We deliberately did not defrag anything before any test, because we are trying to create a real world consumer test environment here. But for the sake of completeness, we totally defragmented the XP Windows system and ran the bare tests again. The results were better, we got 23.5 then 21.4 then 23.7 on the Athlon test machine. XP is certainly more sensitive to fragmentation as well as being more erratic in performance. It can perform slightly more slowly than 2K, and it can perform considerably more slowly than Windows 98! Our lab tests show that XP is a step backwards in performance of an indeterminate size.

Windows 98

Last month 98 managed to run CD1 reasonably and that was it. This month it failed to run CD3! This one CD was too much for it. Windows 98 is certainly the weakest of the 4 operating systems. ME is stronger but less stable, it can carry a greater load, but falls over more frequently. Windows 98 performed consistently as a bare system, averaging a score of 23.9. But it is certainly the case the CD3 is more of a problem than CD1 for 98.

Windows Me

Those of you that read last months instalment of the labs tests, will be aware that I am not the greatest fan on Windows ME. In the first round, as a bare system, although one test failed, Windows ME surprised me by performing a lot better than last months tests with an Average of 23 (ignoring the one failure). However this dim flicker of hope for the end of the line of the 9x series was soon extinguished when CD3 was loaded into ME. When installing 'Ciniplayer 1.5', upon restart, Windows ME insisted that I needed to re-install the graphics card drivers. Of course one cannot run a movie without graphics drivers, but how an OS can 'lose' its graphics drivers has always intrigued me. I am reminded of a time when I stood on a platform in Havant, waiting for a train from Southampton. The voice on the speaker system said, in classic British Rail Hi-Fi:

"We would like to apologise to all passengers hoping to catch the 5:05 from Southampton, we have lost the train, we do not know where it is"

Once I accommodated Windows by reinstalling the graphics card, I was faced with a grumpy Business Winstone 2002, which refused to start, and required an immediate re-installation. It appears that Windows ME lost this application as well! Once BW2002 was re-installed I was then able to run the next stage of tests.

In the second round, ME was clearly struggling, the scores were lowered to an average of 15. Now this is the sort of score that I am more familiar with when it comes to ME. In the third round, the first test failed, and during the second test, Winstone failed to start, and then got stuck in a infinite loop of rebooting. I was simply no longer able to use Windows Me any more.

Windows 2000

Ahh, the ever dependable Windows 2000. Yes, I am a fan of this operating system. In the first round of tests it did not let me down once and produced a huge average of 25.7. Even in last months tests Windows 2000 produced the highest scoring test results. This was a little but of a shock, as one would expect that the 'upgraded' OS, Windows XP, would be faster. Another giant leap for mankind!

In the second round, apart from the fact the first test failed, Windows 2000 produced the highest score of all operating systems over the last 2 months by reaching a score of 26. However in the third round, we found that the stability of 2000 suddenly disintegrated and it failed all 5 tests. We had again found the working limit of Windows 2000. In this case it was 30 applications, from 2 CDs.

Windows XP

Are you ready for the real Windows eXPerience? Have a look at the results for XP over the two months. Both last month and this month, XP proved that it can carry a larger application load than all of its predecessors. So, well done Microsoft for that one! XP managed to run 40 applications from 3 CDs when loaded in the order CD1, CD2, CD3, and it managed to run 30 applications from 2 CDs, when loaded in the order CD3, CD2.

For the conclusions of these tests and of our second group of test for this month which tries to determine how many apps each Windows Os can realistically be expected to run - turn to the end of the Lab test section

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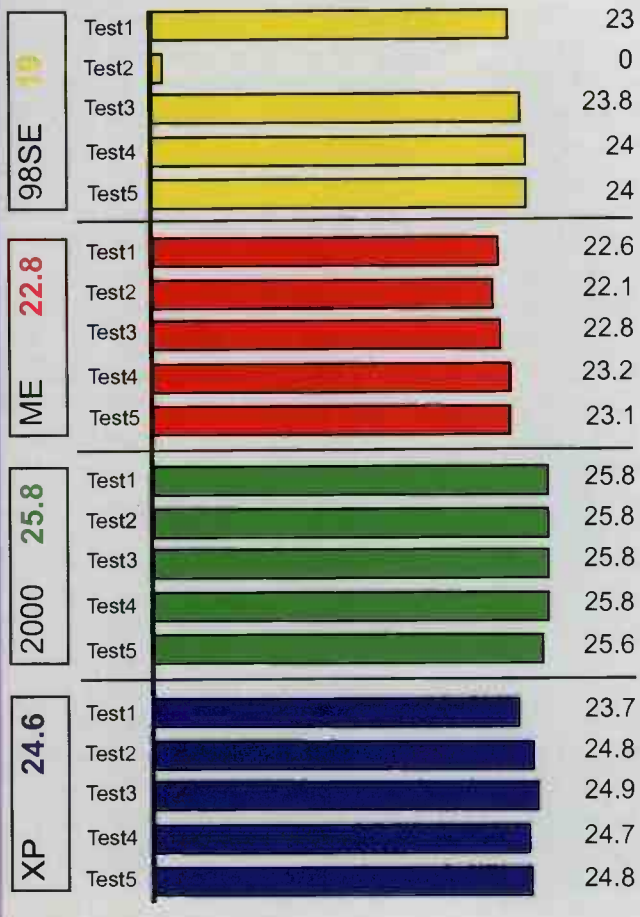
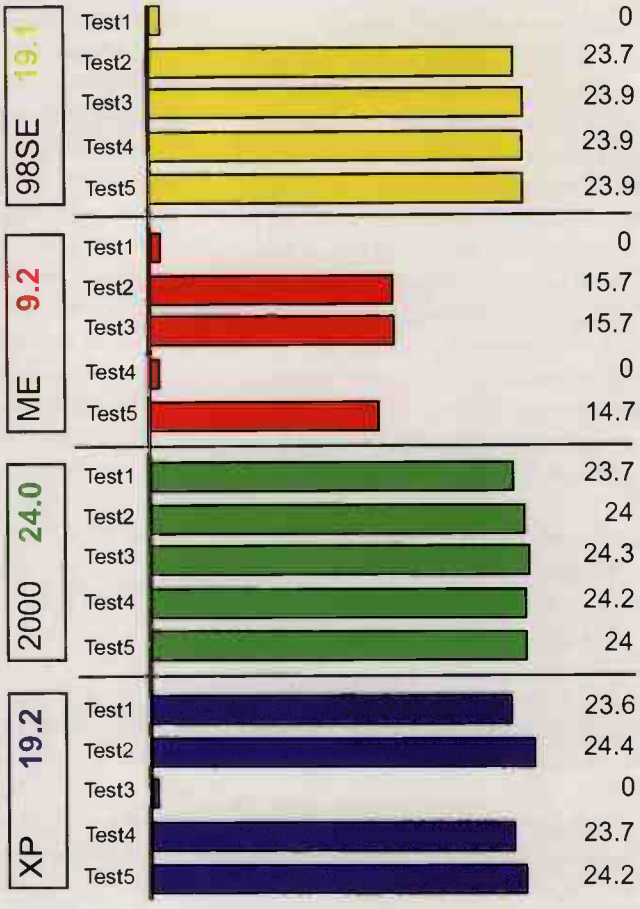
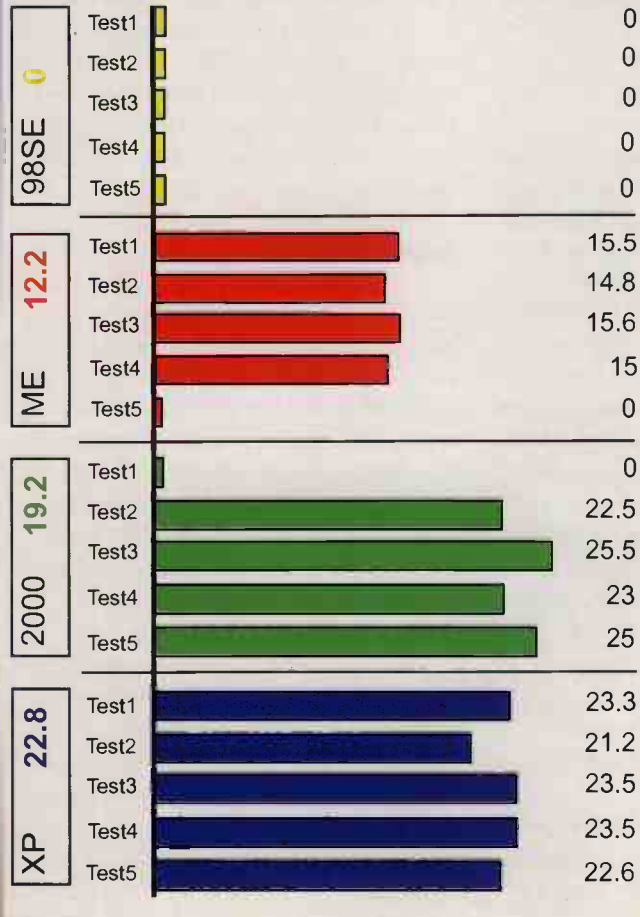
Round 1 - Bare System



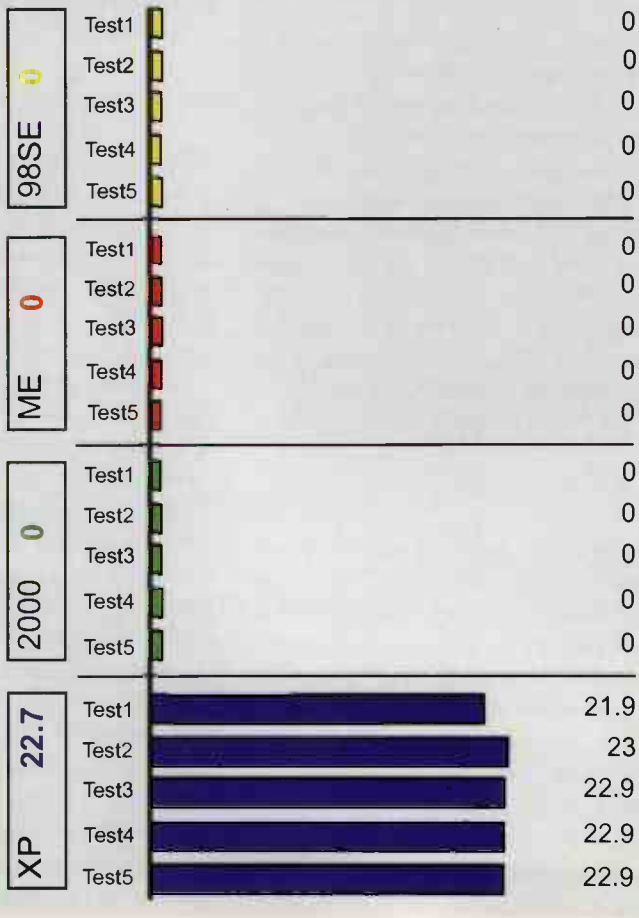
Round 2 - Office/Photoshop/ Quark/Draw + CD1



Round 3 - Office/Photoshop/ Quark/Draw + CD1 + CD2



Round 4 - Office/Photoshop/ Quark/Draw + CD1 + CD2 + CD3



HyperOs Systems

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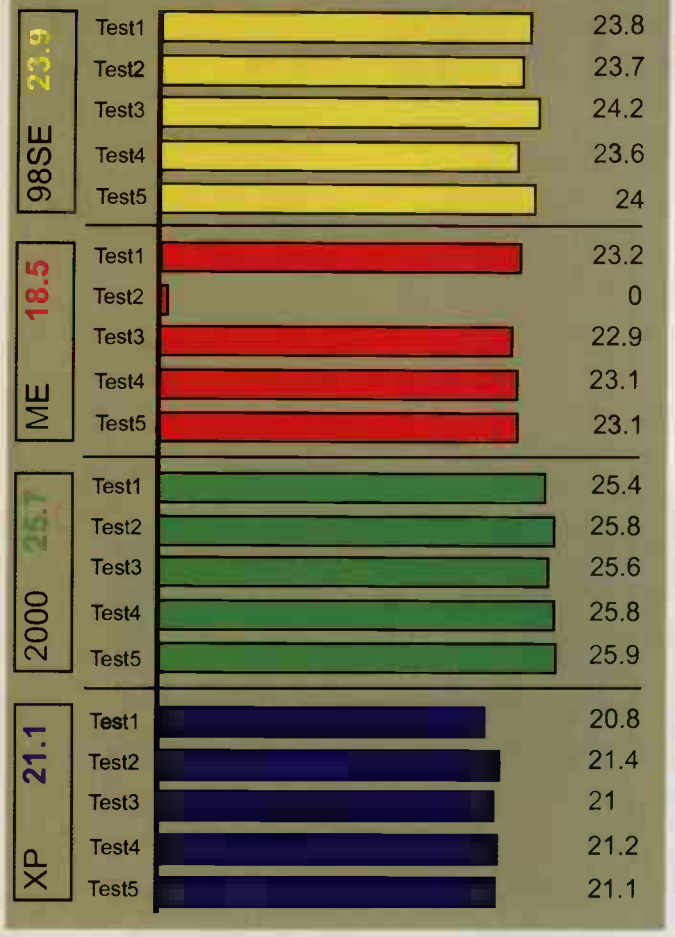
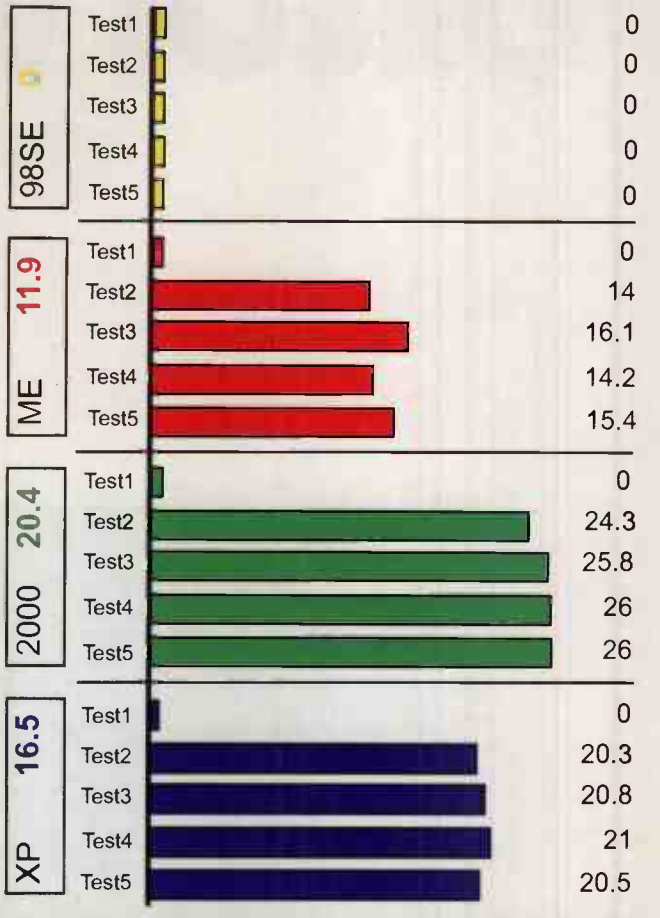
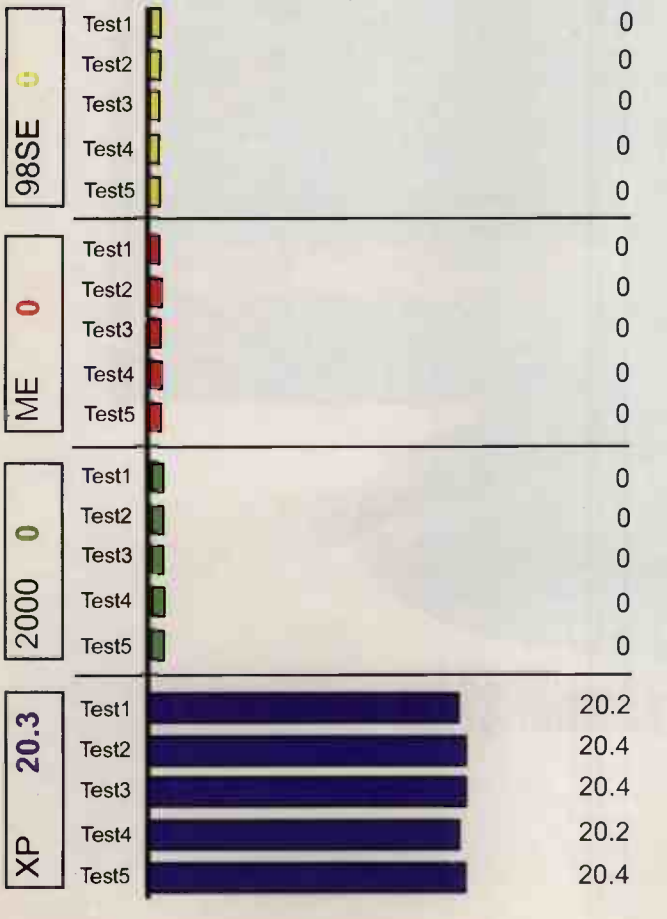
Round 1 - Bare System



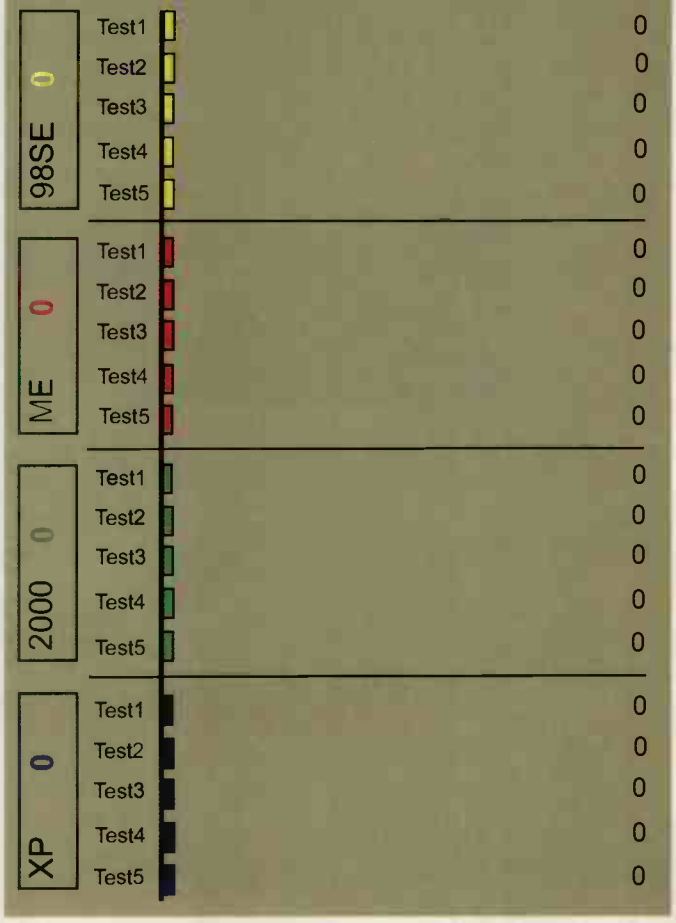
Round 2 - CD3



Round 3 - CD3 + CD2



Round 4 - CD3 + CD2 + CD1



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OneOs versus...

Which one crashes the most ?

HyperOs Systems

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...HyperOs

Which one is the fastest ?

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How Many Applications Can You Safely Load Into Windows?

Since the big advance in PC performance and stability resulting from the Windows 9x series and since the marginal improvement on this series resulting from the Windows NT x.x series, there has been little 'consumer domain' research into how many applications one can safely load into these Operating Systems. Part of the reason for this is presumably that in the past, before HyperOs was available, it was not realistic (or common) for the consumer to have any OS other than one copy of one version of Windows (except in the case of a few of the more adventurous consumers who might have had one copy of Windows 98 and one copy of Windows 2K managed by the Microsoft file Boot.ini). So such research, apart from being irrelevant to nearly every consumer, would also have been depressing. And no one wants to do depressing research, just as no managing director wants to look at his accounts in a week where he made a loss.

But this has now all changed. For not since the days of Sinclair and Amstrad, has a British software company lead the way in the mass market consumer PC game. HyperOs brings multiple Windows PCs within the grasp of every home user. Whether these boxes are running just 2 copies of XP or whether they are running 3 copies of each of 95 98 Me NT 2K and XP.

The question that we are asked all the time is: How big should my 98 or XP partition be? The answer we have been giving to this question is that it is not realistic to expect any of the Windows Operation Systems to run more than 5GB of applications. We have come to this conclusion as a result of our published lab tests with cover disk software. Since HyperOs disables System Restore and Hibernate modes and puts the swap file or paging file on the C: drive, the sizes of the respective Operating systems are generally:

95	100 MB
NT	120 MB
98	230 MB
ME	350 MB
2K	650 MB
XP	1100 MB

These sizes can be increased by several hundred MB if you install your own drivers and opt to install the various 'advertising utilities' that are normally bundled with them. (Creative labs are good at this - and good at making sound and graphics cards). So simply put, there is no point in having any system partition that is larger that 7GB. We are assuming here that the reader understands that best practice is to put your data on a separate partition to your various Windows system partitions.

But the question that we have recently been asking ourselves is this: Is it the number of applications that gets Windows into trouble or is it the size of these applications?

In the case of XP, the more applications that you load up, the more processes XP ends up running simultaneously - just do a ctrl-alt-del and hit the processes tab of the task manager to view them! Also the more applications you load up, the more the registry fills up with entries. There is no need to be scared of the Windows registry. It is merely an automated German book-keeper. It insists on doing everything in triplicate. Furthermore the startup folder can become full of utilities all competing to take centre stage on your desktop every time you start up your PC.

If for example you load in 20 applications, you will find that each individual application can be run by Windows without any difficulty. But the combination of this number of applications is likely to cause problems such as slow Windows start up, slow Windows performance and Windows freezes and crashes. Windows will spend more time doing what it and what its 20 applications wish your PC to do than it does doing what you have just commanded your PC to do.

"Your PC can become like a DSS waiting room"

When you double click on an application, XP gives you a number and asks you to wait in line! In fact if you think about it, the concept of giving XP a command is a bit optimistic. XP treats your commands more like requests. "Oh great and wise XP, I know that you are really busy with all of your crucially important housekeeping and management tasks, I know that I am an irritation and an inconvenience to your schedule of works that are you main priority, but if you could find a few moments between your more important activities to open up a Word document for me I would be very grateful."

I remember, I once went into a City Electrical Factors showroom in Leytonstone. I stood on the customer side of the counter and there was another person on the serving side of the counter. He was ignoring me and doing something which I am sure to him was very important. Anyway after around 3 minutes I decided to ask him: Excuse me, err..., do you work here? Yep, was the relpy. Perhaps he thought I was conducting a survey?

But we shouldn't be too nasty to XP, it has the incredible capability of recovering from a crash all by itself. The only trouble is, one does not know how long the recovery will take or whether it will succeed, and neither, it appears, does XP. So if something goes wrong, one has the option to wait indefinitely in the dark. I guess we take another number for this one. But one thing is for sure, XP is a very good looking OS, and one can forgive a good looking OS a lot, such is the history of man's interaction with good looking persons or machines.

So having found (in our previous lab tests) the rough maximum working load of general Windows applications that the 6 Windows Operating Systems can manage (2GB - 4GB), we are now going to attempt to find the maximum number of general applications that you can realistically load into Windows before it is seriously compromised. It doesn't take long before your programs bar becomes unusably large anyway!

Of course in doing this we are making the case yet again for having more than one Windows system on every consumer PC.

BUSINESS WINSTONE 2002

All of the HyperOs Lab tests use the Business Winstone Benchmark, because it is a real world Benchmark. It actually loads in several popular Office, Internet, Graphics, Email, and Anti-virus applications, runs them,

and then gives a figure for the whole experience. These benchmarks mimic a 'day in the office'. So if an overloaded Windows system can run this benchmark reasonably quickly and without crashing, then Windows is still alive and kicking. In our experience the Sysmark 2001/2002 range of Benchmarks and many other of the more popular Benchmarks, give you a performance figure which mainly measures Intelaherz, which is great for Intel but is not so good for AMD and in our opinion is a pointless and lengthy and unrealistic charade. One already knew the speed of ones processor before one started the experiment! Basically these Benchmarks are Hardware Benchmarks which are blind to IO. Business Winstone, and the whole Winstone range are software and hardware Benchmarks. They actually measure the effect that Windows itself is having on your PC.

Windows XP and the 60 utilities on the March 2003 PC Advisor cover disk.

Before we start this, we must point out that we found the utilities on the PC Advisor cover disk to be wide ranging and excellent, individually. And Windows can hopefully run each and every one of the them very well (Actually there was one that we could not install for some reason). But one more ironic conclusion of our whole experiment was that if you load them all, or if you load a large number of these and by implication any other PC enhancing utilities into Windows, then your PC actually performs over 30% more slowly, and crashes much more regularly! Basically its performance is destroyed.

"The worst thing you can do to a PC is fill it up with performance improving software"

You need to pick and choose which ones to load after conducting many tests. And you cannot realistically do that without several sacrificial Windows test systems. HyperOs gives you these of course.

We loaded in 10, 20, 30 and finally 50 applications from the cover disk into XP, and we loaded 10, 20 and 30 utilities into Me. We did not load in applications which required the downloading of content from the net. We judged that cover disk software has a certain level of integrity, but net downloads in general have a lower level of integrity. All of the applications were either useful or performance enhancing utlities. For the purposes of this experiment it matters little which ones they were. But many are very commonly used.

When installing all these utilities we just accepted every default that we could.

The first disaster was that the startup became full of unwanted adverts, which we had to selectively remove. The next disaster was an application called Zone Alarm. It just took over the whole PC and interrupted everything we were doing to give us incessant incomprehensible warnings. So we disabled Zone Alarm. The test results that we achieved on a bare system were: 22, 23.4, 23.4, 23.7, 23.9. Basically as Silicon heats up, it performs faster - Geforce graphics cards are really susceptible to this. You can get great Benchmark scores by cooking the cards! These bare system scores just reflect that phenomenon.

In general, each time we loaded in a further 10 utilities into ME or XP we then had to re-install Business Winstone, in order to get it to run again.

ME was by far the least stable and was abysmally slow. The Machine we used was a 1.1GHz (1.6 Intelaherz) Athlon Machine with an Abit KT7 motherboard and 512MB of DDRAM with a 40GB IBM 60GXP IDE hard disk.

ME officially could not run 30 applications at all. It gave us an MSAccess error and then a memory error. But we found that if we disabled some of the processes it was running from the task manager, then we then could complete a Business Winstone test. The same was true with XP. Officially XP could run with 30 applications but not with 50 applictions. The fully loaded XP system froze whilst running Netscape 6. So we ran a second Business Winstone test, and it froze again at the same place. Our first thoughts were that one or other net related utility was causing this problem. We should point out here that these utilities resulted in XP performing an additional 22 processes on top of the dozen or so system processes that it performs during a bare Windows session. So we disabled all of the web related processes that we could see (round 8 of them), then ran the test again. It failed again in the same place. So then we disabled every process that was not a system process (all 22 of them). Finally the test finished with a score of 15. We then repeated the test and achieved scores of 17.0 and 17.3. Again we see the score improving as the system heats up, possibly with help from RAM caching. But these results are not realistic for a consumer, who would not know what processes to disable.

Of course by disabling the 22 additional processes we are effectively uninstalling most of the applications. The incredible thing was that even in this state XP ran over 30% more slowly that it did in the bare state. Imagine (and this is really dreaming) if XP had been able to complete the Benchmark with all of these 22 extra processes going! How slow would it have run then?

Furthermore all Windows systems slow down with age, as the registry clogs up with more and more automated German book-keeping. So after a few months XP would be slower still!

So large numbers of applications kill performance and stability. And 50 is way too many. The next question is how many apps are not too many?

Conclusions from all this months lab tests

These tests were run to discover whether the test failures that we saw last month were the result of a faulty CD or of one particularly badly written application, or whether they were true Windows limits. A comparison of the two months results in all 4 Operating Systems shows clearly that the latter is the case. We are truly looking at the maximum working load of Windows here. Windows can run any of these applications by themselves, but certain combinations of these applications, installed in certain orders cause the problems.

The tests also show that the order of installation does affect the viability of your Windows system! We are looking at a complex problem here. But with the knowledge of the results of our other lab tests (see earlier in this article) we are able to produce the following very crude and rough maximum application load guide:

Windows 98	10-15 apps
Windows ME	10-20 apps
Windows 2K	15-25 apps
Windows XP	30-40 apps

So finally, we must take our hats off to XP. For, although its speed is a definite step backwards of a very unpredictable size, its application carrying capability is a large step forwards.

However, if you want to use or simply temporarily experiment with and enjoy a whole cover disk safely, then get HyperOS, whatever OS you are presently using.

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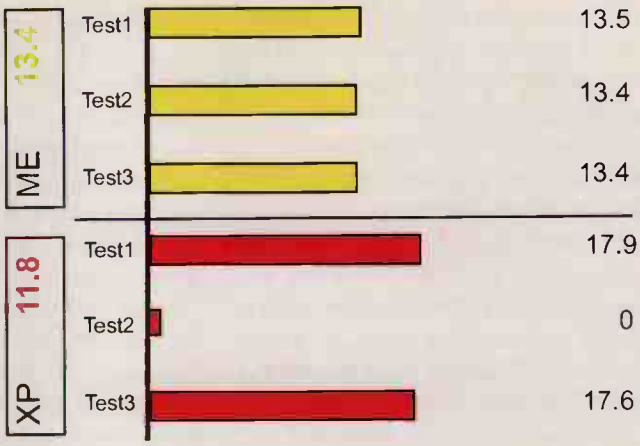
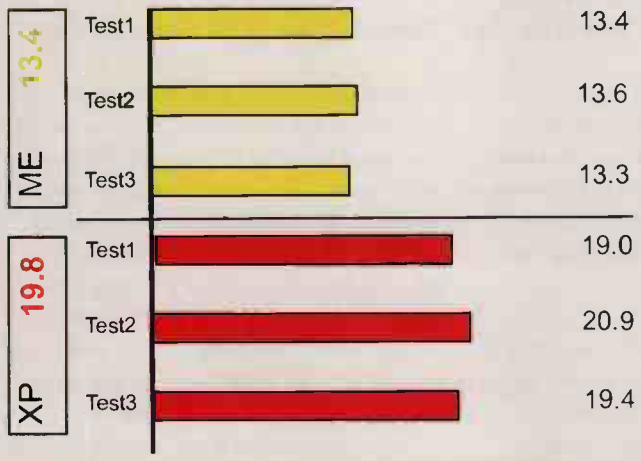
Round 1 - Installed Drivers Only

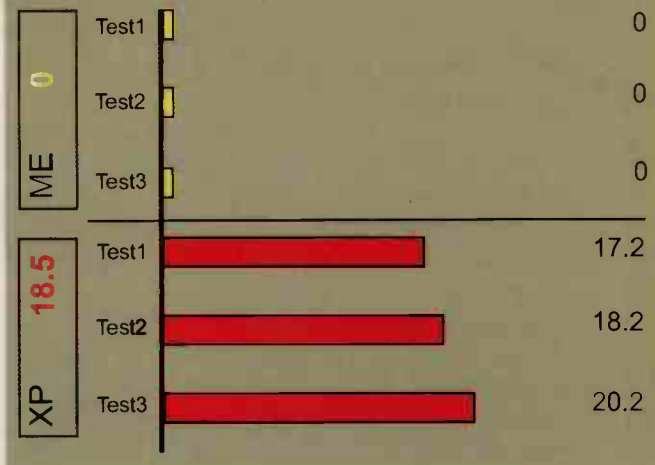
Round 2 - Installed 10 Programs



Round 3 - Installed 20 Programs



Round 4 - 2 Installed 30 Programs



HyperOs Performance Tip

[1] Limit your applications per Windows system as follows Windows 98: 15 apps, Windows ME: 15 apps, Windows 2K: 20 apps, Windows XP: 30 apps.

[2] Test all unknown software in a test system first before introducing it to a main system.

[3] If Windows 98 or ME will not start then reboot. If that doesn't work then reboot and choose to start in safe mode. If that doesn't fix the problem then boot with a boot disk and type: SCANREG /FIX from the command prompt and try again.

[4] If you get any Windows error in any Windows operating system and you would like to try to fix that error, then do not go to any Microsoft website in the first instance. Google.com normally provides a much faster and more relevant index to both Microsoft's help pages and to other individual and corporate help pages. Just type the main words in the error message into the google search engine www.google.com and in most cases some helpful person will have solved your problem or will point you to the correct Microsoft help page. Relevant Microsoft help is normally available on one of their sites, but Google is the fastest way to find it in our experience.

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	Windows 95* & 98	Windows Me, NT, 2000 & XP	PartitionMagic included	Run up to 10 more systems	Run up to 20 more systems	HyperDrive (95* 98 & Me)	RRP (+vat and P&P)
HyperOs 2003 R2	●		8.0	●		95*,98 only	£99.00
HyperOs 2003 R3	●	●	8.0	●			£99.00
HyperOs 2003 R4	●	●	8.0	●		●	£149.00
HyperOs 2003 R5	●	●	8.0		●		£149.00
HyperOs 2003 R6	●	●	8.0		●	●	£199.00

*95osr2

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The HyperDrive - running Windows entirely in RAM

HyperOs 2003 does not require any extra RAM to be installed on your PC unless you intend to use it to run Windows in RAM. If you are going to run Windows in RAM then you will need 768MB of RAM to do it. But, if you intend to use HyperOs to run several Windows systems on your hard disk, then obviously you will not need any more RAM than the normal requirements for Windows (64MB / 128MB) to do it.

Most operations in a modern PC happen in silicon. In silicon there are no moving parts. Silicon transistors which control and store data can change their state (from 0 to 1) over 1 billion times in one second. But incredibly, all of the data which these transistors work on, is taken from and returned to a rotational mechanical device which whirls round and round at 7200rpm.

The hard disk is an obvious bottleneck in PC performance. If this article was merely a couple of paragraphs long we would say something like:

"Electronic devices can transfer information at the speed of light, which is 300,000,000 metres per second, whereas your hard disk is a rotational mechanical device which moves data around at between 5,400 and 10,000rpm"

But this is only a part of the hard disk dilemma. The imbalance in performance between RAM and a hard disk is actually far worse than what one might expect from their differing physical constitutions. This is because the hard disk controller, which is the interface between your disk and your PCI Bus, is often more of a bottleneck even than the hard disk itself. Truly, the hard disk controller is one of the unsung heroes or villains of PC performance. When you buy an ATA100 hard disk, and more laughably when you buy an 'ATA133' hard disk, you can easily be fooled into believing that it will read and write data at 100MB per second or even at 133MB per second. But just try and read or write 100MB of information, say from a 100MB file, you will discover that it will not take one second. Typical data transfer rates vary from 2MB per second to 50MB per second depending on your ATA100 drivers, your Southbridge and your hard disk controller.

If you have no ATA100 drivers, then the hard disk will operate in PIO mode, rather than UDMA mode, and it will transfer data at between 2MB and 8MB per minute (which is not much faster than a CD). If you have a portable PC, then since there is no portable motherboard with a UDMA 5 compatible Southbridge as yet, you will be transferring data at a maximum of around 20MB per minute, even with the best possible ATA100 drivers, and with a UDMA 5 hard disk (which will be operating in UDMA 4 mode). If you have a Pentium IV motherboard with the latest SiS Southbridge, then you may see data transfer rates in excess of 40MB per second from your ATA100 hard disk, which is not what you might hope for but is nonetheless a creditable effort.

However, all of this pales into insignificance when compared with the IO which is achievable from a RAM disk. HyperOs employs a real mode 16 bit RAMdisk, which we call a HyperDrive. With one of these, even if you are simply using plain old 100MHz SDRAM, you can transfer data at 200MB per second (100 million chunks of 16 bits, which is 2 bytes, every second).

If you are using 266MHz DDRAM, in a RAM Hyperdrive, then your transfer rate will be 532MB per second. What this means is that every application that you double click could theoretically open 10 times faster on the HyperDrive than it does on the fastest consumer hard disks available today. In fact due to timing limitations in software, Windows itself will start up around twice as quickly, and applications will open between 3 and 5 times faster.

Instant Desktop

The effect is that you feel like you have an instant desktop. If you look for files on a RAM disk, you will find them instantly. There is no benchmark that we know of that measures this 'clicking around the desktop time. Yet if you use a PC for more than an hour a day at work, then this really is the time that needs to be reduced. By drastically reducing the time it takes for every Window of every application on your PC to open or close, you save yourself huge amounts of real user time. Benchmarks generally measure execution time, which is how long it takes *your PC* to run an application. They do not measure desktop time, which is how long it takes *you personally* to set up the application. The RAM HyperDrive reduces the time that it takes you to do things on a PC. This is often more important than reducing the time it takes your PC to run an application, because while it is running an application, you can be taking a phone call or setting up something else on your PC.

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The HyperDrive rewrites history

giving you total crash recovery

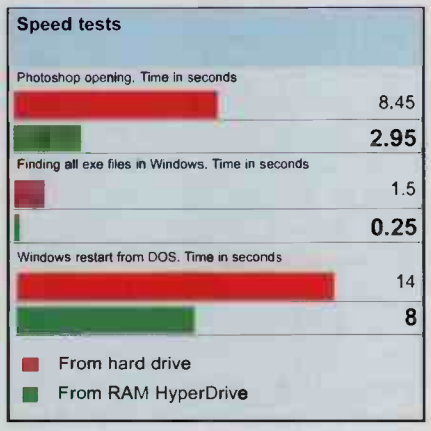
When HyperOs swaps to HyperDrive mode, it first sector copies the relevant hard disk partition (732MB maximum data size) onto the RAM HyperDrive (at speeds of up to 1900MB per minute). Then, it runs this copy of Windows and its applications from RAM. If, during your session in HyperDrive mode Windows crashes, then you have only corrupted the copy of Windows on the HyperDrive, you have not altered the copy on the hard disk. So, if you then swap back to hard disk mode, or exit HyperDrive mode and then reboot back into HyperDrive mode, the PC will have no knowledge of the crash and things will continue as if the crash had never occurred. You will have effectively rewritten history. As a result, the HyperDrive gives you an indefinite number of opportunities to screw up with impunity! This is heaven for experimenters.

Surf the net in HyperDrive mode

The first time you surf in HyperDrive mode with a 56K modem, that is with all of Windows and Internet Explorer or Netscape or AOL in RAM, you feel like you are surfing with Broadband. Various windows open and close so fast it is like there is no one else on the Net! But the advantages do not stop there. Any change to your system is discarded at the end of the session. So ,if the Net takes over your machine and starts bouncing you around different websites, and filling your Windows system with cookies and unwanted favourites, or messing around with your home page, you are immune. Reboot, and things return to exactly the way they were before the session. Every change is lost when you exit HyperDrive mode unless, of course, you choose to save certain files that you have downloaded on to your hard disk, instead of leaving them on the desktop in RAM.

HyperOs for hardware and software reviewers, software designers, web developers and IT testers.

RAM HyperDrive vs hard drive



The results examined

The test system used was an Athlon XP1800+ on an Abit KG7 motherboard, 80GB 120GXP IBM HDD with 1024MB DDR RAM, GeForce3 and TX2 Promise controller.

We used the fastest hard IDE disk we know of, we used the fastest SCSI performance IDE hard disk controller we know of, and the HyperDrive still blew it away convincingly! Need we say more?

If you spend a significant part of your day clicking around your desktop, then the HyperDrive will make all the difference.

One Windows in these circumstances is again pretty much a no-brainer. If you are testing 10 graphics cards, each of which will have its own drivers, then you really need to install each driver for each graphics card into a new copy of Windows. If you do not do this, then you cannot be sure that bits of the drivers used to test your earlier graphics cards are not still lying around and conflicting with the new drivers being used to test your later graphics cards. HyperOs Systems recently supplied HyperOs 2003 release 6 to Computer Shopper Labs for just this purpose. In the past, their hard working engineers have had to reinstall Windows a dozen times to do the group test. But now, with HyperOs, they install Windows once, and back it up in around one minute. Then, they can either make as many copies of it as they want for the test, or they can simply keep restoring a clean image (again in around 60 seconds) before each new test.

Big web design firms such as Rufus Leonard of Clerkenwell (an early customer of HyperOs) can gain huge benefits from multi Windows systems. Rufus Leonard used to have 20 PC's all of which ran different versions of different web browsers. These PC's were used to test website appearance and performance on every conceivable platform. With HyperOs, the whole test of all 20 browser types can be done on one PC, so that hardware differences can be eliminated from the equation, and the testing engineers can multiply their productivity, whilst decimating their hardware bill and freeing up some desk space as well!

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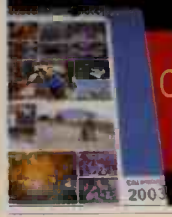

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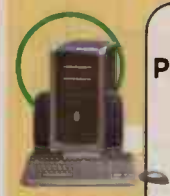

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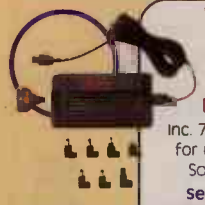

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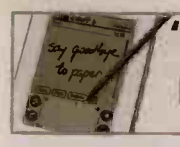

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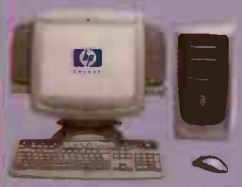

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2449PW	G4-800 SuperDrive	(M8812B/A)	1650.87	1405.00
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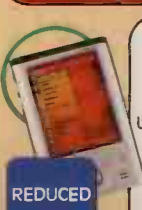

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24CRPW	S500 15" LCD	230.29	196.00
2992PW	S530 15" TFT Monitor 1024x768	269.07	229.00
2425PW	PV700 17" TFT Display TC099	363.07	309.00
138BPW	PV720A 17.1" LCD TFT Silv/Blk	468.82	399.00
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2443PW	17" TFT Multimedia LM-720A	285.00	242.56
28D6PW	18" TFT TV + Remote AL181N No Tuner	450.00	382.98
28D7PW	Internal Tuner Option for AL181N	50.00	42.56
	EIZO		
1YMKPW	L565 17" TFT Panel Black	522.87	445.00
21F6PW	L565 17" TFT Panel GREY	522.87	445.00
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1Z0DPW	CML153SXW-B 15" TFT in Black	257.32	219.00
28Y3PW	CML174SXWB 17" TFT in Black	371.29	316.00
28Y2PW	CML174SXW 17" TFT Panel	386.57	329.00
1Z0FPW	CML171SXW 17" TFT	386.57	329.00
28Y4PW	CML170SXW 17" with Speakers	417.12	355.00
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24N5PW	BX3814UT 15" LCD TFT	222.07	189.00
28WYPW	AX3817BK 15" TFT LCD in Black	264.37	225.00
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28WZPW	AS4314BK 17" LCD in Black	398.32	339.00
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1688PW	AS4637UBK 18.1" LCD in Black	821.32	699.00
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29Y5PW	L1710B 17" TFT 1280 x 1024	405.37	345.00
22N2PW	L1810B 18.1" LCD TFT in Silver	539.32	459.00
224HPW	L1800P 18.1" LCD TFT	757.87	645.00
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131LPW	LCD1550V 15" TFT 0.30 TCO99	274.94	234.00
184BPW	1550V 15" TFT LCD in Black	280.82	239.00
21HYPW	1535vi Digital 15" LCD	287.87	245.00
17LBPW	LCD1700V 17" LCD Monitor	398.32	339.00
	RELISYS		
28KMPW	TL561 15" TFT 1024 x 768	205.62	175.00
28L5PW	TL565 15" MultiMedia TFT	210.32	179.00
18H8PW	TL 540 15" Swivel Panel + SPK	222.07	189.00
28CPPW	Relisys TL766 17" Monitor	339.57	289.00
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17V4PW	SM1515 15" TFT in IVORY	267.89	228.00
13GXPW	SM1515 15" TFT in Silver	269.07	229.00
29BVPW	SM152T 15" TFT SuperSlim	304.32	259.00
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16C2PW	SDM-S81 18.1" TFT LCD	586.32	499.00
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28KDPW	SDM-S91 19" TFT LCD	668.57	569.00
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- 1024 x 768
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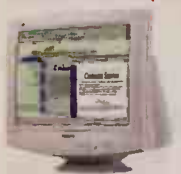

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10VVPW	17" CRT 7Klr+	15.9"	105.00	89.37
1173PW	19" CRT 9Klr+	18.0"	145.00	123.41
	IIYAMA			
22NVPW	VM 1403 17" 1024 X 768	16.0"	104.57	89.00
23ZWPW	VM Pro 1413 17" DiamondTron	16.0"	151.57	129.00
29TYPW	VM Pro 454(a) 2048 x 1536 19"	18.0"	292.57	249.00
25YTPW	VM PRO 513 22" CRT Monitor	20.0"	410.07	349.00
	LG			
23T1PW	SW563N 15" 1024x768 @ 75Hz	14.0"	81.07	69.00
	NEC/MITSUBISHI			
24QKPW	Multisync FE770 17" CRT Black	16.0"	128.07	109.00
24QSPW	Multisync FE770 17" CRT White	16.0"	128.07	109.00
24QFPW	DiamondPlus 93SB 19" CRT	18.0"	204.44	174.00
24QMPW	DiamondPro 2070SB 22" CRT	20.0"	574.57	489.00
	SAMSUNG			
16CXPW	SM551S 15" 0.28 CRT	14.0"	78.72	67.00
1717PW	SM753S 17"CRT 0.28mm	16.0"	96.34	82.00
1718PW	SM753DFXnon BNC17"CRT 0.20	16.0"	116.32	99.00
1808PW	SM959NF 19"CRT 1280x1024	18.0"	257.32	219.00
	SONY			
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2C56PW	E450 19" FD Trinitron Monitor	18.0"	292.57	249.00
14KCPW	E530 21" FD Trinitron	19.8"	586.32	499.00
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SONY

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Ultra-compact and light, goes with you anywhere, sets up quickly, and quietly delivers bright, clear images.

- 1800 ANSI Lumens
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- Remote Commander
- Powered tilt adjuster & Keystone Correction
- On-screen Display

SONY

NISIS Pocket DV2

Amaze your friends and family with this ultimate All in One Camcorder, Camera & Webcam.

Prepare yourself for the Oscars, the New DV2 from Nisis will be the first stepping stone on the path to directing the next box office hit.

The Nisis DV2 is totally expandable to increase the capabilities of your video, camera and audio recording, and all your images are easily viewable on the 1.4" colour screen, or even your TV using the included leads.

DIGITAL CAMCORDER
Capture motion images with sound.

STILL CAMERA
Store up to 80 images in VGA mode.

PC WEBCAM
See, as well as talk to your friends and family on the internet.

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Record up to 30mins of audio.

Pocket DV2
Digital Camera
All-in-one digital video camera, PC still camera with voice recorder and self portrait function
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£94.00 (£80.00 ex VAT)
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quicklinx 2536PW

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quicklinx	NIKON	inc VAT	ex VAT
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21HSPW	CoolPix 5700	891.82	759.00
YJWPW	CoolPix 2500	276.12	235.00

Nikon CoolPix 4300
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4.0 Megapixel
3X Optical Zoom
4X Digital Zoom
1.5" Colour LCD-display
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quicklinx 240NPW

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quicklinx	CTX	inc VAT	ex VAT
ZYBPW	PS-5100 1000 LUMENS	1173.82	999.00
1YFLPW	PS-5110 1100 LUMENS	1373.57	1169.00
	PHILIPS		
17WWPW	cBright CV2 1500 LUMENS	2078.57	1769.00
17WXPW	cBright XG2 1200 LUMENS	2115.82	1799.00
17WYPW	cBright XG2i 1600 LUMENS	2936.32	2499.00
	SONY		
25KVPW	VPL-CX5 2000 ANSI	2226.62	1895.00
13MXPW	VPL-CX11 1500 ANSI	2818.82	2399.00
	TOSHIBA		
1YT1PW	TLP-S60 LCD	1996.32	1699.00
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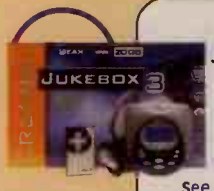

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Immensely versatile and flexible, it is the complete photo printing solution, producing long lasting photo quality prints for you to display, share and store. The Stylus Photo 950 puts you in complete control of your digital image output, allowing effortless edge-to-edge photo lab style prints at breathtaking resolutions. Utilising exclusive EPSON software, you have total image control from capture to output.

EPSON

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The Ultimate flatbed solution for the photography enthusiast.

The EPSON Perfection 3200 Photo is the most advanced consumer scanner to date. It features many technology 'World Firsts' including 3200dpi optical resolution, a built-in 4"x 9" transparency unit with new prism sheet for even greater light intensity and a custom-developed ASIC for high-speed film scans.

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Photo quality printing, business performance, no compromise A breakthrough in all round printing performance

- 4800 x 1200 dpi
- 22ppm mono
- 14ppm colour

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VideoLogic

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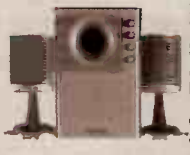

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PSC2210 Printer, Copier, Scanner
Designed for creative home users who want to print photo-quality images, use a digital camera and require high-quality faxing, scanning and copying.
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quicklinx 24YRPW

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ScanJet 3570C The scanner that makes it easy to express your creativity & share the results - 1200dpi /48-bit colour, four one touch buttons.
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quicklinx 29T0PW

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LINKSYS

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- PrecisionServe™
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- 13ppm colour
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Microsoft

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2574PW	CX3200	130.42	111.00
29T0PW	CX5200	173.90	148.00
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2CCHPW	PSC 1205 Printer/Copier/Scanner	94.99	80.84
2BD3PW	OfficeJet 5110	163.32	139.00
PKXPW	OfficeJet K80	229.12	195.00
21XZPW	PSC 2110 Print/Copy/Scan	168.02	143.00
24YRPW	PSC 2210	269.00	228.94
17ZZPW	OfficeJet D135	327.82	279.00
1804PW	OfficeJet D155xi	449.00	382.13
18DFPW	LaserJet 3300	410.07	349.00
18DJPW	LaserJet 3320	487.62	415.00
18DKPW	LaserJet 3330	540.50	460.00
18DLPW	LaserJet 3320N	652.12	555.00
1Y9RPW	LaserJet 4100MFP	2348.82	1999.00
	CANON		
1Y38PW	Smartbase MPC400	186.82	159.00
1Y39PW	Smartbase PC1210D	499.37	425.00
1Y3BPW	Smartbase P1230D	586.32	499.00
1Y27PW	Smartbase MPC600F	280.82	239.00

Laser Printers

quicklinx	CANON	inc VAT	ex VAT
Z51PW	LBP-810	163.32	139.00
	EPSON		
21J4PW	EPL6100	264.37	225.00
21J5PW	EPL6100N	351.32	299.00
29BRPW	C900	586.32	499.00
29BSPW	C900N	668.57	569.00
	KYOCERA		
20NNPW	FS-1010	240.87	205.00
21QYPW	FS-1050	346.62	295.00
	LEXMARK		
10TSPW	E210	170.37	145.00
13LGPW	E320	217.37	185.00
13LHPW	E322	272.60	232.00
	OKI		
LC3PW	OkiPage 8p Plus	233.82	199.00
RZ9PW	OkiPage 14ex	245.57	209.00
	PANASONIC		
Z24PW	KX-P7100	175.07	149.00
Z25PW	KX-P7105	217.37	185.00

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quicklinx	BELKIN	inc VAT	ex VAT
QBWPW	Regulator Gold Series 325VA	69.32	59.00
QBXPW	Regulator Gold Series 425VA	81.07	69.00
QXMPW	Single Outlet Surge Protector+Tel	11.75	10.00
QCKPW	4Way Strip Surge Protector 2M	12.92	11.00
QF9PW	6Way Strip Surge Protector 2M	23.82	20.00
QGNPW	8Way Strip Surge Protector 2M	41.12	35.00

Gaming Devices

quicklinx	LOGITECH	inc VAT	ex VAT
PRMPW	Wingman Formula Force GP USB	41.12	35.00
MFBPW	Wingman Extreme Digital 3D USB	22.32	19.00
RYKPW	Wingman Force 3D - Force Feedb	37.60	32.00
	MICROSOFT		
9YCPW	Sidewinder GamePad Pro USB	22.32	19.00
K5GPW	Sidewinder ForceFeedback Wheel	69.32	59.00
QR5PW	SideWinder ForceFeedback 2 USB	52.87	45.00

Keyboards

quicklinx	CHERRY	inc VAT	ex VAT
G5HPW	Soft Touch 105key Win95 PS/2	17.62	15.00
G5GPW	Soft Touch 105key Win95 AT	17.62	15.00
	MICROSOFT		
22N8PW	Internet PS/2	14.10	12.00
G53PW	Internet Pro USB & PS/2	28.20	24.00
Z1WPW	Office Keyboard PS/2 USB	28.20	24.00
22XPPW	Natural Multimedia Keyboard	34.07	29.00
22XRPW	Multimedia Keyboard	21.15	18.00
22XTPW	Wireless Optical Desktop Pro	88.12	75.00

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quicklinx	LOGITECH	inc VAT	ex VAT
22XNPW	Microsoft Wireless Optical - blue	31.72	27.00
WTBPW	Cordless Mouseman Optical USB	38.77	33.00
SX3PW	Wheel Mouse Optical	22.32	19.00
T0VPW	Pilot Wheel Mouse - PS2 & USB	15.27	13.00
KR7PW	Pilot Mouse PS/2 & Serial	11.75	10.00
	MICROSOFT		
22XSPW	Notebook Mouse	19.97	17.00
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21K4PW	GF4 Ti4200 DVI VO 64MB	107.00	91.07
254LPW	GF4 Ti4200 DVI VO 64MB	113.00	96.17
2942PW	GF4 Ti4200-8x DVI VO 128MB	131.00	111.49
2945PW	GF4 Ti4200-8x DVI VO 128MB	137.00	116.60
	AOPEN		
27ZGPW	GF4MX440-8x-V64 64MB	58.50	49.79
28QHPW	GF4 MX400-8x-DV64 DVI VO 64MB	72.50	61.71
28QJPW	Ti4200 8X-V64 VO 64MB DDR-RAM	111.00	94.47
28QLPW	Ti4200 8X-DVC128 DVI VIVO 128MB	133.00	113.20
	HERCULES		
25DFPW	Radeon 9000 PRO DVI VO 128MB	103.00	87.66
28VKPW	Radeon 9000 PRO VIVO DVI 64MB	184.00	156.60
28VMPW	3D Prophet 9700 DVI VO 128MB	244.00	207.66
0872PW	3D Prophet 9700 Pro DVI VO 128MB	311.00	264.69
	GIGABYTE		
251MPW	Maya AF Radeon 9000 VO 64MB	57.57	49.00
251TPW	Maya AF Radeon 9000 Pro VO DVI 64MB	76.37	65.00
28W6PW	Radeon 9000 Pro VO DVI 128MB	91.64	78.00
	LEADTEK WinFast GeForce4		
28VCPW	UltraTi 4800SE Retail VO DVI 128MB	152.00	129.37
28VFPW	UltraTi 4800SE Retail VIVO DVI 128MB	162.00	137.88
	SAPPHIRE		
25CTPW	Radeon 9000 VIVO 64MB	63.00	53.62
25CYPW	Radeon 9000 VO 64MB	51.00	43.41
25D1PW	Radeon 9000 Pro DVI VO 64MB	75.00	63.83
25VNPW	Radeon 9000 Pro DVI VO 128MB	92.00	78.30
2BC0PW	Radeon 9000 Pro All in Wonder 64MB	136.00	115.75
28YSPW	Radeon 9500 DVI VO 64MB	123.00	104.69
28YTPW	Radeon 9500 DVI VO 128MB	137.00	116.60
28YVPW	Radeon 9700 DVI VO 128MB	202.00	171.92
24YZPW	Radeon 9700Pro DVI VO 128MB	279.00	237.45
28C1PW	Radeon 9700 Pro All in Wonder 128MB	354.00	301.28

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quicklinx	CREATIVE	inc VAT	ex VAT
13QTPW	SoundBlaster 4.1 Digital	26.50	22.56
130VPW	SoundBlaster 5.1 Digital	43.50	37.03
18C2PW	SB Extigy	129.00	109.79
	PURE DIGITAL		
282YPW	SonicXplosion RP	48.50	41.28
2830PW	SonicXplosion DVD RP	77.50	65.96
	HERCULES		
2217PW	Gamesurround Muse LT	12.50	10.64
221BPW	Gamesurround Muse 5.1 DVD	29.00	24.69
25DHPW	Gamesurround Fortissimo III 7.1	44.00	37.45
24LSPW	Game Theater XP 6.1	105.00	89.37
	YAMAHA		
F9KPW	SW1000XG PCI	335.00	285.11
	TERRATEC		
21RTPW	128i PCI	18.50	15.75
2B89PW	Aureon 5.1 Fun	27.00	22.98
21RWPW	512i Digital	28.50	24.26
21S2PW	DMX Xfire 1024	40.00	34.05
21S5PW	SixPack 5.1+	55.50	47.24
2B8CPW	Aureon 5.1 Sky	95.00	80.86
21RXPW	DMX 6Fire Lt	100.00	85.11
2B8DPW	Aureon 7.1 Space	103.00	87.66
21RZPW	DMX 6Fire 24/96	158.00	134.47

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11JYPW	DVD-E616 IDE 16xDVD 40xCD	37.00	31.49
25C2PW	DVR-104 IDE DVD-R/RW	206.00	175.32
	AOPEN		
XX9PW	DVD-1648 Bonus IDE 16xDVD 48xCD	37.00	31.49
24RHPW	DVRW2412 Pro Bonus IDE DVD+R/RW	230.00	195.75
28PFPW	EHD-2412U USB2 DVD+R/RW	299.00	254.47
	LG		
295MPW	GRD-8161B RP IDE 16xDVD 48xCD	33.00	28.09
	NEC		
29N6PW	DV-5800B-SRP IDE 16xDVD 48xCD	38.50	32.77
2CBPPW	ND-1000 OEM IDE DVD+R/RW	175.00	148.94
	PANASONIC		
2132PW	LF-D311DMS IDE DVD-RAM	281.00	239.15
212QPW	SR-8588 IDE 16xDVD 48xCD	34.00	28.94
	PHILLIPS		
233ZPW	DVDRW228K IDE DVD+R/RW	226.00	192.34
	PIONEER		
2C32PW	DVD-119 IDE 16xDVD 40xCD	34.00	28.94
X15PW	DVD-106S IDE 16xDVD 40xCD	37.00	31.49
28N6PW	DVR-105 IDE DVD-R/RW 4x	189.00	160.86
	SAMSUNG		
21FBPW	SD-616FRPS IDE 16xDVD 48xCD	35.50	30.22
	TEAC		
2827PW	DV-516EK IDE 16xDVD 48xCD	44.50	37.88
2CBQPW	DV-W50K IDE DVD-R/RW 4x	238.00	202.56

GeForce 4 Ti 4600 VO DVI 128MB

only £180.01 (£153.20)

quicklinx 1YL9PW

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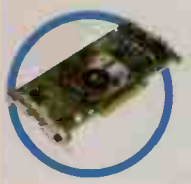

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2179PW	LTN-526S-02VYC IDE Fifty Two Int	18.50	15.75
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17NXPW	FX-5410 OEM IDE Fifty Four Int	17.62	15.00
	NEC		
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ZZDPW	SC-152 IDE Fifty Two Int	17.62	15.00
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MCJPW	CD-224PEK PCMCIA Twenty Four Ext	89.29	76.00
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25J0PW	ZipCD 32498 USB 2 48r40w12rw Ext	89.00	75.75
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	LITEON		
2178PW	LTR-48125 Retail IDE 48r48rw12rw Int	43.47	37.00
2B46PW	LTR-48245 Retail IDE 48r48w24rw Int	47.00	40.00
27T9PW	LTR-52246S Retail IDE 52r52w24rw Int	54.50	46.39
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295LPW	GCE-8480B Retail IDE 40r48w16rw Int	48.00	40.86
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29VNPW	GCC-4320B IDE 16xDVD40r32w10rw Int	81.00	68.94
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252XPW	PX-W4824TA IDE 48r48w24rw Int	72.50	61.71
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28P8PW	2100+	1.73Ghz	256Kb SoA	266Mhz	77.50	65.96
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2166PW	P4	2.408	512KB	S478 533Mhz	175.00	148.94
24SVPW	P4	2.60	512KB	S478 400Mhz	270.00	229.79
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259YPW	Plus9 120 UDMA133	7200			114.00	97.03
2592PW	Plus9 120 UDMA133	7200			128.00	108.94
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25KFPW	Barracuda ATA V 80 UDMA100 7200	85.50	72.77
25KGPW	Barracuda ATA V 80 SATA150 7200	105.00	89.37
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2163PW	PocketDrive 20GB, USB2 cable	128.07	109.00
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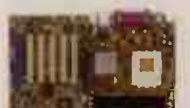

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28J6PW	BG7E Intel 845GE Socket 478 ATX	91.50	77.88
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2810PW	AK77-8X MAX VIA KT400 Socket A ATX	96.50	82.13
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286DPW	P4T533/A/RAID Intel 850E So478 ATX	137.00	116.60
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2BTBPW	K7NCR18D nVidia nForce2 SoA ATX	76.50	65.11
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295ZPW	845PE Max2-R Intel 845PE So478 ATX	88.00	74.90
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2861PW	648E Max SiS 648 Socket 478 ATX	74.00	62.98
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2BDGPW	KT4 Ultra-FISR VIA KT400 Socket A ATX	112.00	95.32
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2869PW	KT4 Ultra-SR VIA KT400 Socket A ATX	90.00	76.60
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2BDHPW	K7T266 Pro2-U VIA KT266A SoA ATX	50.00	42.56
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2BDKPW	K7N2G-L nForce 2 Socket A ATX	100.00	85.11
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250JPW	McAfee VirusScan v7.0 Home	39.37	25.00
250KPW	McAfee VirusScan Professional v7.0	37.60	32.00
24V1PW	Symantec Norton Antivirus SB 5-user	175.07	149.00
247TPW	Symantec Norton Internet Security 2003	45.82	39.00
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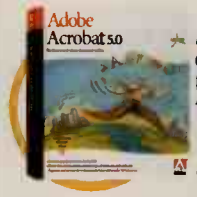

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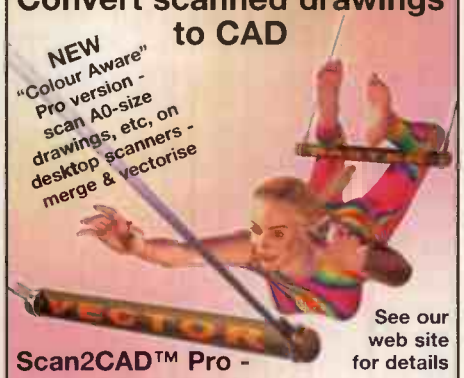
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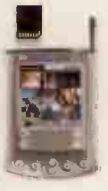

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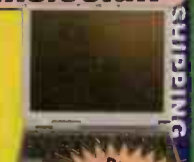

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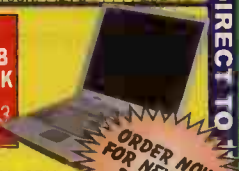

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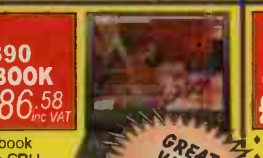

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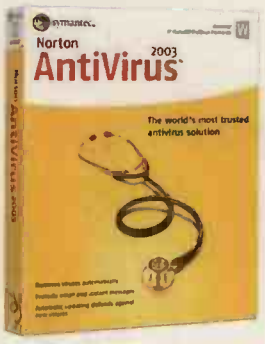

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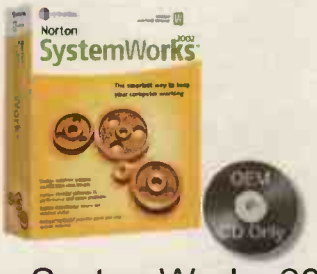

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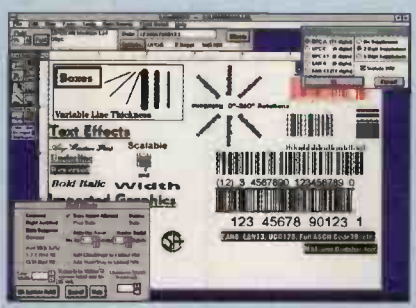

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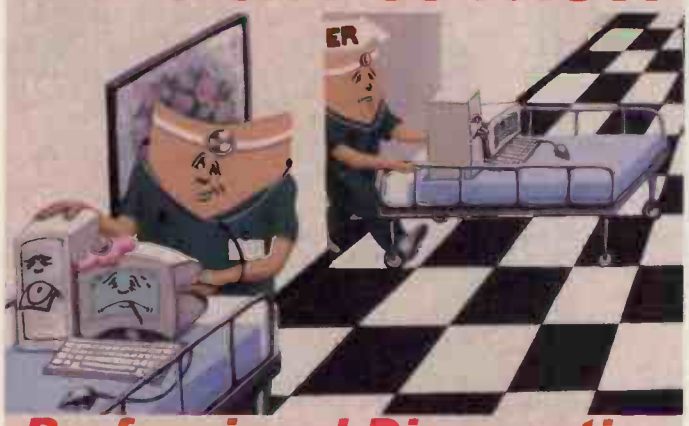

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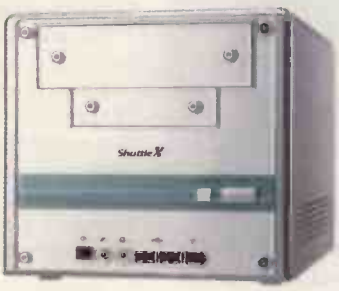

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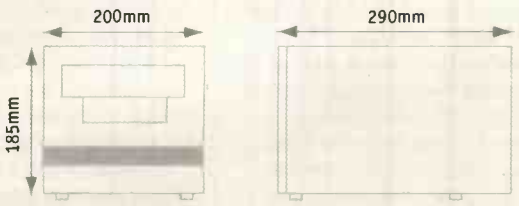

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LOADING...

Miniature Heroes

Taschen's book *1000 Game Heroes* is a celebration of some of the biggest digitised avatars from recent gaming. Many have achieved iconic status: obvious inclusions, such as Lara Croft, have gone on to enjoy notoriety beyond the games that spawned them, while chapters devoted to vehicles like planes and cars seem to stray from the book's simple premise.

Sadly there's a lack of historical depth as the book focuses on modern games and favours pre-rendered artwork over in-game footage. Each chapter is all too brief, although the fact that it has been poorly translated from the original French makes this more of a blessing than a curse. Despite this, its 600 full-colour pages are an excellent showcase of the game designers' art.

1000 Game Heroes, £20
Ed. David Choquet, Taschen
ISBN 3-822816-33-7

Sim City 4

How to take a city from birth to bankruptcy the easy way

ON OUR COVER CD

If the policies and decisions made by governments regularly incense you, then you probably think that, given a chance, you could do a better job. So what better way than to try out your leadership in the consequence-free environs of Sim City 4, the latest iteration of the godfather of all sims.

Benefiting from the user-friendly interface last seen in the Sims, with which it shares parentage, establishing your city is the easy part. A simple terraforming tool gives you god-like powers, allowing you to mould and shape a vast region of sim real estate before filling it with flora and fauna. Then you start designating zones, dictating residential, industrial and commercial areas. Each requires support facilities such as power plants and water supplies.

It's then that people and businesses begin to fill up the place and start demanding things such as schools, medical centres and churches. If you're anything like us, it's here that you start to lose control. The city coffers are quickly drained by well-meaning expenditure on your part forcing you to make increasingly harder choices. Do you increase taxes and risk the population leaving in droves or concede to the construction of a toxic waste processing plant? Any ideals you may have nurtured about creating a virtual utopia soon go out of the window as economic necessity takes over. Over time you'll also be able to establish cities in a number of regions with which you can then trade.

That's the beauty of the Sim City games; trial and error gameplay, and open-ended scenarios that allow you to take the game in whatever direction you choose. Although the game tends to knock you off course with a number of man-made or natural disasters. But if things go down the pan then conjuring up a tornado or volcano soon wipes the slate clean.

Fans of the Sims can install their own Sims into the city. Although you don't have any direct influence upon their lives they will report back to you to let you know how things in your city are going.

The game looks great and is extremely detailed as well as retaining the whimsical humour of its predecessors. In fact Sim City 4 could easily be Sim City 3000 with a fresh coat of paint, although the more demanding economic aspects take it beyond being a simple retread.

Andy Stewart

DETAILS

PRICE £29.99 inc VAT
CONTACT Electronic Arts
http://uk.ea.com
SYSTEM REQUIREMENTS
Windows 98 and above, 500MHz Pentium III, 128MB of Ram, 1GB of hard disk space
VERDICT
Bigger and better but not a million miles from the last Sim City game, which is not necessarily a bad thing
OVERALL ★★★★☆

Above and right: Natural and man-made disasters conspire to make your job difficult

WIN!

Competitions
Win a Sony home entertainment PC or an Acer Pocket PC
Enter our great 25th anniversary competitions
– see page 342

Mechwarrior 4: Mercenaries

Microsoft rolls out the big guns – at a price

This installment of Microsoft's Mechwarriors series is all about money. At least that's your motivation, more so than love or honour, and the rules are equally simple: kill everything.

In many ways Mechwarrior 4 resembles an archetypal first-person shooter such as Quake, except you drive a mech weighing 25tons. The 36 different models of mech carry a huge variety of weaponry and possess differing properties when it comes to speed, weight and armour, as well as a selection of special features such as jump jets. Yup, it's not all walking, many mechs can fly.

Select your mech, get the sponsorship of a mercenary regiment and head off to war. Possibly the most interesting mission is on a planet called Solaris VII where you have gladiatorial fights in a Coliseum-like arena. However, in order to get that level you'll need the Inner Sphere Mech Pack at £10.99, and you'll probably want the Clan Mech Pack also at £10.99, which effectively makes this a £50 game. Ouch. You'll probably want a joystick to control your mech properly.

So now you have 44 Mechs, loads of weapons and electronics plus the full range of 40 missions, let's fight.

Although each mech is approximately shaped like a humanoid it is, of course, a machine, so you have a throttle control, you turn left and right and can also twist the torso of the Mech to acquire and destroy targets. You also have targeting scanners and a range of weapons. Your status and targets are shown in the heads up display but it's hard work to keep track of what's going on without getting blown to pieces. We found helicopters particularly tricky to shoot down.

The graphics, gameplay and audio are all first rate, so it should satisfy your violent urges. It's just a shame you need to invest in so many add ons to make the most of it.

Leo Waldock

DETAILS

PRICE £29.99 inc VAT
CONTACT Microsoft 0870 601 0100
www.microsoft.com/games/mw4mercs
SYSTEM REQUIREMENTS
Windows 98, ME, 2000, XP, 700MHz Pentium III, 128MB of Ram, 16MB graphics, 1GB hard drive space
VERDICT
Fun while it lasts although without the add-on packs it feels a bit incomplete
OVERALL ★★★☆☆

Arx Fatalis

Drop into a fantasy land for a spell

ON OUR COVER CD

The successful marriage of a role-playing game and first-person shooter is not a task to be taken lightly. Arx Fatalis, however, looks to fill this role and aspires to be the new Thief or Deus Ex.

After an introduction warning of an evil god bent on destroying the world, the player's character is attacked and thrown into a dungeon. Unfortunately it seems that at some point he received a sharp blow to the head and remembers nothing about what he was doing, not even his own name. A fellow prisoner provides a hint of how to get out and then a name to keep you going for the moment. After making good your escape you're quickly embroiled in the many and varied problems of the other races that populate Arx, clinging to the hope that this might refresh your memory.

The greatest problem with role-playing games of this kind is how to provide a useful inventory and object interaction as well as a usable magic and combat system. The system in Arx Fatalis is certainly one of the best yet. A clever combination of keyboard and mouse switches means that the right option is always close to hand.

The spell casting system is also innovative. Scattered around Arx are runes with markings on. To cast a spell, the markings have to be 'drawn' onscreen with the mouse. There is a clear logic to the combinations making experimentation worthwhile. However, casting spells in this manner is a double-edged sword for the dedicated follower of magic. Combat is much more fluid without the need to view spell books, but it does require learning the spells and casting takes longer, especially when backing away from an angry troll.

The excellent control system lifts Arx Fatalis from being just another identikit fantasy RPG to an innovative and engaging addition to the genre. The only flaw is that the plot is too linear with no real opportunity to make decisions affecting the outcome of the game.

Tim Smith

DETAILS

PRICE £29.99 inc VAT
CONTACT Jowood 020 8950 8182
SYSTEM REQUIREMENTS
Windows 98 and above, 900MHz Pentium III, 256MB of Ram. 750MB hard disk space, 32MB graphics card
VERDICT
Arx Fatalis offers a near-perfect interactive environment with a good storyline and an excellent control system
OVERALL ★★★★☆

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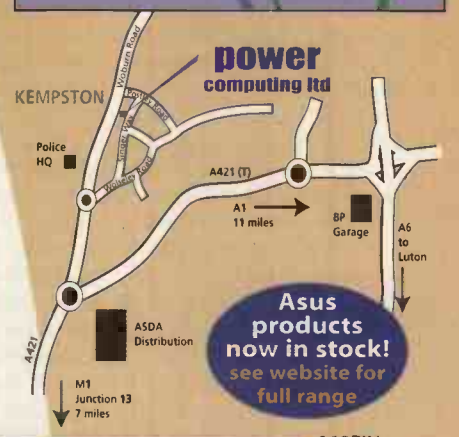

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Sony home entertainment PC

With its excellent spec and software, Sony's PCV-RZ104 is more than a PC, it's a home entertainment system.

Topping the list of entertainment features is Gigapocket software that allows you to record television programmes from your TV and store them on a PC's hard drive. The desktop can also be used as a server once it is connected to other PCs via an Ethernet network or wireless Lan and recorded TV files can then be streamed to 'client' PCs and viewed using Picoplayer software. Also included is Sony's unique Vaio World software, Adobe Photoshop Elements 2.0 and Premiere LE. With these software suites you can explore your creative side and turn your hand to video editing, photo manipulation or digital music list compilation. The software bundle is finished off with Microsoft Works 6.0.

The RZ104 is powered by a 2.8GHz Intel P4 processor and has 512MB of DDR memory, a 160GB hard drive and Nvidia Geforce4 TI4600 graphics card. There is a DVD+/-RW, DVD-Rom and a floppy drive plus a Memory Stick slot. There are plenty of connectivity options, including USB and I-link, a copy of Microsoft XP Home edition and an SDM-S71 LCD monitor are also thrown in.

For further information about Sony products, please call 08705 424 424 or visit **www.vaio.sony-europe.com**. To be in with a chance to win this great prize, simply answer the following question, and follow the 'How to enter' instructions.

Which graphics card features in the PCV-RZ104?

a) Nvidia Geforce4 TI4600
b) ATI Radeon 9700
c) Nvidia Geforce4 MX420

PCW APRIL 2003 SONY COMPETITION ENTRY FORM

Answer Which graphics card features in the PCV-RZ104?

.....

Name: .....

Address: .....

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PERSONAL COMPUTER WORLD

Rules of entry

This competition is open to readers of *PCW*, except for employees (and their families) of VNU Business Publications, Sony and Acer. *PCW* is the sole judge of the competition and the Editor's choice is final. Winners will be selected at random from all correct entries received. No cash alternative is available in lieu of prizes. VNU will use all reasonable endeavours to notify the winner(s) within 14 days of the close of the competition. Prizes will be dispatched direct 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. VNU will use all reasonable efforts to ensure that the prizes are as described on this page. However, VNU 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.

February winners

The two winners of Pinnacle Edition DV Video Publishing packages are: Jeff Wells from Wales and Dr Romano Giorgi of London. The three winners of a year's free broadband Internet access are: JB Winkle or Stafford, Melanie Elkins of Woking and Stephen Barnes of Newtownabbey, Northern Ireland

4 Acer colour Pocket PCs up for grabs

NEW! TEXT YOUR ANSWER TO US
See how to enter information

To celebrate our 25th anniversary, *PCW* has teamed up with Acer to offer four of our readers the chance to win an Acer n20W handheld.

One of the world's smallest colour handhelds, the n20W is the first in a new range of Pocket PCs from Acer. Light and easy to store away, the n20W comes with exceptionally fast processing capacity, fantastic colour graphics, is incredibly simple to use and looks great too.

Running the powerful MS Pocket PC 2002 operating system, the n20W comes with 64MB of SD-Ram memory for user applications and data, 32MB of Flash memory and has a 3.8in LCD TFT screen. The n20W also boasts a built-in speaker and microphone and a range of preloaded handheld software including Microsoft Pocket Outlook, Word and Excel as well as Windows Media Player 8.0. To top it all off, this model also offers 802.11b Wireless Lan connectivity and comes with a two-year collect and return warranty, with an additional one-year international traveller's warranty

So, whether you're managing documents or your diary, sending emails or surfing the Internet, make sure your kit offers leading edge Pocket PC technology, and looks great too.

For a chance of winning one of these great PDAs, simply answer the following question and follow the 'How to enter' instructions.

The Acer n20W comes with...

a) 23MB of Flash memory
b) 32MB of Flash memory
c) 44MB of Flash memory

WIN!

How to enter

Fill in the coupon and send to the following address by 24 March 2003:
Sony Competition or Acer Competition,
PCW, VNU Business Publications, 32-34 Broadwick Street, London W1A 2HG
Or **email** your answer, name, address, daytime and mobile telephone number to us at **pcw_competition@vnu.co.uk**
Or **text** your answer to **81500**, ensuring you put the keyword **PCW1** for the Sony competition, and **PCW2** for the Acer competition at the beginning of your text, followed by a space, then your answer, then a space, then your name (eg PCW1 B John Smith). **Please send separate messages for each competition.**

All text entries cost 50p, plus the cost of sending a normal standard text message (contact your network provider for details). Some Pay As You Go customers may experience difficulties using this service, and it is also not currently available to Virgin Mobile customers. We may use the contact details supplied to communicate with you regarding *PCW*. **If entering by email** please indicate if you are happy for us to contact you via email, daytime telephone or mobile about other products or services available from *PCW* and the VNU Business Publications Ltd Group, and if you are happy for us to pass your details on to other carefully selected companies to contact you about their products or services. Please state in your email if you do NOT wish us to contact you BY POST about products or services available from *PCW* or the VNU Business Publications Group, and if you do NOT wish us to pass your details on to other carefully selected companies to contact you BY POST about their products or services. If you do NOT wish to receive any future free promotional messages by **text message**, please email sms@vnu.co.uk. Competition open to UK residents only.

PCW APRIL 2003 ACER COMPETITION ENTRY FORM

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.....

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.....

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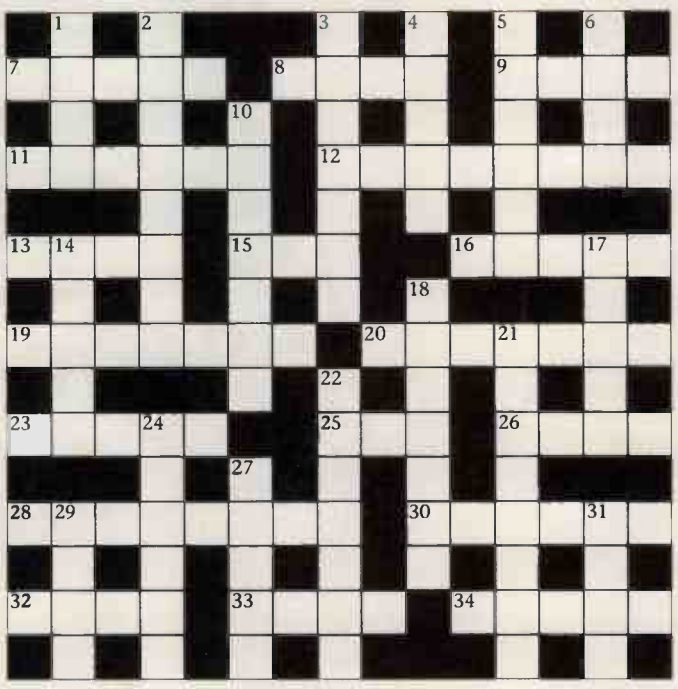
PERSONAL COMPUTER WORLD

Mindbenders

These puzzles will keep you amused for hours, and if you solve them you could win a Concise Oxford English Dictionary or a copy of Hutchinson's Reference Suite

Prize crossword



ACROSS

7 One-way valve (5)
8 ___ Text Format, formatted text transfer (4)
9 ___ hack, total concentration (4)
11 ___ site, one offering protection of information (6)
12 Charged with current (8)
13 Realtime conferencing capability by typing (4)
15 CPU-avoiding transfer circuit (acr) (3)
16 Sequence of items (5)
19 Data ___, modulated frequency (7)
20 ___ disc, CD-ROM drive, eg (7)
23 Computer operators (5)
25 Leading maker of surge suppressors (acr) (3)
26 Sines/tangents branch of maths (4)
28 Activating a device (8)
30 Data manipulating processor (6)
32 Programs for reading email (4)
33 Type of parity (4)
34 Writes data in storage (5)

DOWN

1 US ten-cent coin (4)
2 Loss ___, insurance employee (8)
3 Chip-shop condiment (7)
4 Mr ___, brand-name furniture polish (5)
5 Newspaper chief (6)
6 Return of the ___, film (4)
10 Lowest lake in the world (4,3)
14 Warms up (5)
17 From Baghdad? (5)
18 Biological grouping (7)
21 Essential (part) (8)
22 Tittered (7)
24 Vigorous, hardy (6)
27 Apple-based drink (5)
29 Cairo's river (4)
31 Want (4)

Each month, one *PCW* crossword entrant will win a copy of *the Concise Oxford English Dictionary*, and the brainteaser winner gets a copy of Hutchinson's Reference Suite.

Send your completed crossword to: '*PCW* April – Prize Crossword', VNU, 32-34 Broadwick Street, London, W1A 2HG, to arrive no later than 11 March 2003.
Send the answers to the brainteaser to: '*PCW* April – Prize Puzzle', at the address above, to arrive no later than 24 March 2003.

Please state clearly on your entry if you DO NOT wish to receive information about other products and services from VNU Business Publications Ltd. Please state if you DO NOT wish your details to be passed on to other carefully selected companies for marketing purposes. No purchase of the magazine is necessary to enter the competition.

February winners

The winner of February's crossword is Marian Johnson of Tyne and Wear, and Mr G R Astin of Rugby won the brainteaser puzzle.

Cryptograms

In these cryptograms, each letter of the alphabet is substituted by another, and each cryptogram is in a different code. Solve the cryptograms and send your answers to the address above right.

1. **DVB WGR AGD CLGJ DVB UZEF GHVBJ UVRN OPFAAFA, HBJ JLFD WVXFP G KBU JZJBOF VM ALZRA.**
2. **RA PDSOMVLP UMKM UMVFWSP WA UVK, UM UWDQN GVCM GVN PWQVK MSMKYZ QWSY VYW.**
3. **BDYRVDR JYDAYTV YB VT HTLR MLYAARV JTL BDYRVAYBAB AEKV PETBA BAT LYRB KLR MLYAARV JTL PETBAB.**
4. **WBKVEUC XMEURCYT BG J ZMJV MG J UBLCU OBVP VJGHCUBGC VUCCR JGQ SJUSJYJQC RNBCR.**

SOLUTIONS

March crossword

ACROSS: 7 Chips 8 Into 9 Unix 11 Athlon 12 Ellipsis 13 DETI 15 GPS 16 Types 19 Not gate 20 Clipper 23 Merge 25 ALL 26 Clipper 28 Emptying 30 Newbie 32 Sign 33 Reel 34 G
DOWN: 1 Chet 2 Spilling 3 Intense 4 Fools 5 Supply 6 Midi 10 Knights 14 Evoke 17 Elect 18 Slicing 21 Password 22 Mongrel 24 Get one 27 Libra 29 Maim 31 Idea

March brainteaser

	W		W		H		W	
W	H	E	E	L	E	L	H	O
H	A	L	L	O	W	E	E	N
O	L	A	L	N	N	A	E	E
	E	N		E		N	L	

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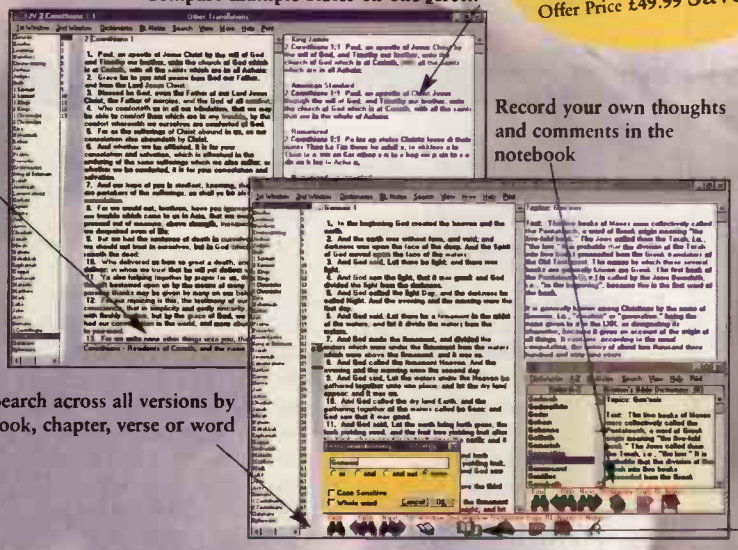

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Transliterated Bible: Pronounceable	0	1
Transliterated Bible: Unaccented	0	1
Webster's Bible	0	1
Weymouth's NT	0	1
International English ® Bible NT (Simple English Bible)	0	1
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Living Bible	0	1
New Jerusalem Bible with Apocrypha (Imprimatur)	0	1
New King James Bible	0	1
New Revised Standard Version	0	1
Revised Standard Version	0	1
Spanish RVA (1981 Baptist Spanish Publishing House)	0	1
Young's Literal Translation	0	1
Word Studies	0	4
Strong's Greek Dictionary	0	1
Strong's Hebrew Dictionary	0	1
Strong's Numbers Linked to Morris Literal Translation & Word Studies	0	1
Harris Theological Wordbook Old Testament 2 Volumes	0	1
Commentaries	2	4
Easton's Book Synopsis	1	1
Henry's Commentary on Whole Bible	0	1
Morris Introduction to Bible Books	1	1
Gray's Bible Study Commentary	0	1
Cross References & Concordances	6	9
Citation to full verse toggles for each Bible	1	1
Concordances of each Bible & each Reference	2	2
Linked Bibles, Commentaries, Dictionaries & Word Studies	1	1
Morris Chain Reference System	1	1
Parallel Linked Multiple Bibles on one convenient screen	1	1
Ellis Englishman's Concordances OT & NT for each Bible Version	0	2
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Dictionaries, References, History, Helps	12	18
Bamford Bible Dictionary	1	1
Bookmarks	1	1
Boolean Plus Multiple Bible Division Searches	2	2
Easton's Bible Dictionary	1	1
Notebook or Use Your Own Wordprocessor	2	2
Personal notes linked to verses	1	1
Tutorial, Tips, Helps	3	3
Edersheim's Life and Times of Jesus the Messiah	0	1
Edersheim's The Temple	0	1
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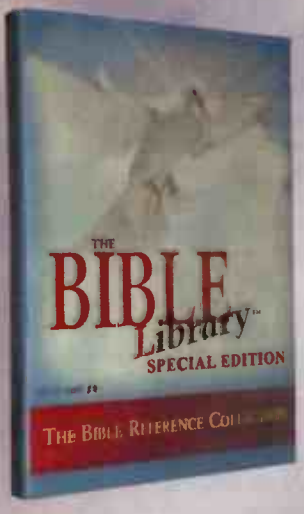

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APRIL 1983

In the days before cover discs, we had to make our own entertainment – literally – and early issues of *PCW* were filled with handy, if rather complicated, code listings. In April 1983 we featured Engine Failure, a text-based game for the BBC in which the hero had to save his spaceship from being burnt up in orbit. Hardly Halo, but impressive at the time.

A rather mercenary ad, meanwhile, promoted the Scorpio as a 'Winchester Killer'. Loaded with five 5.25in floppy disks at a time, it would compress the file structure so each held 1.2MB and, combined, trounced the standard 3MB Winchester. We doubt whether anyone would put up with the unavoidable performance hit this kind of approach would entail any more.

We put Microsoft's predecessor to Excel through its paces, and wondered whether Multiplan, the software in question, would turn out to be the next Ford Edsel. Might our review, perhaps slightly misread, have helped Microsoft come up with the name for its current market-leading spreadsheet?

Finally, Epson was doing all it could to bring a little credibility to the Miss World contest, while at the same time selling some kit. Insisting it wanted to stress the mental abilities of the lovely laydeez, it explained that Epson will 'be figuring very heavily in the actual finals, featuring staff on the judging panels, and setting an Epson technology test to assess entrants'. Hmmm!

APRIL 1988

Oddly, the April 1988 issue kicked off with a complaint about a portable PC running too fast. The Amstrad PPC640 featured an NEC V30 chip that was leaner and meaner than the Intel 8086 chip it was imitating, and so Amstrad adopted it, despite the fact that Word 3.0 would not run when using it.

Incidentally, Intel was a bit miffed by this and set about suing NEC. Intel eventually won, claiming it was just that little bit too similar to the 8086.

Being our tenth anniversary, we looked ahead to the next 10 years. Aside from overlooking Microsoft, we got much of it right, predicting, for example, the invention of a 4GB optical storage medium within 10 years.

We also reviewed the latest greatest hardware in the form of the Sun 4/110. Heralded as the future of home computing, Sun had essentially slimmed down its Sun 4 workstation to micro size,though the Sun home revolution didn't happen.

Finally, Nick Hampshire wrote about the advances in medicine thanks to computers. Molecular biology and gene mapping had begun, and were causing a great stir in both the medical and technological fields.

APRIL 1993

'Few computer magazines can claim to be 10 years old. Only one can boast of being 15 years old', wrote group editor John Barnes in the opening lines of his preface to *PCW*'s 15th anniversary issue that year. That one magazine was, of course, *PCW* and this month the title can lay claim to being the only IT magazine in the UK to have reached 25 years.

To help celebrate *PCW*'s 15th birthday, Apple sent in nine of its newest products, including the restyled all-in-one Mac Classic, which for the first time boasted a colour screen. The Colour Classic was built around a 16MHz 68030 processor with 4MB of Ram and, in order to abide by new EU directives that dictated all office systems should feature a tilt and swivel screen, the entire system was mountable on a special stand to give greater screen manoeuvrability. Meanwhile in news we looked ahead to the planned launch of the Pen Mac, a pen-based Macintosh, which was scheduled for August, and Danny Bradbury reported on the arrests of a virus writing group in the UK.

The all-in-one Mac Classic has a colour screen , 16MHz processor and 4MB of Ram - not to mention a stand that let you move the screen around

APRIL 1998

The big news in April 1998 was that an international agreement had been reached on a 56K modem standard. V.90 was a compromise between two incompatible 56K standards, 56Kflex and x2, respectively backed by Rockwell and US Robotics. Although we now have V.92, the V.90 standard is universal and has lasted well.

Elsewhere we covered the 64bit Intel Merced processor, which was to become the first Itanium with the proud headline 'move to 64bit next year' – ie 1999. It's possible that we were a little optimistic there.

Columnist Michael Hewitt expounded on digital cameras, having bought a Fuji DX-7 for £400 with a 640 x 480 CCD (a not so huge 0.3megapixels). As digital cameras were so new he had to explain even the most basic points, including the LCD display. In our Reviews section we looked at the 0.9megapixel Konica Q-M100, which would have set you back £599 – with no optical zoom.

We also reviewed the Compaq Armada 7795 notebook, which weighed eight pounds (3.6kg) and had all the styling and poise of a breeze block. The Pentium 266MMX processor was the fastest available and that was reflected in the hefty price tag of £4,934 inc VAT.

Our peripherals group test of 17in monitors had 24 contenders, ranging from £316 to £699, which shows how things have changed, while our budget PC group test, with a price point of £1,000, shows how some things never do.

The PCW team

Back in 1984 the 'Einie' was a programmer's dream. But it was relatively expensive for its time

The Einstein

Once a technically desirable product, the Einstein soon proved to be a flawed genius

The advert began: 'The title of "genius" is not bestowed lightly on man or machine: those extraordinary qualities and powers of intellect are rare.' Thus we were introduced in 1984 to a new microcomputer from Taiwanese electronics giant Tatung, a machine that was designed and built in Britain. As the ad went on to describe its specification and pricing as 'sheer genius', the micro-computer's name seemed appropriate: the Einstein.

The name was chosen after much deliberation. The preferred option was to go for a fashionable fruity badge – such as Apple, Tangerine or Apricot – but finding a suitable fruit that exuded an air of 'technical genius' proved too hard a task. In the extremely competitive micro marketplace of 1984, could Tatung deliver a product that lived up to this hype?

The company's journey to PC building was a long one. Tatung is an old district of Taiwan's capital Taipei, but the company that eventually adopted its name wasn't born until 1918, when a Mr Shan-Chih Lin set up a new business association. The first documented company milestone came in 1939 when the Tatung Iron Works was established. In 1946, Tatung repaired 577 railway cars for post-war Taiwan and then soon began specialising in high-quality electric fans.

By the end of the 1960s, Tatung had moved into the production of refrigerators, TVs and air-conditioning units and had also set up a school of study, which grew into the Tatung Institute of Technology. SC Lin donated much of his own property to set up what became the Tatung Senior High School and Tatung University.

The company steadily grew, offering scholarships and internships to its students. While electric fans dominated Tatung's international exports, it also moved into heavy plant machinery, developing electric motors and transformers. The first sign of IT products became evident in 1973 with the opening of the Tatung Chinese Character Processing Computer Company.

During the 1970s Tatung opened international branches in Japan and the US and, by 1981, the new UK office started supplying TVs, VCRs, monitors and domestic after-sales support. At this time the microcomputer market was exploding, and Tatung UK boss WT Lin wanted a piece of the action.

Judging by the specification selected by project leader Roy Clarke, Tatung was clearly inspired by the emerging MSX platform devised by Microsoft of Japan. MSX consisted of a minimum hardware specification, which ran an extended version of Microsoft's Standard Basic 4.5.

MSX was supported by, among others, Canon, Sony, Toshiba and Yamaha. But, sadly, each had its own idea of what made a great computer and added proprietary, incompatible features, which effectively killed the concept of a standard platform.

While the Tatung Einstein was incompatible with MSX, it shared many of the platform's characteristics, particularly in terms of graphics and sound. The Einstein's high-resolution graphics mode supported 256 x 192 pixels in up to 16 colours with 32 sprites, and there were three channels of sound with the possibility of voice synthesis.

At the heart of the Einstein was a Z80 processor running at 4MHz with 80KB of Ram, 16KB of which was used for the display memory. Tatung made a big deal about the built-in 500KB 3in floppy drive, which at the time was impressive for a machine in the sub-£500 price bracket. Along with TV and monitor outputs, the Einstein also featured a serial RS232, a Centronics printer port, joystick connectors and an exclusive 'Tatung Pipe', which accessed the 8bit bus.

Industrial designer John Law was responsible for its look and feel, styling a single integrated box with a built-in keyboard. A rectangular depression on the top of the case was designed to position the monitor at exactly the right viewing distance.

At its launch, the Einstein proved to be a technically desirable product. It was described by some programmers as a dream, while certain aspects of its Machine Operating System turned up during development of the Atarl ST and Commodore Amiga. Sadly, at £499, the 'Einie' was just too expensive against the competition.

An expanded 256KB Einstein was later released, but by this time Tatung had acquired rights to produce IBM PC clones. Like many other companies, Tatung switched to this increasingly popular platform, leaving the Einstein to be remembered as an expensive and flawed genius.

Gordon Laing

April Cover Disc

Top to bottom:
PlanIT Health & Safety 3 Pro
PC Magazine Ebook 3
PCC Payroll
Defragmenter Pro

Truespace 3.2

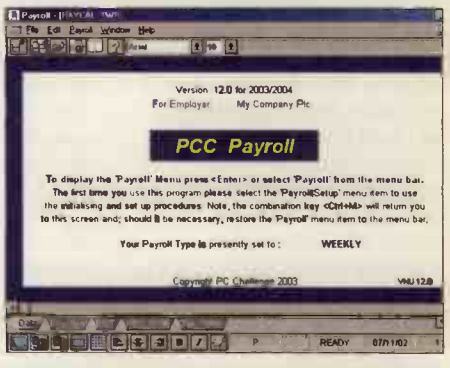
FULL PROGRAM

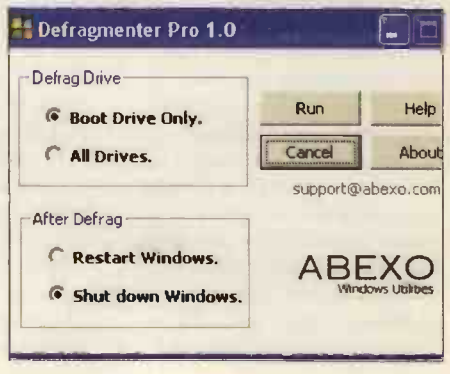
When you run the installation for your copy of Truespace 3.2, you'll be asked to enter a serial number. To get that serial number visit: http://forms.caligari.com/forms/ts3down_pworld.html.

You'll be required to enter your name and a valid email address, after which the serial number will be emailed to you. You can then enter this in order to complete your installation.

Truespace 6.5 – Upgrade offer

Be sure to try out the Truespace 6.0 demo (also included on the CD), to see how far Truespace has evolved since 3.2. At the time of going to press, Truespace 6.5 was undergoing final development, and you'll be able to upgrade from Truespace 3.2 to the latest version 6.5 for only £249 ex VAT and shipping - see page 276 for details of how to upgrade your software.





Full version

PlanIT Staff Manager Pro

The bureaucracy associated with staff management can be a nightmare. Staff Manager Pro walks you through the whole process with the minimum of fuss, using a range of documents from recruitment right through to retirement.

PlanIT Health & Safety 3 Pro

We all know that companies are bound by health and safety legislation. PlanIT's Health & Safety 3 Pro will help you keep up to date with the latest rules and regulations.

Installing the PlanIT programs

Some readers may experience problems installing or running PlanIT Health and Safety 3 Professional and Staff Manager Pro. The software publisher has provided a patch for each program that will fix the problem.

Staff Manager Pro: After the software has been installed, the file PatchSMP.exe should be downloaded from www.planit.co.uk/PatchSMP.exe and run (it can also be run directly from the link if you wish).

When you run PlanIT Pro Staff Recruiter for the first time you will be asked for a user name and password. The default for both of these is 'planit'.

Health and Safety 3: After the software has been installed, the file update_hs.exe should be downloaded from www.planit.co.uk/update_hs.exe and run (it can also be run directly from the link if you wish).

After installation you'll find the entry 'PlanIT Business Management' in the Windows Start menu. When you select this, the main PlanIT menu will appear and from here you can choose to run any of the PlanIT programs that have been installed on your PC.

IMPORTANT: If Internet Explorer 6 is not already installed on your PC (for example, if you use IE5.5), PlanIT Health and Safety installs IE6 and Outlook Express automatically. You will not be given the option to skip this step!

The version of PlanIT Health and Safety featured on this disc is the full retail version for companies that wish to create a plan that covers up to five employees. If you need to create a health and safety plan that covers additional personnel you should visit www.planit.co.uk and purchase an upgrade.

Top to bottom:
Cadenza Mnotes
Turbozip
Arx Fatalis
Mame emulator

Free version

PC Magazine Ebook 3

Here's the third *PC Magazine* ebook edition, designed to give you a taste of what's to come. It's part of a new venture that will make *PC Magazine* available to readers online. You'll need to install a copy of Adobe Acrobat Reader or Ebook Reader (both are provided on the disc if you need them).

Trial versions

PCC Payroll

www.pcchallenge.com

PCC Payroll provides everything you need to run your own payroll. Unlike some software, it does not require any special stationery – all reports including pay slips are designed to print on a single sheet of plain paper (typically A4).

This package meets all Inland Revenue requirements with regard to tax and NI and incorporates the revised National Insurance system for 2003-2004. It runs on all versions of Windows from 3.x to XP.

NOTE: Version 12.0 is only valid from 6 April 2003 (2003-2004 PAYE year). A further update will be required following the proposed March 2003 Budget – when changes are made to tax rates, bands, etc. These usually become effective in May/June following the Budget.

A Support and Maintenance Contract is available to users who register the software for 2003-2004 at a cost of £75 ex VAT (normal subscription price £115 ex VAT).

Defragmenter Pro and Defragmenter Lite

www.abexo.com

Defragmenter Lite and Pro are utilities that automate the necessary steps for an efficient and problem-free disk defrag.

Cadenza Mnotes

http://cs.commontime.com

Mnotes gives you access to your Lotus Notes email, contacts, calendar, tasks and journal when you're on the move with your Windows CE, Pocket PC, Palmsize Palmtop or HPC device.

Utilities

Linux Hands on files

These files can be found in the folder \software\unixhandson\ – check out this month's Linux column (page 244) for more information.

The six programs included on the disc are:
- Lame 3.93.1, an educational tool designed for learning about MP3 encoding
- Libdvdnav 0.1.3 and Xine-dvdnav 0.9.13 DVD tools for Linux
- Xine-ui 0.9.13 and Xmms 1.2.7 source Rom for Red Hat 8 multimedia players
- XMMS MP3 Plugin for Red Hat 8.

Windows XP tools

X-Setup
Powerpack 2003 Pro
File Compair 2
Magic Folders
Ram Idle Professional
Cacheman 5.11
Turbozip
Fast Explorer 2001
SiSoftware Sandra 2002
Handybits File Shredder
Active Ports 1.1
Advanced NT Security
Started
Easy MP3 converter
CD to WAV/MP3 ripper
Easy MP3 CD Extractor

Game demos & trailer

Praetorians (playable demo)

This 3D strategy game is set in the time of Julius Caesar at the height of the Roman Empire.

Arx Fatalis (playable demo)

In this new RPG from Jowood (reviewed on page 339), your goal is to destroy the secret cult of Akbaa, the god of devastation and chaos, thereby preventing his return to the physical world. So, not *The Mummy* then...

Sim City 4 (Quicktime trailer)

Create, build and run a realistic city; connect your metropolis with other cities you've created to form a massive region of Simcities (reviewed on page 338).

On the bonus CD

Nvidia & ATI graphics card drivers

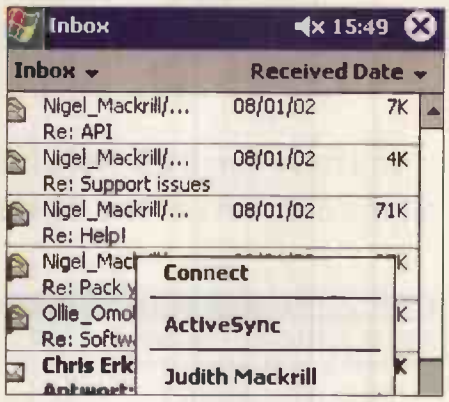
The gamers among you will appreciate the inclusion of Microsoft DirectX 9 plus graphics drivers from Nvidia and ATI, which should save you hours of download time if you still rely upon a 56K modem.

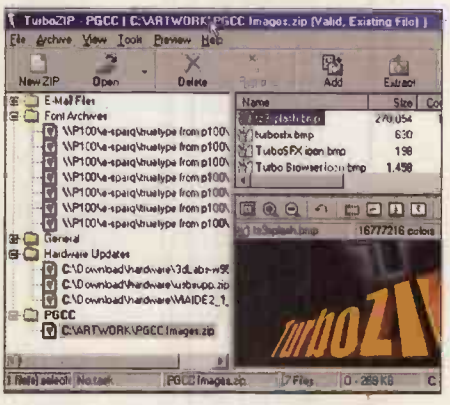
Emulators

Edsac Simulator
Mame version 0.63
CCS64 Commodore 64 emulator
Sinclair ZX81 emulator (freeware)
Spectrum emulator (shareware)

Retro games collection

Relive you past with these games: Astro Fire • Brainwave 2 • Ploing 2 • Strayfire • Jumpstar • Crosscraze • Terrafire • Invaders 78.





What's on the DVD

If you have the DVD-Rom edition of *PCW*, then you'll have all the contents of the CDs plus the extra goodies below

Full versions

Age of Terror: In The Name of God

This hour-long documentary is the first episode from the Discovery Channel series and focuses on religious zealots. It contains violent scenes that may be inappropriate for some viewers, so caution may be required.

Starting with the Palestinian hijackings in 1970 at Dawson's Field in Jordan, the documentary follows the religion-led terrorism right up to the destruction of the World Trade Center towers. Narrated by Tim Piggot-Smith, Age of Terror will inform you about this emotive and complicated subject. Subsequent episodes look at other incarnations of terrorist: the radical revolutionary, the nationalist and the state-sponsored enforcer.

NOTE: To get back to the main menu from the chapter selection screen use the menu button on your DVD player's remote control.

Also on the DVD

PCW product group tests

You'll find two years of product tests from the pages of *Personal Computer World*. Desktop PCs, anti-virus software, CD writers, databases, digital cameras, DTP software, hard drives, image editors, monitors, motherboards, notebooks, PDAs, printers, scanners and much more – right up to, and including, the April 2002 issue. The group tests are presented as Adobe Acrobat files, to preserve the original layouts.

50 essential utilities and add-ins

In our regular section you'll find more than 50 of the top must-have programs and add-ins, sorted into five main categories – Internet, Office, Creative, Utilities and Others. Here's just a selection:

Zonealarm

With Stealth Mode enabled, Zonealarm's firewall renders your computer invisible to the Internet and potential intruders.

Tiny Personal Firewall

Tiny Personal Firewall represents smart, easy-to-use personal security technology that protects PCs against hackers.

WSFTP LE

This 'lite' version of Ipswich's popular file-transfer software is one of the easiest to use but has all the features you'll need.

G-Force 2.2

G-Force visualises audio in real time and exists as a plug-in for audio players and as a standalone application that accepts line-in audio.

Ulead Photoexplorer

Photoexplorer lets you display and print photos full size as well as enabling the printing of thumbnail indexes.

Evolution Audio Lite v1.43 (full version)

This Midi sequencer is designed with beginners in mind and allows you to record and edit audio tracks.

Irfanview

This great freeware image viewer/converter is the first graphic viewer with gif and Multiple-ICO support. It also boasts multipage tiff support.

Cdex

This utility can extract digital audio tracks from an audio CD and save them as files on your hard disk. The extracted audio tracks can be stored as wav or MP3 files.

Muvee Autoproducer

With this program you simply need to select video files and then choose any music you like from over 20 styles in order to add your own soundtrack.

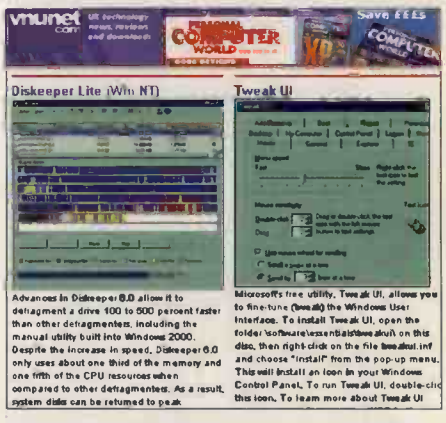
Smartsum Calculator 2

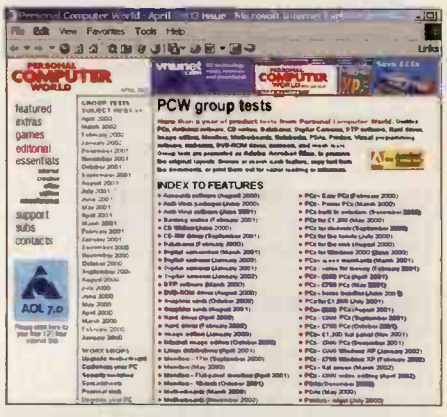
This free Windows-based talking calculator emulates the traditional calculator/adding machine and printer found in many business environments.

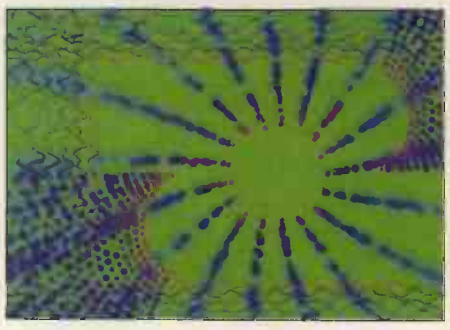
Aladdin Dropstuff 5

Dropstuff and Expander (both very popular on the Macintosh platform) overcome cross-platform file transfer problems between Windows and Mac users.

Top to bottom:
Age of Terror
50 essential utilities
PCW group tests
G-Force 2.2







PERSONAL COMPUTER WORLD

Next Month

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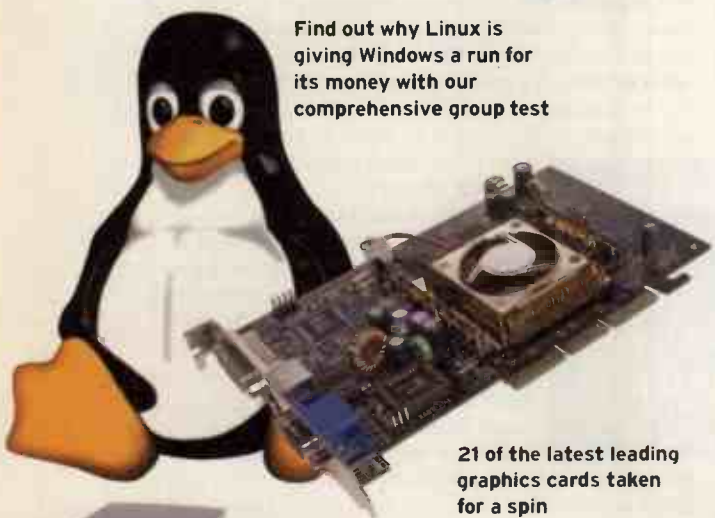
Everything you need to know about building your own wireless network



Find out why Linux is giving Windows a run for its money with our comprehensive group test

21 of the latest leading graphics cards taken for a spin

What's hot and what's not with this season's high street PC fashions

DIY wireless home networking

Got an extra PC or two lying around at home? Or maybe a PDA? Why not connect them all up without the hassle of drilling holes and running cables through your walls. We tell you everything you need to know to create a wireless home network.

Lovely Linux

Windows' closest rival is becoming ever more popular, and has the added bonus of now being easier to use. We've rounded up eight of the leading packages to see how they compare.

Graphics cards

Whether you're looking for an affordable upgrade or the best-of-the-best in graphics cards, our group test should have exactly what you're after. We test 21 leading brands to find the one best suited to your requirements.

High-street PCs

For many people, buying a PC direct from a manufacturer is an easy thing to do, but it does mean you have to wait days or even weeks for it to arrive. For those of you too impatient to wait we round up the best high-street PCs available to buy straight off the shelf.

There's lots more in May's *PCW*, don't miss it...

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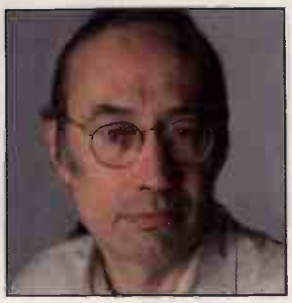

Can the West learn lessons from East?

Countries such as India and China are not so blinded by Microsoft's light as the UK, says Ed Henning

edwardh@pcw.co.uk

With the depressed state that the PC industry has been in for the past couple of years, it can be interesting to see what is happening in those parts of the world where there is still significant growth – mainly in the east: China and India to name just less than half of the world.

In my view, the biggest problem we have had in the west with the PC industry is a lack of pragmatism. By this I mean not applying proper consideration to these devices as tools to do particular jobs and, considering properly their suitability, costs, and so on. I am sure this applies to other areas of technology, but it seems particularly severe with PCs. Fashion has often led over productivity, and style over content.

And here's one fine example. As a marketing ploy for Compaq (now merged with HP), Gartner came up a few years ago with the concept of total cost of ownership (TCO) of PCs. It was done very badly, treating people working with PCs as if they were on a production line, and was an excellent target for columns such as this.

But for all its failings – and there were so many of them – this whole concept brought to light one important fact. That many, perhaps most, companies were simply throwing high-tech equipment at their businesses without any real understanding of the benefits such as productivity gains, and so forth. In fact, later studies tended to show very few gains at all, if any.

> 'There are two things in life that should not be computerised, and education is one of them'

The situation in the US was worse than in Europe – we are more pragmatic – but we were doing much the same.

We were also doing it in education. I used to get quite angry reading news stories about PCs in education, and particularly Bill Gates making deals to get hardware into schools running his software. It would be unfair to criticise him for doing such a good job at selling his products, and priming a new generation with those products. What upset me so much, particularly as I used to be a teacher, was to see politicians and journalists lapping it all up uncritically as if he were some kind of altruistic visionary instead of simply a good salesman.

There are two separate topics here – whether PCs have any major place in schools and, if so, do you allow one company to promote its products in those schools? As far as the former point is concerned, I have always agreed with Intel's Andy Grove: there are two things in life that should not be computerised and education is one of them.

So, getting back to India and China, I recently went on holiday to India and just about the first article I read in a local magazine had a subtitle that started 'Bill Gates plays altruistic godfather'. Thankfully, unlike so many articles I read in the mainstream press over here in the 1990s, the title continued 'with a not-so-secret business mission'.

This magazine (*This Week*, 24 November, 2002) was not falling for the altruistic visionary image like our press did. The basic story was the same, about special deals to get Microsoft software into schools, but there was a twist that I had not previously considered.

Why might Gates be quite so keen on evangelising Windows in Indian schools? For a start, the TCO problem hardly arises, as Indian businesses and organisations are not as cash rich as most of their western equivalents, and so the temptation simply to throw high-tech at a problem and overspend is not there. Taking much more care over costs also means taking a much closer interest in software like Linux and other open-source products; particularly in a country so rich in programming talent – with 600,000 developers, second only to the US. Where better to develop your own Linux based applications than in a country like India?

And this leads straight to another point. Gates understands the need to get on the right side of the developer community, and his company has done a very good job of doing this in the west. If the developers feel at home programming for his system, they are more likely to do so, and thereby help make his system a success.

But this battle has not been won in the east. China has shown strong interest in Linux in the past few years, and now many states in India are also doing the same. And there are two benefits to these countries: not only cost savings thanks to (largely) free software, but also, and perhaps more importantly, freedom from a proprietary system developed in a foreign country.

My initial take on this Indian article was to see more of the same as we had over here, but at least the Indians seem wise to Gates' manoeuvrings and will force a more even-handed balance in the battle between Windows and open source.

If only our governments, both local and national, would do as some Indian states are doing, and instruct their organisations only to use Windows if some open-source solution to a problem does not exist. China has shown similar interest in open source, and is usually much more critical before accepting Windows solutions. It would seem somewhat ironic if the UK government could take a lesson in competition from the People's Republic!

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BCO2 Black	BJC150/BJ200/BJ220EX/BJC1000	£ 9.35	£ 8.23
BCO5 Colour	BJC150/BJ210/BJ220EX/BJC1000	£12.75	£10.99
BCO6 Photo	BJC240/BJC250/BJC1000	£13.75	
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BJC3000/6000	Black	£ 4.49	
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51645A Black	710C/720C/820CXI/850CXI/870CXI	£ 9.95	£ 9.99
51633A Black	310/320/340	£10.45	
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12A1970 Black	3200/5000/5700/7000/Z11/Z31/Z51	£13.89	£ 9.99
15M0120 Colour	Z42/Z51/Z52	£17.50	£11.75
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