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editorial

The future is wireless, according to some at the Comdex show, but it better hurry up, says Riyad Emeran

Something in the air

I've recently returned from Las Vegas where I was attending Comdex. Comdex is an Expo where technology companies come together to show off what they have, and what they will have in the future.

Unsurprisingly there were quite a lot of new and exciting products on show, but one message seemed to ring loud throughout the show – that the future is mobile or wireless.

Of course, after the disappointment of WAP, the future of IT being mobile isn't the most exciting prospect, but the future of IT being wireless makes a little more sense.

One of the most interesting stands I came across at the show was NetGear. As its name suggests, NetGear is a network solutions company. In fact it walked away with a Highly Commended award for its network starter kit in the November issue of *PCW*. But NetGear wasn't showing off a new corporate or even small-business network solution, it was showing off its latest consumer networking package.

The whole NetGear stand resembled a home with rooms such as a living room and a study. NetGear felt that consumers should be making more of the latest broadband Internet connections such as ADSL and cable modems, so it was demonstrating how that connection could be made accessible throughout the house. Obviously no-one wants CAT5 cable trailing all over their home, so NetGear was pushing a wireless solution and it even made the wireless transceivers look cool so they didn't spoil your décor.

With a solution like this you could access the Internet from anywhere in your home using a desktop, laptop or any other device that can be connected to an Ethernet. This is how the Internet should be, with no need to go to the study or wherever your PC happens to be if you want to read your email or check out a website. Not only that, it also gives you the opportunity to sit out in the garden and work – if we ever get a summer.

Another company that seemed to have some good ideas about the wireless world was Red-M, which was nestling in the Bluetooth pavilion. I've moaned about Bluetooth being vapourware and not ever really materialising for a long time so I won't do it again, especially since Red-M had a viable product on its stand.

The 3000AS access server is a device that allows any Bluetooth-enabled client to connect to a network or the Internet. It acts like a hub that can be connected to ADSL or ISDN and will allow any Bluetooth device within range Internet access. This might seem limiting with the Bluetooth range being only 10m, but the 3000AS has a strong transceiver that boosts the range to 100m.

Obviously this will allow you to use Bluetooth like any other wireless networking product, but there are a lot of other uses that are much more interesting.

If you believe the hype and accept that in the not too distant future every PDA, notebook and mobile phone will ship with a Bluetooth chip then a device like the 3000AS could be great.

Imagine if devices like these were in place in airport departure lounges connected to an ADSL link. You'd be

> **You'd be able to browse the Internet or check your email from your PDA without having to put up with the PAINFULLY SLOW GSM CONNECTION**

able to browse the Internet or check your email from your notebook or PDA without having to put up with the painfully slow GSM connection, not to mention the cost of the call. Having a single access server in a small office would allow every worker to synchronise their PDA with the online diary without even taking it out of their pocket, let alone having to connect a cable. And electronic invitations could become a reality by simply downloading them to your PDA which could then be read when you arrived at the venue.

The success of a product like the 3000AS depends heavily on the next generation of PDAs and phones being Bluetooth enabled, but Red-M is trying to bridge the gap. It's already produced a Bluetooth SpringBoard for the Handspring Visor to help things on their way.

In the end, I have to agree that wireless and mobile networking could change the way we use IT and consumer technology. Let's just hope that this time the wireless dream really is just around the corner.

Riyad Emeran, Editor in Chief

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February COVER DISCS

GAMES | **APPLICATIONS** | LIBRARY | ENTERTAINMENT | INTERNET

Top of the bill this month is Laplink Professional, the complete solution for your PC-to-PC control and file transfer needs. This issue also marks the first of our selections of great new MP3 music tracks from peoplesound.com. And you'll find the powerful Corel Presentations 9, plus AutoStreet 2000 Lite, Inside Information's IT products reference database, and some great new games demos. Read on...

LapLink Professional

FULL VERSION

LapLink Professional gives you complete access to another computer from any location. Whether you are using a modem, network, wireless device, or cable, you can connect to other computers running Laplink and transfer files between them. When you're out of the office, you can use the files and programs on your office computer – as well as other computers on your work network. You can even 'chat' (through Text Chat) with someone sitting at your office computer while you work with office files from a remote location.

LapLink Professional is the fastest, most flexible and easiest to use solution for mobile professionals and telecommuters. It's a superb tool for remote access, control and transfer of files to and from your office PCs. Optimised for Windows 98 it fully supports USB and Fast Infra-red. Building on LapLink.com's patented remote access technology, LapLink Professional supplements the award-winning LapLink 7.5 features, with first-to-market

Working away from the office doesn't mean you are cut off from your PC

USB cable support. Now users can connect two computers at network-like speeds of up to 6Mbits/sec, many times faster than the more usual 500-800Kbits/sec.

LapLink Professional takes full advantage of Windows 98 features, allowing users to expand their desktop onto multiple monitors, making a large virtual desktop, and allowing them to schedule a

file transfer using the Task Scheduler provided in Windows 98 and Internet Explorer 4.0. LapLink Professional also gives users the option of controlling the display-intensive aspects of Windows 98, which can hinder remote control performance. Other major enhancements include support for all Windows platforms in one box (98, NT4, 95, 3.1) and a free CE client via web, connection via Fast Infra-red (FIR) and print redirection.

Features such as Xchange Agent and Address Book save you time and simplify your work. With File Transfer, you can move or copy files between computers. Customising any of the several File Transfer settings simplifies complicated transfers. LapLink.com's patented SpeedSync technology makes updating files faster because they are compared, and only changes, not entire files, are transferred. A comprehensive security system, including encryption, protects your valuable data at all times.

The Xchange Agent feature lets you synchronise files and folders between two computers (or drives). Use Xchange Agent to transfer vital information to and from a portable computer, or to back up important files. You can schedule Xchange Agent to run

You can control who gets into your PC

regularly, so that your information is always up to date; Xchange Agent automatically connects, transfers files, and disconnects.

With Remote Control, you control another computer as though you were sitting at it. Whether your computer is controlling or being controlled, you have the same setup and start-up procedures. You can even copy information from one computer and paste it on the other.

Print Redirection enables you to print a document from a remote computer to your local printer over Remote Control, or print local documents to a printer at a remote location. This means you don't have to use File Transfer to get documents printed where you want them.

Using Text Chat, you can exchange messages with someone at a remote

IMPORTANT NOTICE

During installation you'll need to enter the following serial number: LPR OPCW-250357-20B

Features included in LapLink Professional

- File Transfer moves files between PCs.
- Xchange Agent synchronises files and folders.
- Remote Control lets you work on a computer at another location.
- Print Redirection lets you print documents on a printer attached to another computer.
- Text Chat lets you type a message to someone over LapLink.

LapLink Professional (continued)

computer by typing messages in a window. This is useful if you need to communicate with the person at the other end while performing other services like File Transfer and Remote Control. Text Chat information is saved, and you can also cut and paste text into the Text Chat window.

Getting started

To start working with LapLink, the program needs to be installed and running on two computers. You can connect from LapLink to any other Windows version of LapLink (or to Remote DeskLink).

Before you can connect, you need to change security settings on the computer you want to connect to. To connect to another computer:

● Click the Connect button on the LinkBar, and click the connection method you want.
● If you have created an Address Book entry for the other computer, select it. Otherwise, specify information about the other computer in the Connect dialog box. The information you provide varies depending on how you are connecting.
● Click the names of the services you want to open when you connect. If you select Remote Control, be sure to click any locking privileges you want to use.
● Click OK. LapLink attempts to connect to the other computer.

If security is set up on the other computer, you might have to type a password to log in to the other computer.
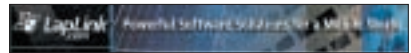
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Customer services: 0870 241 0983
Technical support and fax: 0870 241 2481
Website: www.laplink.co.uk
For product information email
sales@laplink.co.uk

Save over £95! Upgrade to LapLink Gold for only £64.61

If you need to access Windows 98, Me and 2000 machines and are looking for USB support, Internet connectivity or increased security features, then upgrade to LapLink Gold for only £64.61 inc VAT, saving over £95 on the RRP.

LapLink Gold gives you quick, easy access to your desktop PC or network resources when you're working away from the office. You can access and transfer files, synchronise data, run desktop apps, read and send email, and support remote users.
The benefits
● Fastest file transfer on the market
● Remote control

● File transfer and synchronisation
● Windows 95, 98, Me, 2000 and NT4 compatible
● Easy user interface
● Supports USB providing file transfer at network speeds.
● Prohibits access to unauthorised PCs, drives, directories with multi-level encryption and case-sensitive passwords.

LapLink Gold is ideal for system administrators and helpdesk professionals supporting multiple users located anywhere in the world and for delivering training materials and deploying software updates to many users – the possibilities are endless.

LapLink FTP included!
Expand your file transfer capabilities and

move files to/from a remote server and your local PC. LapLink FTP is great for transferring large files such as games and music from the Internet.

System requirements for LapLink Gold: Microsoft Windows 95, 98, Me, 2000 or NT4, Intel or compatible 486DX 100MHz, 15MB of RAM.

More savings...
LapLink Parallel Cable purchased with an upgrade costs £13.50 (save £5)
LapLink Serial Cable purchased with an upgrade costs £13.50 (save £5)
LapLink USB Cable purchased with an upgrade costs £31.12 (all prices include VAT)

READER OFFER

Personal Computer World Laplink upgrade offer

Item	Price	Quantity	Code	Total price
LapLink Gold	£64.61		LGD000-UN-EU	
LapLink Parallel Cable	£13.50		CAYE	
LapLink Serial Cable	£13.50		CABL	
LapLink USB Cable	£31.12		USB	
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Peoplesound.com MP3 Top Ten

peoplesound.com

Listen to some of the hottest new sounds around. On the cover disc are 10 full tracks from peoplesound.com in MP3 format:

- Doctor Rock – Higher
- 4D-Control – Control
- Jo Swan – Don't Ask
- Kai Motta – Picture That
- The Zephyrs – In Your Arms
- Morph – Beautiful Lies
- Caroldene – Time is a Healer
- Kry – Miles Away
- 2DB featuring Kym Marsh – Heaven in your Eyes
- Criptic – Is This The End?

Peoplesound.com is Europe's leading music download site. It was set up with three aims in mind: to help emerging artists get heard, to give consumers access to the best new music and to increase efficiency

Download MP3s from peoplesound.com

within the music industry. Since its launch the company has developed a dominant consumer brand presence and has established itself as the pre-eminent Internet partner for the music industry.

Peoplesound.com uses a revolutionary technology, peoplesound.com navigator, to

'learn' about consumers' music tastes and ensure that they always get quality music that meets their particular taste or mood.

Consumers can select from and instantly play thousands of tracks across all major music genres. Tracks can be downloaded in MP3 format and played at CD quality on PCs, portable MP3 players or via their hi-fi equipment. Consumers can also buy custom-produced audio CDs of their favourite artists and tracks. Peoplesound.com also brings artists and talent scouts together, improving the selection process that record labels use to sign new acts.

Following the success of the UK website, launched in November 1999, peoplesound.com has extended its European reach to include new local sites and operations in the key markets of Germany, France, Spain, Holland and Italy.

Inside Information

Inside Information is the UK directory of software and hardware for PCs and networks. It is published on disc, updated monthly and, for each product, lists references to all the reviews in the major computer press over three years.

Inside Information helps you find software and hardware in the UK. The directory gives websites, UK phone numbers and UK fax numbers for over 2000 software publishers and hardware manufacturers.

On the cover disc is a full working copy of Inside Information except that we have limited the reviews index to just five titles. These are: *Personal Computer World*, *PC Magazine*, *Software World*, *Database & Network Journal*, and *What PC?* You'll find it a valuable reference to products and vendors in the UK. What's more it's fast and very simple to use.

Key features of the full version include:
- An independent guide to both software and hardware.
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Search by category, company or product name to find what you're looking for

- Create your own personal notebook of interesting products.
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Check out **www.inside-information.com** for more details.

DirectX 8.0

The latest version of DirectX offers updated graphics, faster frame rates, and support for extensive multiplayer games. It also offers more immersive audio when running and displaying programs rich in multimedia elements such as full-colour graphics, video, 3D animation, and surround sound.

If you had an earlier version of DirectX installed on your system, you will see little difference in available space on your hard

drive following the installation. DirectX 8.0 will overwrite any earlier versions.

NOTE: After installation, the DirectX 8.0 run time cannot be uninstalled. DirectX is a system component. It cannot be uninstalled without reinstalling your operating system.

There are also different versions for Windows 95/98/ME and 2000. Make sure you install the correct version.

Playable games demos

Disasteroids 3D v1.2
A freeware OpenGL-accelerated version of the arcade classic. It's just as addictive as the original, but far more spectacular.

Delta Force: Land Warrior
This includes one single-player mission where you must fight your way to recover a briefcase containing deadly bio-toxins.

Virtual Pool 3
Take on all-comers at the local pool hall. This game's accurate physics achieves a full simulation of all aspects of pool.

Corel Presentations
FULL WINDOWS DOWNLOAD VERSION

Corel Presentations lets you create high-quality slide shows and drawings that can include text, data charts, organisation charts, and graphic objects.

You can use Corel Presentations to produce professional-looking project proposals, interactive demonstrations, multimedia presentations, flyers, signs, banners, and more. Your slide shows can be presented on large monitors, portable
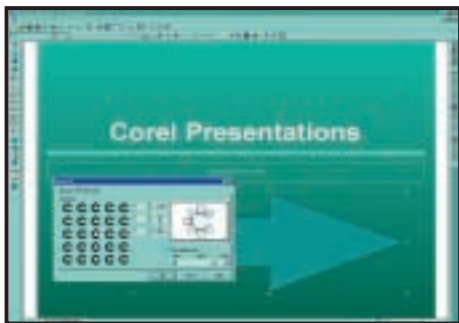
Corel Presentations comes with a wide range of effects and transitions

computers, overhead transparencies, 35mm slides, or printed in colour or black and white. You can also send your presentations to other people over the Internet.

Corel Presentations 9 has the following new features:

Microsoft PowerPoint Export lets you export slide shows in PowerPoint format.

Corel RealTime Preview lets you see a change in a Preview window. It also allows you to see a preview of the change displayed on the page before it is applied. This enables faster and easier document development. RealTime Preview applies to font attributes, frames, borders, colour fills, outlines, zoom, and undo and redo operations.

Install-As-You-Go lets you minimise the hard drive space required by WordPerfect Office 2000 applications. If you select a non-installed item, Corel Presentations asks if you would like to install it.

Shapes enable you to add over 100 predefined lines, shapes, arrows, call-outs, flowchart elements, and buttons to your slides and drawings.

Convert To Polygon lets you convert shapes, then apply 3D effects, use QuickWarp, contour text to a shape, and use the combine tool to combine the polygon with another object.

Image Tools let you apply special effects to the shapes, bitmap images and vector images in your slide shows and drawings.

Scrapbook gives you faster access to folders of clip-art images, organised by category. You can search and preview images, then drag and drop or copy and paste the images to drawings, charts, slide shows, spreadsheets, letters, papers, or reports. You can also create your own categories and view automatic updates of thumbnails. The enhanced Scrapbook also lets you preview sounds, movies and bitmap images.

Internet Publisher guides you through the process of publishing your slide show in HTML format. You can choose page styles, colours, and buttons to customise the look of your HTML slide show.

PerfectPrint lets you create books, banners, posters, booklets, and handouts. You can enlarge or reduce documents to fit any paper without changing the format of the page and you can print on both sides of a page.

Redesigned Property Bars give you quick access to the features you use frequently. Many features that could only be accessed through menus in previous versions can now be accessed through the Property Bar.

Exclusions

This Electronic Software Download (ESD) version represents a sampling of what a full version of Corel Presentations 9 offers. Some tools and features may not be supported. These include Templates, the Scrapbook, the Reference Center electronic manual, Desktop Application Director (DAD), Comments, Equation Editor, TextArt, Corel Versions, Import/Export filters, Graphicsland slide service, VBA, mapping functions, advanced formulas, the Borland Database Engine (BDE) and any related database functionality. The Writing Tools include a default set of fonts and support English, French and Spanish. To insert a spreadsheet in Corel Presentations, you must first install and launch Quattro Pro 9. Use Insert | Graphics | From File instead of Insert | Graphics | Clipart to add clip-art to your spreadsheet or slide show.

IMPORTANT NOTICE

Note that during installation, when a dialog appears requesting a serial number, you should leave the serial number field blank (just click the NEXT button).

Using the cover disc

The *PCW* cover disc uses a web-browser-style interface. As well as cutting the time needed for development, content designed for the web can be easily ported to the disc (and vice versa).

Compatibility issues are reduced as your browser has been installed to work on your individual PC. However, to get full functionality from it, you'll need to use Microsoft Internet Explorer (version 4 or later). This is because we use a special ActiveX plug-in that allows us to install software directly from the browser, without all the usual options, dialogs and security warnings.

Unfortunately, Netscape doesn't properly support this software. For non-Microsoft users, we've included a small installer that will run when you insert the disc, or when you run the program pcw.exe in the root of the disc. Of course, you can still launch the main browser to read all about the software on this month's disc.

IMPORTANT

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

● Faulty disc (ie, the disc is physically damaged and will not load) – return the disc for a replacement to:
PCW February cover disc, TIB plc, HelpLine Returns, Unit 5, Triangle Business Park, Pentrebach, Merthyr Tydfill, Mid Glamorgan CF48 4YB quoting ref 'PCW Vol 24 No 2'

● You have problems installing/running the software. Check the support page on the CD, or the support website at www.pcw.vnunet.com/cd. You should also check the manufacturer's website

● For general difficulties call 01685 354726

● If you're still stuck, drop us an email at pcwcd@vnu.co.uk – we may be able to help.

Systran Personal

FULL ENGLISH/GERMAN VERSION

Fast and accurate language translation is becoming increasingly vital to business. Systran Personal translates up to 5K of plain text that has been copied using the standard Windows Cut and Copy features, and you can paste the translation where you want it. You couldn't find an easier way to translate from one language to another!

When you translate cut or copied text using Systran Personal, the program takes the cut or copied text that has been stored on the clipboard, translates it and puts the translation on the clipboard in its place. Then you can paste the translation into any document within which Windows Cut, Copy, and Paste features work.

Systran's technology translates one language into another by performing a detailed morphological and grammatical analysis of the input sentences. Systran strives to achieve the highest possible accuracy, however no computer translation is 100 per cent perfect, nor is it intended to replace human translators. The quality, in particular the grammatical construction of the input, significantly affects translation.

Apart from Systran Personal, the product range includes:
Systranet: an easy-to-use browser that translates web content.
Systran Professional Standard: a SOHO productivity tool to enable small businesses to translate websites, emails, letters and professional business documents interactively

Systran Professional Premium: targeted at the corporate user, with translation speeds of 2,280 words per minute and offering 20 industry-specific glossaries for context-sensitive translations

Systran Enterprise: tailored for use by corporations on an intranet, extranet or LAN, offering employees access to translation anywhere in the world, on the company network, through an IP address.

Easy translation using cut and paste

Upgrade to Systran Professional

Systran Personal is ideal for basic translations for the home user and retails for £39.99 (a full version of the English<>German module is free on this month's cover disc).

Now, in an offer exclusive to *PCW* readers, you can upgrade to Systran Professional Standard, aimed at small business users, for just £69.95 inc VAT & delivery, a saving of almost £60 (RRP £129). With increased functionality, custom dictionaries and the facility to specify 'Do not translate words' and five bidirectional language pairs – English <> French, German, Spanish, Italian & Portuguese, your translations will become more precise and meaningful (see above for Systran's product comparisons).

To take advantage of this offer call Systran on 01959 578 310 and quote Systran Professional Standard Reader Offer.

Visit the Systran website at www.systransoft.com for further information on Systran products & services.

READER OFFER

AutoStreet 2000 Lite

FULL VERSION

This powerful route-planning software comes with these unrestricted features:
- Latest Ordnance Survey map data
- Calculate and display the shortest routes
- High-resolution raster maps
- Five levels of zoom
- Intellizoom technology
- Over 220,000 named places of interest
- Multidirection and multispeed scrolling
- Push-pin database of petrol stations
- Laptop zoom feature

Upgrade to the Standard version to get
- Street-level maps within the M25
- Full GPS tracking throughout Britain
- Seven zoom levels
- GPS tracking to street level within M25
- 1.6 million GB postcode database
- Address checker and postcode locator
- Latitude & longitude navigator & locator

Latest maps, not historic 1995 data
Auto Street 2000 uses only the very latest Ordnance Survey data to produce its quality, high-resolution maps.

Postcode Locator
This uses a highly efficient algorithm to calculate the best, mean position for each postcode.

READER OFFER

Special upgrade offer

The installation on this disc includes two products: Autostreet 2000 Lite (full product) and Autostreet 2000 Standard (30-day trial version).

Users of the Lite version can upgrade to the fully working, unrestricted Standard version for just £23.99. This represents a saving of 20 per cent off the RRP of £29.99.

Similarly, users of the 30-day Standard version trial can upgrade to the unrestricted Standard version for the same price of £23.99.

Autostreet 2000 Professional
This two-CD product contains ALL the streets in Great Britain. This retails at £49.99. But *PCW* readers can buy it for a special offer price of £39.99, representing a 20 per cent reader discount.

All prices are ex VAT and P&P, the latter will will be charged at £3.95.

All orders placed via Autostreet's website www.auto-street.com will NOT be charged for P&P, just VAT!

PCW COVER DISCS BROUGHT TO YOU IN ASSOCIATION WITH:

AOL | LINE**ONE**

GAMES **APPLICATIONS** LIBRARY ENTERTAINMENT INTERNET

What's on the DVD

If you've bought the DVD edition, in addition to all the programs on the preceding pages, you can also enjoy all the programs below, including a full version of Total CAD, a powerful HTML editor, two Linux distros, and some great game demos.

Total CAD 2D-3D
More than 100 2D design tools put drawing, editing and viewing power at your fingertips.

With Total CAD 2D-3D it's easy to import drawings, express 2D drawings in vivid 3D, create fully rendered counterparts, view models from any angle, and experiment with light sources, textures and shadows.

Work through the User Guide chapter by chapter to discover new features, then explore the material on your own before starting the next chapter. The online help system is available while you're using TotalCAD.

TotalCAD's electronic tutorial stays on top of your TotalCAD window. To start the Tutorial, choose Tutorial from the Help menu. The Tutorial Topics page will appear.

AceExpert v3.03s
HTML editor AceExpert v3 has a user-friendly interface with graphical toolbars that allow you to create pages quickly and easily. A set of tabs organised by category make it easy to find your way through an impressive array of web authoring tools. The version on this disc is fully functional, although some elements have been omitted (you will need to download the FTP plug-in from www.visicommedia.com). We've also included a trial version of AceHTML Professional.

Ulead ArtTexture
(Photoshop-compatible plug-in)
This creates custom textures based on a gradient by combining various textures. You can then build up your own collection in the Library. You can even create gif animations using multiple textures. Drag and drop textures from the samples to the Storyboard. Click Animation to save the thumbnails as a gif. Open the file in your gif animation application to add the finishing touches.

ArtTexture works with Adobe Photoshop 3.x/4.x, JASC Paint Shop Pro 4.1+, Microsoft Image Composer 1.5, Corel Photo Paint 6.0+, and other imaging editors compatible with 32bit Photoshop Filter and Acquire plug-in technology.

Storm Linux 2000
This Open Edition (an ISO-9660 image on the disc) contains the same basic OS as the Storm Linux boxed editions, but does not include the third-party software such as Star Office or Partition Magic SE. Nor do

you get user manuals or technical support. There are several ways of installing the Open Edition. We recommend using the CD Installation method (you'll need a CD burner). The Storm Linux 2000 Installation Guide is recommended reading. Installing Storm Linux 2000 means that you will be placing an entirely new OS on your computer, so back up all data before you begin.

The installation ISO is in the folder \software\stormlinux\. To find out how to create a boot disk, and the installation options, visit the stormix website (www.stormix.com).

Linux Mandrake
NEW version 7.2 (FINAL CODE)
Linux Mandrake is a pre-configured graphical Linux OS. It's easy to install and use – and this is the FINAL CODE.

The installation is in the form of two ISO-9660 image files. You'll need to burn these onto CD-R discs before installing. **NOTE:** Mandrake is built with CPU speed optimisations for Pentium-class PCs so it WILL NOT RUN on older i386 and i486-based computers. We strongly recommend you read the comprehensive tutorial BEFORE going any further...

Songplayer 2.5
Songplayer is a musical instrument tutor that uses your existing CD collection. Instead of using a conventional music score, 'Songplayer' uses simple graphics that illustrate, beat by beat, each chord in the song.

Ulead Photo Library
We've got 780 royalty-free stock photos for your personal use. These images are in jpeg format, and are ideal for brightening up your website or other screen-based presentations. Use any image browser, or Ulead's own PhotoExplorer to view and organise your collection. The images are in the folder \software\ulead_photocollection

Use PhotoExplorer to organise your pics

Resident Evil 3: waging war on the undead

Ulead PhotoExplorer
Get photos from digital cameras and memory card readers with the Digital Camera Wizard. Organise and make image adjustments. You can display photos full-size and step through photo collections; print thumbnail indexes or full-sized prints.

This banner-ad version of Photo-Explorer 6.0 is fully functioning, free software. Users also get a free account on iMira.com, Ulead's photo sharing and services website. For support and FAQs, visit: www.ulead.com.

Playable games demos
Blair Witch 2: Legend of Coffin Rock: A Civil War soldier is drawn into a world of human sacrifice and supernatural terror.
Resident Evil 3: Nemesis: More challenging enemies that come back to life at any time. **WARNING:** this game includes scenes depicting graphic violence.
Sno-Cross Extreme: Extreme sled racing across the world.
Zeus: Face monsters, fight alongside heroes and encounter the gods.
Fur Fighters: An elite fighting force of stuffed animals rescue their families.
Venom: Resist an alien invasion of Earth in 2034.

PCW group tests
Six months worth of product testing from the pages of *PCW*. The group tests are presented as Adobe Acrobat files.

Plus there's the *PCW* Essentials collection, extra hot games demos and much more.

Starting the DVD-ROM
The DVD should auto-start, just like the CD. If it doesn't, double-click the DVD-ROM icon in My Computer or, alternatively, run the file pcw.exe on the root of the DVD. Check out the support website at www.pcw.vnunet.com/cd for late-breaking news on the programs on the disc

contents

NTL slashes broadband cost

NTL kept up the pressure on broadband prices by cutting monthly charges for a 512Kbits/sec cable link from £40 to £19.99 a month. The offer is open only to people who sign up before 2001.

Some customers will be able to sign up for a 'starter' 64Kbits/sec service for £9.99 a month. Users can either buy a cable modem for £149 or pay an extra £5 a month.

Telewest charges £33 a month plus £50 installation. A BT home ADSL link costs £39.99 a month, plus £150.

Eutelsat is planning a web-satellite service which could use the same aerial as Sky digital TV, opening up a huge potential user base.

Pens in comeback as PCs reach end of their tether

Computing is moving off the desktop to a more fluid, untethered way of working, judging from the annual snapshot of the industry that is Comdex Fall.

There are also glimpses of a more 'natural' way of communicating with computers. One of the most impressive was a pen-driven interface demonstrated by beleaguered Microsoft (see page 46). Another was the Anoto pen (see below).

My pick of the show was Nokia's concept design (right), which uses digital TV as an extra data source for mobiles. Like Psion's work on Digital Audio Broadcasting (DAB), this technology won't mature for at least a couple of years.

Both companies are seeking ways to exploit, as efficiently as possible, *all* data channels available to mobiles. Oddly, this efficiency could reduce the revenue potential of costly 3G cellular networks that Nokia is helping to develop.

Local wireless links like Bluetooth and 802.11b, were big and the new HomeRF spec looks very good. But it's a confusing picture, as reality kicks in over Bluetooth (see also Editorial page 9, and Inside Information page 59).

My pick of Comdex was this Nokia Mediascreen, a portable web pad that downloads pages from digital TV stations. It uses GSM as a return channel. I'm told Britain's On Digital is taking a close look at it. The pad is too big and heavy but it is only a prototype. Up to a million pages an hour can be broadcast using the entire TV signal. Users can take their pick, perhaps caching it at night. You could receive your morning epapers in this way. Or pages can be carouselled during TV broadcasts, using spare bandwidth

Handheld design looks like being in a state of suspended animation until emerging air links enable next-generation designs, including Symbians. Meanwhile Handspring and Palm seem to be holding their own against models using Microsoft's PocketPC OS.

The handheld format itself faces competition from ultralites running Windows or Linux. Transmeta showed pen and keyboard-driven types using Crusoe chips (see page 45) and Microsoft flourished its new Tablet (page 46).

Comdex seemed smaller than usual. Big names like IBM, Apple and Sun either stayed away or lurked in side rooms. The fact that this did not detract from the show is itself significant: big US firms no longer hold absolute sway. Some of the most exuberant creativity was visible on stalls from Taiwan, Singapore and Korea. Ericcson's R380 PDA cellphone from Europe was one of the hits of the show.

CLIVE AKASS

This Bluetooth-linked Anoto pen, which had its US debut at Comdex, was featured in *PCW* (August) by Nik Rawlinson.

It will reproduce on screen whatever you write on paper with a special non-repeating pattern. It is expected to ship next year.

Details at www.anoto.com.

NETWORKS

Clive Akass looks at the emerging wireless world and finds it profoundly confusing

Blue note plays for new networks

Bluetooth and 802.11b wireless networking were flavour of the show, with the latter vaunted as today's big thing and the former as tomorrow's. But some complex issues lurked behind the hype.

Many vendors were offering 11Mbits/sec 802.11b PC Cards with US prices down to $99 (£70) – that is, down on last year but still high for a mass market (especially one that doesn't yet know that it wants wireless networks).

But 802.11b has a rival. The HomeRF people (www.homerf.org) were plugging their new 10bits/sec spec which looked very interesting. Intel believes it is much cheaper to produce than 802.11b.

It does not have 802.11b's roaming capability, which lets you stay in contact as you move past different access points, but it does include eight isochronous channels for voice, music and other data that needs

Red-M showed the only Bluetooth product

to be delivered in step with its source.

These use the same DECT protocol as wireless home phones but with a different transport layer.

Siemens apparently plans to launch HomeRF-compatible DECT phones.

Intel expects to offer 10Mbits HomeRF by the middle of 2001, says Andy Greenhalgh, manager of its European network platform group. These will retail at no higher than its 1Mbit nodes – about $99 each in the US.

Comdex had one actual Bluetooth product, the network access boxes from UK-based Red-M (see right, and Editorial, page 9). Everyone else at the Bluetooth stand was showing next year's products, mostly PC Card adaptors at about $150. This from a technology designed to cost $5 or less per device to make it ubiquitous.

It was clear, talking to vendors, that Bluetooth will take at least a couple of years to settle down. Remember

the problems infra-red ports, modems and PC Cards faced in their early days? You could never guarantee that one would work with another.

Bluetooth, a wire replacement with no networking layer, has the added problem of being used for 'personal area networking'. There are sure to be problems when hundreds of users are within range of each other. There were stories of odd goings-on between the few devices at Comdex.

Early applications are likely to be specific combinations, like headsets and PDAs or phones, that vendors know will work together.

Bluetooth and stable, faster, far more versatile, Ethernet-savvy HomeRF, use very similar spread-spectrum technology. James Benefer, wireless product marketing manager with National Semiconductor, said he thought they could be made for much the same price in very large volumes.

It makes you wonder: with HomeRF, who needs Bluetooth?
See Inside Information p59.

Madge gets the Red-M light

Red-M is proud of the fact that its 3000AS access server, which links with a 1000AP access point, won the innovation award at June's Bluetooth conference, attended by hundreds of developers across the world.

Red-M was launched last May as a subsidiary of Madge Networks, a world leader in Token Ring networking, the use of which is now confined to high-end corporates.

The subsidiary is a bid by Madge to reinvent itself by

Wilson: We had the expertise

launching into a related but next-generation technology. 'We had all the networking expertise and we brought in Bluetooth,' said Red-M CEO Mike Wilson.

He sees Bluetooth as providing for building interiors what 3G cellular links will provide for exteriors: instant access to local networks and the Internet.

At the huge Venetian hotel in Las Vegas the Red-M boxes were used to demonstrate how Bluetooth users could book in without the need to talk to a receptionist, as well as access IT facilities from their rooms.

Come back Infra-red, all is forgiven

A minor shock, returning from Comdex, was to find that Samsung's splendid new nV notebook lacks an infra-red port. I fear the Bluetooth bandwagon may be starting to squash infra-red, which actually works and can hit a mean 16Mbits/sec.

Infra-red has long been the orphan of connectivity. Vendors almost killed it by fitting it on notebooks but not desktops – fatuously giving the former nothing to talk

to. We have yet to learn how one Bluetooth user will pick out another easily from a crowd. Infra-red has a very simple way: pointing. No wildy contentious frequency hopping. No tortuous protocols.
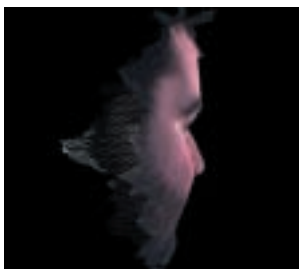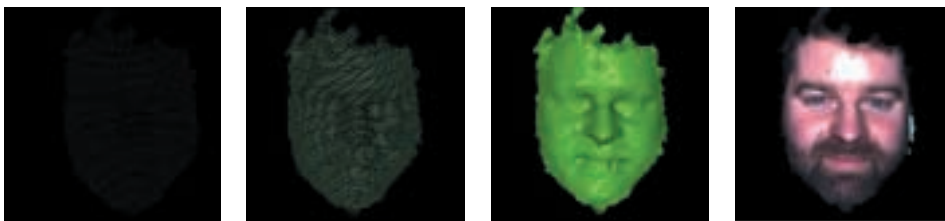
There are deep, subtle issues here that I'll write about next month. In the meantime, beware of vendors spoiling a £2,000 notebook (or, come to that, a desktop) for the sake of a £2 IR port.

CLONING

We have the technology…

(Left to right) The first three pictures show the construction of a 3D mesh mapping of PCW stalwart Scott Montgomery's face. Other shots show how he looks from different angles

A 3D clone generator will let you paste 3D versions of real people's faces on characters in shoot-'em-up games such as Quake III.

The technology, from 3Q, was developed for visualising reconstructive surgery and other medical applications.

The cloning generator looks like a space-age photo booth. Inside, you sit on a stool and face a camera. A video screen pipes the camera image to make sure you are at the correct height. You then follow on-screen steps to create your virtual clone – complete with scars if you wish.

The booth has three cameras, two to calculate the facial geometry and a third to take a digital photo – the 'skin' – which is applied to the 3D rendition of the face. The process, called Digital Surface

It's not the game he's hooked on. That's his boss he's been laying into for eight hours.

Photogrammetry, works by combining the two images from the geometry cameras.

This is then represented as a wire frame, which is covered and smoothed. The digital photo is then applied to the contoured face as a texture, giving an alarmingly realistic 3D image of your face.

With whole body scanners also in development, we will soon be able to see people of our choice in their full virtual glory within computer games – and kill them. No doubt the technology will cause concern from those opposed to computer violence. And in this case, where the lines between reality and fiction are even more blurred, their case will doubtless be stronger.

SCOTT MONTGOMERY

32MB floppy hits a snag

Imation, mega-supplier of storage media, looks to have blocked the Panasonic 240MB super-floppy drive that is said to pack 32MB on a standard floppy (see page 42). The company said it 'has no plans' to make media for it.

Public affairs manager Lance Quantrill said Imation believes there is no market for the drive. 'If people want more than 120MB they'll go for a CD writer,' he said.

Psion debuts on Bluetooth

First news of Psion's entry into the Bluetooth market came as we went to press, with an exclusive look at two new products that it will be launching early in 2001.

The gold PC Card is a Bluetooth client with a push-in aerial that switches the devices off in aircraft to comply with safety regulations. The UK price is expected to be around £120.

The other device is an access point that plugs into a PV USB port. Also in the pipeline is a Bluetooth modem for plugging into a phone jack.

L&H IN KOREAN WAR
Speech recognition specialist Lernout & Hauspie (L&H) has filed for Chapter 11, a US measure designed to help a company stave off bankruptcy. L&H had to restate its 1998 and 1999 financial reports after supposed Korean customers denied any business dealings with it. Three directors resigned in November.

IBM GETS SHARPER
A photo-quality display claimed to be 12 times sharper than current models has been developed by IBM. The display boasts more than nine million pixels – 200 per inch.

The active matrix LCD screen uses aluminium instead of the molybdenum and tungsten that is found in current displays. Initial applications will be graphics-intensive, such as telemedicine and mapping. Flat CRT– see page 49

BRAZIL NUTS
Hackers scrawled abuse on two Brazilian websites of security giant Network Associates, publisher of McAfee anti-virus software.

FOOTBALL MAD
WAWSports has launched a range of £19.99 CD-ROMs called Fanstations, each featuring a different football club with details of fixtures, history and statistics. Details are at 0870 2411754.

CITY GUIDES IN YOUR PALM
Two companies are offering free guides to London and other cities for Palm and Handspring PDAs. One, from Citikey, includes restaurant reviews and is available from www.citikey.com. A rival from US-based Vindigo is available from Palm download sites.

MP3 gadgets dominate

The predicted wave of Internet appliances has yet to gather strength, and consists largely of MP3 players. Voyetra-Turtle Beach produced a variation on this theme with its Audiotron home MP3 player (below) which is designed to fit with a home hi-fi system.

The idea is that you can

pull MP3, wma or wav files from the web or your linked PC, and play them via your hi-fi system rather than a PC.

By the time it launches in Europe next year, the Audiotron should also act as an Internet radio. US price is around $299. Details are at www.turtle-beach.com.

Simple Devices (www.simpledevices.com) showed this net-enabled alarm clock, which wakes you up with your selection of web content.

Few appliances yet conform to the original concept – that the devices would be both cheap and simple – almost throwaway.

Why pay up to £300 for an MP3 player when you can buy an MP3-playing PDA for little more?

Taiwan-based CMC takes this idea to the limit with its pen-driven PDA Cyberboy.

It's an organiser, FM radio, still camera, and MP3 player and can double as a webcam through its USB port. CMC says it will ship here early next year for around £300. Details are at CMC.taiwannet.com.

Palomino and Morgan are under starter's orders, reports Riyad Emeran

AMD hammers into 64bit

AMD's presence at Comdex was pretty low key. Rather than having huge stands promoting itself like Intel did, AMD had a private suite where in-depth information was divulged – by invitation only.

It's been a good year for AMD. It has established itself as a serious competitor to Intel, and taken the performance lead with its range of Athlon chips using DDR SDRAM. But AMD isn't going to rest on its laurels.

The company was very open about its roadmap and 2001 looks set to be interesting for anyone thinking of investing in new PC technology. Naming its next generation of processors after horses, AMD will be releasing the Palomino and Morgan in the first half of 2001. These are the next generations of the Athlon and Duron, with the Palomino increasing from its current 1.2GHz limit (a 1.5GHz was on show) and the Morgan rising above 800MHz.

The Palomino is also SMP compatible so you'll finally be able to build dual-Athlon systems. One example on show was whizzing through a 3D Studio Max render, but we'll reserve our judgement on the performance until we can test one. What it does mean is that AMD can chip away at the high-end workstation and server market.

What's really interesting is that AMD will be releasing mobile versions of the Palomino and Morgan simultaneously with desktop versions, and both will use PowerNow! technology to boost battery life. AMD was quoting enough battery life to watch an entire two and a half hour DVD movie on a single charge.

However, the really exciting stuff is set for the beginning of 2002. AMD's Dresden FAB is already being prepped for 0.13micron production that will enable its CPUs to evolve once more. The Palomino will evolve into the Thoroughbred, and the Morgan into the Appaloosa. The thinner process will allow for faster performance and cooler running and mobile versions will be available.

As if that isn't enough, Q1 2002 will also see the launch of AMD's 64bit processor, also based on a 0.13micron process. Rumours about the Sledgehammer chip have been circulating for some time, but AMD revealed that the Hammer processor had now been split into two ranges, the Sledgehammer and the Clawhammer. The Clawhammer will be aimed at single or dual-processor workstations, whereas the Sledgehammer will be available in four- or eight-way solutions for high-end server systems.

The Hammer range of AMD chips will be going head to head with the Intel Itanium range of 64bit processors, but the Hammer will have the advantage of being backward compatible with x86 architecture.

All in all it looks as if AMD has got a bright future ahead of it – as long as it can produce enough yield to meet the demand.
● AMD has also released an x86 64bit simulator to help the developers prepare code for the new chips.

I think therefore iRobot

Sony's latest robots received a lot of publicity around the time of Comdex, with talk of models that can play football.

The Linux-driven iRobot (pictured) lacks the humanoid look of the Sony offerings but in its way it is just as impressive, and probably more useful.

Its multiple wheels allow it to negotiate obstacles and even climb stairs. It has a mic, speakers and a webcam and is linked wirelessly to the Internet. This means you can control it from anywhere in the world to check out your home or office. You can buy one for around £5,000. www.irobot.com

New buses drive add-ons outside box

This USB 2.0 adaptor for a Cardbus PC Card slot from Japanese firm Ratoc (www.ratocsystems.com) will, like other products using the new bus, not be available until early next year. The same company showed a PCI-based USB 2.0 host adaptor.

Device makers have woken up to the fact that both USB and FireWire allow PCs to be upgraded without opening the system box. They also allow devices to be swapped easily between mobile, home and office machines. So there were a number of external USB and FireWire storage devices on show. Some, like a FireWire CD-RW drive from Ratoc, were slimline for use with notebooks.

Pockey USB 1.0 external hard drives (above right) from Korean firm Flotec (www.pockey.co.kr) are the type of devices that will benefit from migrating to USB 2.0 next year.

The big question is whether they will see off FireWire drives like those pictured above from Taiwan firm Bencent (www.bencent.com). What does seem to have died is the idea of Drive Bay, where these devices would be stacked on a PC in standard bays linked by both FireWire and USB buses.

Other storage media were not forgotten at Comdex: pictured left is a USB Smart Media reader from Diography (www.diography.com).

Fast USB squeezes 1394

Many products using the new fast USB 2.0 bus were previewed at Comdex, presaging a confusing time for buyers and device designers.

The products will start to roll out next year.

USB 2.0 is rated at 480Mbits/sec, no less than 40 times faster than the USB 1.0 spec. Real maximum transfer rates are at least 30 per cent slower in each case, due to overheads, but USB 2.0 will still be equivalent to current implementations of FireWire (aka 1394).

Spot the new bus… new logo certifying an approved USB 2.0 product

FireWire is set to speed up to 800Mbits/sec and 3.6Gbits/sec is on its roadmap, but it is not an Intel technology, which may be why it is still on few motherboards. A prototype

P4 mobo shown by Intel sported USB 2.0 but not FireWire, indicating that the company hopes to keep things that way.

But FireWire is used by virtually all digital video cameras, a fact that has not escaped Far East vendors, notably Gigabyte, which is beginning to put the bus on motherboards. Currently you can pay almost as much (more, if you don't shop around) for a FireWire add-on card than for an entire motherboard with FireWire support.

USB 2.0 is sure to go on motherboards as standard from 2001 so it could be used in many products that might otherwise have used FireWire (see left). Equally, certainly, consumer vendors like Sony are not going to drop the faster, more mature (and, many say, better) FireWire.

Price was originally a big selling point of USB over FireWire. But an official from Texas Instruments, which makes chips for both products, said there is no longer a big difference in implementation costs. He could not see the point of putting FireWire on a motherboard, apparently on the grounds that as he did not want to edit his home videos… no-one else in the world would either.

But Intel is not unaware of the danger of driving PC makers to Far Eastern suppliers for the chance of featuring FireWire at minimal extra cost, especially if users start to ask for it. An official told me off the record: 'We are watching the situation. If there is a demand for FireWire we have not ruled out the possibility of putting it on our motherboards.'

CLIVE AKASS

nVidia gets mobile with GeForce2

It seems nVidia has a never-ending supply of chips up its sleeve. The company rocked the graphics card market more than a year ago with the release of the GeForce 256 chipset and the subsequent GeForce2 pushed the boundaries even further.

Now nVidia is going after a new market: mobiles. The graphics performance of notebooks has stayed pretty uninspiring while their CPU power and RAM capacity has increased significantly. Until now, that is.

At a press bash at the Harley Davidson Café in Las Vegas, nVidia unveiled its latest chipset, the GeForce2 Go. It is based on the GeForce2 chipset and sports some impressive 3D acceleration, especially in the notebook arena. It can use up to 32MB of SDRAM.

The GeForce2 Go shares the same unified driver model as all nVidia chips and has full support for DirectX and OpenGL.

Toshiba will be the first notebook vendor to ship the GeForce2 Go in its new range of Satellite mobiles due in January.

If take-up is good the GeForce2 Go could greatly increase nVidia's market share and give ATi something to worry about.

RIYAD EMERAN

Comdex shorts

DVD JUKEBOX
The FireWire box (below) generated a lot of interest at Comdex. The PowerFile C200 is a 200-disc DVD changer, with two DVD-ROM drives that can also read CDs. At a suggested US price of $1,799

(£1,285) it is claimed to be a fraction of the price of other similar products.

It can provide a terabyte of storage for a network and if you need more the drives can easily be daisychained. PowerFile is looking for a distributor in the UK.
www.dvdchanger.com

TV ON CD
Video CD has never really taken off in the UK, but here is an example of

what you can buy in the US. The $599 (£488) Terappin recorder is designed to sit on your TV to allow you to record programs. It will also take input from a camcorder and claims to pack 74 minutes of full-screen video, with audio, onto a CD-R or CD-RW disc.
www.goterappin.com

SITE FORESEEN
X2Search.com showed its systems of screening

thumbnails of pages in search-result listings. It is a little slow but might save you time on some types of search.
www.x2search.com

Riyad Emeran sees a great DVD writer - and a great DVD write-off

Pioneer beats RW deal

Pioneer's new DVD R/RW drive can write DVD-R discs, ideal for mastering DVD media, as well as DVD-RW discs that can be read on most DVD players and ROM drives. Blank disks are expected to fall to the level of CD media, which the drive can also write to. Even at $2,000, it's a bargain

Once again Comdex played host to the competing DVD formats, even though the whole point of DVD was supposed to be a multipurpose single-format optical disc.

Hewlett-Packard (HP) hosted a morning briefing along with Philips and Ricoh to try to convince the world that it is still worth waiting for DVD+RW, or just RW as it's now known. Several years ago, HP, Philips and Sony decided that the DVD Forum's decision to go with DVD-RAM as the rewritable DVD format was the wrong one and split to develop the DVD+RW format instead. Since then DVD-RAM has gone through two generations of commercial products while a single retail RW device has yet to appear.

The ongoing saga of RW and its failure to appear was not put to rest at this briefing. Instead, we were told to expect products around Q3 2001. Earlier in the year, Philips promised a consumer RW device for the end of 2000, but this has now slipped well into 2001.

What the assembled press were treated to was yet another compatibility demonstration, showing discs taken from PC drives and put into consumer drives and playing back faultlessly. This demonstration also included playing back RW discs in DVD players from manufacturers not associated with the format. Unfortunately, being cynical journalists here at *PCW*, we're holding our judgement on the compatibility until we can test it ourselves, although by the sound of it that could be a year away.

Taking the official DVD Forum route, Pioneer was showing off a new device based on the DVD-RW format. Pioneer has already been shipping a consumer video recorder based on DVD-RW technology and it's now adding a PC device to the line-up. Like RW, DVD-RW has a similar reflectivity to a standard DVD-9 dual-layer disc. This means that most DVD players and ROM drives should be able to read the media. One of the issues with DVD-RAM is its low reflectivity, something that the RW community has been talking about for a while.

The device that Pioneer was showing on its Comdex stand resembled a standard DVD-ROM drive, but it was far more than that. As well as being able to read and write to DVD-RW discs it can also burn DVD-R discs, making it ideal for mastering DVD media. As if that wasn't enough, you'll also be able to burn CD-R and CD-RW media on Pioneer's new baby.

Pioneer is promising a Q1 2002 launch for the product and an estimated US price of around $2,000 (£1,330). This may seem like a lot of money, but considering that Pioneer's previous DVD-R drive, the DVR-S201 (*PCW* Sept 2000 p101) sold for £3,000 ex VAT, this new device could almost be considered a bargain.

Whether the relentless onslaught of DVD-RAM and DVD-RW devices will kill RW before it even launches remains to be seen. But one thing is for sure, if we don't start seeing RW products soon the world might decide that there's no need for them.

Pioneer set up what must be one of the world's most expensive floors as a way of highlighting its new 40in and 50in plasmas screens. Those floor panels consist of plasma screens worth around £7,000 each. Naturally, each was covered with very thick glass, just in case someone put their foot in it.

CAMERAS

Digicam sales overtake film

Digicam sales will produce more revenue than those of film cameras in the US this year and will outsell them by 2002, according to US analysts. The figures point to other trends: people are finding new ways to share pictures. Gone are the days when you had to invite everyone around to see your holiday snaps, or pay for extra prints of a wedding to send round to all the guests.

Kristy Holch, head of the InfoTrends Research Group, points out that the most common use of scanners is to enable people to email photos. Increasingly people are sticking pictures on a CD or posting them on one of the proliferating photosites that allow you to view or download pictures at a resolution of your choice.

Amit Goswamy, head of the Spotlife photo portal, said these sites are causing a behavioural change. 'People are starting to realise that they can stick up a picture to be seen by 1,500 people.'

But already critics claim there are too many photosites and that there will be fewer when broadband links allow people to post photos on their own sites at home.

Online print services, set up by companies seeking a replacement for film and processing revenues, will generate an estimated $2.5b (£1.7b) in the US by 2005, Holch said. And she reckoned that an estimated 30,000 photobooths, where you can get prints from digital pictures, will be installed in the US this year alone.

Dedicated picture viewers are starting to appear, with the ability to use the TV screen. Holch predicted an increasing convergence between digital and still cameras.

CLIVE AKASS

If you can't beat 'em...
The Olympus C-211 Zoom claims to combine the advantages of print and film by churning out prints itself in the manner of old Polaroid cameras. Which is not surprising because it stems from an alliance between Olympus (www.olympus.com) and Polaroid; it uses Polaroid 500 film (or paper, whichever way you want to look at it). The C-211 sells in the US for around £600. There is no release date yet for Europe. Meanwhile, a company called Applied Science Fiction (www.asf.com) has announced a completely dry, and allegedly environmentally sound, process to 'develop' 35mm and APS film directly into digital files for distributing or printing.

So which is best?

I was torn between digital and film for covering Comdex. After years of being hooked on 35mm SLRs I have been trying some of those mini-cameras with built-in zooms – they are less than a quarter the price of the equivalent digital.

In the event I left behind my little Konica, with its 38-140mm zoom, in favour of Epson's £799 (inc VAT) PhotoPC 3000Z, with a 3x optical zoom, equivalent to 34-102mm on a 35mm camera.

The Epson (reviewed *PCW* January) is slightly heavier and very slow to start and set up; but it is sensitive enough to allow indoor shots in fair light without flash. The 3.3megapixel resolution gives a lot of scope for cropping down to details and I didn't have to mess with getting pictures developed.

I'd still carry the Konica for serendipity shots, though: it is lighter, and far quicker on the draw. The built-in flash on both cameras is good only for close shots. What I want to see are smart flashes that allow you to point and shoot without having to worry about distance, red-eye or glare. **CLIVE AKASS**

Clive Akass reports on how the new jpeg format is behind schedule

It's JPEG 2000... er, 2001

JPEG 2000, the putative next-generation web image file format, looks like it'll be more like jpeg 2001 – or even 2002.

The format, which is completely different from today's jpeg, uses wavelet compression and stores an image at several different resolutions.

Images are downloaded in layers of increasingly fine detail, allowing you to choose which you want. Part 1 of the new specification, which covers the actual image format, was expected to be ratified in December.

The German company Luratech, which has worked on the standard, was at Comdex showing products available now that are based on this specification.

Details can be found at www.luratech.com. There are also demonstrations of the format, including a picture heavily compressed using the new and old standards. The difference is impressive.

Part 2 of the new specifications will cover metadata, non-visual image information in an XML-compliant format. This will facilitate indexing and credits.

A specification has been drawn up by the Digital Imaging Group and submitted to the International Standards Organisation's jpeg working group.

But even if JPEG 2000 were approved immediately, it would not be in common use for a couple of years.

Looking for a look

You don't need metadata (see above) to search for images. We reported in August how Iterated Systems is using its fractals technology to search its MediaBin database.

Now a French firm called LookThatUp is offering a similar service. The cartoon shows the idea: a girl sees a dress she'd like and uses the image to find a similar one. The image goes to the LookThatUp site, which points her to the appropriate product.

LookThatUp says the system could be used even for tasks such as identifying birds. Business development officer Alexandre Moha, says the system encodes shape, colour and texture and trains a computer to

recognise them. Only textures are described in fractal terms. www.lookthatup.com

Burglar check or baby watch

Developers have been a little slow to exploit always-on links to help the paranoid check out their homes at a time when, in big cities at least, police frequently refuse to respond to burglar alarms on the grounds that most are set off by the likes of cats.

A company called Inetcam was demonstrating software called Ivista at Comdex, which allows you to stream audio and video from your home. You can download a version from its site at www.inetcam.com.

There's also a motion detector you can set up to send a picture if an intruder enters the camera's field of view. It costs $29 (£18) for a single camera version and $69 (£43) for multi-cameras. The company also does a two-camera kit for £306.

Child watching is another webcam use. Surveyor demonstrated a SeeMyBaby service which lets parents view a webcam of their kids (or babysitter). Its site is at www.surveyor.com but when we looked there was no sign of the service. Seems a good idea though.

Comdex shorts

DIGITAL DAZZLE
Dazzle, which took over video specialist Fast Multimedia, showed a converter that allows PC and Mac users to capture signals from old analog videos and translate them into digital format for storage and editing.

The Hollywood-DV Bridge should launch in Europe early next year. The US price will be $299 (around £200).

Dazzle will also launch a low-cost USB link that allows you to capture analog camcorder, VCR and TV output for editing with the Movie Maker software bundled with Windows Me. US price is $49. UK prices are not known.
www.dazzle.com

YOU SPIN ME ROUND...
The 360-degree digital camera allows webcasts to feature all-

round views of events allowing viewers to scroll round to details they wish to see. Demonstrations can be viewed at the developer's site at www.behere.com

DUAL CAMERAS
We spotted a couple of examples of dual-mode webcams that can double as standalone digital cameras. Both the EZDual (details at www.exzonics.com) and the Hiper HIC-300 (www.hiper.com.kr) are powered by the USB port when connected to a PC and batteries when used untethered and can store around 20 VGA pictures in RAM.

MINI STORAGE

Challenges to Microdrive

Several mini-storage technologies are competing with expensive Flash memory for use in digicams and PDAs.

Sanyo showed a camera using a mini optical drive taking 730MB discs, a little over half the size of a floppy, which it hopes will see off the IBM Microdrive, now available in capacities up to 1GB.

This seems unlikely, if only because the Microdrives can be used as a direct replacement for Compact Flash (CF) cards in CFII slots, whereas

A Panasonic photoprinter with one of the new SD cards

Sanyo's new iD-Photo discs require a dedicated drive. The discs will cost about £25 each, compared to £7 for Iomega's 40MB Clik! discs, another rival in this space.

The iD technology, said to support a write speed of 20Mbytes/sec, was developed jointly with Olympus and Hitachi.

One of the new MO disks slotting into a Sanyo still/video camera

Sanyo showed the drive in use in its IDC-1000Z iDshot, a cross between a still and video camera. A disc is said to hold two hours of VGA quality (640 x 480) video at 30 frames per second, or 11,000 stills.

Panasonic showed its 3.3megapixel PalmCam digital still camera, which uses a 120MB superfloppy drive. Presumably the next step will be to fit its next-generation 240MB drive (see below).

The company also showed off uses for the new SD memory card which includes data protection. Demos showed a video running off a sample 256 SD card (not available for at least a year) and an SD photoprinter.

SD cards are slightly thicker than multimedia cards, which can be used in SD slots. William Frank, executive director of the Compact Flash Association,

scorned the new media. He said CF cards could already provide similar copy protection and though the SD cards are smaller than CF, their drives are much the same size.

At least three companies were offering neat, thumb-sized Flash modules which plug directly into USB ports. One called the Q!, from EI (www.eiware.com), is in the form of a key ring and is expected to ship in the UK early next year.

Similar products were

Key to compact storage... one of the new thumb-sized USB solid-state drive from EI

being offered by Q-Tek (www.usbdrive.com) and Trek 2000 (www.thumbrive.com), which offers capacities up to 512MB (watch out for a review in *PCW* soon).

Prices seem on a par with CF and unless cameras and PDAs start sporting USB instead of Compact slots these neat devices will have rather a narrow market. If the format does take off, it seems a natural platform for Sony's memory stick

Drive packs 32MB on a floppy

There were those who doubted that this product existed following a poorly publicised report from Japan that Panasonic had produced a drive that could pack 32MB onto a standard floppy.

The UltraSD drive also reads new 240MB as well as standard 120MB superfloppies. Curiously there was no sign of it at any of the Panasonic displays at Comdex. But we found this sample in a corner of a Singapore-

based company called ACS and we will test it out as soon as we can get our paws on one.

ACS was also offering an MP3 player built round one of the drives.
www.acsconmpro.com.sg

Transmeta claims Intel will never match battery life

Islands of success for the Crusoe chip

Transmeta will beat Intel in the race to cut power consumption on x86-compatible chips, the company's president Dave Ditzel claimed as he presided over a Comdex display of machines using his Crusoe chips.

Intel has already launched a 600MHz Pentium it says is on a par with the Crusoe on battery drain. But Ditzel claimed: 'The chip they are claiming is a one-watt chip was originally a six-watt chip. They have simply redefined what power consumption means.'

Intel has said that it will offer a new low-power chip next year. But Ditzel believes it will take longer. 'They can't produce a chip that takes lower power than us because we use fewer transistors,' he explained. 'We do in software what Intel does in hardware.'

He was referring to the fact that Transmeta has, in effect, sacrificed processing power to save electrical power. It uses the increasing power of processors to do software

Ditzel demonstrates a Crusoe-based notebook to journalists at Comdex

operations that are hard-wired into conventional x86 chips, increasing their transistor count.

Transmeta chips also have the overhead of translating x86 code into Crusoe machine code, and so have less processing power than an Intel chip of the same clock rate; but they are still powerful enough to run standard Windows applications.

Ditzel brushed aside reports that IBM has dropped

plans to bring out a Crusoe-based notebook. 'They had one that lasted five hours on the battery,' he said, picking up an NEC sub-notebook. 'This one can last up to 11 hours on one battery charge. So IBM decides that it won't bring out that model. It doesn't mean they will not bring out a Crusoe model. IBM is still talking to us.'

The claim of 11 hours seemed a little over the top from what could be gleaned from other manufacturers. A Sony spokesman said he could get two hours out of his company's Crusoe-based ultralight, or up to eight hours carrying an extra heavy-duty battery.

'This is the real advantage of the Crusoe,' he said, patting the underside of the machine. Intel-based mobiles can run almost too hot to touch underneath. The Crusoe-based Sony was cool to the touch. But at $2,300 (about £1,530), it certainly wasn't setting a challenge on price.

Sony's Crusoe-based PictureBook PCG-C1VN weighs just 2.2lb. And includes a digital camera. Battery life is up to 2.5 hours though a clip-on battery pack is said to give you up to eight hours of untethered use.

Gateway designed this Crusoe-based web terminal in conjunction with AOL. Transmeta's Ditzel said they would sell for around $599 (£428), but AOL UK says it does not know when they will be available in Britain.
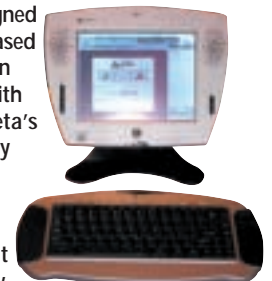
The beautiful wireless web pad from Hitachi allows you to stay online as you move round the home or office.

And Casio has stuck a Crusoe into its neat little Fiva ultra-portable (below).

Ten big names cruise on Crusoe

Transmeta claimed 10 different vendors are making machines based on its Crusoe chips. Sony, Hitachi, NEC, Casio, Gateway and Fujitsu all showed Crusoe-based machines at a reception thrown by the company.

Also there was VIA, with a wearable computer under test by the US Army, and Rebel with its Netwinder 3100 Internet server appliance. There is no

UK release date for any of these products.

But critics pointed out that Toshiba, Compaq and IBM have dropped plans for using Crusoe. This is despite the fact that Compaq invested in Transmeta and IBM manufactures the chips.

An IBM insider was quoted as saying Transmeta had been very useful in getting Intel to focus on power drain rather than trying to make ever faster

processors; Intel has promised a new low-drain processor for mid-next year.

This bears out speculation that many vendors were using Transmeta as a lever on Intel, a role chipmakers such as AMD have played in the past. Intel has indeed announced plans for a new low-drain chip for mid-2001. But Transmeta retains a lot of credibility and its shares doubled after the Comdex rollout.

TABLET PC

Watch out Palm, Microsoft is reinventing the pen-interface – and it looks very good indeed

Pen is mightier than the keyboard

Surprise, surprise. One of the highlights of Comdex was the Bill Gates keynote, his annual sales pitch for Microsoft. It began routinely enough with a video showing Gates and the company's new president Steve Ballmer cavorting like Sixties pop stars (hey… we are quite human you know, almost like you).

Gates gave a spiel about .Net and how XML will rule the world, with a quick look at Office 10. Then he introduced a flunkey called Bert Keely to demonstrate what he called a Tablet PC, which resembled nothing so much as an A4 clipboard – a real, physical clipboard, not the Windows cut-and-paste buffer.

The hardware, running Microsoft's next-generation Whistler operating system, was interesting enough (see picture, top right) but you could walk round Comdex and find any number of similar-sized pen-pads – in colours rather easier on the eye than the Tablet's lurid red.

But, insofar as one could tell from Keely's demonstration, the Tablet PC had the best pen interface I have yet seen. By that I mean an interface that allows you to use a computer more or less like you use paper (I hesitate to say 'naturally' because writing itself is not natural).

The screen was lined like an exercise book and Keely wrote normally along the line with a stylus. He then edited the handwriting, cutting and pasting as if it were standard ASCII text, and the script repositioned itself as if he was using an ordinary word processor.

The Tablet PC has all the normal Office software, and Keely was demonstrating only the Jotter applet. I suspect that he was using it carefully, and that the word processing functions would not work nearly as cleanly in practice, but even as proof of concept it was impressive.

No mention was made of handwriting recognition. The Tablet does have the capability, according to the Microsoft website, and you can draw your own conclusions on why Keely did not show it working.

But this interface does more than move the goalposts as far as handwriting recognition is concerned: it redraws the pitch. There seems to be nothing in principle to stop you writing as if you were using paper, but with the editing facilities of a computer, and then letting the machine attempt a translation at its leisure. You can of course retain the original for comparison.

The beauty is that, potentially, it separates the translation from the writing process so that your flow is not forever interrupted by the effort of getting the machine to understand what you have written.

I have absolutely no doubt that development will not stop there when people start using this kind of interface in

The pen also has other uses such as Visio's diagramming tool

earnest. A clue to where it might head lies in Microsoft Word's Autocorrect function, which allows you to register short forms that it will elongate for you. The next step will surely be short handwritten forms (t-space for 'the' is an obvious one) that could evolve to a shorthand and eventually (decades? centuries?) into a complete new gesture language for human-machine communication.

Processing power, and software, will eventually be up to the job of translating as fast as we can write; but, given the fact that we ourselves can't always read our own handwriting, translation will never be perfect. It may turn out to be a matter of taste whether you use instant translation.

Regular readers may recall my hunch that sooner or later we will reinvent handwriting to provide symbols that can be read by machines with the unambiguous precision of a keyboard. I still think that would be a worthwhile exercise but evolution does not necessarily proceed rationally.

But this new Microsoft interface, or something like it, provides a landscape on which such evolution can develop. It makes the little writing box of the Palm interface, currently the world's leading pen-driven GUI, look crude. **CLIVE AKASS**

The writing's on the wall for 'limited' PDAs

Microsoft gave few details of the Tablet except to say that it is a 'fully fledged PC' targeted at people who need to carry around more than the limited functionality of a PDA. Alexandra Loeb, general manager of the Tablet project, said the aim is to treat pen input as equal in flexibility and power to that from a mouse or keyboard. 'We want the PC to adapt to the way that individuals work, not the other way around,' she said. Users will even be able to index and search 'digital ink' text.

Microsoft won't be making Tablets itself. They will be made by other vendors to its specifications. But, as with Pocket PC, vendors will be able to produce variations on the theme.

Target launch is for 2002. Meanwhile, software developers will be encouraged to make their products 'pen-aware' and there will be development kits to help them.

DISPLAYS

Could the future of displays lie in the triode valve of ye olde steam radio? Sort of, says Clive Akass

The cathode-ray tube falls flat

The cathode-ray tube has been squashed completely flat to create what the developers believe could be the next cheap mass-market display.

California-based Telegen (www.telegen.com) has put $20m (£13m) into the High Gain Emissive Display (HGED) technology. The image produced by an 11in prototype in a demonstration at Comdex was marred by pronounced lines, but it clearly works in principle and the design is so elegant that you feel it *ought* to succeed.

Telegen chief technology officer Bonnie Crystal said the screen was handmade and that the lines would 'not be an issue' on displays made by high-precision machines.

At the heart of a normal CRT is a triode valve, as used in early radios: a heated cathode, a control grid and an anode, set in a vacuum. Electrons 'boil' off the cathode, in a process known as thermionic emission, and are accelerated so fast that they pass through the control grid and shoot past the positive anode to hit the distant phosphor screen.

A major design goal has been to reduce the depth of the cathode ray tube.

An HGED display consists of a mass of 21st-Century triodes that glow bright when they go live and are ingeniously contrived from a matrix of wires (see right). By contrast with a CRT the phosphor layer is placed *behind* transparent anodes.

The operating voltage is 15-20v, less than a thousandth of that of a CRT, and the display depth is as little as half an inch. Telegen says widths can match those of today's plasma screens, but at a fraction of the cost. The screen is also said to produce less potentially harmful radiation than a CRT.

HGED is more efficient than a liquid-crystal display, which is inherently wasteful because it works by blocking out light. This would seem to argue for HGED use in mobiles, as LCDs constitute a major battery drain.

But Crystal said the company aims to compete with plasma screens for wall displays and with CRTs on the desktop – HGED displays will cost more than standard monitors but less than LCD flat panels. 'We will only be making around a million a year ourselves. We plan to license the technology to other manufacturers,' she explained.

Crystal believes the design is particularly attractive to CRT makers at a time when prices have dropped so much they are having a hard time making money. CRT plants can be easily adapted to make HGED displays, she said.

Manufacture is inherently easier than that of LCDs that require a large, near-flawless substrate of transistors. An HGED has no transistors: the driving chip is separate .

An incidental advantage is that the screen is capable of frame rates of up to 1,000 per second, compared with the usual 50 or so.

Telegen has had to recruit technologists from Russia. 'Thermionic technology is so old we couldn't find anyone in the West who was still working on it,' said Crystal.

How HGED works
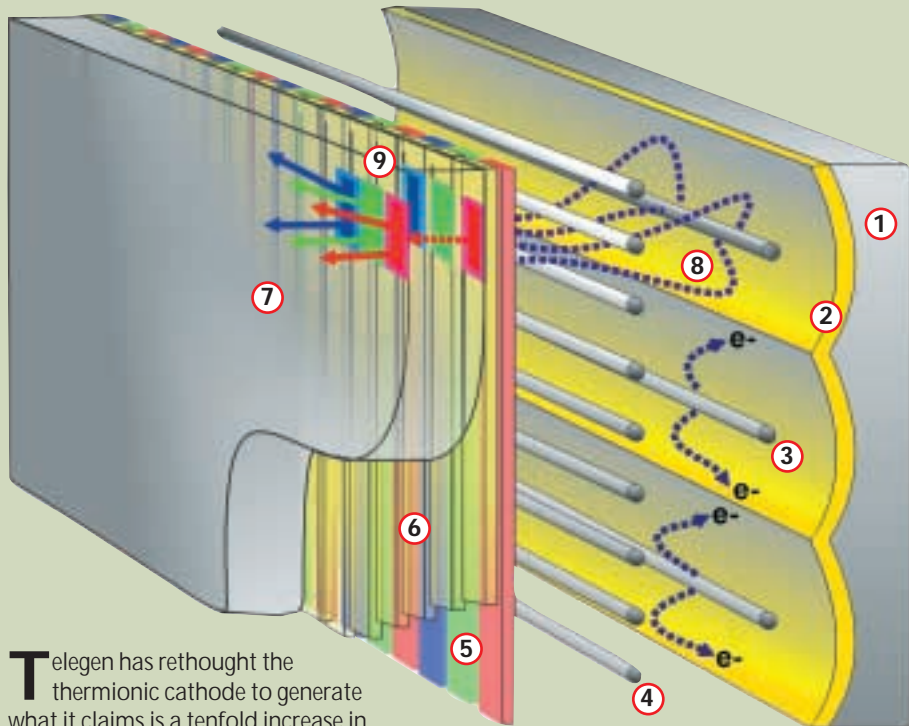
Telegen has rethought the thermionic cathode to generate what it claims is a tenfold increase in electron density with a consequent increase in the display's brightness and efficiency.

The classic cathode was a cylinder surrounding a heater element. A Telegen cathode consists of a thermionic filament (3) that generates just enough heat as current flows to 'evaporate' electrons into the vacuum. There are many of these filaments, each set at the focal point of a parabolic channel (2) on one face of a glass backplate (1) coated with a conductor that is held negative. This repels the electrons (8) and directs them between the nearest control filaments (4), which can block or boost electron flow as required.

The anodes on the back of the viewing plate (7) consist of strips of transparent Indium-Tin Oxide conductor (6) a third of a pixel wide. Each is covered with R,G or B phosphor as appropriate. A sub-pixel (9) lights only when both its anode and the control filaments are at the correct voltages, so an image can be formed by scanning each conjunction.

2000 REVIEWED

Tim Bajarin reviews the year when dotcoms took a reality check and the Y2K bug failed to bite

Back to business almost as usual

This time last year people were in fear and trepidation over the Y2K bug, the dot commers dreamed of floating their companies for fortunes, and the high-tech stock market was shooting for the sky. The Internet bubble was clearly going to burst, but many analysts felt the need for old economy companies to develop a net strategy that would keep a momentum up for most of 2000.

What a difference a year makes! There were signs of trouble as early as Christmas 1999, when web retailers flopped under the weight of high demand: they had not stocked enough products, and provided poor delivery and customer service. In the end, the old-world retailers rescued weary customers.

Online selling will thrive eventually, but smaller online consumer ventures went under in droves during 2000 and only giants such as Amazon.com can be relatively sure of making it in the long term. While the tech boom is far from over, investors have gone back to basics and demanded that dot coms play by the old-world rules of growing on profits not promise.

At the same time their focus has switched from the online consumer market, which has yet to materialise, to corporates where there is a real demand for online services. The biggest winner over the past 12 months has been Siebel Systems, the top supplier of

Customer Relationship Management (CRM) software tools. CRM has become the fastest growing segment in corporate computing. The software has been client-server based, but vendors have all been adding Internet components that allow closer links with customers.

Also key in 2000 was the introduction of Windows 2000. Many corporate sites that resisted the change from Windows 95 to Windows 98 began the slow and painful process of integrating Windows 2000. Sales took off slowly, but Win2K has picked up steam, and it has encouraged PC sales as corporates took the opportunity to upgrade hardware with the new operating system.

So, while sales of PCs have slowed down from 1999, we will still see growth of 18 per cent for 2000. This growth should continue over the coming year, which should also be good for Microsoft as sales of both Win2K and ME (also a slow starter) gather pace. Of course, the really big

consumer OS from Microsoft, codenamed Whistler (see page 126) should hit the market by late in 2001 but probably won't have a real impact on Microsoft until 2002.

Another key market in 2000 was wireless technology. Demand for first-generation WAP phones started to fizzle by mid year, two-way pagers, wireless connections to hand-held devices like Palm PDAs and next-generation WAP phones became hot products. At the same time, 802.11 wireless LANs started gaining strength in business settings and this technology is poised to explode in 2001.

Expect wireless to be even hotter in 2001 as the first Bluetooth products start hitting the market and the first real PDA/cellphone combinations make their
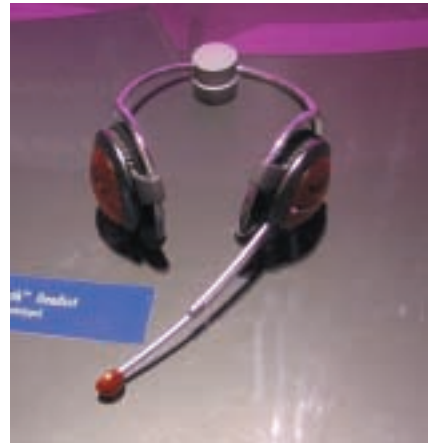
Prototype Sony headphones... one of emerging range of Bluetooth products

debut. One that could be big in the US is the pDQ smart phone which packs a Palm PDA and uses CDMA wireless links.

Another key focus has been Internet appliances, defined as any device that connects to the Internet other than a PC. The big loser in this space was NetPliance with its EyeOpener terminal which flopped because it was tied to a dedicated service. Newer products, such as 3Com's Audrey (below), let users use any service provider. It will be at least another year or two before we understand where these products are heading, but we should see a lot of creativity in this space in the coming year.

It's been a difficult year for high tech investors, but in some ways it's been a good year. From this point on, high-tech firms will be judged by more stable measures and, after three years in which the industry has allowed itself to run wild, it is starting to set more realistic goals, such as finding out what customers really want.

Audrey web terminal: could be a winner

Talk of the imminent arrival of Bluetooth is getting a bit too long in the tooth for Gordon Laing

Promises, promises

They say wireless is the future – well it's certainly not the present if Bluetooth is anything to go by. The Bluetooth technology, named after a Viking King and championed by a convergent range of companies from Ericsson to Intel, at least reads like a dream. Designed as a wire-replacement, its promised incorporation into mobile phones, headsets, notebooks, PDAs and all manner of peripherals should see them all communicating without the need for cabling.

Imagine the possibilities: a Bluetooth headset allows the wearer to use their mobile phone so long as it's somewhere in this or the next room, while a group of Bluetooth-equipped notebooks could create an impromptu network. That's the dream, but one that's far from being realised.

Last Easter, I moaned that at the latest trade show, I'd been told Bluetooth products were about six months away. This bothered me, as I'd been told the very same thing six months earlier and, to be honest, six months before that too. Now I've just returned from the annual Comdex show, where various members in the Bluetooth pavilion used less-than-promising terms like 'second quarter 2001' and worse still 'unlikely before the end of next year'.

So what's going on? I searched for an answer but no-one could come up with a satisfactory explanation. I was told of high costs and low demand, but these plague every new technology – have all the early adopters suddenly curtailed their enthusiasm and tightened their purse-strings?

To be fair, I did see a couple of early Bluetooth products, which their manufacturers claimed would be available by the time you read this. First was IBM with a plain, but useful Bluetooth PC Card, costing around £150. Buy a pair and you could have a nice wireless peer-to-peer network, but when I asked the representative about acquiring one more for a little threesome, his face expressed signs of discomfort. Apparently, someone he knew had done it in a lab, but it wasn't something they felt was ready for Comdex.

A quick shuffle round the corner to Epson revealed a Bluetooth-equipped inkjet printer. Well, not quite. Like many other members of the pavilion, it was demonstrating a Bluetooth dongle for existing equipment, in this case a parallel port to Bluetooth module and accompanying PC Card package, estimated to cost around £130 together.

Logitech was also present at the Bluetooth pavilion, demonstrating a wireless keyboard and mouse. But wait a minute, hasn't it already done this? The answer is yes, with its own wireless technology. While Logitech said it could produce Bluetooth keyboards and mice if the market wanted them, they wouldn't make sense until the middle of 2001.

This got me thinking – since the cost of Bluetooth modules will remain high for a while to come, it simply won't make sense to put them into low-cost peripherals. But why would you want to wait for Bluetooth when you can already buy relatively low-cost wireless keyboards and mice using alternative technologies?

A little browsing round the show revealed further wireless alternatives for joysticks, printers and other peripherals, all cheaply available today. Most crucially, there are established wireless solutions for networking a number of notebooks and PCs together that are lowering in cost every day. Beyond the capable wireless Ethernet, there's the increasingly popular HomeRF standard, which allows up to 10 PCs or notebooks to wirelessly network at up to 1.6Mbits/sec. It's growing in the US and

WHY WAIT FOR BLUETOOTH when you can already buy relatively low-cost wireless keyboards and mice using alternative technologies?

there are various approvals pending, I reckon it or something similar could be big over here - check out **www.proxim.com/symphony** to see the kind of products I'm talking about.

As Bluetooth continues to be delayed, HomeRF and its counterparts pose ever-increasing threats, delivering relatively cheap wireless solutions today. With the backing of huge European companies like Nokia and Ericsson, Bluetooth will undeniably arrive over here, but by that time I suspect the Americans at least may have adopted an alternative. Just like current mobile phones, the world could once again be split between a number of incompatible wireless standards – hardly the convergent future Bill Gates spoke of in his Comdex keynote speech.

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Barry Fox warns that you shouldn't get taken in by the publicity people when GPRS comes to town

Don't believe the hype

The cellphone industry absurdly overhyped WAP as a way of getting Internet access on the move. This winter we are in for another dose of hype… GPRS, the General Packet Radio Service, which offers always-on connection, with payment for data handled rather than time on line, as well as higher data speeds.

But how high is higher? Already the publicity people who overblew WAP are doing a similar number on GPRS, promising what the systems cannot deliver. Hard numbers are the only antidote.

The existing GSM system uses radio channels that are 25KHz wide and can carry data at a rate of 200Kbits/sec. Each channel is divided into eight time slots. For speech, each time slot is used to carry one half of a conversation; the other half is carried by a matching time slot in another 25KHz channel. The handset buffers and reconstructs a Full Duplex conversation – so both parties can talk at the same time. This technology, called Time Division Multiple Access, is basically the same as that used to combine telephone calls over international lines.

When a GSM time slot is used for data, such as WAP, error correction slows the rate to a snail's pace of 9.6Kbits/sec, one-sixth the speed of a desktop modem and fixed line. After a year of delays, and with next to no publicity, Orange launched a speeded-up GSM system in August. High Speed Circuit Switched Data (HSCSD) reduces error correction to raise data speed to 14.4Kbits/sec per slot and gangs two slots to give 28.8Kbits/sec.

Don't be suprised if you missed HSCSD. Orange committed to the system before being bought by France Telecom. Most other networks, including the French, are using GPRS, which more economically lets users share time slots. The system has four different levels of error correction. CS-1 is the most robust, but delivers only 9.05Kbits/sec per slot; CS-4 has no error correction and delivers 21.4Kbits/sec. CS-2 and CS-3 fall in between.

Up to five – and usually four – time slots can be ganged for the downlink into the GPRS phone, giving a robust data rate of 36.2Kbits/sec and a flakey 85.6Kbits/sec. Even these are not real speeds, however, because the Internet sucks data for labelling and retransmission if there are errors. And if a lot of people are using the system at the same time, the speed reduces – as it does on the Internet.

The key point is that these rates are for the downlink into the phone. Handsets can only transmit up and out with one or two slots because the chips get too hot and burn out. Power consumption doubles when two time slots are used for transmission, and this halves battery life. Most important, though, above two slots electromagnetic radiation exceeds agreed Specific Absorption Rate health risk limits.

Motorola's first GPRS Timeport phones for Cellnet's service will cope with only one time slot up or out of the phone and two down or into the phone. So error-free data rate is limited to 9Kbits/sec transmit and 18Kbits/sec receive. The next generation will be one up/four down, to double download speed.

But Motorola's own website and technical briefing documents cheerfully talk of data speeds up to 171.2Kbits/sec with 'streaming and live video content', while BT's publicity literature gaily promises the chance to 'send and receive data up to five times faster than is currently possible' with speeds 'up to 10 times faster in the coming months'.

Motorola's PR suits in the UK and US got very upset when an honest engineer in the company's Invisix joint

> Already the publicity people who **OVERBLEW WAP** are doing a similar job on GPRS, promising what the systems cannot deliver

venture with Cisco blew the gaffe by saying 'the maximum rates we can get from GPRS are 64Kbits/sec into the handset and 30Kbits/sec out. We regret the sales talk, and data rate exaggeration'.

A BT Cellnet engineer was privately even more conservative, promising only between seven and 10Kbits/sec per slot, or a best case scenario of 10 or 20Kbits/sec transmit and 40Kbits/sec receive. Even low-quality mono sound needs two time slots; MPEG4 videophone links can manage only one or two barely recognisable pictures a second.

Bear all this in mind when the GPRS adverts start rolling out. Bear in mind, too, that first generation one-slot handsets cannot later be upgraded to two-slot.

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It may be the 21st Century's smart way to shop, but it's not the reliable way says Roger Gann

Vote with your efeet

As I write my first column for *PCW* it's the end of a soggy November and Christmas is bearing down on me like an express train. The stress of buying Christmas presents is too much for a gentle soul such as I, and so I shop the smart way, online. It's totally stress-free and very convenient. Not exactly rocket science, you might think and not surprisingly, last Christmas was probably the first one that generated a significant amount of online custom.

The only problem was, last time round, buying online wasn't quite as stress-free as it could have been, because in an alarming number of cases, although the goods were ordered in plenty of time, the online shops were unable to deliver the prezzies before Christmas. UK research company Insight estimated 65 per cent of orders didn't arrive on time.

Well, a year has gone by and you might think that this is plenty of time for those trail-blazers of the new

> Research concludes many UK ecommerce sites are 'FUNDAMENTALLY FLAWED' in their ability to handle customer after-sales service

economy, 'etailers', to get the whole online shopping experience well and truly sorted out.

Well, it'll probably come as no surprise to you to learn that they haven't, as a welter of research has revealed. OK, let's not be too pessimistic, some online outfits are slick to the point of being oily – the customer relationship management at sites, like Amazon, Dabs and Insight, is pretty darn good. The ordering process is easy to follow, shipping charges are crystal clear, stock availability is unambiguous, you get an order acknowledgement email virtually immediately you place the order, you get advised when the goods are being shipped and how, they're well packed and they turn up when expected.

And that's the way it should be – when you buy online, you're dealing with an essentially invisible vendor that could be located in Timbuktu for all you know. Handholding at every stage of the transaction gives the veneer of attentive 'personal service', a feel-good factor conspicuous by its absence in most face-to-face retail transactions these days. And, of course, this apparent service isn't in any way 'personal' - it's no more than a few computer-generated robot emails, that's all. But it's enough to reassure you.

Maybe I've been lucky, but I can honestly say I've never had any serious problems buying stuff online. But by all accounts it seems I've led a charmed existence. The findings of US research consultancy Shelley Taylor & Associates (www.shelley-taylor.com) for example, make damning 'ereading'. One of its reports looked at 70 US and 30 UK etailers and found that a mere 48 per cent of the goods ordered arrived when they were meant to. The report also revealed that the UK lags behind its US counterparts; UK sites were nearly three times more likely to send goods out without receipts, while US sites were three times more likely to provide order-tracking facilities. Just being able to deliver reliably and conveniently is key to etailing success, according to Verdict Research (www.verdict.co.uk). It suggests that 'excellence in all aspects of fulfilment will separate the online winners from the losers over the next few years'.

Meanwhile, further research by PLAUT has concluded that many UK ecommerce sites are 'fundamentally flawed' in their ability to handle customer after-sales service.

But surely it doesn't have to be that way? Online shopping may be a very new medium, but shopping isn't a new activity. Far too many companies have jumped on the ecommerce bandwagon without bothering to construct a proper infrastructure, one perfected by their land-based counterparts over centuries of retailing. The relatively low barriers to online entry, made possible by easy access to capital and web design software, have led to a proliferation of web store fronts – but behind them, it seems that no-one is minding the store. Consumer tolerance is already wearing thin. Frustrating user experiences undermine customer loyalty and lead me to question why online stores purport to be vendors when they can't deliver the goods.

I think time is now running out for ecommerce. Etailers know the score – they're only too aware that rivals are only a mouse-click away and that 'ecustomers' are only too ready to vote with their 'efeet' if they don't get good service. And once again, it looks like I'll be moseying over to Oxford Street and not Lastminute.com for my last-minute shopping.

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After France's move against Yahoo, Nik Rawlinson tackles the thorny issue of Internet censorship

Borderline irresponsible

So the French courts have ruled against Yahoo and ordered that it find a way of preventing French users from accessing auctions of Nazi memorabilia on its website, or face daily fines of somewhere in the region of £10,000. The word that springs to mind is 'niave'.

I'm not going to support the Nazi material in question. My argument is with the French authorities, or any company that follows its example. Expecting Yahoo to censor itself, when it would be far easier for the authorities to simply get around the problem in ways that would ultimately cost French jobs, is short-sighted and demonstrates a clear lack of understanding of the concept of borders – something the current chair of the European Union ought to have figured out by now.

Think of the Internet the way you do continental Europe. Drive from Holland to France the way I did last weekend and you'll cross three borders without having

> To expect a single company to censor itself **DOES NOTHING** to solve the problem in question – it merely sweeps it under the carpet

to do so much as slow down, never mind wave a passport. Now imagine my car was a packet of rogue data and the roads and junctions were the cables and switches on which the Internet is built. If France wanted to stop me crossing its borders it would put up roadblocks and send a dozen gendarmeries to link arms across the carriageway – it would not expect me to run ahead of myself, block the road and then get back in the car to try and continue my journey. But that is precisely what it is expecting of Yahoo.

'Aah, but this is information we are talking about,' you say. 'Not a car full of people.' True, but then if you tried to bring a banned magazine from the US to France it is the French customs police who would stop you, not the US publisher.

It is easy to see why France has taken the action it has. It is highly unlikely that the French nation, as a whole, would welcome any form of government censorship, such as that which would be necessary if

it were left to the authorities to recognise and filter the content flowing across its borders. It is also unlikely that the technology is in place to effectively block the material from passing through French servers without disrupting the larger flow of Internet traffic. Data passing through a French server could, for example, be destined ultimately for a screen in Sydney or a terminal in Tokyo.

France could easily impose penalties on its locally situated ISPs if they pass the offending data on to users within its national borders, but that would be contrary to a European directive, and something of a political '*pomme chaude*' as it would effectively be penalising its own citizens for the actions of a foreign company.

Rather than pay the proposed fines, I would urge Yahoo to close its Parisian Rue Torricelli offices and relocate its French operation overseas. The French government could perhaps demand the revocation of its domain – AFNIC, the French domain administration authority is, after all, part maintained by the Ministries of Telecommunications, Industry and Research, but then Yahoo is now standardising on a naming structure where the two-letter country code appears before the domain anyway, so yahoo.co.uk becomes uk.yahoo.com and yahoo.fr translates to fr.yahoo.com. yahoo.fr is now nothing more that a redirection point.

While racism cannot and should not be tolerated, I would urge Yahoo to ignore the ruling of the French courts. This would leave the French authorities with no choice but to devise a method that will allow it to accurately block the material in question, as perhaps they should, and the methods they formulate can then be used for the greater good of the Internet as a whole. To expect a single company to censor itself does nothing to solve the problem in question – it merely sweeps it under the carpet for the time being. One day, perhaps sooner than we think, it will rear its head once more, only this time the publisher in question may be a far less reputable example than Yahoo, and the fix will be neither so quick nor so simple for those in power.

If France is serious about preventing the dissemination of any kind of electronically published material then it must take responsibility for doing so itself. Only then can it, and those who have positions of responsibility around the world, learn and move on.

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letters

DIGITAL DILEMMA

I was very surprised when I read the following statement in Gordon Laing's *Inside Information* column in the December 2000 issue: 'for now, anyway, digital cameras are not for everyone'.

He writes: 'You can't beat the price of film and chemical processing for a set of postcard-sized pictures'. However, about 80 per cent of pictures taken by amateurs are not worth printing. Therefore, an amateur would only want to print about 15 shots from 24 – which would cost him at least £7, or 50p a postcard.

A digital camera user would upload the pictures to a PC, delete the mistakes and print out the few he wanted to display in his house, enlarging the best.

Although a digital camera requires a PC and printer, most people already have one or are going to get one anyway. As for the price of digital cameras, who, apart from a professional, would want a £700 camera when a £400 digital one will do as much as a £100 traditional camera? The odd £300 will quickly be recovered by the saved cost of printing.

As for having to be near a mains supply to recharge, how many people are more than two days away from one and desperately need to take that many photos? Maybe an Amazon explorer, but we're talking about amateurs.

He says that the Internet is the solution of all the various woes upon us. I didn't know that the Internet magically decreases the cost of printing or recharges batteries. I'd enjoy watching the Amazon explorer transferring the contents of his 64MB memory card over his mobile phone connection.
GAVRIEL KISSIN

GORDON LAING replies ›
As a long-term digital camera owner, I absolutely stand by what I said. My point is that digital cameras are currently not for people without PCs and printers, and that includes the vast majority of photographers. Even if you do have a PC and printer, it's more hassle and cost than you think to even print out 15 out of every 25 shots as you suggest — certainly more than going to a conventional lab. And regardless of the poor success rate you claim most amateurs suffer from, I still believe many more people prefer a full set of even average prints compared to enlargements of just a couple of the best.

£700 is also the going rate for a 3.3megapixel camera, which is required for making decent sized prints or crops, whether you're a pro or a beginner. Sure, you can get 2.1megapixel models for around £400, but most film cameras will thrash them in terms of quality, and the running costs will only be lower if you don't bother printing any of your pictures.

Of course the Internet isn't going to recharge your batteries, but new online services will make it easier to share your pictures and remove the hassle and cost of printing for friends and family, along with up freeing up your memory cards.

JOBS FOR LAZY PCS

In his article about the above subject (*PCW* November 2000, p189), Toby Howard tells of some interesting data. Through the support of two million people, some 285,000 years of computer time have been spent on the SETI@home project.

Since this exercise has not identified a single extra-terrestrial signal I started thinking about the sense of such projects.

When a PC in action consumes 150w per hour then the 285,000 years of computer time would be equivalent to 374,490megawatts.

Even someone who is not an 'energy-saving freak' might wonder about the justification of such a waste of energy. No need to justify this even in part with the comment that the computer would be idling if not used by SETI, because most PCs could save that energy by switching to standby mode.
WIM MATTAAR

TOBY HOWARD replies ›
I disagree with Mr Mattaar's view that it's a waste of energy. On the contrary, it's a cheap price to pay for the chance to find evidence of extraterrestrial life. And, since more than half a PC's power is consumed by the monitor and SETI@home doesn't need one, you can cut your alien-finding bill by half straight away.

DON'T GO CHANGING

As a long-time reader of *PCW* I have generally welcomed improvements to the magazine. I make an exception,

LETTER OF THE MONTH

MUM KNOWS BEST

After years of resistance, I finally gave in to the heart-rending pleas of my offspring that without a PC they would stand no chance of passing a single GCSE, would never get a job or have any friends, and it would be all my fault!

Before Social Services stepped in, I started researching the market. At last I found a mail order deal for about £1,200 that included a 600MHz processor, 20GB hard disk, 128MB of RAM, 56K modem, DVD, CD rewriter, printer, scanner and a reasonable bundle of software. I figured this would suit most of the family's requirements and, with upgrades, keep the kids happy for the foreseeable future.

Once our new PC was finally up and running and connected to the net, I sat back to observe my teenagers surf, create, learn and display a mastery of the beast that I had fondly imagined they must have acquired in school.

I began to suspect all was not so when they swiftly began appealing to me, the total computer novice, to sort out their problems.

Armed with the research I'd amassed while seeking out a system, I have generally been able to work out the solutions. I wish I could attribute this to natural brains or flair on my part but I suspect it has more to do with the very patchy nature of my children's skills as they don't seem to have a grasp of how, why or what it is they are actually doing when they interface with the console. Presumably this is because their teachers don't see this as a relevant part of mastering the technology.

It seems that pupils are rarely encouraged to fiddle with dropdown menus, and even less with settings for fear that their experiments may be considered as tampering or potentially damaging, but surely aren't these fundamental learning methods?

Maybe I'm just being pedantic. There's nothing wrong with their gaming savvy, and perhaps it doesn't matter that they look at me completely blankly when I explain the difference between a browser, a portal and a search engine, or that they are incapable of doing anything without leaving stray unnamed files littered all over the hard drive. True they also leave their bedrooms in a similar state, but that is laziness, not ignorance.

I don't actually think schools do a bad job of educating kids on the whole, or that today's youth is fundamentally any worse or better than previous generations. But the expectations and pressures on them are different; I wonder how well we're equipping them to meet the challenge of an IT culture.

CATHY GROOM

though, to the change to the *Best Buys* section earlier this year.

Before this change you offered alternatives to the first choice, which were often cheaper products more suitable for those on a budget.

Surely in a world where the majority of buyers don't require the latest technology for which they are charged premium prices (eg graphics cards) there should be a budget alternative as often listed in the lab tests.

DAVID ASHCROFT

NIK RAWLINSON replies ›

PCW likes to present its readers with the most up-to-date information on which they can make informed buying decisions. It was therefore felt that by removing these secondary selections the PCW Best Buys section would present the most definitive snapshot of the top products on the market in any given month. We still award Highly Commended gongs in our group tests, but Best Buys is, and always has been, primarily based on Editor's Choice products and reviews section winners.

HIDDEN COSTS OF ME

In a previous edition you recommended an upgrade to Windows Millennium. At its current reduced price I generally agree, but I think for those people about to embark on the upgrade, a quick warning is in order: you'll end up paying far more than just the price of Windows Me.

I installed the upgrade with no problems at all, but I have been disturbed by the significant amount of my old software that no longer worked after the installation.

Most notably, my current virus checker was no longer present after the installation and I found that I needed to buy a new, Windows Me-compliant version. That immediately doubled the cost of the upgrade.

Also, during the installation, Windows Me gave me a message regarding incompatibility of my Adaptec CD-RW software. Sure enough I now find that my CD-RW has become a CD-ROM.

I appreciate the improvements that Windows Me has given, but if I'd known in advance the true cost of upgrading I might have held off for a while, or at least have been better prepared.

CHRIS LETTS

JOBS, WHAT JOBS?

I was surprised to read in Guy Matthews' feature, 'Learn to Earn' that, 'as a nation, we are simply not generating enough people to fill the number of computing jobs that the industry is creating.'

I am 26 years old. I graduated with an HND in Computing from Liverpool John Moores University in 1998, my average grade being a merit. I started applying for jobs as soon as I left university. I tried for jobs as diverse as system support to web page development, which is my particular

favourite. However, every time I got as far as an interview I was told that I didn't have enough experience.

Eventually, I was offered a job, electronically testing circuit boards. This wouldn't be so bad if it weren't for the fact that the position is in Hedge End in Hampshire and I am currently residing in Dorset.

My question to Mr Matthews is this; why is it that a young person with a lot of interest as well as qualifications in just about every aspect of computing from database development and programming to systems analysis and design, as well as distinctions in all aspects of communicating, cannot find work in the IT industry?

I would be happy to do anything from hardware and software installation to work behind a helpdesk, or even, perish the thought, writing for a computer magazine. Why can't I get a job?
DAN LADLE

GUY MATTHEWS
replies›

I was truly sorry to hear of your experiences in the IT job market. It sounds as though you have been on a very demoralising treadmill. It goes to show that even in a vibrant sector like IT, it is not always plain sailing for a good candidate to get the job they want.

It might just be that by going for such a wide range of jobs over such a broad geographical area, you have inadvertently lowered your chances of securing a position. I suggest you home in on a particular area of the IT job market, perhaps web development as that's your favourite, and give it your full attention. That way you can make a good case at an interview as to why that's the job you really want, rather than perhaps giving the impression that anything will do. Good luck!

STORM IN AN MP3 CUP
For over a year, we have all been reading articles about the evil of MP3 music downloads, and now we are seeing the same thing with MPEG4 films, although the cost for most of us to download a 650MB film is about the same as buying the DVD. What has surprised me most about this is the claim that this is a new phenomenon. In fact this kind of thing has been going on since the invention of the wax cylinder.

For decades now, people have been recording songs onto cassette from the radio, and films onto VHS cassette from the television. How many people have

collections of musical hits and films that they have recorded from some form of broadcast medium? This material is just as illegal, and is often higher quality.

I find that most MP3s recorded at a lower bit rate than 320Kbits/sec are unacceptably poor quality (as, in my opinion, are analog audio cassettes), while most pirate music is recorded at 32Kbits/sec, or at most 64Kbits/sec. People are always going to try to get something for free, and MP3 music is no exception, but people will continue to buy music on CD or DVD, for the quality, and in the case of

DVD audio the value added extras.

I submit that perhaps the music industry is suffering from a severe attack of Ludditeism, without actually looking at the facts. Has *Top Of The Pops* destroyed the recording industry? Is MP3 music any more likely to?
DAVID CHISNALL

WHERE TO START?
Lately I am finding it more and more difficult teaching myself the basics of many different applications, to a degree that I can consider myself proficient. The increased functionality of many applications, supposedly making then more accessible to a wider audience, actually has a reverse effect on many others.

Programs are now so feature packed, that many novice users don't know where to start or get so confused, that they are scared to venture out from the very basic level of understanding.

I do not consider myself a

novice, spending many an hour 'playing' with applications just to see what they can do and trying to incorporate them into efficient daily use. However, after hours of searching through jargon in help files and newsgroups, I am amazed and annoyed at what I still do not know and what I have not been able to learn.

Much has been reported about how the computer will have to be as simple to use as a TV or a video cassette recorder if it is going to be of any use in the average household. I am sure this sort of 'dumb down' would not be necessary if the manufacturers could invest time and effort into making help files, tutorials, guides and instructions a lot more readable and understandable.

Many people are technophobes and program makers should be trying to attract these people to their products instead of confusing them and frightening them away.
DAVE BUTLER

HOW MUCH?
Years ago, the idea of paying £1,500 to £2,000 for a 386 machine was the best thing since sliced bread.

Over the years the price of these machines has not changed and every month in *PCW* there are reviews of new systems supplied by various manufacturers. The prices of these machines are still around £2,000. Although the specifications change, *PCW*'s reviewers still use the word 'only' to describe the costs.

I felt compelled to write as I am not sure if being a journalist for *PCW*, or for any other PC magazine for that matter, automatically means you leap into an alternative universe where earnings rise exponentially. The average salary in this country is about £18,000 to £20,000. After taxes and bills, to spend £2,200 on something would take about two months' wages. Perhaps advertising companies assume the use of the word 'only' causes a momentary lapse of reason, which makes people believe that 'only' is an synonym of 'bargain'.
NAME AND ADDRESS WITHHELD

CLARIFICATION
We have been informed that the Atlas Meridian A1100 CW, reviewed on page 178 in our January issue, will ship with Microsoft Works Suite 2000, not Works 2000 and the Office 2000 Pro upgrade.

REVIEWS

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Overtaking on the inside

Jason Jenkins
REVIEWS EDITOR

Brace yourself for a hot tip: 2001 will be AMD's year. The once-mighty Intel has been looking a little less mighty lately, and it is mostly down to the Sunnyvale-based company. It has slowly been chipping away at Intel's market share and, according to latest figures, is starting to make real progress in the UK.

In the performance and budget PC market, AMD compares very well to Intel. Its Athlon processor currently offers roughly comparable performance to Intel's Pentium III equivalents, and they are ever so slightly cheaper as well. Small wonder then that the majority of manufacturers choose to submit Athlons

than the Celeron system. Add to that the fact that a Duron is a lot cheaper than a Celeron, and you have a killer product on your hands.

Two processors alone won't produce the kind of dominance the company is looking for, though. Intel has a far wider range of solutions encompassing dual processing, high-end server chips and faster mobile parts, not to mention a whole raft of Internet appliances. AMD knows that it has to break into these markets if it is to succeed in the long term, so it's unsurprising that the latest roadmap shows exactly these kinds of products appearing on the horizon.

Out of all the new products, the key launch for the company in the coming

There is evidence to suggest that a 1.2GHz Athlon can take on a 1.5GHz Pentium 4

in their review machines. When coupled with Double Data Rate (DDR) memory, there is evidence to suggest that even a 1.2GHz Athlon can take on a 1.5GHz Pentium 4, although we haven't seen enough systems or SSE2-optimised code to pass a final judgement.

Unfortunately for AMD, though, the power consumption of an Athlon is higher than a Pentium III, and this makes it unsuitable to be squeezed into smaller corporate desktop cases. If AMD wants to dominate the desktop market, this is one area it will have to address, although this may well happen with its next version of the Athlon, codenamed Palomino.

At the budget end of the market, AMD has possibly one of the least-celebrated successes of 2000: the Duron processor. Our tests consistently show that it beats Intel's Celeron hands down. Compare the Systemax machine on page 76, which uses a 766MHz Celeron, with the Mesh Matrix D750 reviewed on page 78 in our November 2000 issue, which used a 750MHz Duron. You'll see that the Duron system was 57 per cent faster at completing the SYSmark 2000 scripts

months will be the mobile versions of its Athlons and Durons. We have already taken a look at the technology underpinning these – PowerNow! In contrast to Intel's SpeedStep, which can only run at two different power levels, PowerNow! offers multiple power levels. It changes between these on the fly, depending on the application being run at the time. Playing a DVD, for example, requires more processing power (and therefore more battery power) than word processing, and the chip adjusts itself accordingly.

As far as dual processing goes, there's nothing yet, but it will be implemented in the forthcoming Palomino core. AMD has already demonstrated dual-processor systems at trade shows, so expect something soon. This will be its second key launch: if it can persuade its customers, and the buying public, to opt for AMD rather than Intel workstations, the company will be on the right road to convincing the like-minded people to adopt its forthcoming 64bit chip. And that is where the high margins it needs to become a true success lie.

ratings

★★★★★	EXCELLENT
★★★★	VERY GOOD
★★★	AVERAGE
★★	BELOW AVERAGE
★	POOR

evesham.com Origin 1200X

A 1.2GHz system that uses DDR memory to deliver decent performance at an excellent price

We took an exclusive look at the first AMD 1.2GHz machine using DDR memory last month, but as the Panrix machine we featured (*PCW* January 2001, p82) did not run as fast as a demonstration machine we saw from AMD, we wanted to see what another manufacturer could come up with.

The fundamental difference between this machine and the Panrix is the motherboard. The board in last month's machine used a mix of AMD and VIA chips. evesham.com, however, has opted for a full AMD solution. We thought this might be significant, as the faster demonstration machine we saw also used the full AMD solution, but on this evidence it doesn't seem to be.

This motherboard uses AMD's 761 system controller, with DDR SDRAM and AGP 4x support together with the AMD-766 Peripheral Bus Controller on the Southbridge. This has support for UltraDMA100, together with four USB ports, so it's an ideal chip for the speedy processors for which it is intended. If you use buffered DDR SDRAM, there's a potential to take the maximum memory up to a massive 4GB, but whether this option is implemented depends on motherboard manufacturers. With unbuffered memory, only two slots will be available to you. At the time of writing, motherboards were thin on the ground, so we took a look at a late Beta version. The final manufacturer and model had yet to be decided, so check before you order.

Inside the case is a 1.2GHz Athlon, and this has the appropriate 266MHz front-side bus (FSB). AMD is selling both 200MHz FSB versions, which can be used with PC1600 DDR memory, and 266MHz FSB versions that go with PC2100 DDR memory. If you are thinking of buying a processor, you can tell them apart by the part code: 200MHz FSB Athlons end in a B, 266MHz FSB Athlons in a C.

There isn't any reason for a system integrator to use PC1600 memory, though, so evesham.com has installed 256MB of PC2100 DDR SDRAM. There is also a 60GB Maxtor Diamondmax Plus 60 hard drive inside. This 7,200rpm EIDE drive uses only three platters, which should increase performance.

A 3DPower 64MB GeForce2 Ultra supplies graphics. This card only has a D-SUB port, so you'll only be able to connect it to your monitor.

The standard DVD and CD-RW combination is here: a Pioneer DVD-115 and a Samsung SW-2088 sit in the uppermost 5.25in bays. The Samsung is an 8 x 4 x 32 (h x d x w) unit – a little disappointing when you consider that there are so many 12 x 10 x 32 drives out at the moment, but nothing too major.

Sound comes from an OEM version of Creative's SoundBlaster Live! player 5.1, which has an onboard Dolby Digital processor, and a decent set of Creative's Cambridge Soundworks 5.1 speakers make the most of this.

The monitor is an excellent 19in aperture-grille Mitsubishi Diamond Plus 91, one that we've praised so many times, we don't need to repeat it. A V.90 PCI modem is included of course, and there's a copy of Windows Me installed. One thing you don't get is any application software – something of a shame, but when you hear the price, you'll forgive evesham.com. The Origin 1200X is only £1,728 ex VAT. That's a very good deal in our book, and considering that this includes delivery, two years' on-site hardware warranty and free phone technical support, it's even better.
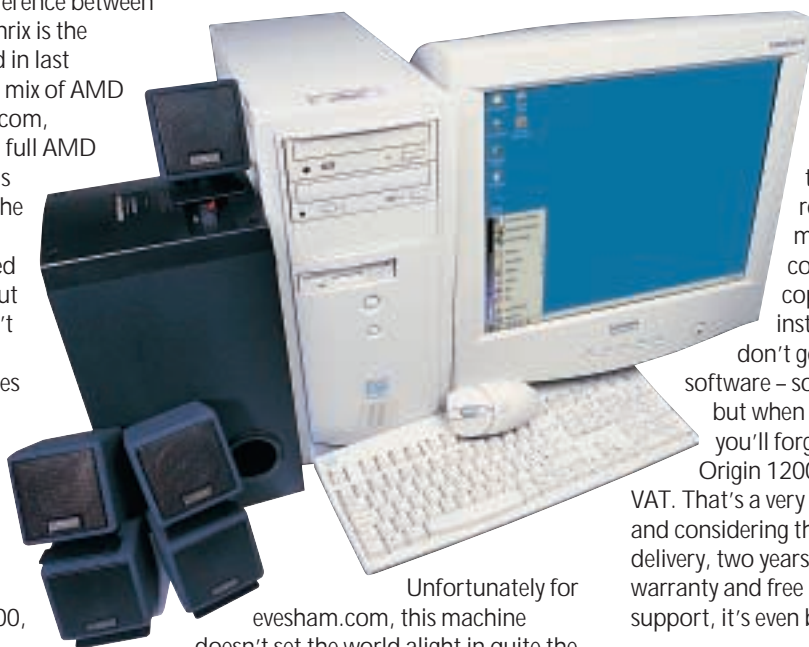
Unfortunately for evesham.com, this machine doesn't set the world alight in quite the same way as the Panrix did in terms of 3D performance. In Quake III, this machine ran 15.5fps slower than the Panrix, meaning that it scored lower than the three Pentium 4 machines we reviewed in the last issue (*PCW* January 2001, p76). It could, however, run 3DMark 2000, but again was slower than the Pentium 4 machines. However, these are still very fast scores that would delight any dedicated gamer.

In SYSmark 2000 terms, this machine leaves Pentium 4 machines standing (it is around 20 per cent faster overall), but, as we discussed in last month's Pentium 4 review, Intel says that the benchmark does not contain applications that allow the processor to be shown off to the full. We're not entirely convinced by that one, although there is some evidence to support it. Certainly, Windows Media Encoder 4.0 is around 80 per cent slower than the Pentium 4s on this machine.

JASON JENKINS

DETAILS
★★★★★

RECOMMENDED — PERSONAL COMPUTER WORLD

PRICE £2,030.40 (£1,728 ex VAT)
CONTACT evesham.com 08707 28 70 70
www.evesham.com
PROS Great package; well built
CONS Could be faster
OVERALL It is not without its problems, but ultimately you are getting the latest technology at a bargain price

PERFORMANCE RESULTS

0	100	200	300

SYSmark 2000 — 211

0	1,000	2,000	3,000	4,000	5,000

3DMark 2000* — 4,577

0	20	40	60	80	100fps
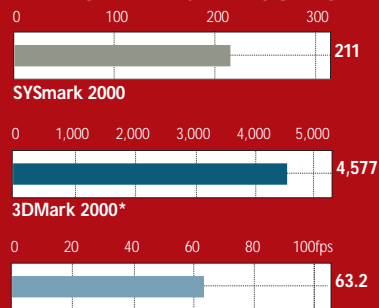
Quake III* — 63.2

* 3DMark 2000 and Quake III are tested at 1,280 x 1,024 32bit colour and textures

Acer Veriton FP2

An all-in-one system that balances a stylish slimline design with the possibility of upgrading

Integrated PCs have been arriving thick and fast in the *PCW* office recently. Some we've liked, some we haven't, but they've all shared the same two problems: they are difficult to service and difficult (if not impossible) to upgrade. Acer's Veriton FP2 is an attempt to solve these problems and we're mightily impressed with the results.

The FP2 has a small footprint, making it ideal for situations where space is at a premium. It is slightly more expensive than a traditional desktop, but for some companies it will still work out cheaper to buy an FP2. Buying smaller machines means that companies can use the space saving to squeeze more employees in to their expensive offices. It is a great improvement on the first FP and has some unique features to offer in an increasingly competitive market. Inside the machine is a Pentium III 800EB, 128MB of SDRAM and a 20GB hard drive.

These are all standard desktop parts and the fact that Acer has managed to fit them into such a small case is down to the design of the motherboard. This is based on Intel's 815 chipset, from which the FP2 derives most of its functionality. The design of this board is interesting: Acer has maintained upgradability where possible while also saving space. Integrated into the board are LAN, audio in/out, DVI, D-SUB, two USB, parallel and serial ports. The single PCI slot contains a V.90 modem, which also features a telephone pass-through. There's an AGP slot, which, providing you have a card that fits inside the case, offers the potential to upgrade the graphics. There are two memory slots, one of which is occupied. All of the ports are located in a well on the left-hand side of the machine. A plastic cover in the box keeps the untidy cables hidden.

Although Acer recommends that you get an engineer to do it, we found it very easy to get inside the machine. The minimum number of screws has been used and, once the rear is off, you've got quick and easy access to all the components straight away. The stylish black case even has a carrying handle, so if you need to transport your FP2 around from time to time there won't be a risk that it will slip out of your hands.

Underneath the LCD are a couple of speakers behind a grille. These give off a decent enough sound for the tasks the FP2 is intended for.

The DVI connector outputs to the integrated 15in LCD panel, but unless you need to do anything to the Veriton FP2, you'll never know it is there.

The screen is excellent, being both extremely bright and clear. The fact that a digital connection is used means that you won't have to re-adjust the clock phase. Even better is the fact that the screen is removable – simply undo five screws and you can swap it for another model if it should fail.

Should the panel break, while you're waiting for the replacement you can use a standard monitor with the D-SUB connector. A 17in screen is also available. In a stroke of genius, should you opt for this at a later date, you'll still be able to use the existing screen with a stand that Acer also sells. This addresses one of the key problems companies have had with this kind of product: maintenance is made a lot easier and upgradability is assured.

Both a floppy and DVD are included in the slimline unit and these are both notebook, rather than desktop, parts. These can be hot-swapped using an installed utility, but to help prevent theft, this can only be achieved in Windows when the FP2 is switched on. Until the utility is run, a metal bar clicks into place and secures the drives.

The USB keyboard has a number of useful shortcut keys, including volume and playback control, and there's also a USB mouse. These can plug into the two USB ports at the front of the machine, or the two located in the left-hand side well. The front also has audio in and out ports.

In keeping with its business focus, our FP2 came with Windows 2000 installed. You don't get any extra software for your money, which is a bit of a shame, but then many corporates would rather choose their own packages and add the cost separately.

Performance is nothing to write home about, but who cares? The FP2 has a decent amount of memory, a good subsystem and a speedy enough processor to see it through corporate tasks. If you're thinking of buying it for the home, it won't be able to cope with most modern games, but then it isn't intended to.

Compared to another great integrated product, IBM's Netvista X40, this is more expensive. However, the extra features, plus the easy time you'll have if you need to maintain the device make it a winner in our book.

JASON JENKINS

DETAILS
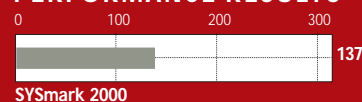
★★★★★

PRICE £1,878.83 (£1,559 ex VAT)
CONTACT Acer 0870 900 2237
www.acer.co.uk
PROS Removable flat panel; excellent design; stylish
CONS Small price premium
OVERALL Simply the best example of an integrated PC we have seen

PERFORMANCE RESULTS

0	100	200	300

137

SYSmark 2000

Systemax 766MHz Celeron

This snappily named C766RV Premier 0210 is well specced, keenly priced and includes a printer too

First things first: this Systemax uses a 766MHz Celeron processor and has 128MB of PC133 RAM to call upon in times of need, so it's the ideal entry-level system for first-time buyers or anyone looking to buy on a midrange budget.

Drive-wise, you're looking at a 30.7GB Matrox VL40 hard drive as your primary means of storage. This is supplemented by the now usual complement of floppy and optical drives, with the latter comprising an Iomega Zip CD running at eight-speed when burning to CD-R or four-speed when rewriting, and capable of a 32-speed read. In the bay above this sits a slot-loading Pioneer DVD-105 drive. This leaves one 5.25in and one 3.5in bay free should you need to expand your allocation at a later date. Likewise, two memory slots sit vacant for future use.

The hub of the system is the AOpen AX-34 motherboard. Sound is onboard, with mic, line-in and line-out ports on the back, as well as the common, although now less frequently used, game/MIDI port. These sit below parallel and dual nine-pin serial ports, and the now ubiquitous keyboard, mouse and two USB connection points. The bundled Xerox C8 colour inkjet will make good use of the parallel port. This boasts a top resolution of 1,200 x 600dpi and has an innovative ink monitoring system that should save you ever running out mid-job. In our tests the C8 proved to be nothing special, but it's certainly better than a lot of printers that are bundled with other PCs.

Graphics are handled by an AOpen nVidia GeForce2 MX card with composite and S-Video out connections to supplement the more usual D-SUB interface. This makes it a good choice for anyone who plans to use the Pioneer DVD drive to play films on a television using the bundled InterVideo WinDVD playback software. In normal use, though, the card feeds an excellent CTX PR705 screen. This 17in aperture-grille monitor produces a vibrant, clear image across its whole surface and loses points only for its captive cable.

A tidy PC is not unusual these days – in fact, it's quite a surprise if we discover a mess inside, but we were still impressed when we first removed the side of the Systemax case. Every cable and power lead is neatly routed between the components and clipped or tied into place so that almost the whole of the motherboard is unobstructed.

Connection to the Internet is via a Connexant PCI modem, leaving the AMR slot empty, which is perhaps a shame since it means there's a PCI slot in use that could otherwise have been left free. It does avoid the potential processor hit that would result, though.

The keyboard, on which this review was written, is limp and fairly unresponsive, but serves its purpose. It benefits from three additional buttons for browser access, launching an email client or sending the system to sleep, although upon arrival only the sleep button was active. The Logitech mouse is uninspiring too, but benefits from a scroll wheel. It's a shame it's not a Microsoft sample, but lefties should be happy – it's symmetrical, so skewed toward neither hand in particular.

We were pleased to see Microsoft Office Small Business Edition on the hard drive. This quality piece of software is the *de facto* office suite and its addition greatly enhances the overall value of the system. This sits on top of Windows Me, so right from day one you're about as up to date as you could hope to be.

Also installed is a copy of Adaptec EasyCD Creator 4. This was once the standard to beat when it came to CD creation software, but recently Nero Burning ROM has proved itself to be an equal, so it's now really a matter of personal preference.

If you've not yet worked it out for yourself, we were impressed by the spec of this Systemax. It is keenly priced, especially when you consider that Office and the bundled printer would cost you £450 if you bought them separately, and has enough software to last you a good while yet. It also has a 12-month parts and labour return-to-base warranty. The only trouble is, it's not all that fast. It will run current office software as quick as you'd like, but with revisions just around the corner we might not be saying that in 12 months' time.

NIK RAWLINSON

DETITLS

DETAILS
★★★★

PRICE £1,173.83 (£999 ex VAT)
CONTACT Simply 08707 297 366
www.simply.co.uk
PROS Great bundle; well built; good monitor
CONS Not the fastest PC we've seen
OVERALL You'd have to go a long way to find someone else selling this much kit at this price

PERFORMANCE RESULTS

	0	100	200	300	
SYSmark 2000					**74**

	0	1,000	2,000	3,000	4,000	5,000	
3DMark 2000*							**1,617**

	0	20	40	60	80	100fps	
Quake III*							**23.1**

* 3DMark 2000 and Quake III are tested at 1,280 x 1,024 32bit colour and textures

EXCLUSIVE

Hi-Grade Notino S8200

The ultra-portable S8200-800 keeps up with the competition at an affordable price

For our money, Sony has the best ultra-portable notebooks going. Hi-Grade's latest ultra-portable notebook, however, has many of the functions that we look for, but at a fraction of the price.

The new notebook, which is co-branded with the manufacturer Asus, looks fairly stylish. The S8200-800 has gently rounded curves at its edges, rather than the harsh points we've become used to seeing over the years. The colour may not appeal to everybody, but at least it's a departure from the usual boring black.

Much more important than how it looks, however, is what it feels like to use, and luckily the Notino scores highly here also. The range is currently shipping with 12.1in TFT screens. Ours came with a 1,024 x 768 resolution screen, but an 800 x 600 option is also available if you want to save around £50. It's not worth it, though – with this higher resolution you can fit so much more on the screen at one time. Our review panel is an excellent example of its type, with a clear, bright image. The backlight is even, and there are no dead pixels evident. Graphics come from a Silicon Motion Lynx 3DM chip with 8MB of video memory. This has motion compensation support to help take the load off the processor if you play DVDs. When you have an external monitor connected to the D-SUB port at the rear, you can use an excellent installed utility to put different applications on the two displays.

Control of the pointer is achieved through a touchpad, and this is as good as any currently available. Between the two standard selection buttons, there are scroll up and down buttons to aid navigation. Next to the power button are four configurable hot keys.

The keyboard is decent enough, although we do have a couple of issues with it. It is laid out in a very similar fashion to other Hi-Grade/Asus notebooks we have reviewed. That's no bad thing, but it does mean that you get a small Return key. Whether this is a problem will depend on the individual. Typing is comfortable, despite the fact that the keys are fairly thin. The whole

keyboard is reasonably bouncy, and we'd like to see future releases sport firmer versions. That said, it's not a huge problem, and certainly not enough to make typing uncomfortable.

Around the edges of the S8200-800 are a decent number of ports. One Type III or two Type II PC Card slots are situated on the right-hand side towards the front. A single flap protects these and, when closed, it helps to maintain the stylish, rounded look of the product. Next to these is an IrDA port. This is one of the newer opaque varieties and is easy to mistake for a blanking cover, but it works as well as the older, clear infra-red connections. The rear sees a proprietary connector (more on this in a minute), D-SUB and two USB. In an excellent final touch, the S8200-800 has both 10/100 Ethernet and V.90 modem integrated, with two separate ports next to the USB ports. There's no parallel port, but a USB to parallel cable is in the box.

All this makes the S8200-800 appropriate for use in the office and on the move. A small microphone is at the front of the unit, and small speakers output basic sound using the AC97 compliant chip.

The proprietary connector

mentioned earlier is for Hi-Grade's Ai-Box. This is an external media bay, into which slot a variety of devices. Ours came with a DVD drive, but it can just as easily take a CD-ROM, CD-RW or second hard drive. This price also includes a USB floppy drive.

Our review S8200-800 is fully specced up for any task you could throw at it. Inside is a mobile Pentium III, clocked at 800MHz and using battery-saving SpeedStep technology. 128MB of memory is installed; enough to cope with all the programs you're likely to throw at the device. Hi-Grade installed Windows 2000 on our model, but it could just as easily give you Windows Me or even 98. Windows 2000 offers more advanced power management functions and better stability, though, so it's our recommended operating system for this product.

A 20GB Hitachi hard disk is also inside, and this can be easily removed from a bay at the left of the unit. You even get Works Suite 2001 and Norton AntiVirus.

Taken together, this is an excellent product at a very attractive price. The engineers have clearly thought long and hard about the kind of features a notebook of this size needs to have, and they've provided every single one. The keyboard could be slightly better, admittedly, but it's not a huge gripe. And with a claimed battery life of up to two hours, this ultra-portable notebook deserves to sell like hot cakes.

JASON JENKINS

DETAILS

★★★★★

RECOMMENDED PERSONAL COMPUTER WORLD

PRICE £1,996.33 (£1,699 ex VAT)
CONTACT Hi-Grade 020 8532 6111
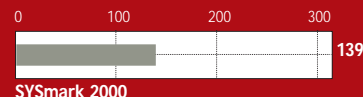**www.higrade.com**
PROS Good feature set; expandable; well designed
CONS Keyboard could be less bouncy
OVERALL A speedy; well integrated ultra-portable

PERFORMANCE RESULTS

0	100	200	300

139

SYSmark 2000

Dell Inspiron 8000

Increased performance, versatility and a higher resolution screen in a rather disappointing case

The Inspiron 8000 is the latest addition to Dell's range of desktop replacement notebooks and offers increased performance, versatility and a higher resolution screen. It's particularly well suited to business users who need to do presentations, and it has S-Video and FireWire ports. Its docking port lets you connect to an optional docking station when you're in the office.

The system is powered by an Intel 850MHz Pentium III SpeedStep processor and is the first notebook we've seen with Intel's 815 chipset. There's also 128MB of SDRAM which is configurable up to 512MB for a cost of £1,386 (£1,180 ex VAT). Two memory sockets are accessible at the underside of the case and let you add another memory module yourself.

It comes with a good-quality 15in screen with a massive native resolution of 1,400 x 1,050. This is an impressive partnership, and the large workspace makes multitasking applications like spreadsheets a breeze. Despite its size, the screen produces a consistently even display with no noticeable patches. Colours are also reproduced relatively realistically.

The Inspiron 8000 uses ATi's latest Rage Mobility M4 chipset. There's a huge 32MB of video memory that helps to accelerate 3D applications and games. This is reflected by our 3DMark score of 1,173 at 1,280 x 1,024 in 16bit colour. A slightly less impressive hardware addition is the 20GB UltraDMA66 IBM Travelstar hard disk drive that only spins at 4,200rpm. Regardless of this slightly slower spin speed, the IBM Travelstar helps it achieve a fast SYSmark 2000 score of 161.

The Inspiron 8000 is a well-equipped notebook for business use. Its three-spindle design supports one removable optical drive, with the floppy disk drive a permanent fixture. Its integrated Media Bay allows you to install a second optical, floppy disk, Zip 100, hard disk drive or Li-Ion (lithium-ion) battery.

Besides the convenience of allowing you to install a variety of peripherals, a piece of software included with the system called Bay Manager lets you hot-swap the peripherals in the Media Bay.

This means you don't have to power down to swap a DVD-ROM drive to a battery, or a CD-RW drive to a hard disk drive for example.

There are a number of connectivity ports on the rear and right-hand side of the system. Most noticeable is a FireWire port that lets you connect an external hard disk drive, DV camcorder, scanner or other compatible device.
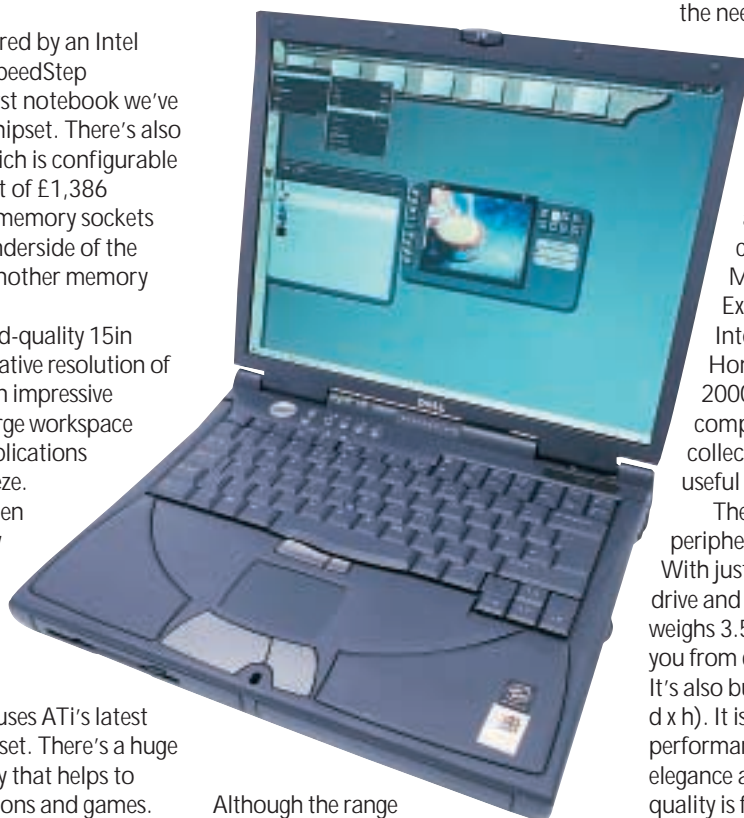
Although the range of FireWire devices is currently limited, performance is quicker than USB devices and it is well suited to video-capture and playback.

Dell has further catered for the video market by including an S-Video port. An adaptor cable is included which provides a composite video out port for connecting to devices lacking an S-Video port.

For conventional business use, an integrated combination Mini PCI card provides a V.90 modem and 10/100Mbits/sec Ethernet connection. A PS/2 port lets you connect a mouse or keyboard, and a VGA port gives you an external display up to a maximum resolution of 1,600 x 1,200. There's also a serial and parallel port, as well as two USB ports. An infra-red port provides wireless connectivity.

At the base of the screen are four AccessDirect buttons – two of which can be personalised – that with one click let you access the Internet and other applications, including CD and DVD playback controls. One of the buttons takes you online to Dell's E-Support site. Here you can find answers to any queries you may have, and even 'chat' to a technical support representative. It's a neat and quick solution that minimises the need to wade through customer support links.

As well as Windows 2000 Professional, there's a variety of software included with the Inspiron 8000, including MGI's VideoWave III and Works Suite 2000, which comprises a number of Microsoft products – AutoRoute Express Europe 2000, Encarta Interactive World Atlas 2000, Home Publishing 2000, Money 2000 and Works 2000. This is a comprehensive and versatile collection of software that will be useful in the office and at home.

The multimedia features and peripherals come at a price though. With just one optical drive, floppy disk drive and battery installed, the system weighs 3.58kg – almost enough to deter you from carrying it between meetings. It's also bulky at 331 x 276 x 44.5mm (w x d x h). It is good value considering its performance and versatility, but it lacks elegance and portability, and its build quality is far from robust – the casing creaks when pressed in a number of areas and the replaceable palm rests feel loose on our review model.

ROB CHRISTIAN

DETAILS
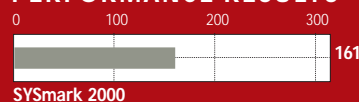★★★

PRICE £2,585 (£2,199 ex VAT)
CONTACT Dell 0870 907 5664
www.dell.co.uk
PROS Versatile; high-resolution screen; two USB ports and FireWire connectivity
CONS Bulky and heavy; poor build quality
OVERALL Practical and packed with features but it won't turn heads

PERFORMANCE RESULTS

0	100	200	300
			161

SYSmark 2000

Dell Latitude C600

Dell's revamped corporate workhorse still packs in the features in its lighter and restyled chassis

The Latitude C600 is the baby brother to Dell's Inspiron 8000 (see page 79), but still manages to pack almost as many features into its restyled chassis that is smaller, lighter (2.7kg) and more robust than the Inspiron 8000. The most noticeable difference is the 14.1in display. The smaller screen has a native resolution of 1,024 x 768 and produces a good-quality and consistent image.

The Latitude C600 is powered by Intel's latest 850MHz Mobile Pentium III SpeedStep processor, which is partnered with 128MB of SDRAM (which can be upgraded to a maximum of 512MB). An ATi Rage Mobility 128 graphics controller that has just 8MB of SGRAM caters for graphics. However, the 20GB IBM Travel-star UltraDMA66 hard disk drive helps the system to achieve a respectable SYSmark 2000 score of 162.

There is an integrated V.90 modem and 10/100 Ethernet connection as standard. Dell claims the Latitude is 'wireless ready': to the rest of us that means it has an infra-red port and PC Card slot. Other connectivity ports are kept to a minimum – there's no FireWire and only one USB port. A single PS/2 port lets you connect a keyboard or mouse and a VGA port lets you output a display on a monitor or via a projector. When connected to the VGA port, the maximum display resolution using a monitor or projector is 1,600 x 1,200.

The Latitude C600 is a twin-spindle device, so you can only fit one module at a time as well as the battery. The media bay at the front of the unit lets you juggle with C-Family media modules, such as the included floppy disk drive and eight-speed DVD-ROM drive or optional devices, such as a Zip 250 or LS-120 drive or second battery.

Two module release latches on the underside of the chassis let you remove either of the two modules quickly and effortlessly.

There's also an optional Advanced Port Replicator that provides more convenient desktop expansion. Existing Dell customers will be pleased to know that the Latitude C600 retains

backwards and forwards compatibility with all Latitude C-Family media modules and docking solutions.

The 88-key keyboard is excellent and the large palm rests make typing more comfortable. The keys have 2.7mm travel but are sensitive and the key spacing of 19mm makes touch-typing comfortable compared to more cramped ultra-portable PC alternatives. The full-size return, backspace and spacebar keys help give a full-sized keyboard feel. The touchpad is set to a decent level of

sensitivity as standard, but the trackpoint offers a more precise control method if you don't like touchpads. One problem we noticed when using the trackpoint is that we tended to accidentally touch the touchpad, causing erratic mouse pointer movements. You can disable the latter if this causes problems, though.

Software bundled with the Latitude 600 comprises Windows 2000 Professional, InterVideo's WinDVD for DVD-video playback and a modem diagnostic test that checks your modem is functioning and obtaining a dial tone. There's also a hypertext user guide that provides information like setting up and

operating the system, solving problems and useful web links. Its browser-like interface makes navigating the comprehensive topics quick and intuitive. Within the documents is the full technical specification of every component in the system, which is useful if you install new components and need to refer to the original configuration.

The Latitude 600 supports Dell's OpenManage Client software which is designed to reduce a company's total cost of ownership by allowing you to manage, support and track notebooks in a networked environment. The software lets network managers remotely access and manage portable-specific attributes like battery status, power management settings, display type, PC Card information and docking system connections.

OpenManage offers security lockout features by providing the capability to remotely disable the floppy disk drive, serial, parallel and mouse ports. It supports industry standard DMI 2.0 and WBEM specifications. Mobile security software lets you set a primary system password, administrator password, and hard disk drive password.

Its components are housed in a better quality case than the Inspiron 8000, but it still looks dull. Nevertheless, the Latitude C600 offers a practical combination of performance, features and portability for business use, but it's an unexciting product and a little pricey.

ROB CHRISTIAN

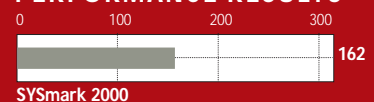## DETAILS
★★★★

PRICE £2,466.33 (£2,099 ex VAT)
CONTACT Dell 0870 907 5664
www.dell.co.uk
PROS Practical design and software configuration
CONS A bit weighty for twin-spindle chassis; bland case
OVERALL Good overall, but it's a rather standard device

PERFORMANCE RESULTS

0	100	200	300
			162

SYSmark 2000

Umax ActionBook 660T

Umax is more renowned for its scanners, but its latest notebook is good value for money

Umax is best known for its wide range of scanners, but it also produces notebooks, and the ActionBook 660T is the latest to reach us. This is a substantial, desktop-replacement notebook. It is definitely not in the super-light category, but neither will you need a course of steroids to lift it. It's attired in a rather fetching dark grey and shot-blast silver case, which opens to reveal a bright 14.1in TFT screen.

This is a good display, clear and well detailed at its native resolution of 1,024 x 768. The backlight isn't completely even over the entire surface of the screen, making the display lighter at the bottom than at the top, but the effect isn't too pronounced and the display is perfectly usable.

Set into the top of the main body of the ActionBook is a full-size notebook keyboard, with the cursor keys set out in a proper inverted 'T' formation and all the others in their usual places. The key action is soft and smooth and the keyboard is quiet enough to use in libraries. In front of the keyboard is a 68mm Alps GlidePoint touchpad, which is easy to use and, as usual, supports double tapping for selection.

Between the lid hinge and the back of the keyboard is a row of indicators, a power button and two special function keys. When you run the EZ button software, supplied with the machine, these two special function keys are programmed to kick Outlook Express and Internet Explorer into life.

The ActionBook is well equipped with ports and devices, spread liberally around the edges of its case. On the left-hand side are CD and floppy drives – with the CD running at 24-speed – and twin USB sockets. Opposite these are two Type II or one Type III PC-Card slots that you can use for all kinds of adaptors, from GPS navigation to network connection. There's a modem socket here, for the 56K software modem, and the battery pack slides out from this side, too.

Along the front edge of the machine are the sound sockets for microphone, line in and headphones, and there's a small volume control set into the fascia. An ESS chip provides sound, and the twin speakers set into the front face of the machine give remarkably good sound for their size. You're still better off using headphones with the machine, though, if you want to listen to music.
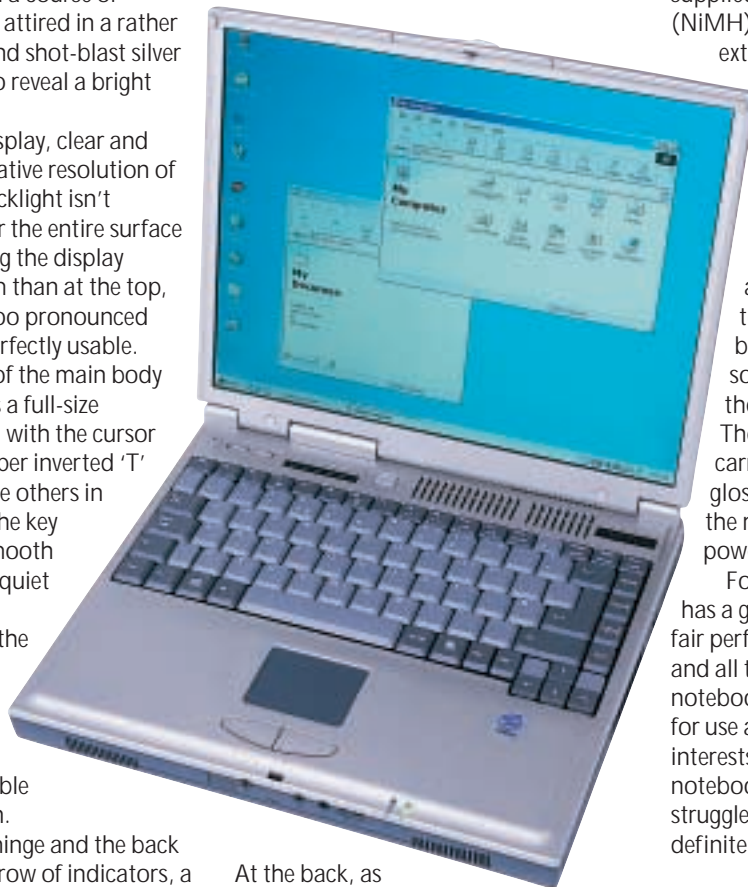
At the back, as well as external keyboard and monitor sockets, there are serial and parallel ports, a proprietary expansion port and a socket for S-Video output, to run the display signal into an external TV.

Running all this capable hardware is a 600MHz mobile Celeron processor, with 64MB of main memory. The 660T also uses an ATi Rage Mobility M graphics chip with 4MB of its own graphics memory. This gives better graphics performance than Intel's 810 chipset, which is found in many budget desktops these days. It's still not enough, though, to run 3DMark or most modern games.

The combination of processor, memory, graphics and the 6GB Hitachi hard drive makes a good core around which to build a notebook. Under test, the ActionBook 660T managed a SYSmark result of 85, which is hardly breathtaking, but is adequate for most applications you're likely to run on a notebook.

Umax has opted for a lithium-ion (Li-Ion) battery. However, many notebooks in this price range are supplied with nickel metal hydride (NiMH) cells, which suffer from both extra weight and a memory effect. In comparison, Li-Ion packs don't require as careful use. The ActionBook is supplied with Windows 98SE, but no application software. There's a rather oddly translated manual on the accompanying CD, which shows too much of its Taiwanese origin, but apart from the drivers for sound, graphics and buttons, there's nothing else on the CD. The ActionBook comes with a vinyl carrying case, which looks a bit glossy and cheap, but does protect the machine and its external power supply.

For the money, the ActionBook has a good general specification, fair performance, an adequate screen and all the essentials of a modern notebook PC. It could even be suitable for use as your main PC, unless your interests include games, where many notebooks in this price range will struggle. But at just over £1,400, it's definitely good value.

CHARLES MICHAEL

DETAILS
★★★★

PRICE £1,409 (£1,199 ex VAT)
CONTACT Umax 01344 871 329
www.imcnet.com
PROS Decent enough construction; special function keys for Internet access
CONS No application software or utilities; basic configuration
OVERALL Umax's ActionBook 660T is basic, but at this comparatively low price we can't complain. With all the essentials in place, it just needs a bit of application software to be a useful mobile tool

PERFORMANCE RESULTS

0	100	200	300
			85

SYSmark 2000

Compaq iPAQ H3130

It may have a monochrome screen, but Compaq's stylish new Pocket PC doesn't fail to impress

The Compaq iPAQ H3130 Pocket PC is a fine looking unit, identical to its bigger brother the H3630 (December Group Test, p204) except for the control buttons, which are matt black rather than chrome effect. The other most noticeable difference is that the H3130 sports a monochrome LCD. The image, which has a 240 x 320 pixel resolution, is extremely crisp, which cannot be said of many colour screens of this size. Holding the on/off button activates the backlight, which works well in poorly lit environments.

Following its bigger sibling, an Intel StrongARM SA1110 processor drives the unit along at a respectable 206MHz. The memory is half that of the colour version at 16MB, a bit of a shame as 32MB is common on other Pocket PCs. An expansion slot sits on the bottom for upgrade to the bulky proprietary expansion packs, allowing options such as addition of Compact Flash or a PC Card connector.

The synchronisation cradle allows you to charge the unit as well as synchronise information with your PC. The cable is serial rather than USB.

Operating the H3130 has the kind of *déjà vu* feel of using the full-blown Windows environment, although a touchscreen is used to interface.

There is a character recognition option for written input, although with a miniature touch keyboard on screen, you can choose to stick with what you know. All the usual programs are bundled, including pocket versions of Word, Excel and Money.

Overall, this is an aesthetically pleasing, easy-to-use Pocket PC. The monochrome screen is excellent and certainly does not make this a lesser unit for its inclusion. The price tag is hefty, especially when compared to the monochrome equivalents from Handspring and Palm but it's cheaper than the colour version.

SCOTT MONTGOMERY

DETAILS
★★★★

PRICE £338.40 (£288 ex VAT)
CONTACT Compaq 0845 270 4000
www.compaq.co.uk
PROS Good-quality monochrome screen with an excellent image
CONS Still very expensive despite being monochrome
OVERALL If you want a Microsoft-powered palm-sized device, this one is certainly worth looking at. The screen is excellent and, though not cheap, it's cheaper than the colour version

Oregon BackFlip PDA Pro

Want to email on the move? Don't have infra-red on your mobile? This PDA has the answer

This simple idea really should have been thought of sooner. Not everyone has an infra-red port on their mobile phone. So when most of us are away from our PCs we're also away from our email. The BackFlip, though, solves this by looking to the past.

As a PDA, the BackFlip is nothing special, with just simple email software and organising functions burnt into the ROM. The back of the case, though, houses a speaker and flip-out microphone. Position these against the handset of a regular phone and you have a modem reminiscent of the acoustic couplers used in the IT dark ages.

Enter some details from a card in the packaging and your BackFlip is set up and ready to send your first message. You're forced to use the pocket.com email service, but we got our first choice of user name.

We were a little concerned that to send our messages we had to dial into a premium-rate number, but the whole process completed so quickly that it probably cost us no more than 10p or so to send three mails and download a pocket.com 'welcome' message. Calls are charged at 25p a minute, rounded to the nearest second. More worryingly, though, was the 60p a minute charge for calling customer services. Fortunately, there's plenty of help on the pocket.com site, but the idea behind the BackFlip is that you use it away from your PC so you'd not have access to this while you're on the move.

The keyboard is fairly lousy and it has sticky-shift enabled, which we hated. The screen is a rather blocky 40 x 8 characters, comprising a 240 x 80 resolution. In all, it's a great idea, if you want email access and little else.

NIK RAWLINSON

DETAILS
★★★

PRICE £99.99 (£85.10 ex VAT)
CONTACT 01628 826 688
www.oregonscientific.co.uk
PROS Short connect times; doesn't rely on a PC
CONS Premium-rate customer support number; poor keyboard and screen; no support for attachments; access number may be blocked from some phones
OVERALL Email on the move made easy, but not pretty

ATi All-in-Wonder Radeon

The latest incarnation of this graphics card adds fast 3D performance to its large feature set

ATi's All-in-Wonder cards have always been something of a mixed bag. They seem to have it all: providing 2D and 3D graphics acceleration, TV reception, hardware accelerated software DVD playback and analog video capture. What more could you ask for?

The one big drawback with the All-in-Wonder has been the 3D graphics performance. In its previous two incarnations – based on the Rage 128, then the 128 Pro – the All-in-Wonder has clocked up the sort of performance figures that would be spat upon by those who take their gaming seriously.

This Radeon has earned a little more respect than its predecessors, though. With 32MB of DDR memory clocked at 333MHz and Transform and Lighting (T&L) support, though it's not at the cutting edge of polygon-crunching performance, the gap has narrowed to make it a much more attractive option for those who want to have their Quake and eat it.

The All-in–Wonder is an AGP 4X card and as it occupies the vacant AGP slot left by your existing card you don't even have to give up a single PCI slot. Considering you could use up three slots for a tuner, hardware DVD and video-capture card, this makes it a good solution for those with limited space, not to mention funds.

On the back panel there's a DVI output (a D-SUB converter is supplied for analog monitors), aerial socket and A/V in and out ports. Our review board also came with a mini breakout box providing composite and S-Video ports, and an S-Video cable.

ATi's Multimedia Centre 7 has been revamped to provide some interesting new features. In addition to the TV tuner, the launchpad toolbar contains icons for the DVD player, video CD player, video editor, CD audio player, file player and Teletext viewer.

The biggest change to the tuner is the addition of what ATi calls video on demand. This basically allows you to pause a TV programme while you make a cup of tea, then resume it at your leisure.

The tuner saves the program to disc as an MPEG-2 file that it replays when you're ready – continuing to record the remainder of the programme at the same time.

The digital VCR also saves files in MPEG-2 and provides a timed recording function. Unfortunately, the feature that allows you to log on to a web TV listings site to check programme details and click to view a channel only works in the US.
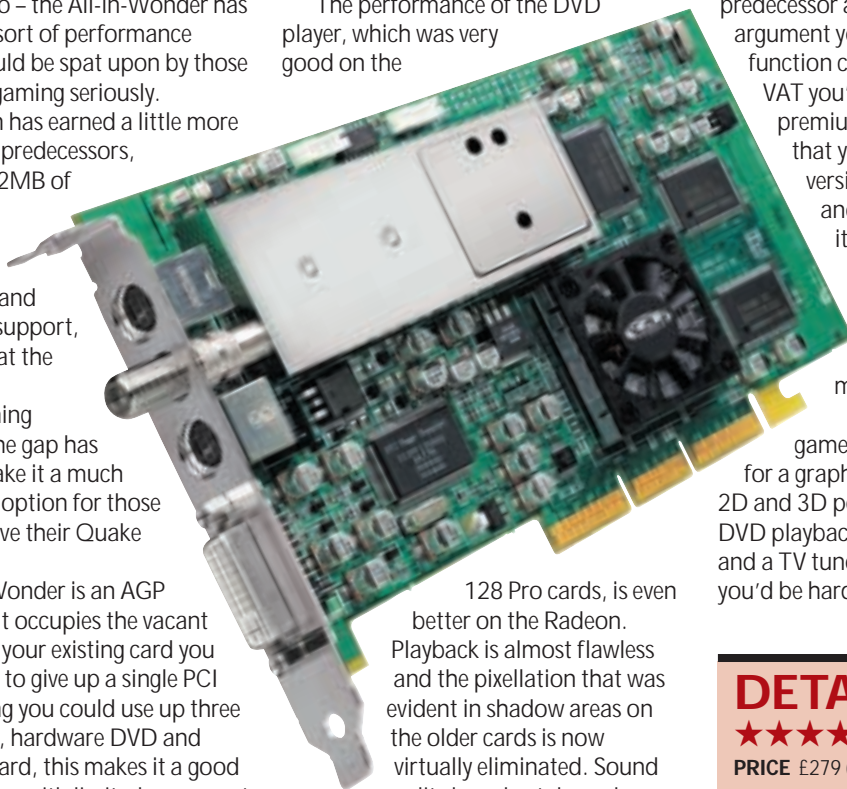
The performance of the DVD player, which was very good on the 128 Pro cards, is even better on the Radeon. Playback is almost flawless and the pixellation that was evident in shadow areas on the older cards is now virtually eliminated. Sound quality has also taken a leap forward – for those with the speakers to take advantage of it – you can output Dolby Digital 5.1 via the S/PDIF connector.

In the past the All-in-Wonder cards have come under fire for the poor quality of the drivers and it's regrettable that, on the basis of our beta drivers, this situation doesn't appear to have improved much – though to be fair ATi says the problems will be sorted by the time of the release. Currently, though, stability is not the first word that comes to mind after the struggle involved in getting the TV tuner application to run. Our past experience with the All-in-Wonder has been that while it can take some effort to get everything working properly, once there it's fairly solid. The Multimedia Centre keeps a tight

track on resources and if you launch an application that requires something that's already in use you are given the option of shutting down or suspending the original program, or running both and suffering the performance consequences. This worked well for everything bar the TV tuner that frequently became confused and required a system restart to sort itself out.

The All-in-Wonder Radeon is a substantially better product than its predecessor and the most compelling argument yet for adding a multi-function card to your PC. At £279 inc VAT you're paying quite a heavy premium for performance given that you can pick up the 128 Pro version for a little over £100, and use the new software with it. Nonetheless, improved games performance and DVD quality are well worth it to those who are going to make the most of these features.

If you just want to play games, forget it. If you're looking for a graphics card with respectable 2D and 3D performance, outstanding DVD playback, analog video in and out and a TV tuner with some useful features you'd be hard pushed to better this.

KEN MCMAHON

DETAILS
★★★★★

PRICE £279 (£237.45 ex VAT)
CONTACT www.atitech.com
PROS Excellent video capture; DVD and TV functions; well integrated
CONS TV picture quality not good at full screen; tuner application currently unstable
OVERALL The functionality of three cards in one; uncompromising performance; attractively priced

PERFORMANCE RESULTS

0	1,000	2,000	3,000	4,000	5,000

3,057
3DMark 2000*

0	20	40	60	80fps
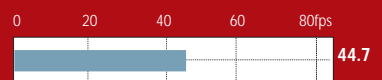
44.7
Quake III*

* 3DMark 2000 and Quake III are tested at 1,280 x 1,024 32bit colour and textures

3dfx Voodoo TV FM

## The graphics card specialist aims to work its magic on a TV FM PCI card but needs to try harder

The Voodoo TV FM is 3dfx's first foray into the multimedia arena. The name says it all; the TV FM is a digital tuner that provides both TV and FM radio reception with some nifty software that allows you to channel surf and record both video and audio to disk. It will also block access to stuff you don't want your kids to see.

The TV FM is a PCI card, and unlike the ATi All-in-Wonder (reviewed opposite), doesn't replace your existing graphics adaptor, but just adds the TV and radio functions. It's fairly easy to install and you only need to connect the stereo audio output to an input on your sound card with the supplied cable, and connect the IR receiver for the remote control unit.

With the drivers and Visual Reality software installed, the first job is to tune in the channels. There's an autoscan function that does this for you, in our case without much success. You can scan for broadcast channels with an aerial connected to the RF socket or for cable TV with a set-top box. Initially, we had little success with either. Scanning for broadcast channels with a portable aerial we just about picked up Channel 4, but despite much tweaking were unable to improve on a very noisy image. We also managed to pick up BBC2 for a few seconds. Reception on a conventional TV using the same aerial in the same position was, while not perfect, very watchable. With the cable set-top box we had no luck at all.

What could be causing such lousy reception? Surely the Microtune MT2032 tuner chip couldn't be that poor. It wasn't. The cause of the problem was that the default video standard configuration was NTSC. You set this from the tabbed properties panel that appears when you press the menu button on the remote. A pull-down menu provides country options and the appropriate video standard is then configured when you restart. The next problem was that the UK did not appear on the list, although everything from Afghanistan to Zimbabwe did. After changing the setting to Belgium, on the

basis that this country might use PAL, the reception was a little better. By now, though, the United Kingdom had miraculously appeared on the list.
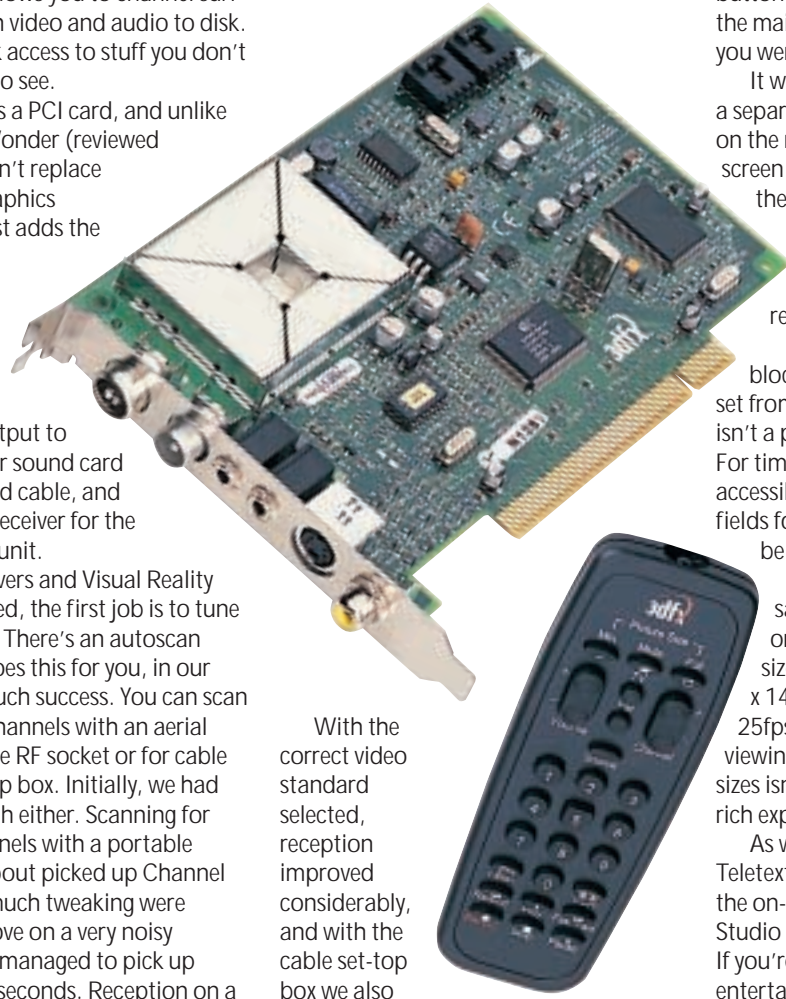
With the correct video standard selected, reception improved considerably, and with the cable set-top box we also managed to get a decent picture.

You can select the input source, assign channels to preset buttons, switch channels, zoom in on selected areas of the image, surf and capture stills and video from the confusingly named 'remote' control, which being an on-screen interface is nothing of the sort. Aside from switching channels none of this works very well. For example, the source buttons glow when you move the mouse pointer over them, but don't stay lit once selected, so you have no way of knowing whether you're watching the TV tuner, a VCR or a console connected to the composite socket. There's also a separate physical remote control, which you can use to switch channels or change the source.

The channel you are watching is momentarily displayed when you press the display button, but this would be much better permanently displayed on the remote. When you press the surf button, active channels are displayed in the main viewing window, so whatever you were watching disappears.

It would be better if you could surf in a separate window and still keep an eye on the main event. There's possibly a full-screen mode accessed by double clicking the title bar, but on our test machine this only produced a blank screen from which it was only possible to recover using the hardware reset switch.

Channel management, channel blocking, and timed recording are all set from a tabbed properties panel which isn't a particularly user-friendly setup. For timed recording, something more accessible than a dialog box with fields for start and stop times would be preferable.

Video can be captured and saved in either uncompressed avi or MPEG-1 format. There are four size options from the miniscule 192 x 144 to a respectable 768 x 576 at 25fps. Like the TV image, though, viewing MPEG-1 video at the larger sizes isn't what you'd call a visually rich experience.

As well as the FM tuner, there's Cebra Teletext, a choice of substitute skins for the on-screen controller, Ulead Video Studio 4 and Microsoft NetMeeting 3. If you're looking for big-screen entertainment the Voodoo TV FM is not the place to tune in. For quarter, or half-sized TV in a window while you work it does the job. But if 3dfx is serious about producing this kind of product it needs to work on the quality, features and interface.

KEN MCMAHON

DETAILS
★★★

PRICE £99.99 (£85.10 ex VAT)
CONTACT 3dfx 01753 502 800
www.europe.3dfx.com
PROS Easy installation
CONS Poor TV quality; thin on features; lacklustre interface
OVERALL Okay for basic TV in a small window, but do you want to pay £100 for it?

Creative GeForce2 MX

In staging a bid for the MX crown, this latest 3D Blaster graphics card uses DDR memory

Last month we had a look at Creative's high-end graphics card, the 3D Blaster GeForce2 Ultra (*PCW* January 2001, p93), which is quite simply one of the fastest cards we've ever seen. At the other end of Creative's spectrum is its new budget card: the 3D Blaster GeForce2 MX. Over the past couple of months we've seen cards based on the GeForce2 MX chip from both Hercules (*PCW* October, p92) and Asus (*PCW* November, p109). However, this offering from Creative is the first of the MX cards to use faster Double Data Rate (DDR) memory. So how does it compare to the other MX cards we've tested?

Surprisingly, testing the card on one of our reference machines showed its performance to be worse than other MX cards we've seen. In Quake III at 1,280 x 1,024 with 16bit colour and textures, the Creative pumped out 40.2fps compared

to 45.3fps from the Hercules and 42.2fps from the Asus. At 1,600 x 1,200 at 32bit the
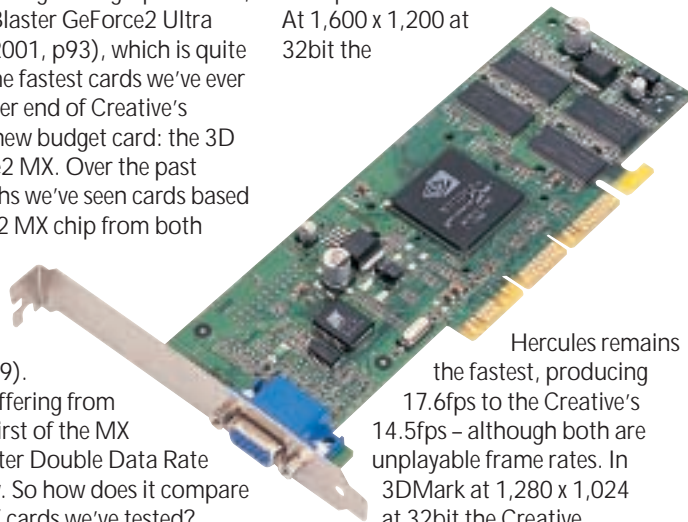
Hercules remains the fastest, producing 17.6fps to the Creative's 14.5fps – although both are unplayable frame rates. In 3DMark at 1,280 x 1,024 at 32bit the Creative again lagged with 1,728. The Asus managed 1,828.

So overall the DDR memory didn't put this card into competition with the other MX cards around. With a couple of games bundled it isn't a bad buy,

but if you're looking for an MX card the Hercules is still the fastest around.

SCOTT MONTGOMERY

DETAILS
★★★★

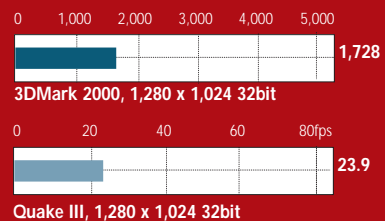**PRICE** £99 (£84.25 ex VAT)
CONTACT Creative
www.europe.creative.com
PROS Relatively cheap
CONS DDR memory doesn't give it any performance benefit over other MX cards
OVERALL A rather disappointing debut for DDR memory on an MX card
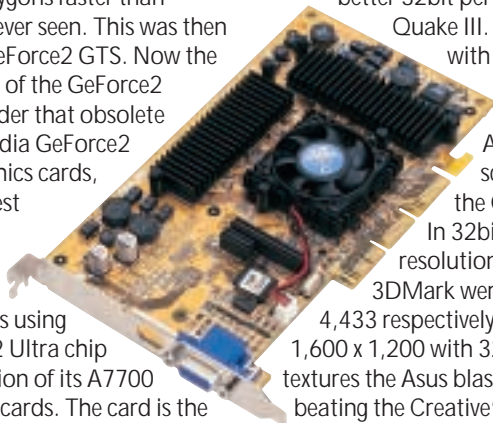
PERFORMANCE RESULTS

3DMark 2000, 1,280 x 1,024 32bit — **1,728**

Quake III, 1,280 x 1,024 32bit — **23.9**

Asus V7700 Ultra

Cutting-edge nVidia technology provides the speed for the Ultra version of Asus' A7700 range

These days a graphics card chip holds the 'cutting-edge' title for little more than a few months. First this year there was the GeForce 256, which shifted polygons faster than anything we had ever seen. This was then usurped by the GeForce2 GTS. Now the latest incarnation of the GeForce2 has arrived to render that obsolete too. Enter the nVidia GeForce2 Ultra-based graphics cards, currently the fastest cards on the market.

Asus is one of the manufacturers using the new GeForce2 Ultra chip with its Ultra version of its A7700 series of graphics cards. The card is the traditional Asus mustard colour, with black heatsinks over the 64MB of onboard DDR memory. The backing plate has a hole in it for the addition of the S-Video riser card, which fits into the connector that sits beside the processor's heatsink and fan.

Performance of the card is excellent, although slightly slower than the Creative GeForce2 Ultra reviewed last month (*PCW* January 2001, p93), despite its better 32bit performance in Quake III. At 1,280 x 1,024 with 16bit colour and textures in 3DMark, the Asus produced a score of 6,005 to the Creative's 6,026. In 32bit at the same resolution the scores in 3DMark were 4,360 and 4,433 respectively. In Quake III at 1,600 x 1,200 with 32bit colour and textures the Asus blasted out 50.8fps, beating the Creative's 49fps.

The V7700 comes bundled with Soldier of Fortune, and AsusDVD version 2.2. The card is ready to take the S-Video board, so there is versatility with this board over some of its competitors. However, with a hefty price tag and its status as a cutting-edge card certain to

be short lived, you would have to really need the extra frame rate.

SCOTT MONTGOMERY

DETAILS
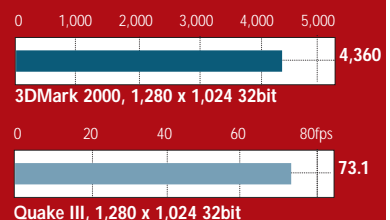★★★★

PRICE £452.38 (£385 ex VAT)
CONTACT dabs.com 0800 138 5240
www.dabs.com
PROS Potential to add S-Video connector
CONS GeForce 2 Ultra cards are prohibitively expensive
OVERALL For the best graphics performance this card is as good as any available

PERFORMANCE RESULTS

3DMark 2000, 1,280 x 1,024 32bit — **4,360**

Quake III, 1,280 x 1,024 32bit — **73.1**

Net2Phone YAP phone

Improved compression and better quality are making VoIP calls a more attractive proposition

For years we have been told that Voice over IP (VoIP) will transform the telephone. Packetising voice calls, as the Internet does with data, makes far more efficient use of the network and so promises free or very cheap calls.

But VoIP calls on the web (as opposed to company networks) have tended to sound like Moon to Mission Control. This has less to do with bandwidth than with the fact that the current version of the Internet Protocol (IPv4) was not designed to deliver data in a timely fashion. This will change as the next version, IPv6, begins to make itself felt over the next two years.

In the meantime, better compression techniques have improved quality, and toll-free unmetered or broadband links have made VoIP a far more tempting proposition. Moreover, whereas you could once make VoIP calls only between computers, several companies now offer PC-to-phone links in which your call is passed to a gateway that routes it as a local call. Charges are thus linked to the cost of a local call in whatever country you are ringing. To kickstart the market, some companies are offering some PC-to-phone calls free.

Net2Phone offers two bundles for its YAP (Your Alternative Phone) services: a headset or a slightly more expensive USB phone, with setup software and around £7 worth of calls. You buy time, much as you do with pay-as-you-go mobiles.

All PC-to-PC calls are free. PC-to-phone charges, posted at the Net2Phone site, vary day-to-day and according to destination. At around 2p a minute they are not that competitive for within the UK, but there are good rates for other destinations and, for the moment, calls to the US are free.

You can also use the ID and pass number from your PC bundle to make phone-to-phone VoIP calls. These are more expensive than using a PC but very much cheaper than using a hotel phone. The quality is better than from a PC, where quality is dependent on your local ISP link, but connecting is slow and troublesome: we counted no fewer than 40 digits to dial from a hotel in the US.

There, and in some other countries, you dial a freephone number to gain access to the Net2Phone network; in the UK, you have to dial a London number.

PC-to-phone quality varies a lot. Calls are supposed to be full duplex (data travelling in both directions at once) but they don't always sound like it, and at times you can sound like you are talking down an intercom. You can also get echoes, which you can reduce by adjusting sound levels.

Setup of both products is much the same and relatively simple with both giving you an on-screen dialling box. The USB phone version can be switched on by picking up the handset. Dialling for all calls from the UK takes the form '011 + country code + area code + number', which is a lot to get right. You can quick-dial numbers from an address book but curiously there is no provision in the software for shortcutting direct dialling – even the rudimentary Windows Dialler will do prefixes for you. The Net2Phone dialler includes an advertising bar that regularly carries particularly irritating examples of adverts that pose as message boxes.

You don't need to take our word for whether VoIP is worth your while. The odd thing about both these products is that if you have a fully fledged multimedia PC you don't need them. You can download the client software from Net2Phone's website and use your own hardware. (While you are at it, check out offers on other VoIP sites: Go2Call, for instance, is offering free calls to phones in many European countries.)

But you need a good mic with stereo headphones (you'll have feedback problems if you use a speaker) so the Net2Phone headset pack looks a fair deal with its bundled line time. We cannot, frankly, see the point of paying £10 more for the USB phone unless you have an objection to headsets.

If you can never brook less than standard phone quality, forget VoIP over the net, for a couple of years anyway. But many people will be prepared to put up with some echoes and hiccups for the chance to spend more time on the phone. If you pick a time when the wires aren't crowded, and you tune your hardware with care, the quality can be surprisingly good.

CLIVE AKASS

DETAILS
★★★

PRICE Handset £49.99 (£42.50 ex VAT). Headset £39.99 (£34 ex VAT)

CONTACT **www.net2phone.com**

SYSTEM REQUIREMENTS 100MHz Pentium PC or running Windows 9x, 2000, or (after downloading a patch) ME

PROS Cheap or free calls to some destinations

CONS Quality varies

OVERALL Worth a look if you need to cut phone bills. You don't need the hardware if you have a good mic and headphones already

CD-RW round-up

Creative, Evergreen, Plextor and Ricoh battle it out for pole position in the CD-RW stakes

With CD rewriters fast becoming the preferred option for removable storage and with a wide variety of connectivity options both external and internal, we decided to take a look at four new CD-RWs. We tested two EIDE drives, the Ricoh DVD CD-RW MP9120A-DP Combo drive (with 12-speed write, 10-speed rewrite, 32-speed CD read, and eight-speed DVD read), the Creative Blaster 12 x 10 x 32 BurnProof drive (with 12-speed write, 10-speed rewrite and 32-speed CD read); a SCSI drive, the Plextor W1210TS BurnProof (with 12-speed write, 10-speed rewrite and 32-speed CD read); and an external FireWire drive, the Evergreen fireLINE (with six-speed write, four-speed rewrite and 32-speed CD read). Each drive came with packet-writing and burning software.

The Ricoh Combo and the Creative use Nero 5 for burning discs, with packet writing covered by InCD 1.66 for the Ricoh and Prassi abCD 1.3 for the Creative. The Ricoh drive also comes with WinDVD 2000 DVD-playback software. The SCSI Plextor drive employs WinOnCD 3.7 for burning and Packet CD 2.0.0.42 for packet writing. This drive also comes with Plextor PlexTools software. The Evergreen writes discs with Easy CD Creator 4.02c, while Direct CD 3.01c deals with its packet writing.

We tested each of the drives with our standard copying tests, although all the results aren't directly comparable due to the different interfaces. We've compared the FireWire drive with the Sony CRX120Ei-DV FireWire drive (with four-speed write, four-speed rewrite and 24-speed CD read) from our CD-RW group test (*PCW* June 2000, p201).

Taking the internal drives first, the Ricoh came out top in copying a cover CD to CD-R, clocking up a time of two minutes 23 seconds, beating the other two by seven seconds. Similarly, copying a video

Clockwise from top left: Evergreen fireLINE CD-RW, Creative CD-RW Blaster, Plextor W1210TS BurnProof and Ricoh DVD/CD-RW MP9120A-DP

CD to CD-R was also the Ricoh's forte, with a time of five minutes 23 seconds. The Creative was around 10 seconds slower, with the Plextor off the pace b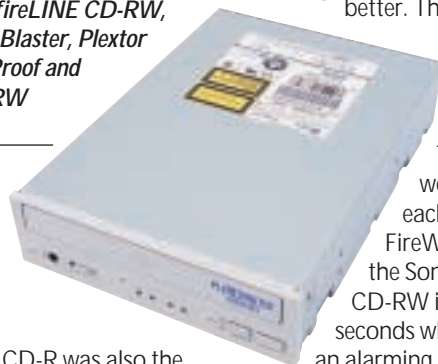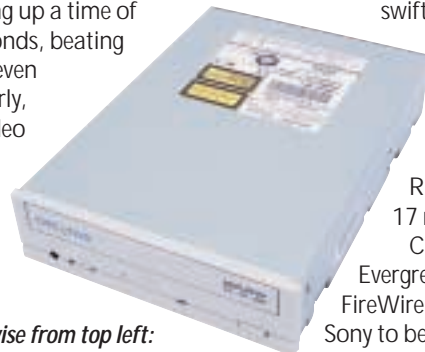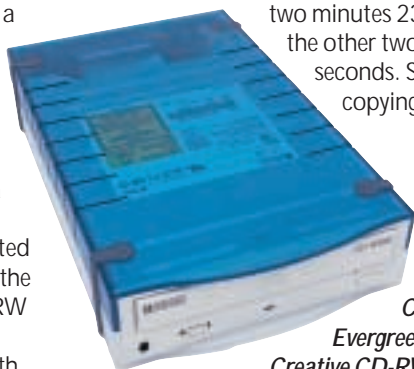y two and a half minutes. The Creative managed to blow the others out the water when it came to formatting a CD-RW, where it was the swiftest with a time of around eight minutes. The Plextor took nearly 15 and a half minutes while the Ricoh took over 17 minutes.

Comparing the Evergreen to the Sony FireWire model revealed the Sony to be overall slightly better. The cover CD to CD-R copy took 14 minutes with the Evergreen compared to over 15 minutes with the Sony. The rest of the times were within seconds of each other for the two FireWire drives, although the Sony could format a CD-RW in 10 minutes 13 seconds where the Evergreen took an alarming 25 minutes 46 seconds.

Which drive you choose will depend on what your needs are. However, the Ricoh is probably the best drive overall, and versatile too.

SCOTT MONTGOMERY

DETAILS
★★★★

CREATIVE CD-RW BLASTER 12X10X32
PRICE £239 (£203.40 ex VAT)
CONTACT Creative
www.europe.creative.com
PROS Fastest CD-RW formatting in the test; BurnProof technology
CONS More expensive than the faster Ricoh
OVERALL A good CD-RW, although the speedier Ricoh gives DVD on top of removable storage

DETAILS
★★★

EVERGREEN FIRELINE CD-RW
PRICE £386.58 (£329 ex VAT)
CONTACT Evergreen 01793 601 300
www.evergreennow.co.uk
PROS FireWire CD-RW solution
CONS Uninspiring speed in general; poor CD-RW format time; expensive
OVERALL If you need a FireWire CD-RW it's worth a look. If you can get away with an internal, the others here are faster

DETAILS
★★★★★

RECOMMENDED
Personal COMPUTER WORLD

PLEXTOR W1210TS
PRICE £386.58 (£329 ex VAT)
CONTACT dabs.com 0800 138 5240
www.dabs.com
PROS Fast internal SCSI CD-RW
CONS Comparatively slow copy time to CD-R
OVERALL A fine and fast BurnProof SCSI drive, beating Mirai's unit (p121 September)

DETAILS
★★★★★

RECOMMENDED
Personal COMPUTER WORLD

RICOH DVD/CD-RW
MP9120A-DP
PRICE £234.94 (£199.95 ex VAT)
CONTACT jungle.com 0800 0355 355
www.jungle.com
PROS DVD; speedy write times
CONS Quite lengthy CD-RW format time
OVERALL A fast CD-RW with DVD capabilities

Philips UGO X-Lite and Acer PalmPro 7765PE

The latest pair of DLPs may be lightweight and easy to use, but they're still not top of the crop

The good news for anyone who has to lug a projector from venue to venue to earn a living, is that the load is getting lighter. The Philips UGO X-Lite is an ultra-compact portable projector. Weighing only 1.3kg, you can comfortably carry it under your arm. A separate lightweight case is provided for the remote and all the other cables and connectors.

The UGO is incredibly simple to set up. You just place it on the table, plug in the power and video cables and you're in business. It has a resolution of 1,024 x 768 and this is clearly the way the UGO is designed to be used. At a distance of about 2m from the screen you get an image just less than 2m diagonally and the lens projects the image upwards so everyone gets a clear view.

There's no zoom, so you need to move the projector back and forth if you're aiming for precise screen dimensions. A sliding cover protects the lens when not in use and a manual focusing ring provides the means to a sharp image – almost. We found it impossible to get the image sharply focused from top to bottom.

In every other respect the image quality is good, with bright, even corner-to-corner illumination. The X-Lite's 130w lamp produces 800 ANSI lumens which is not nearly as much as some larger DLP (Digital Light Processing) projectors. Nonetheless it makes for comfortable lights-on viewing with a reasonably large image size. Text, especially bold text, looked as if it was spreading and filling in, though, and this wasn't helped by the lack of overall focus.

As well as a downstream USB mouse connector so you can use the remote to control your mouse pointer, the X-Lite has S-Video, composite video and audio in

connectors and so it can double as a home entertainment projector. Its big selling point is clearly its size and weight, and it's a bit of a shame that the superb picture quality that DLP is quickly becoming renowned for is less in evidence here than

Above: Philips UGO
Below: Acer PalmPro

in some larger models. While not quite matching the minute proportions of the Philips UGO X-Lite the oddly named PalmPro is compact and light, weighing in at 2.27kg – the two-tone gunmetal grey casing and bulbous red IR receiver combine to give it a slightly retro appearance. It also has a resolution of 1,024 x 768. Conversely, the remote control looks like something from *Star Trek*, its moulded silver form housing a multitude of buttons providing everything from mouse operation and laser pointer to on-screen menu (OSM) functions

As with the UGO, setup is straight-forward. Having plugged in the power and video cables, the projector automatically senses the input signal and displays the screen image. A rubberised mount on the lens produces a crisp image, and there's also an optical zoom.

Digital keystone (adjusting the image so the edges are parallel even when the

projector is pointing up, or down at the screen) and other adjustments are made via the OSM either using the remote, or the projector buttons that are conveniently backlit to save you from fumbling about in the dark.

If you want to connect anything other than a computer you'll need the optional AV box, which clips onto the rear of the projector. This has RCA sockets for composite video and stereo audio, S-Video and audio in and out as well as a speaker. Putting these facilities on a peripheral means most people will neither pay for, nor carry what they don't need.

On the whole, the Acer's picture quality was excellent, but not without flaws. After about 10 minutes' use the previously rock-solid image began to flicker, though to be fair it became stable again after about five minutes. When connected to a PowerBook there was a marked 'kink' in the image that diverted everything in the left third of the screen upwards at a slight, but noticeable angle.

Though minor, you don't expect these problems with a projector at this price.

KEN MCMAHON

DETAILS

PHILIPS UGO X-LITE
★★★★
PRICE £5,286.33 (£4,499 ex VAT)
CONTACT Philips 01756 702 892
www.philips.com
PROS Very small and light; easy setup
CONS Picture quality less than we've come to expect; no optical zoom; expensive
OVERALL Great portability and still far superior to LCD models, but not the best DLP picture quality you'll find

ACER PALMPRO 7765PE
★★★★
PRICE £3,519.13 (£2,995 ex VAT)
CONTACT Acer 0870 900 2237
www.acer.co.uk
PROS Small and light; optical zoom; good range of remote functions; optional AV box
CONS Flawed picture quality
OVERALL No-nonsense projector aimed at the business user, picture quality falls well short of perfect though

Sony notebook webcam

Sony's CMR-PC1 will make you the envy of everyone… guard it well

Pay attention Bond. Sony CMR-PC1 notebook camera kit. About the size of a matchbox. Attaches to your notebook PC using this ingenious spring-loaded grip.

The good news is you don't have to be in the employ of MI6 to get your hands on this miniature Sony camera. You adjust the viewing angle by rotating the cylindrical lens mounting and focus the lens by turning the wheel on the tiny lens mount, though you probably won't find this necessary as the lens has a large depth of field and everything from about 5cm to 1m is in focus on the closest setting.

It's USB, so once you've installed the drivers you simply plug and play. A viewer applet lets you see yourself in a video window that you can configure to any size from 40 x 30 pixels to 640 x 480 and set frame rates from 6.25 to 30fps. At 640 x 480 it has a tendency to drop the odd frame, but if you're using it for video-conferencing you won't be running at anything like that resolution so you needn't worry. The Sony applet also lets you capture video clips and stills.

The camera is supplied with Keyware Technologies' biometric password screensaver that you configure for voice and facial identification. However, if the software fails to identify you there's the conventional keyboard entry to fall back on.

Microsoft NetMeeting is included in the package, making this an ideal way to turn your notebook into a mobile video-conferencing centre. Finally, Arcsoft's PhotoImpression 2000 and VideoImpression 1.6 will allow you to carry out basic still image and video editing.

Out-of-the-box mobile video-conferencing kits don't come any better than this. It's tiny, quick to set up and provides superb image quality, even in low light conditions. Try and bring it back in one piece Bond.

KEN MCMAHON

DETAILS
★★★★★

RECOMMENDED PERSONAL COMPUTER WORLD

PRICE £99.99 (£85.10 ex VAT)
CONTACT Sony **www.sony-cp.com**
SYSTEM REQUIREMENTS Windows 98, 2000 or ME. Pentium MMX 200MHz, 64MB of RAM, 210MB of hard disk space, USB port
PROS Small; stylish; good-quality images; good software
CONS Susceptible to theft by envious enemy agents
OVERALL Owners of notebook with built-in cameras will be kicking themselves

Philips Expanium

Awkward MP3 navigation and a chunky design are the downfall of Philips' portable CD player

We were very impressed with the styling of Philips' Rush MP3 player reviewed in January's group test so we were looking forward to getting our hands on the Expanium – a portable CD player that can also play back CD-ROMs containing MP3 files.

Unfortunately, the device's styling isn't anywhere near as attractive as that of the Rush player. This is mainly because it's substantially bigger than your average portable CD player and is very blocky in appearance.

The device works fine as a normal CD player, as you would expect, but as an MP3 player it has some problems. The Expanium's display just isn't up to the job. Faced with a single-line display that's incapable of showing song titles, it's an absolute nightmare to navigate your way around a CD-ROM packed with MP3 tunes. Navigation is made even more difficult by the fact that you can't music search through songs stored in MP3 format.

Philips says that the Expanium will play back MP3s at bit rates from 32Kbits/sec to 320Kbits/sec, as well as files encoded in Variable Bit Rate format. We tried a number of Variable Bit Rate files and the Expanium dealt with them without any problems.

There's not much more in the way of additional features. You get a bass boost function, a hold button and a mode selector that skips between playback modes such as random and shuffle.

One other function is described as Magic Electronic Skip protection. Luckily this has nothing to do with Paul Daniels, but instead refers to the anti-shock system. This is actually very good. Try as we might to make the music skip, we just couldn't fool the Expanium into interrupting playback – even when we shook the device quite vigorously for long periods of time.

Unfortunately, though, the Expanium just does not appeal to us: its chunky appearance and awkward MP3 navigation robs it of some stars.

NIALL MAGENNIS

DETAILS
★★★

PRICE £200 (£170.21 ex VAT)
CONTACT Philips 020 8665 6350
www.expanium.philips.com
PROS Good sound quality; great anti-shock
CONS Poor display makes navigation of MP3 CD-ROMs difficult and annoying; larger than your average portable CD player
OVERALL The large footprint and poor display count heavily against the Expanium

Pentax EI-2000

Digital SLR cameras tend to carry a 'professional' price tag, but Pentax has just changed all that

There have been two conspicuous absentees from the digital camera market – the well-known camera maker Pentax, a brand synonymous with photography, and affordable SLR digital cameras. Well that gap has now been filled as Pentax recently dipped its toes into the turbulent waters of digital photography with the release of two digital cameras; one compact zoom, the EI-200, and a Single Lens Reflex (SLR) model, the EI-2000.

There are other digital SLRs on the market – both Canon and Nikon make them – but they tend to have 'professional' price tags of a couple of grand. The EI-2000 is a more respectable £700, which is on a par with many 'range-finder' compact digital cameras. This sum buys you a built-in zoom lens, auto-focus, auto-exposure and auto-flash. Both new cameras are the result of a joint development program with HP so you'll see these two cameras sporting the HP logo as well.

Pentax hasn't gone for broke with its new cameras and the EI-2000 has a relatively modest specification. It's a 2.24megapixel CCD, offering 1,600 x 1,200 pixel images with a 36bit colour depth. Its sensitivity range is equally modest. It is equivalent to films between ISO 25 and 400. On the glass front, it has a 3X zoom (equivalent to 34-107mm lens on a 35mm SLR) with a maximum aperture of f/3.9 to f/2.5: nothing special for a zoom and a bit dim for a standard lens.

Nevertheless, for general daylight tasks, this lens is very capable – it can auto-focus down to 0.5m while in macro mode it can focus down to 20mm. Having an SLR is such a big advantage over compact 'range-finders' because you can actually frame a shot with a degree of accuracy. One niggle is that the viewfinder lens is located on the left of the body, not centrally, which is the usual position on SLRs. That said, you could always use the hinged LCD display if you can't actually get your eye near the camera.

The typical SLR camera user is used to having total control over exposure and they'll feel at home with the EI-2000. You get a choice of metering modes; spot, centre-weighted and average, shutter speeds from 1/1000th down to four seconds, +/- 3EV compensation, auto-bracketing of half or one stop either side and colour temperature compensation. There are a handful of exposure modes, too. You can choose from aperture or shutter priority, manual, programmed and a raft of subject-matter modes. Well-placed dials and buttons make it easy to control what is a fairly complicated piece of kit.

The EI-2000 stores its images on Compact Flash cards – it comes with an 8MB CF card as standard, which is a bit mean as this will hold only one uncompressed tiff image and 13 shots taken at the 'Better' image quality, which is a bit light in our eyes. True, you could invest in bigger CF cards but sadly the EI-2000 doesn't take the ultimate in CF storage, the IBM Microdrive. Transferring the images to a PC is easy with the supplied USB cable – a Windows 98 PC sees the camera as another removable disk drive.

And if you have an HP PhotoSmart printer, you can use the EI-2000's infra-red JetSend facility to beam your images straight to a printer via its IrDA port. This isn't particularly fast but as colour printing is a painfully slow process, this isn't a problem. If you have another camera that has the Flashpoint Digital camera firmware, you can even beam a snap over to it.

As with most digital cameras, this one has a video output, letting you plug it into an RGB socket on a TV or VCR to show your handiwork on a large screen. One neat touch is automatic image orientation. This means when you take a snap in portrait mode, it's saved in portrait mode – a boon if you're giving a 'slide show' on a TV.

Apart from 36bit colour depth, the EI-2000's claim to fame is the image processing (courtesy of HP) that takes place, to optimise your pictures, adjusting for tricky lighting conditions and colour balance. And the images it delivers certainly bear close scrutiny – A4 prints, taken at the modest 'Better' setting, reveal very little pixellation or noise. The EI-2000 may be a megapixel shy of the market leaders but this deficiency really didn't manifest itself in the finished result – it delivers very good images indeed.

ROGER GANN

DETILS
★★★★

PRICE £700 (£595.75 ex VAT)

CONTACT Pentax 01753 792 792

www.pentax.co.uk

PROS First low-cost digital SLR; well specified; plenty of control

CONS No interchangeable lens; a bit too chunky

OVERALL A good first attempt from Pentax – the viewfinder allows you to accurately compose shots, which is a big plus. And you don't necessarily need 3 and 4megapixel resolutions to deliver sharp images

HP Photosmart 1218

A versatile printer that will do your photos justice – and it doesn't even need a PC

HP's Photosmart 1218 certainly has a lot to offer and doesn't even need a PC connection to be put to good use. It sports an infra-red port, a Type II Compact Flash (CF) slot and a SmartMedia slot. More attractive than most, the 1218 is housed in a sleek curved black chassis. Lifting the lid puts the head to the centre of the chassis for easy cartridge swapping. Connection is by means of parallel or USB cable.

HP doesn't usually make what it would call dedicated photo printers. Instead it prefers to talk about its photo enhancement technology, PhotoREt III, which lays up to 29 drops of ink on a single spot on the page to produce any one of around 3,500 shades of colour. This saves the printer having to work on printing the very small dots needed to achieve the same result through half-toning. But, if you're a traditionalist and resolution says more than technology, you'll be pleased to hear that when printing on photo paper it switches to a 2,400dpi mode. It needs no user intervention to do this – it scans the paper, detects what kind it is, and makes the necessary adjustments.

The driver is up to the usual high standard we have come to expect from HP, with the common three print quality settings supplemented by a plethora of additional options. The number of paper types stretches to 27, including iron-on transfers, Hagaki and greetings cards, each split into logical subsections for easy navigation, and in a choice of 19 sizes. Printing up to four pages per sheet helps you cut down on waste for proofs or archiving, and poster printing will stretch your output to cover up to 16 sheets (4 x 4) for hanging on the wall. If your images don't come out quite the way you'd have liked, you can tweak the saturation, brightness and colour tone on-screen, as well as increasing the volume of ink laid down or upping the drying time to avoid smudging.

A two-line digital panel and a series of buttons dominate the front of the unit. These are used to control the direct printing of photos from the Compact Flash and SmartMedia slots. When the Photosmart is connected to a PC, these cards appear in 'My Computer' as removable drives, so the printer can double as a card reader which, depending on your connection, could make this a quicker way to download snaps than the conventional software and cable. Printing this way is pretty much instantaneous. As soon as we selected our images and specified the printing size, it was off. There are six size options, spanning 2.5 x 3.25in to 8 x 10in. A section of the paper tray is devoted to holding postcard-sized sheets of photo paper, so you can try and fool your friends into thinking you've had your pics professionally developed.

Our standard A4 test photo was well rendered at high quality on photo paper in a respectable seven minutes eight seconds, with perhaps the most realistic skin tones we have ever seen. Tonal transitions were smooth and unstepped, and there was no evidence of banding or bleeding between dark and light areas. We would not have thought twice about putting the results on the wall. Vector graphics were adequate, although slightly grainy on inkjet paper, and the colours produced were not as vivid as those from some of the entrants in our last inkjet group test. That said, it did complete the A4 image in just four minutes 12 seconds.

Standard black text on photocopy paper was also well rendered, with sharp edges and no evidence of feathering. However, our test document included a number of hyperlinks that Word had turned blue, and the ink used to print these bled into the page, softening the characters with a hazy cyan halo. This is disappointing since HP has traditionally been top dog when it comes to textual output. The last sheet of a 95-page document of black text and greyscale images dropped into the output tray 24 minutes 42 seconds after we hit Print – a rate of almost four pages a minute, which is truly impressive.

Drivers aside, the bundled software runs to ArcSoft PhotoImpression and PhotoMontage, both of which will appeal far more to the home than business user, and once the novelty of PhotoMontage has worn off you'll probably not look at it again. On a more positive note, though, use it at a high enough resolution and with the poster printing option ticked and you'll see some impressive results.

Under the hood there's 16MB of RAM and eight built-in fonts, but HP has only included light-user cartridges – you get only 21ml of black ink rather than the full 42ml of the standard cartridge, but you do get a duplexing unit as standard. The infra-red port allows you to print directly from notebooks, WAP phones or suitably equipped PDAs and cameras, and with easy networking, a 5,000-page a month duty cycle and HP PCL Level 3 this printer should appeal to home and business users alike.

NIK RAWLINSON

DETDETAILS
★★★★

PRICE £329 (£280 ex VAT)
CONTACT Hewlett-Packard 0990 47 47 47
www.hp.com
PROS Great photo output; direct printing from IR devices and CF/SmartMedia cards
CONS Low-capacity ink cartridges bundled; minor feathering of coloured text on photocopy paper
OVERALL So versatile, calling it merely a 'printer' seems inadequate. HP has stolen Epson's photo printing crown, but to the slight detriment of some of its traditionally strong points

IBM Microdrive

With its increased capacity of 1GB, this storage medium works out cheaper than Flash memory

Being confined to the Compact Flash Type II form factor (42.8 x 36.4 x 5mm and in this case weighing 16g), the only way IBM could increase the capacity of its Microdrive was to up the areal density, and that's exactly what it's done here. The original Microdrive (*PCW* Jan 2000, p90) came in two flavours – 170MB and 340MB. The former has been dropped and the latter supplemented by 512MB and 1GB capacities, the 1GB model being on test here. The areal density has trebled from 5.04 to an impressive 15.2Gbits/sq in.

Handling the drive, which still consists of just a single platter-head combination, you get a reassuring feel of solid build quality. The stats back this up, and IBM claims that when not being used the drive can now handle a shock 1,500G (formerly 1,000G). This drops to 175G when in use, but that's still up on the 170MB version that would keel over under the force of 150G.
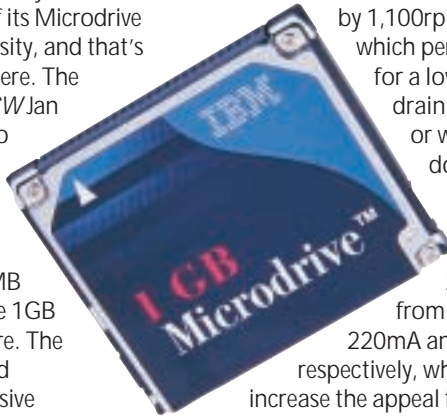
Rotational speed is down by 1,100rpm to 3,600rpm, which perhaps accounts for a lower power drain. When reading or writing this is down 50mA to 250mA, and it now idles at 140mA and 20mA, down from a former 220mA and 65mA respectively, which should increase the appeal for digital camera and PDA users. That said, it sustains a data transfer rate in the range of 36Mbits/sec to 60Mbits/sec with an average seek time of 12ms.

To test it, we took two identical photographs with an Epson PhotoPC 850Z using its 1,984 x 1,388 pixel HyPict mode. A standard Compact Flash card saved the image in 12 seconds, while the Microdrive completed the same operation in 13 seconds. With a 1GB capacity the Microdrive can now take 1,000 2.1megapixel photographs, the same number of 200-page novels or around 18 hours of high-quality digital music in its stride, and when you take price into account, it works out far cheaper than a comparative quantity of Flash memory.

NIK RAWLINSON

DETAILS
★★★★★

RECOMMENDED
COMPUTER WORLD

PRICE £399 (£339.57 ex VAT)
CONTACT IBM Storage 01475 898 125
www.storage.ibm.com
PROS High capacity; low price; widely accepted form factor
CONS None to speak of
OVERALL If you can afford one, it's the only sensible way to run a certified compatible camera or PDA

Teac PowerMax 1500

Dolby Digital speakers that pack more than enough punch for even the most demanding PC user

To get the best out of a computer system, especially when it comes to DVD movies, a set of Dolby Digital speakers are a must.

One option is the Teac PowerMax 1500, which also supports EAX and A3D. In keeping with the Dolby standard – 5.1 channels of sound – the set comes with five satellite speakers, and a sub-woofer for low frequency effects. A separate amplifier unit controls the setup.

Unfortunately, the sub is inside a cheap plastic housing, and vibrates annoyingly when there's a serious amount of bass passing through the system.

After this things get a lot better. The rear of the amp contains the inputs; in addition to the analog connections – for stereo and four-point surround – both optical and co-axial digital inputs are included. These are the inputs that have to be used to get Dolby Digital sound, so a compatible sound card is required such as the SB Live!

The sound is of surprisingly good quality. At the loudest volumes there is no distortion, although the satellite speakers are a little tinny. Bass performance makes up for this somewhat, with loud, thumping effects.

Playing with the sound controls we were disappointed that there were no controls to adjust bass or treble, especially when the other controls are so comprehensive.

On top of this, the sound mode – Dolby Digital, Pro Logic and four-point surround – can be manually switched to match the input type.

At the end of the day, they might not be as good as a dedicated home cinema system, and the sub's not as good as it could be, but for the average computer they'll pump out enough noise to keep the most demanding person happy.

DAVID LUDLOW

DETAILS
★★★★

PRICE £199 (£169.36 ex VAT)
CONTACT Micro Warehouse 020 8906 9111
www.teac.co.uk
PROS Good selection of inputs; fairly good sound quality
CONS Plastic casing on sub-woofer causes it to vibrate; no bass/treble controls
OVERALL A plastic-encased sub-woofer is a disappointing part of what's otherwise a decent Dolby Digital setup

Microsoft Office 10

Our six-page special reveals all about a tempting upgrade to this core business suite

Microsoft Office is the *de facto* standard for core business applications, despite the efforts of Corel, Lotus and Sun to unseat it. Its competitors are cheaper by far, but when the crunch comes most businesses still choose Office, although they wisely do not always bother to upgrade when a new version appears. Office 10 introduces another option, a subscription model. When your subscription expires, the product reverts to viewer-only functionality, after a suitable warning period. Outright purchase also remains available, although it looks likely that registration will be required.

Office is a mature product. It is also to some extent boxed in by its past. Major changes to Word or Excel would be greeted with howls of anguish from users who like it precisely because of its familiarity. A case in point: Microsoft has restored the MDI (Multiple Document Interface) to Word, after heavy complaining when it was removed in Word 2000. The result is that changes to the main applications are minor embellishments rather than fundamental improvements.

The serious changes are elsewhere, in the area of collaboration and web support. Microsoft is building deep integration between the Office desktop applications and its server products, particularly Exchange and Internet Information Server (IIS). To get the full Office experience, organisations will need to buy into the entire Microsoft platform, creating exactly the kind of integration that competitors find so frustrating and hard to break into.

Along with a new, flatter look to toolbars, the first thing users will notice is the task pane, a docked or floating window that offers shortcuts to common tasks relevant to the current context. The task pane includes a handy multiple clipboard viewer, although oddly it does not support drag-and-drop.

Both Corel and Lotus support speech input, which in previous versions of Office required a third-party add-on. In Office 10 speech input is built in for both text and commands. It just about works in this Beta, but only if you switch language to US English.

Another usability feature is smart tags. These gadgets are icons that magically appear in a document when Office decides you might need some
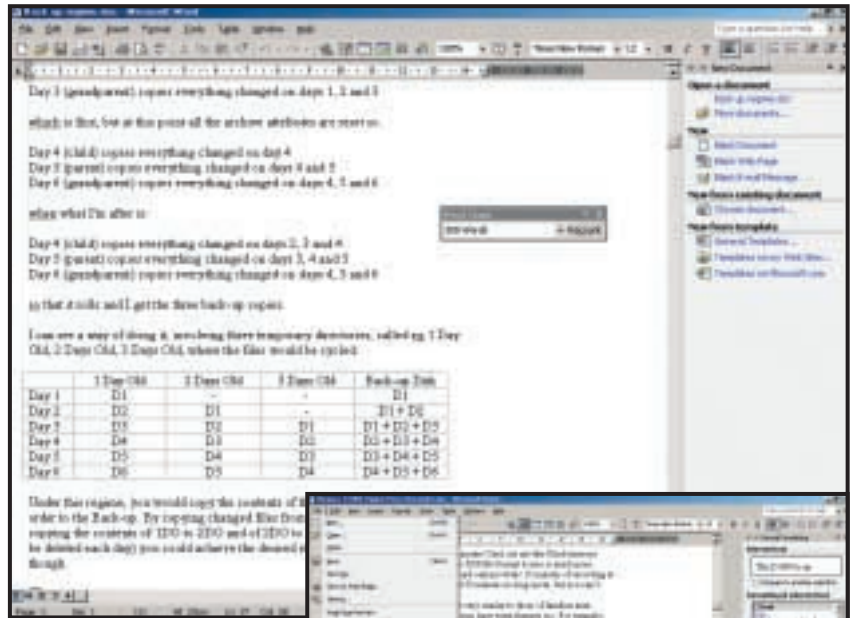
Above: The Task Pane makes opening and saving documents more straightforward, and the realtime word count will delight essay writers

Right: To send a document out for review just pick from the File menu

help. For example, if you paste a table into Word, a smart tag lets you change its format after the event. If it all goes wrong and an application crashes, the new Document Recovery feature attempts a just-in-time document save, and when the application restarts you are meant to get user-friendly choices about how best to rescue your work.

The collaboration features are the most interesting. Microsoft has greatly improved the Office Web, an instant intranet that first appeared in Office 2000. With hardly any setup required, Office installs a website that provides shared and indexed documents, discussion boards, contact lists, shared task lists and a shared calendar. Easy administration pages let you manage users and permissions, and as a whole it is more compelling than its predecessor.

Outlook has always had superior functionality when used as an Exchange client, but in Office 10 Exchange has a new role as a Web Storage system. Web Storage combines the roles of web server, file system and free-form database. It turns an Exchange public folder into a

container where you can save documents and give them extended properties, which are then available for searching and categorising. Web Storage is also a platform for web applications, and Office 10 includes Office Designer, a tool for creating workflow and document management applications. Then again there is the server, codenamed Tahoe, a new product that provides Web Storage without the workflow and messaging features of Exchange, but with additional document management facilities. Along with SharePoint, that makes three different ways to do web-based collaboration using Office, proving Microsoft is more than serious about this concept.

Word

The look and feel of Word has changed noticeably from Word 2000. Although many elements of the existing product stay, others have changed to give the program more of an 'Encarta' feel.

The menus and buttons bars have a completely flat look, with selected options highlighted by coloured insets,

rather than by a 3D feel. A new Task Panel down the right-hand side of the editing screen opens when loading or saving documents and offers all the usual template, new and existing file options, but in a more consistent way and includes options like 'create new document from existing one'.

Manipulating text is much the same, though there are a few extras that will make formatting easier. One of the most useful is being able to make multiple selections. Much like selecting several files in a file browser, you can now select disparate text elements and apply formatting or editing instructions to all the selections in one go.

A handy feature for those who use Word as an email editor is to add an introduction to a document before emailing it. This is a bit like creating an email and attaching a document to it, but in reverse. It means you don't have to leave Word or change the contents of a document to email it.

Perhaps as a sop to all the journalists who will be writing on as well as about the new Word, Microsoft has introduced the Word Count toolbar. This produces an ongoing word count as you type, in much the same way as you can continuously check for spelling or grammar errors. The Word Count toolbar, like other floating toolbars, can be docked to the sidebar in a Corel-like fashion.

You can now open a new drawing canvas, into which you can position photos, drawings and text boxes, without worrying about where text will wrap or where objects within the frame will end up. Objects are fixed within the canvas unless you explicitly move them.

One of the main new feature sets in Word is for peer review and group editing. Microsoft is late catching onto this – it's been a core feature of SmartSuite since before Ami Pro morphed into WordPro. Indeed, it's one of the main advantages the Lotus product has had over Microsoft's.

No more, though, as the new features are comprehensive and well organised. When one member of a workgroup sends a document out for review, anybody else opening it is automatically provided with the right reviewing tools. Reviewers can also view the changes made by others before them, collectively or person by person. Once the review is complete, the original author of the document can choose which amendments to merge into it and which to surreptitiously ignore.

Thank heavens Microsoft has seen the error of its 'new document, new instance of the word processor' working method,

introduced in Office 2000. While this is still the default, you can switch it off from the View menu and then open multiple documents in the same Window, as of old (see above).

Excel

The last couple of releases of Excel have concentrated not on adding more and more mathematics, but on making worksheets more approachable. This focus on ease of use continues in the new version, with new and usually easier ways to achieve results.

Smart Tags is the name Microsoft gives to little alert labels that may appear on cells in your worksheet. Hold your mouse pointer over one of these and it explains what the alert's for. In most cases, you can drop down a menu of possible remedies, too.

Tool tips are also given more to do. When you type in a formula using Excel functions, a tool tip shows the next variable expected and you can click on the variable name to display its definition. This makes entering formulae a lot easier – you no longer need to commit function syntax to memory.

Little formatting niceties have been added to the new Excel so, for instance, you can interactively draw borders around cells in colour and with solid or dotted lines. You can colour worksheet tabs, too, to aid recognition in a multi-sheet workbook.

It's often difficult to keep an eye on the contents of several different cells, particularly if they're widely spread in a

large worksheet. Microsoft has come up with a novel solution, called the Watch Window. By right-clicking on any cell you can add it to this floating window and any changes made by recalculation or editing are continuously reflected there. The feature works across worksheets and workbooks, too, so you can bring together important values from several projects at once.

The new Formula Auditing toolbar enables you to go through the formulae in your worksheet and check each is valid by evaluating it with current data. You
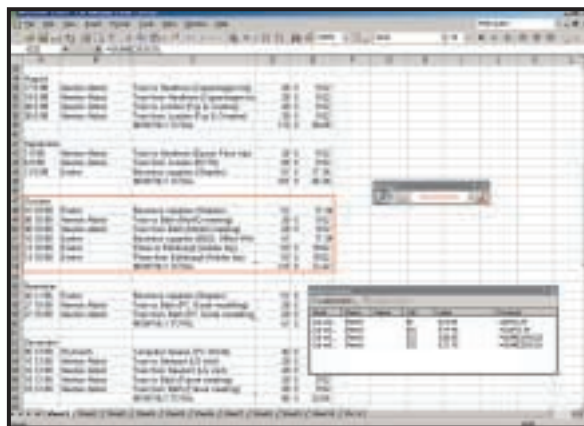

The Watch Window makes it easy to monitor cells you select. The border tool lets you draw interactively around groups of cells

can search through for precedents and dependencies, too, to ensure your formula is calling on the right cells and only the right ones. It's linked to the Watch Window, so you can easily add cells for continuous monitoring.

Extensions to Excel's web links mean you can create a refreshable link to information, such as stock quotes, from specific web pages. This isn't a trivial task, though and will depend on the Internet source you're using for your information.

Peer review of spreadsheets mirrors the new functionality in Word and gives you the facility to launch a worksheet across your workgroup. It can then be annotated individually and returned to you for consolidation. The features are well implemented and comments are colour highlighted for easy identification.

Should Excel, or any of the other applications in Office, stop responding, you can now send details of
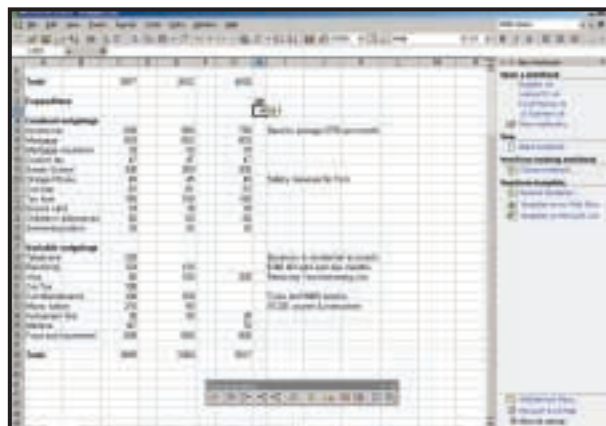
If a column is too narrow to show cell contents, a tooltip pops up to show it instead. The Formula Auditing toolbar checks for errors and dependencies
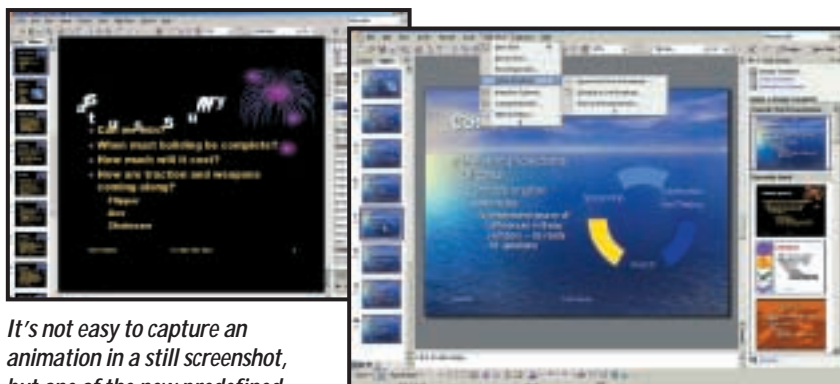
It's not easy to capture an animation in a still screenshot, but one of the new predefined moves is for an elliptical roll of the characters in a heading

Inserting business charts onto a PowerPoint slide is now an internal job, but there are new Internet broadcast facilities

the error to Microsoft over the Internet in the hope of a quicker fix. Excel looks more human in this incarnation, with genuinely intelligent extensions to its user interface. While there's little change to the calculating core of the program, it's much easier to get productive work from it.

PowerPoint

Microsoft has put a lot of work into PowerPoint since its last release, to improve both functionality and ease of use. As with the other modules in the new Office, Task Panes figure heavily. There are panes for slide design, animation, colour schemes, indeed most of the core functions benefit from a cleaner, more Internet-browser-like appearance.

The main screen of PowerPoint is now split into three panes, with the central pane showing the slide you're working on. Down the left-hand side is a tabbed panel, showing either the outline of the presentation or a scrolling column of the slides included in it. Down the right is the Task Pane that will change depending on the task you're performing.

There are new facilities for dealing with diagrams and photos in presentations. PowerPoint now supports built-in organisation charts, pyramid and Venn diagrams. Microsoft maintains this internal solution, which no longer needs OLE, makes for smaller file sizes. This is also the reason behind the compressed picture format for files, which automatically compresses bitmaps using jpeg compression. This hybrid compressed file format is common to the other modules, too. Incidentally, bitmaps can now be rotated in 90-degree increments.

In desktop publishing, it's often useful to have more than one master design for different types of page in the publication. Multiple masters now feature in PowerPoint, too, so you can have an overall design sub-divided into related and toning sections. Once

defined, these slide masters can speed the development of presentations.

There's a lot more variety in the kind of animations you can apply to elements of slides in the new PowerPoint. There's a very good range of standard moves, which get away from the rather tired fades and wipes that have been presentation graphics fare for a long while and include some novel and entertaining ones. For example, you can define the path of animations on a slide and PowerPoint even provides an elementary timeline so you can co-ordinate the movements of several objects at once.

When you come to delivering the presentation, there are extra features to help you, too. If you can refer to a PC running the same presentation that is being projected, you can take advantage of a separate presenter's view. This provides extra help, like displaying slides and bullet points before they appear on the main screen and showing you your speaker notes. It also gives you the facility to jump to any slide.

Presentations can be broadcast across a LAN or to the Internet using HTML, but there's no support for streamed broadcast, where each slide can be downloaded as needed. Document recovery and group review facilities, new to Office, can be used on presentations as they can in the other modules.

PowerPoint continues to be an important tool for anybody whose job involves communication through multimedia. It doesn't quite maintain the ease of use that Word and Excel enjoy, but offers a huge range of presentation possibilities.

Outlook

Outlook, the emailer and organiser of Office, doesn't pull too many surprises in its new version. The default layout, with the Inbox as the top pane, a message

pane below and a column of shortcuts down the left-hand side will be familiar to most people, although of course the default view can be customised.

Start a new email and you'll notice Word is now the default mail editor in Outlook. This feels a bit heavyweight to anyone used to a quick and light text editor, but you soon start to appreciate the facilities of the full word processor.

Just because you're using Word for creating your emails doesn't mean you have to stick to Word format. Depending on your intended recipient, you can pick plain text, rich text (rtf) or HTML and the email browser can display all formats too. If you're using plain text, Outlook can clean it up automatically, by removing superfluous line breaks.

There have been several improvements to the Outlook address book, including a Display As field, to give your email contacts a more convenient handle than their email address. When you type an address that Outlook knows about, the program auto-completes it in the same way URLs are auto-completed in Internet Explorer.

When you're connected to a server over a LAN, there are several new features designed to speed up access, such as only downloading attachments and large emails once. You can now continue working while that download's taking place, too. Should the network Exchange server go off-line, you're no longer stopped from working in Outlook, another bonus.
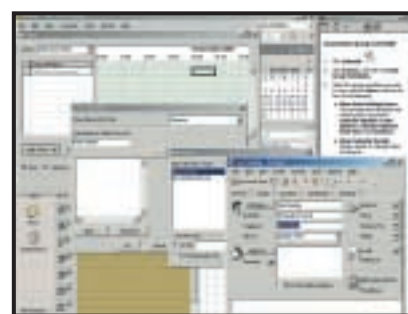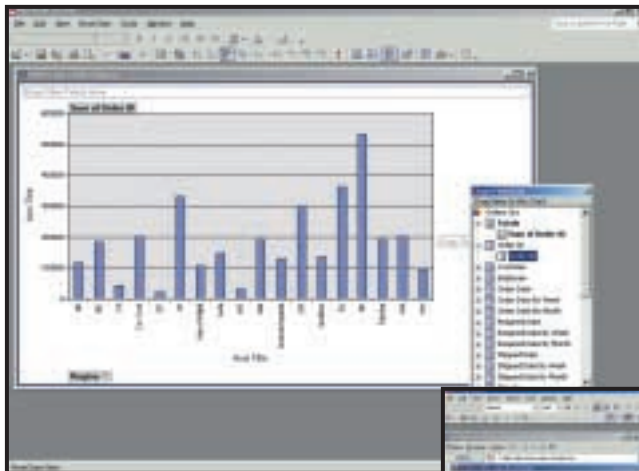

Adding people to a group schedule is easy, though you have to mine down through five levels of dialog
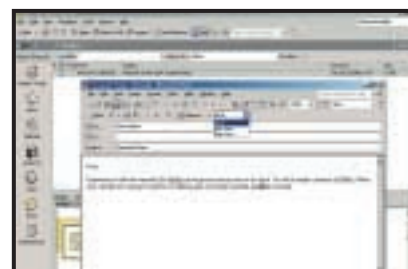
Word becomes the default email editor for the new Outlook, and can produce text in plain, rich or HTML formats

If you have several email accounts, including Hotmail, you can select which of them you use to send a particular email. This is one way you could easily restrict particular contacts to selected email addresses.

Being as popular as Outlook and Outlook Express has its drawbacks, not least of which is that it has become a main target for virus writers. Microsoft has tried to redress the balance a little, by providing elementary protection. This includes being able to prevent uncertified programs from having access to your address book and from using it to send automated emails to people in it.

The organisation side of Outlook has been improved through the introduction of Group Schedules. These let you publish details of your calendar, so others on your network can find out when you're free. It's also now possible to create a genuinely shared schedule that two or more members of a workgroup can access freely together. You can also share free/busy information, so it's easy for a third party to set up meetings or other group events. Calendar entries can be colour coded for quicker event recognition.

Overall, the improvements in Outlook are worth having, though Microsoft has never managed to compete fully with the simple operation of a program like Lotus Organizer. It's still not quite there.
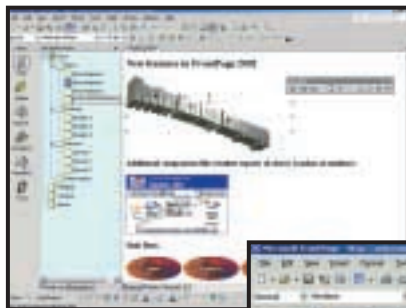
Access

It has always been doubtful whether a database management system can ever really be an end-user product, and with contact management handled well by Outlook, Access is increasingly a developer's tool. The big new feature in Access 2000 was native support for SQL Server databases and the inclusion of a free-to-deploy version of the SQL Server database engine, called MSDE (Microsoft Database Engine). Access 10 has nothing of equivalent significance, although the SQL Server components
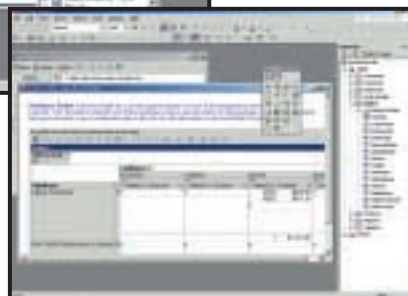
have been updated for SQL Server 2000.

It's an excellent client-server database, with the added advantage of seamless upgrade to the full SQL Server if it becomes necessary. This version can link tables to SQL Server databases, a useful piece of functionality that was missing in Access 2000. This lets you easily link Access and SQL Server tables. The MDB format is still supported and to improve compatibility it uses the Access 2000 version by default. There is a

new Access 10 format as well, and Microsoft promises that its built-in extensibility means that further changes won't be necessary.

Aside from distractions like the new speech command feature, the two most important enhancements in Access 10 are Data Access Pages and XML support. A Data Access Page is a web page disguised as an Access form. You can design it using similar tools, and save it for viewing on an intranet. This type of data-driven web page requires client-side

components and an Office licence to view, so it's aimed at intranet rather than Internet use. Forms and reports can be converted to Data Access Pages by Save As.

XML support means you can import and export data and data structures as XML. When you export XML data you can automatically include an XSL (Extensible Stylesheet Language) document that generates an HTML 4.0 presentation of the data. This is fundamentally more flexible than straight HTML export, particularly if you want to support more than one presentation format or integrate with other systems. On the other hand, this is a developer feature that makes little difference to the average Access user in the office.

Users may be more interested in the PivotChart and PivotTable views on offer. Any table, query or form can now be viewed as either a PivotChart or a PivotTable, with an easy drag-and-drop design tool. This lets you analyse data in a way that previously would have required export to Excel. You can also create hierarchical tree views on data, which let you easily drill down into related detail tables.

Finally, the form designer has been enhanced in this version, particularly if you are working with sub-forms or sub-reports. A right-click option opens a sub-form in its own design view, for easy customisation. Another handy feature is multiple undo in the form designer, and also in most other areas of the product.

FrontPage

Microsoft's web authoring tool is popular among casual web users but scorned, sometimes unfairly, by many professionals who accuse it of generating
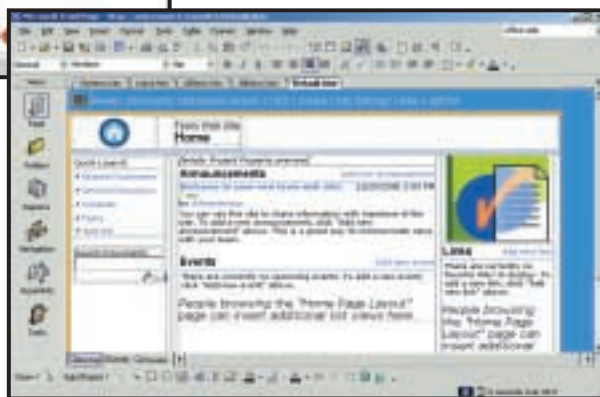
bloated or Microsoft-specific HTML. Most of the problems were corrected in FrontPage 2000, although there is a conflict between the desire to support Microsoft-specific features and the advantages of simple, fast HTML code. FrontPage Extensions have to be installed on the web server in order to use some features, such as discussions and searches, and to support user-friendly web publishing and site management.

The downside is not only compatibility but also that if anything does go wrong it is harder to troubleshoot. On the other hand, the extensions do provide an easy route to some useful features, and are now widely supported by ISPs. It is also simple to configure FrontPage not to assume the presence of extensions, and to generate HTML that is compatible with a wide range of browser versions, so many of the issues disappear for those with a thorough understanding of the product.

FrontPage 10 supports the Office drawing tools, including autoshapes, flow charts and the Word Art text effects designer. This generates VML (Vector Markup Language), giving proper scaling in Internet Explorer, while also providing a bitmap for other browsers. It's a significant feature, and provides an alternative to Macromedia Flash if all you need is vector graphics.

Automatic web content lets you plug in live links to web resources such as MSNBC headlines or Expedia maps. There is also an option to Find Components on the web, which will allow the list of available services to be extended. This is compelling since, provided that enough resources become available, there is the prospect of snapping together your own combination of immediate dynamic content and portal-style links. For example, a business could provide relevant stock quotes, travel services for employees, maps that keep themselves up-to-date, local weather forecasts and news headlines, simply by inserting appropriate components. You do not need FrontPage to do this, but having this built in as a standard feature will increase the momentum behind this type of service. In the Beta, an inserted weather forecast did not work with Netscape Navigator 4.7, the kind of problem that must be ironed out if this concept is to succeed.

As you would expect, FrontPage integrates well with Office SharePoint, the team intranet already mentioned. You can insert discussions, and add or edit lists such as contacts, events or

tasks that users can update from their own browser. There is also support for themes, with around 70 different presentation formats that can be applied to individual pages or to an entire site.

Pages tabs are a usability feature, showing opened pages on tabs just above the document area. It is only an alternative to the Window menu, but far more convenient. Also new are Link Bars, a solution to the tricky task of maintaining accurate navigation bars across a website. The Link Bar component reads the FrontPage navigation outline and constructs a panel of link buttons accordingly. You can set properties to determine what part of the site you want to link to, along with the appearance style, and it will update automatically as the structure changes. It generates standard HTML so there are no compatibility problems.
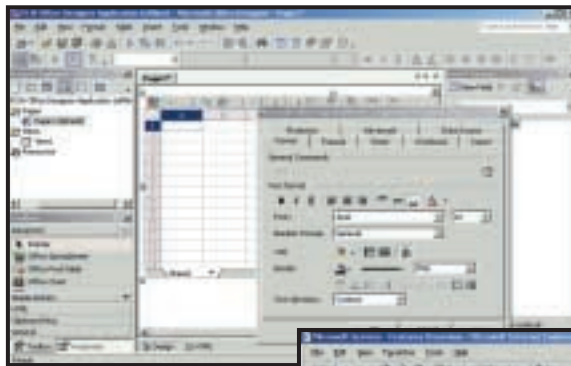
Office Designer

The Office Designer is a developer tool for creating workgroup web applications. These run on Exchange 2000 (with Service Pack one to support the WebStore feature) or Tahoe, the new document management server. Office Designer uses the Visual Studio.Net IDE, which makes its first public appearance here.

In one sense Office Designer Applications are a rich extension of Outlook Web Access, enabling developers to create browser-based applications that have access to all the features of Exchange. This is extended in Exchange 2000 to include document management, with the Web Storage system offering in effect an extended file system that supports read and write access via HTTP. You can also access the Web Storage system as a shared drive in Explorer, integrating both network and web access. One of the advantages of Web Storage over a standard shared directory is that it

supports server events. For example, the act of saving a document could trigger dialogs requiring the user to specify document categories, keywords and properties before the save can be completed. This applies whether the save is from the web, or from the network. The resulting structured document store has many advantages over the jumble of documents that can easily end up in an ordinary shared folder. You can also design workflow applications that route documents to different departments in a structured fashion.

Other features of Office Designer applications include support for Office Web Components such as spreadsheets, charts and pivot tables, dynamic data access using Active Server Pages, and the ability to work offline through a local version of the Web Storage System.

A perplexing aspect of Office Designer is how it fits within Microsoft's overall

Left: The Office Designer is based on the Visual Studio.Net development environment. This sample page shows an Excel spreadsheet component

*Below: Office Designer will also support the new server codenamed Tahoe*

web application strategy. The current Microsoft technology for web application is Active Server Pages. The forthcoming .Net Framework upgrades ASP to ASP.Net, a richer, faster environment based on server-side components that run on the Common Language Runtime (CLR). Now here comes Office Designer, which builds web applications that run on Exchange 2000 or Tahoe, using the old ASP technology as the connecting piece. In a future release this is likely to be upgraded to ASP.Net, but in the meantime developers will have to choose between ASP applications built on Exchange 2000/Tahoe, or .Net applications built on the CLR.

The Office Designer itself lets you assemble an application from several element types. Pages are Active Server Pages that provide the highest-level container for presenting text, controls and other resources. Views are essentially the Outlook View Control, an ActiveX control that embeds a view of an Outlook folder into a web page. In addition, you have all the normal resources that can go into an ASP application, including scripts and other web controls. Development is simplified by the provision of a range of templates, encompassing issue tracking, workflow, document management, discussion groups and several others. The idea is that further templates will be available on the web, to kickstart Office Designer applications within an organisation.

Publisher

Publisher is a desktop publishing application with the focus firmly on ease of use. It does not pretend to challenge the likes of Quark XPress or Adobe InDesign for professional features. But for small businesses or people at home producing fliers, cards and newsletters, Publisher is fantastic. The driving insight behind Publisher is that few people have
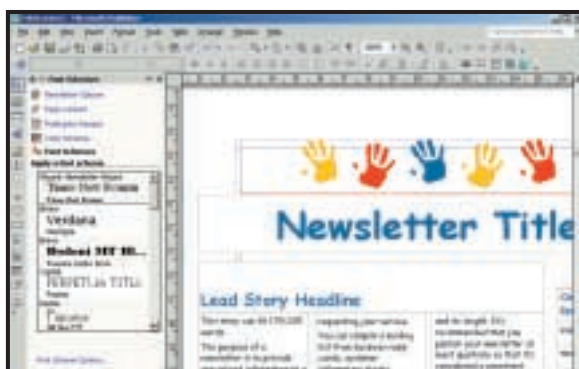
New in this version, font schemes provide a sensible combination of fonts you can apply to any Publisher template

design skills. Publisher will do it for you, providing variety by letting you apply design, colour and now font schemes to its range of template publications. The new Task Pane is ideally suited for presenting and applying these schemes, and the similar panel in Publisher 2000 may well have been the inspiration behind the whole Task Pane concept. The advantage is that you do not have to take all the decisions when starting a publication, but can experiment with different themes while you work. Other Task Panes include the visual clipboard, styles and formatting, and mail merge.

This is a good upgrade for Publisher users. It now supports multiple documents, so you can copy and paste

between publications without starting a second instance of the application. Earlier versions of Publisher lacked a Print Preview option, an omission that has now been rectified. The interface has been revamped, with customisable command bars, AutoShapes as used elsewhere in Office, and a Format dialog box that brings together options previously found in several different dialogs.

You can create headers and footers for an individual page, where previously this could only be done on the master page. Native support for jpeg and tiff images means a reduced file size in many cases, and simplifies work particularly if you are sourcing images from a Mac.

Publisher supports Pantone spot colours, widely used as a standard colour set in the printing industry, and the previous limit of three spot colours in a publication has been lifted. You can now use both process colours and spot colours in the same document, which is important for businesses that have standard colour schemes.

Microsoft offers Publisher as a web design tool, but users should be wary. Even setting the web options to maximum compatibility, we could not dissuade Publisher from generating huge HTML files with information used for 'round-tripping', in other words HTML that is there to maintain full document features when a file is reopened. This means pages open more slowly from online locations, and it also works against you when you want to edit the HTML manually. Publisher does support HTML fragments, manually inserted code that is not tampered with. As a web editor, Publisher might be tolerable on an intranet where Internet Explorer is the standard, but probably not for wider use.

Publisher is a fantastic product, provided you can live with its limitations. It is genuinely easy to use, and a huge range of built-in designs is usefully supplemented by a clip-art gallery on the web.
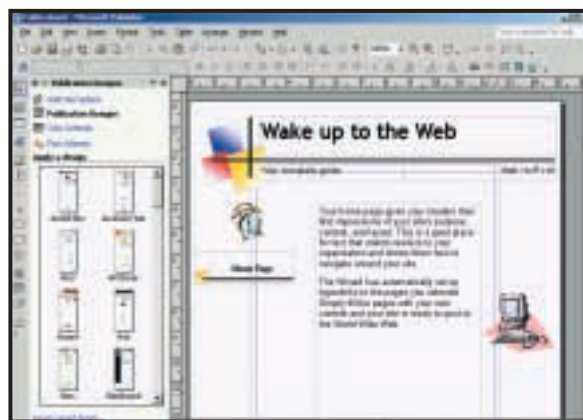
Publisher will generate web pages but file sizes tend to be huge

Overall

There is no doubting that there are significant developments present in Office 10. It doesn't yet seem to include everything necessary for it to fit seamlessly into the forthcoming .Net strategy, given what we know about that to date, so some form of patch or upgrade is likely to be issued in the future, though. The new subscription ownership model will also most likely appeal to corporate customers.

We're glad to see the maintenance of core file formats, so Office 10 application data should be compatible with earlier versions, but while this serves to reinforce Microsoft's position as the dominant supplier of integrated office suites it damages the value proposition of an upgrade, making it easy for users to stick with what they already have in place.

Ultimately, the decision on whether or not to upgrade will be made in relation to enhancements evident across multiple applications. Fortunately for Microsoft, though, there seems enough here to tempt many.

TIM ANDERSON, SIMON WILLIAMS
AND NIK RAWLINSON

DETAILS

WORD	★★★★★
EXCEL	★★★★★
POWERPOINT	★★★★
OUTLOOK	★★★★
ACCESS	★★★★
FRONTPAGE	★★★★
DESIGNER	★★★
PUBLISHER	★★★★
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OVERALL The number one office suite just got better

AOL 6

This updated software gives net newbies everything they could want, and at a good price too

Among some Internet users it's almost fashionable to hate AOL. However, that may be about to change. At the time of writing AOL appears to be about the only company offering a really sustainable flat-rate service in the UK, at £14.99 a month. Of course, you don't need the latest version of the software to use it, but that's what you'll get if you sign up.

Existing users will feel pretty much at home with AOL 6, but there are some changes, evident when you sign on and see the new Welcome screen. As well as links to your mailbox and news, there's a new Calendar icon for the online diary.

The email client is slightly improved too, allowing you to sort your online mailboxes by date, subject and author, and address book entries are automatically completed for you.

If you're not used to AOL, you'll find that the software is pretty straight-forward, though in areas such as reading news and email it lacks the finesse of some standalone applications. You can run other programs through AOL's connection to the Internet – but choosing to 'associate' AOL with your Internet applications may cause problems when you want to use other ISPs.

Lurking under the hood is a copy of WinAmp, powering the AOL Media Player; you can play MP3s and plenty of other media types, including movies, directly within AOL, you can build up play lists too. When broadband connections are finally widely available, the software will detect them and provide additional content automatically.

Not all the new features are restricted to people who have AOL 6; the new Groups facility, which provides a website

Some of the changes are evident on the new Welcome screen

and email list for members, and the AOL Calendar, both use web pages, so members who don't upgrade can access them too. The Groups facility is particularly useful: all members can make entries in a shared calendar, or add information to the web page, and you can add all the members of a group to your buddy list in one go.

No doubt diehard net users will say 'What's the point? You can get all of this elsewhere on the net'. True, but AOL 6 includes, in one package, just about everything most net users will need, and all with a consistent interface.

One of the most useful aspects is the Parental Controls. Each AOL account has seven 'screen names', allowing enough for work, personal, spouse and kids. Each of those names can have different privileges, affecting access to the net as well as to AOL services. For parents, that alone could be a good enough reason to choose AOL.

However, there are some niggles. One is the pop-up messages from AOL Store, which offer you various shopping deals. You need to click these to make them go away. Also, if you want to use it

simply to access the Internet with the flat-rate deal, you'll find that the way TCP/IP is tunnelled over the AOL connection makes using some services fiddly, to say the least. But then AOL's not really meant for those people.

On the other hand, if you're a relative newcomer and you want something that's simple to use, with lots of information close to hand, and you appreciate having facilities like the ability to play MP3s built in to a single program, not to mention a reasonably priced flat-rate deal, then AOL 6 is certainly worth a look.

NIGEL WHITFIELD
Nigel Whitfield is the author of The Official AOL UK Handbook.

DETAILS
★★★★

PRICE Software is free; Monthly flat-rate service subscription £14.99
**CONTACT** AOL 0800 376 5588
www.aol.co.uk
SYSTEM REQUIREMENTS Windows 95 or 98: Pentium-class processor; 16MB of RAM minimum; free hard drive space: Win95 70MB, Win98 80MB, **Note:** up to 180MB if Internet Explorer 5.01 is installed; VGA, SVGA or better display; 640 x 480, 256 colours or better screen (optimised for 800 x 600); Microsoft Internet Explorer 5.0; modem or other Internet connection. Windows 2000: Remote Access Services (RAS) Installed; Pentium-class processor 166MHz or higher; 64MB of RAM or more; 80MB hard drive free space required for install, **note:** up to 190MB free if Internet Explorer 5.01 is installed; VGA, SVGA or better display; 640 x 480; 256 colours or better screen (optimised for 800 x 600); Internet Explorer 5.0; modem or other Internet connection
**PROS** Built-in media player, calendar and improved email services. Very easy to use. Good parental controls
CONS Advanced users may find it restrictive. Inability to choose alternative mail and news clients. Pop-up offers can be irksome
OVERALL There are some improvements over the previous version, and it's very simple to use – but ultimately you still need to decide if AOL is the right service for you
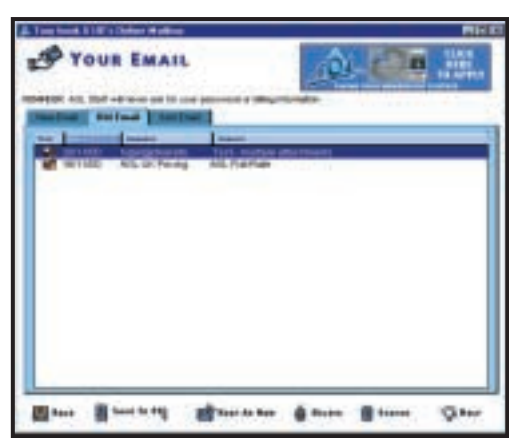
AOL's new-look sortable email client
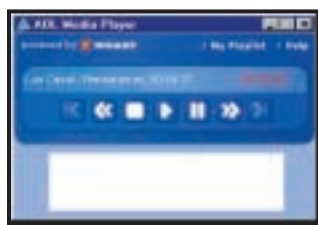
WinAmp-powered Media Player

Microsoft Whistler

Microsoft unveils the Beta version of its next generation of Windows. So, what's the verdict?

November saw the release of the first public Beta of the next generation of Windows. Codenamed Whistler, the new OS will form the core of a family of operating systems, which will be available in Personal, Professional, Data Server and Advanced Server versions. For the first time, Microsoft will have a single, unified, Windows platform for every level of deployment, from the home user right up to the corporate server farm.

At the moment, Whistler is little more than a skin job on Windows 2000 – a good analogy is that Whistler represents the product of a head-on collision between Windows 2000 and Me. If Windows 2000 was Windows NT 5.0, then Whistler is Windows NT 5.1. For most users this has to be a win-win situation – consumers gain the benefit of an extremely stable and reliable version of Windows, while business users get the bonus of great multimedia support and ease of use.

The downside of this is that, at present, in Beta 1, there are few significant features that you can't find in either Windows Me or Windows 2000. But virtually everything new in Me is also in Whistler.

While Whistler will be the first fully fledged upgrade to Windows 2000, it won't be the release upon which the company is betting its .NET architecture. According to sources this will rely on
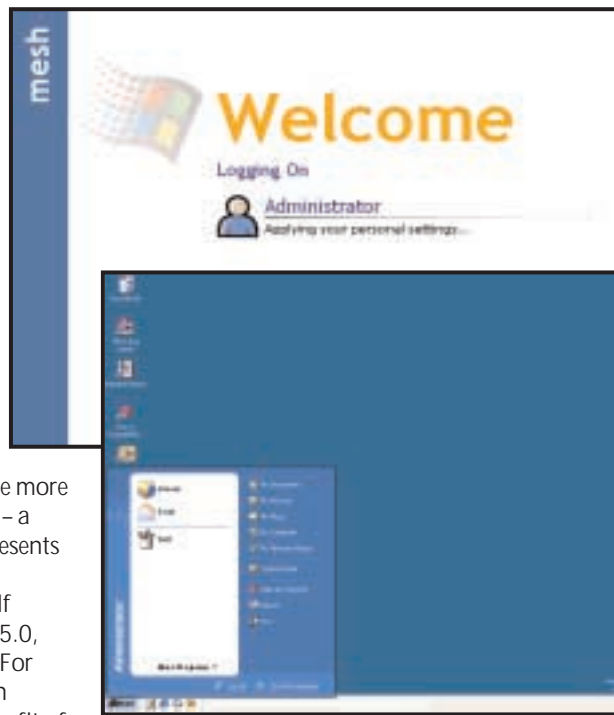
Where's everything gone? The desktop is empty but My Documents, My Computer and other Windows elements have been relocated into the new Simple Start menu

Blackcomb, not Whistler, as one of its key enabling products. Little hard detail is known about Blackcomb – it is rumoured, for example, that Microsoft will replace the Windows NT file system with the core of the SQL Server database for improved performance. There is, apparently, some .NET code in Whistler but Microsoft is being coy and won't say what.

The .NET architecture is an application framework, meaning that it provides applications with the system and network services they require. The .NET services range from displaying graphical user interfaces to communicating with other servers and applications in the enterprise. It replaces Windows COM (Component Object Model) with a much simpler object model that is implemented consistently across programming languages. This makes sharing data among applications, even via the Internet, easy and transparent. Also .NET substantially improves application scalability and reliability, with portability being a stated but not yet realised objective.

Versions

Personal
Whistler Personal is an upgrade for Windows 9x/Me, offering users the same functionality as Windows Me while upgrading them to the reliability and stability of the Windows 2000 platform. It has uniprocessor support and will only be available in the 32bit version.

Professional
Whistler Professional is a superset of Whistler Personal, adding support for two processors, roaming network profiles and other business-oriented features, as well as a 64bit edition, for Itanium-based systems. Home users shouldn't miss the extra features in the Pro version. These include support for large LAN-based services like Active Directory, Remote Desktop (Terminal Services) and IntelliMirror, new C2 security features (Whistler Personal users will get an improved version of the Windows 2000 security set minus C2). Both Personal and Professional editions include OS emulation modes that allow them to fool older applications into thinking that they are Windows 95, for better backwards compatibility.

Whistler timeline

Neptune NDAs sent out	Early December 1999
Initial Neptune Alpha release (Build 5111)	27 December 1999
Build 2211 leaked to net	20 March 2000
Build 2223.1 leaked to net	17 April 2000
Whistler technical Beta begins	30 June 2000
Whistler Preview (2250)	13 July 2000
Whistler Alpha (2257)	24 August 2000
Whistler interim release (Build 2267)	3 October 2000
Whistler Beta 1 (2296)	31 October 2000
Anticipated schedule	
Whistler Beta 2	1st quarter 2001?
Whistler Release Candidate 1	2nd quarter 2001?
Whistler Release Candidate 2	3rd quarter 2001?
Whistler Release to manufacturing	4th quarter 2001?
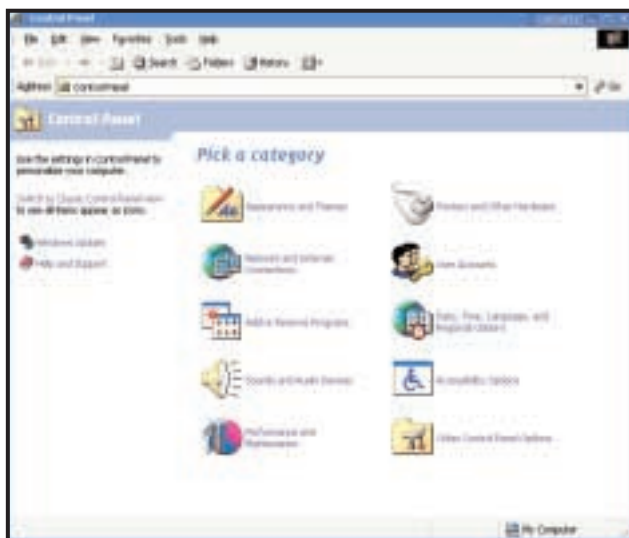
Whistler's Control Panel gets the Windows Me treatment

Server

On the server side, Whistler is focused on pushing the performance, scalability, reliability and manageability Microsoft is touting with Windows 2000. One of the keys is the 64bit version, which in theory should perform twice as fast as the 32bit operating system.

What's new

We installed Beta 1 Build 2296 on a 500MHz Athlon PC with 128MB of RAM, a once cutting-edge device, now merely entry-level. We blitzed the 20GB hard disk first and let the machine boot from the Whistler CD-ROM – boot floppies play no part in the installation process so you'll need a PC with a BIOS that supports bootable CD-ROMs. Apart from revised screen graphics, the install closely mirrored that of Windows 2000, certainly in terms of time taken – allow at least an hour for this. At the end, the only device it didn't successfully install a driver for was an ancient 3Com Etherlink III 10Mbits/sec NIC (network interface card), but a quick visit to the 3Com website rectified that (with what looked to be a Windows 98 driver, of all things). It ran quite smoothly on this PC.

The most obvious difference between this early build of Whistler and Windows 2000 is the user interface (UI). It sports a mildly revised UI that remodels the Start Menu, Control Panel, System tray, folder window views and the My Pictures folder. Our first reaction on the final reboot was 'Where's everything gone?' as the Desktop was essentially empty – no My Computer, no My Documents, no Internet Explorer, no Recycle Bin. The reason for the absence of these crucial elements of Windows is that they've now been relocated onto the new 'Simple Start' menu, (formerly the 'Start Panel') which,

as a result, is now considerably enlarged.

The Simple Start Menu replaces the old Start Menu from Windows 2000/Me with a Taskpad-based window that makes it easier to access frequently used tasks. For example, applications that you run most often appear at the top of the Start Menu. And if you want to actually launch a program, a 'More Programs' link at the bottom opens up the actual programs menu. Clicking one of the 'My Documents etc' icons doesn't open a submenu, but closes the Start menu and opens the appropriate icon as a folder. The Control Panel now gets the Windows Me treatment, another change that's of debatable value.

Whistler includes support for UI Themes (previously called Visual Styles), an XML-based 'skinning' feature that will allow users to tailor the way their system looks in ways that were never before possible. The new UI, currently called Forms Plus, combines features of Windows 32 with HTML. It merges the user desktop with the web browser, in an extension of the 'much-loved' Active Desktop feature built in to Windows 98 that lets the desktop look and function like a browser.

But you shouldn't judge a Whistler by its cover, lurking below its contentious UI are some interesting new features. For example, text to voice technology is incorporated into Whistler, although it's not in the same league as RealSpeak.

Improved manageability is an important issue and Whistler is riddled with numerous tweaks designed to simplify and accelerate network rollouts. An example of this is 'headless' management, which supports remote management without having system requirements for a keyboard and a mouse. Companies that have servers in remote locations will find this a boon as it will let you do anything from shut down to boot up the system.

An end to 'DLL Hell' is also in prospect. In Whistler, applications will think they're copying their files as usual, but the OS will manage the process so that they don't actually overwrite any

existing files. Then, each time the application is run, Whistler will ensure that it only uses its copies of the files, ensuring that all apps run correctly and none of them are able to get in the way of other applications.

Device driver support should also be better. When Whistler ships a larger number of signed drivers will be available than with Windows 2000. And in the event of a bad driver being installed it's possible to roll back the installation to a previous 'last known good' configuration. Whistler also supports Hot Plug PCI, which allows devices to be installed on a server without requiring it to be downed. Network administrators will also be able to control precisely what software can be installed on workstations with Whistler's 'signed application' system, which can prevent an unsigned application's code from executing.

It may not seem it but Whistler is at least as big a change in the Windows platform as, if not bigger than, the introduction of Windows 95 and maybe even the creation of Windows NT. Overall, we found Whistler Beta 1 to be rock-solid, with some gains in simplicity, less so on the usability front. Whistler was originally slated for Release to Manufacturing on 18 April 2001, but it came as no great surprise when Bill Gates announced at the PDC (Professional Developers' Conference) in July that this had slipped to the second quarter of 2001. This time round, Microsoft is promising a phased delivery of Whistler and on present information it looks likely that the Personal and Professional versions will be on the shelves in time for Christmas 2001 and that it'll be Q1 2002 before we see the Server versions. But we wouldn't bet on it.

ROGER GANN

Some useful links:
www.activewin.com/win2000/index.shtml
www.etplanet.net

DETAILS

SYSTEM REQUIREMENTS
Whistler Personal one CPU 233MHz CPU, 64MB of RAM, 2GB of hard disk space. Recommended: 300MHz CPU, 128MB of RAM
Whistler Professional two CPU 233MHz CPU, 64MB of RAM and 2GB of hard disk space. Recommended: 300MHz CPU, 128MB of RAM
Whistler Server four CPU 233MHz CPU, 128MB of RAM, 2GB of hard disk space. Recommended: 300MHz CPU, 256MB of RAM
Whistler Advanced Server CPU
233MHz CPU, 128MB of RAM and 2GB of hard disk space. Recommended: 300MHz CPU, 256MB of RAM

EXCLUSIVE

Tadpole-RDI UltraBook IIi

This transportable SPARC workstation is more than just a toy for wealthy geeks

Today, the x86 PC architecture scales from PDAs to enterprise servers, and it's difficult to point to a line that separates PCs from RISC workstations and servers. Traditional delimiters – lots of storage, high-speed buses, fast processors and multi-user operating systems – are increasingly blurred. Still, differences remain in scalability and reliability.

High-end Unix systems support dozens of processors and hundreds of gigabytes of memory, and multiple machines can be clustered together to share the load. As the hardware and software are closely controlled, unlike the thousands of independent vendors of PC components, these systems can offer 99.999 per cent availability. This means downtimes of a few minutes per year and the ability to remove and replace hardware and software components while the system is in use.

This is why companies such as IBM, Hewlett-Packard and SGI still sell these sophisticated and expensive computers. Arguably the dominant supplier is Sun, whose SPARC processor-powered systems, running Sun's Unix variant, Solaris, are popular in educational, scientific and financial markets, and run many Internet and ecommerce servers.

The UltraBook IIi is a laptop-sized transportable Sun-compatible SPARC workstation with an internal battery that is claimed to last for one hour. Normally, though, you'd wire it to a network and the mains.

The base specification is impressive: 400MHz UltraSPARC IIi processor, 256MB of RAM, integrated 10/100BaseT Ethernet, UltraWide SCSI and a 14.1in 1,024 x 768 TFT LCD display driven by an ATi Mach64 graphics adaptor capable of both 8bit and 24bit operation. There are three device bays, two of which hold a 12GB EIDE hard disk and a battery as standard. Supported options include one battery and two disk drives, or three drives and mains-only operation. Our machine had the maximum 1GB of RAM and a second 12GB drive.

There are also two CardBus slots for two Type II or one Type III device, although Tadpole only supports certain LAN and 56K modem cards. External

floppy and CD drives are available as optional extras, as is a Sun Creator3D graphics module that occupies the left rear bay. With either display, the machine supports simultaneous use of LCD and external Sun monitors – or SVGA with a supplied converter cable. Another cable provides one parallel and two serial ports.

At 326 x 296 x 58mm (w x d x h), the unit is nearly 1.5 times as big as an average notebook PC. This leaves room for an excellent 97-key US-layout keyboard, although the layout is idiosyncratic, with the cursor keys above and to the right of the main block. There's a three-button touchpad and a single Sun mouse/keyboard port for external devices.

The components are good, but build quality is disappointing, with flimsy plastic protective flaps and external labelling in blurry white paint. This may be RDI's influence – early Tadpole systems exuded quality, but this one feels more like an economy clone notebook than a £16,000 top-of-the-range machine.

There's no meaningful way to compare its performance with a PC's, though in workstation terms it has a SPECint95 score of 16.1 and SPECfp95 of 20.4. The MHz rating belies the power of the RISC

processor – by comparison, a 500MHz Pentium III returns around 20.5 and 14.2 respectively. Although Tadpole also offers Solaris 2.51 and 2.6, our machine came preloaded with Solaris 7, plus StarOffice 5.2 and the HotJava browser, with Netscape 4.51 on CD. Tadpole also preloads some useful accessories for power management, suspend/resume and hot-switchable network configuration.

Despite offering a choice of OpenWindows or CDE/Motif GUIs, Solaris feels distinctly clunky and old-fashioned compared to Linux, and we would have liked to see tools such as Perl and Samba supplied as standard. More recent versions of Solaris should fix this, and Sun plans to offer the GNOME desktop as an option in the future. The machine should also run Linux (or xBSD) happily, and this is likely to offer better peripheral support and more personal productivity applications.

This isn't a personal computer; its target market is engineers and salespeople who need to take substantial Solaris applications, from large databases to network management packages, into the field. Compared to a conventional Sun Ultra10 workstation of equivalent specification, the UltraBook is about twice the price. However, Tadpole estimates that if it were carried on-site three times a month, against the cost of shipping a conventional workstation to a customer's site, an UltraBook would pay for itself in just over a year.

For such users, the UltraBook is unbeatable – and it's also a desirable toy with serious pose factor for wealthy geeks.

LIAM PROVEN

PERSONAL COMPUTER WORLD
BEST BUYS

YOUR GUIDE TO TODAY'S TOP PRODUCTS ▶▶▶▶

ENTRY-LEVEL PC
Atlas
Meridian A800T ME

Based on the 800MHz Athlon, this PC has an Asus A7V motherboard, a 1GHz processor and has a 200MHz FSB augmented by 128MB of PC133 SDRAM. There is a 15.3GB IBM hard drive, as well as a Teac CD-RW drive and an eight-speed DVD-ROM drive for movie playback. It's also great for video-in-and-out functionality with a Prolink TV-tuner card.

Review *November 2000, p192* **Price** *£1,173.83 (£999 ex VAT)*
Contact *Atlas 07000 285 275* *www.atlasplc.com*

MID-RANGE PC
Panrix
Magnum 900

Built on the Asus A7V motherboard this PC has a 900MHz Athlon, 128MB of PC133 memory, a 40GB Maxtor DiamondMax Plus hard disk and a BURN-Proof CD-RW. Its DVD is a slot loading AOpen drive, while graphics are covered by a 32MB Radeon. With video piping out to the Mitsubishi Diamond Plus 91 19in monitor this is an excellent mid-range system with Windows Me.

Review *December 2000, p75* **Price** *£1,761.33 (£1,499 ex VAT)*
Contact *Panrix 0113 244 4958* *www.panrix.com*

HIGH-END PC
Systemax **P1000RV**
Entertainment Edn

This is an excellent PC that includes a 1GHz Pentium III, 256MB of PC133 memory, a Pioneer DVD-105, Iomega Zip CD-RW, a Creative SoundBlaster Live! Platinum, a 30.7GB Maxtor DiamondMax hard disk, Cambridge Soundworks speakers, a Hauppauge Win-TV tuner card, an ATi Radeon, a CTX PR960F monitor and more.

Review *December 2000, p181* **Price** *£1,676.73 (£1,427 ex VAT)*
Contact *Simply 0870 7297 366* *www.simply.co.uk*

FULLY-FEATURED NOTEBOOK
IBM
Thinkpad A20P

This well-built notebook exudes quality. The Thinkpad has a mobile Pentium III 700MHz, 128MB of RAM, 16MB ATi mobility M3 graphics, 18GB hard drive, DVD, floppy and all the ports you need except FireWire. IBM's Ultrabay 2000 allows you to swap the DVD for optional extras, and the 1,400 x 1,050 TFT is a shining example of a 15in screen.

Review *November 2000, p93* **Price** *£2,205.47 (£1,877 ex VAT)*
Contact *IBM 0870 010 2512* *www.pc.ibm.com/buydirect*

ULTRA-PORTABLE NOTEBOOK
Sony
Vaio PCG-Z600NE

The Z600NE has taken everything that was good about the original and made it that little bit better. It is built around a 650MHz Pentium III SpeedStep processor, which drops the speed and voltage of the CPU in order to preserve battery power. With 128MB of RAM, a 12GB hard disk, IrDA, a modem and a FireWire socket, the Vaio is both versatile and ultra-portable.

Review *October 2000, p79* **Price** *£2,399 (£2,042 ex VAT)*
Contact *Sony 08705 424 424* *www.sony.co.uk*

PDA
Psion
5mx

The Psion 5mx is a quality PDA weighing 354g. It has a screen resolution of 640 x 240, a serial connector for syncing with your PC and space for upgrading with Flash memory. The keyboard is excellent and responsive, ideal for its word processing capabilities. With 16MB of memory and 15MB of Flash memory this is an ideal handheld computer.

Review *December 2000, p220* **Price** *£347.49 (£295.99 ex VAT)*
Contact *Psion 0990 143 050* *www.expansys.com*

PDA
### Handspring
Visor Platinum

A 33MHz Motorola Dragonball VZ processor makes the Platinum about 50 per cent faster than its predecessor. The battery meter now has a '3D' appearance and the address book functions have single tap duplications.

Review *January 2001, p90* **Price** *£249.10 (£212 ex VAT)*
Contact *Handspring 020 7309 0134 www.handspring.com/uk*

WEBCAM
Creative
WebCam Go Plus

With 8MB of memory and a built-in mic, the WebCam Go can also be used as a low-res handheld snapper or video camera. With excellent image quality and software you can snap up to 150 pictures in 32bit colour.

Review *October 2000, p96* **Price** *£104.57 (£89 ex VAT)*
Contact *dabs.com 0800 138 5240 www.europe.creative.com*

SOUND CARD
Creative Labs
SB Live! Platinum 5.1
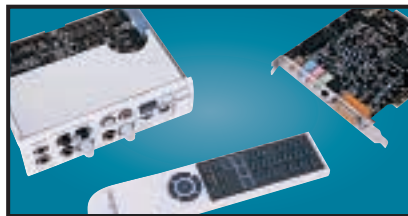
The best consumer sound product just got better. Creative has added onboard 5.1 channel Dolby Digital processing and an infra-red remote control. It's got every connector you could ever ask for and is truly the card for sound enthusiasts.

Review *January 2001, p102* **Price** *£144.52 (£123 ex VAT)*
Contact *dabs.com 0800 138 5240 www.europe.creative.com*

SCANNER
Epson
Perfection 640U

new

This well-rounded 36bit TWAIN-compliant scanner has a maximum optical resolution of 600 x 2,400dpi, is easy to set up and comes bundled with Adobe PhotoDeluxe Home Edition.

Review *February 2001, p188* **Price** *£119 (£101.28 ex VAT)*
Contact *Epson 0800 220 546 www.epson.co.uk*

BUDGET LASER PRINTER
Kyocera
FS-1000

This printer is driven by a 75MHz PowerPC processor, comes with a standard 4MB of RAM and can print up to 1,200dpi. It also has an environmentally friendly re-usable toner drum.

Review *October 2000, p110* **Price** *£304.33 (£259 ex VAT)*
Contact *dabs.com 0800 138 5240 www.kyocera.co.uk*

COLOUR PHOTO PRINTER
Epson
Stylus Photo 870

Aimed at the professional imaging user, our test photo was beautifully rendered, there was no evidence of undesirable banding and skin tones were accurately reproduced.

Review *July 2000, p206* **Price** *£173.90 (£148 ex VAT)*
Contact *dabs.com 0800 138 5240 www.epson.co.uk*

BUSINESS LASER PRINTER
### Hewlett-Packard
LaserJet 4050TN

The 4050TN's 1,200dpi resolution is outstanding, and with a 133MHz NEC processor and 16MB of RAM it can turn out 16ppm. It also comes network-ready as standard.

Review *September 1999, p96* **Price** *£1,185.57 (£1,009 ex VAT)*
Contact *dabs.com 0800 138 5240 www.europe.hp.com*

DIGITAL CAMERA
Sony
Cyber-shot DSC-P1

Squeezing in a 3x optical zoom this compact boasts 3.3megapixels. With 15-60-second video capturing capability and a built-in speaker, there are some great features here.

Review *January 2001, p202* **Price** *£699 (£594.89 ex VAT)*
Contact *Sony 0990 111 999 www.sony.co.uk*

GRAPHICS CARD
ATi
Radeon
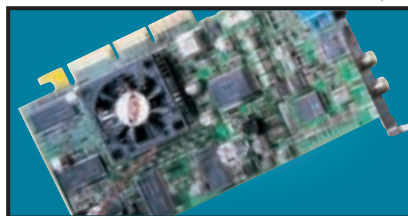
With an integrated Transform and Lighting engine, the Radeon also supports hardware environment bump mapping for lifelike surfaces and its 32bit performance is second to none.

Review *October 2000, p199* **Price** *£229 (£194.89 ex VAT)*
Contact *ATi 01628 477 788 www.ati.com*

MOBILE PHONE
Nokia
6210

Weighing 114g, this lightweight WAP phone has a larger memory than its predecessors and supports HSCSD. It uses Nokia's WAP 1.1 browser, which is the most intuitive around.

Review *December 2000, p87* **Price** *£129.99 (£110.63 ex VAT)*
Contact *Nokia 0990 003 110 www.nokia.com*

EIDE HARD DRIVE
IBM
Deskstar 75GXP

A 75GB drive with an areal density of 11GB/sq in. It has a spindle speed of 7,200rpm, a 2MB data buffer and an average seek time of 8.5ms. A lot of storage for the money.

Review *September 2000, p109* **Price** *£404.20 (£344 ex VAT)*
Contact *dabs.com 020 8523 4020 www.dabs.com*

SCSI HARD DRIVE
Quantum
Atlas V

Increased areal density makes this 36GB drive impressive. It may not be as fast as 10,000rpm drives, but with seek times around 6.3ms and a spin rate of 7,200rpm, it's good value.

Review *July 2000, p100* **Price** *£528.75 (£450 ex VAT)*
Contact *Quantum 01344 353 500 www.quantum.com*

SOCKET A MOTHERBOARD

Abit
KT7 Raid

This motherboard has a HighPoint HPT370 controller for onboard UltraDMA100 IDE RAID for anyone who needs a lot of disk space, a fan on the Northbridge of the chipset for overclocking and an ISA slot for any older cards.

Review *December 2000, p100* **Price** *£139.82 (£119 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.dabs.com*

FC-PGA MOTHERBOARD

Asus
CUSL2
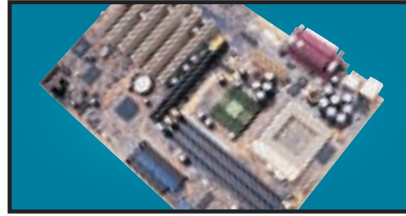
A well laid out 815E motherboard that sports six PCI slots, two CNR slots and an AGP Pro slot. The documentation is first rate and the board is simple to set up. Quite expensive, but certainly worth the money.

Review *November 2000, p219* **Price** *£135.12 (£115 ex VAT)*
Contact *dabs.com 0800 138 5204* *www.asus.com*

PROJECTOR

Ask
M3

This is 60 x 175 x 210 (h x w x d) and weighs in at 1.7Kg. It produces a very bright 1,000 ANSI lumen image, up to 230in diagonal that is easy to read even under fluorescent lights. With DVI and USB at the rear, it is versatile too.

Review *December 2000, p101* **Price** *£5,046.62 (£4,295 ex VAT)*
Contact *Ask-Proxima 01628 666 622* *www.askproxima.com*

17IN MONITOR

Iiyama
VisionMaster Pro 410

This monitor has excellent image quality and vibrant colours. With resolutions on the Natural Flat aperture-grille tube up to 1,600 x 1,200 at 75Hz this unit is an ideal 17in solution.

Review *September 2000, p192* **Price** *£276.12 (£235 ex VAT)*
Contact *Iiyama 01438 314 417* *www.iiyama.co.uk*

19IN MONITOR

CTX
PR960F

Equipped with an FD Trinitron tube this has a constant 0.24mm pitch across the screen. It also has an additional BNC input and a built-in USB hub as standard.

Review *June 2000, p91* **Price** *£374.83 (£319 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.dabs.com*

21IN MONITOR

Sony
Multiscan G500

The name Sony is synonymous with high-quality displays and this 21in FD Trinitron monitor is no exception. It has dual-input connectors and remains crisp even up to 1,800 x 1,440 at 75Hz.

Review *May 2000, p226* **Price** *£911 (£775 ex VAT)*
Contact *Sony 0990 424 424* *www.sony-cp.com*

LCD MONITOR

Synnex
18NE-TD

This 18in display has a native resolution of 1,280 x 1,024 and it only has a DVI connector. When connected to an appropriate graphics card, this will ensure a perfectly sized picture.

Review *November 2000, p121* **Price** *£1,761.33 (£1,499 ex VAT)*
Contact *Synnex 01952 207 364* *www.synnexuk.com*

SPEAKERS

Creative **DTT3500**
Digital Speakers

This is the best audio solution we've seen. It's got its own Dolby Digital processor, great sound reproduction and all the cabling you need to get a home entertainment system up and running.

Review *January 2001 p102* **Price** *£249 (£211.91 ex VAT)*
Contact *Creative* *www.europe.creative.com*

CD-RW

Plextor
PX-W1210TA
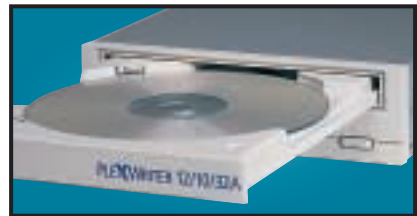
This CD-RW uses Burn-Proof technology and has one of the fastest rewrite speeds around: 10-speed rewrite and 12-speed write, making using this loads of fun.

Review *September 2000, p121* **Price** *£185.64 (£154 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.plextor.com*

REMOVABLE STORAGE

Panasonic
LF-D201 DVD-RAM

With a disc capacity of 4.7GB per side, compatibility with existing 2.6GB and new 4.7GB per side discs, and a versatile software bundle, this is a great product for storing large amounts of data.

Review *October 2000, p98* **Price** *£351.33 (£299 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.panasonic.co.uk*

BACKUP

OnStream
SC30

The SC30 has a 30GB compressed data capacity and using Backup Exec it achieved over 70Mbytes/min. Echo software provides drive-letter access so you can treat it like a hard drive.

Review *September 1999, p102* **Price** *£370.13 (£315 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.onstream.com*

DVD DRIVE

AOpen
DVD 1640 Pro

An impressive 16-speed DVD reader that includes Cyberlink's Power DVD movie player. A first-class unit that marries excellent performance with solid build quality.

Review *August 2000, p196* **Price** *£118.68 (£101 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.aopen.nl*

Internet Networks

With ADSL finally starting to roll out, Nigel Whitfield looks at its viability as well as the other choices available for those wanting to connect their networks to the Internet

ILLUSTRATION MAGICTORCH

As BT finally starts to roll out ADSL, those of you who didn't suffocate while holding your breath may be starting to think about how you'll connect your network to the Internet. If you can't get ADSL there are now plenty of other options.

BT's prices for leased lines are – slowly – dropping, to a point where they may become more economical for some people to consider, especially in central London, where £1,000 a month is enough to supply a 2MB line. A few years ago you'd have paid not far short of that for a 64K link.

There are cable modems too, and flat-rate telephone deals, including BT's SurfTime offerings which some ISPs will allow you to combine with a network dial-up account. This will give you all the access you can eat at a fixed price, which, although probably still too much for some, compares very favourably with leased line prices.

So, whether you're a small company that wants to put Internet access on every desk, or just someone with a couple of computers at home that you want to link together, connecting your whole network to the Internet is a much more realistic proposition than it's been in the past. And while you've always been able to do just that with a dial-up connection, it's been something of a grey area for many ISPs. Now, however, with the Ethernet variant of ADSL and other permanent connections, suppliers are falling over themselves to encourage you to connect all your systems.

As with so many things to do with the Internet, there are lots of different ways you can do it, so we're going to look at some of them here, and explain the different decisions you'll need to make when you connect your network to the Internet.

What do you want to do?

Before you rush ahead and configure all your systems, you really need to sit down and work out what you're hoping to achieve when you connect all your computers. Do you simply want to provide access to the web for all the systems? Or will people want video-conferencing using tools like Netmeeting? What about running a virtual network, linking yours with, for example, a remote office, or home workers? Do you need to run your own servers,

ADSL – the right solution?
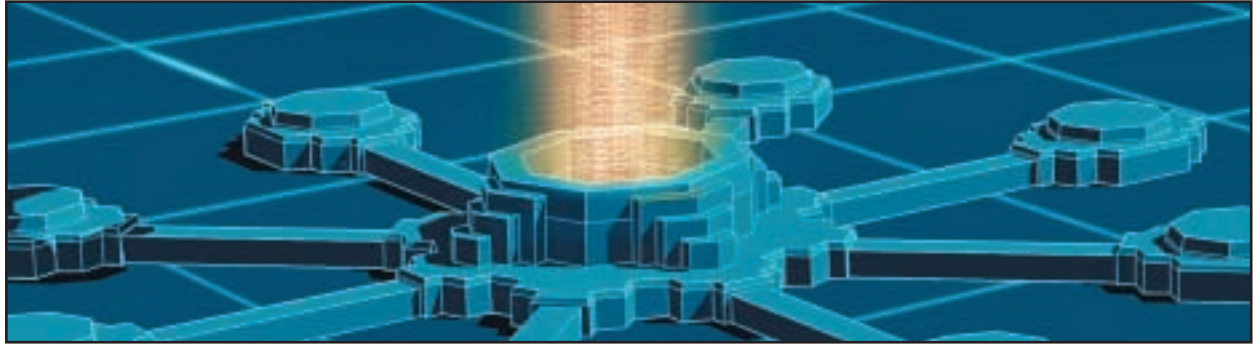
Until recently, if you wanted to link your network to the Internet, you really only had two options: a leased line or a routed ISDN connection with dial-on-demand. The first is expensive, and the second is hard to run servers on, without using dialback systems and running the risk of very large phone bills.

ADSL then, to many, is a heaven-sent solution, offering the possibility of connecting a whole network at a relatively low cost.

There are some caveats to bear in mind, however. First, there's no SLA (Service Level Agreement) with ADSL at the moment. While a fault on a leased line will ensure pretty prompt service, it's by no means clear that you'll have the same speedy response with ADSL, and some of the early adopters have experienced what may hopefully just be teething problems.

If you're anticipating using ADSL for a business where you need guaranteed availability, you might want to wait a little longer. Since no-one is offering an ADSL router with automatic ISDN or modem fallback at present, you'd need to roll your own solution if that was important to you.

The lack of SLA isn't the only thing that may put you off hosting things in-house with ADSL; while download speeds can be up to 2Mbits/sec, the outbound speed on offer is only 250Kbits/sec. Certainly that's faster, and cheaper, than a 64K kilostream link, and it might just do the job for a lightly used web server. Remember that ADSL is contended, which means that if usage is very heavy, you might not get the throughput you expect.

In theory, it shouldn't be an issue, due to the nature of net traffic. In practice, you need

to wait and see; if you want to send a lot of data fast, ADSL may not be the solution for you; the best advice is to experiment and see.

Of course, for high-speed hosting, it's likely that the best solution is to have your web pages or other information served from a machine at the ISP's premises – with such deals from around £75 a month, it may make sense to host your pages there and use ADSL simply to update and administer them.

Or you can wait until the spring, when local loop unbundling may bring better deals, and technologies such as SDSL (Synchronous Digital Subscriber Line), with more realistic speeds for serving information.

In the meantime, ADSL is certainly worth considering, but it may not be the replacement for costly leased lines that many people wished it to be.

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for things like web and email, or will you rely on things hosted at the ISP to cover those for you?

All these things will affect the way you want to set up your network, and what you can do with it. Choosing the right offering from an ISP is essential if you want to get everything working in just the way you need, without exposing yourself to any unnecessary security risks.

There are, broadly speaking, three different ways that your computer network can be connected to the rest of the world; you can have a non-routed connection, a routed connection with Network Address Translation (NAT) and a routed connection without NAT.

A non-routed connection is, essentially, a single IP address assigned to you by your ISP, either permanently or dynamically, changing each time you connect. Ordinary dial-up Internet is a non-routed connection, as are single-user ADSL solutions.

With a routed connection, the link, whether via modem, leased line, ADSL or wireless, is a conduit, along which traffic passes for all the systems on your network. Effectively, your network becomes a part of the network to which it's connected at the other end.

And NAT? That allows systems on a network to be assigned addresses that aren't necessarily the ones by which they're accessed from the rest of the Internet. For example, regardless of which computer at *PCW* someone's using, when they connect to the outside world, the address is translated, and they appear to be using the same system.

NAT can be used for a variety of different reasons – the main reason it's deployed with always-on connections at the moment is to conserve IP addresses; by using NAT, a number of systems can be given addresses in the private ranges.

## NAT a lot of people know that
One of the misconceptions that people have about NAT is that it's some sort of firewall; it's not – or it doesn't have to be.

NAT does exactly what it says on the box – it translates one network address to another, but there are a number of different ways that can be done. When NAT is performing a 1:1 translation, it's just as if all the systems on the network are connected to the Internet; the only difference is that all the traffic coming in and out is redirected through the NAT unit which could

Setting up a network on your PC

1 The first step in setting up your network is installing a network card in your PC. Make sure you follow the usual precautions to avoid the risk of static, and insert the card in to a spare expansion slot inside the system. When you restart the computer, Windows should automatically detect the network card and, if necessary, prompt you for the disk or CD with the drivers on.
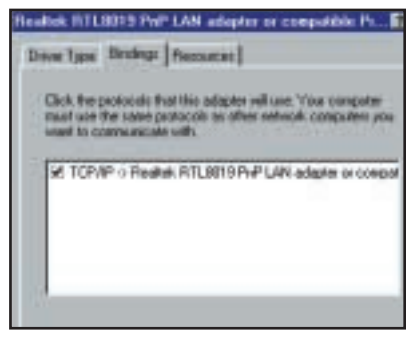
2 You'll need to make sure that TCP/IP is configured to run over the network card. Use the Network Neighborhood Properties to add TCP/IP if it's not already installed, and bind it to the network card. Next, find the TCP/IP entry for the network card, and click the Properties button.

3 If you have a router, cable modem or a server that can assign Internet addresses using DHCP, check the box marked 'Obtain an IP address automatically'. Otherwise, you'll need to give each system a unique IP address, either in the range assigned by your ISP, or in a private range, like 192.168.1.*
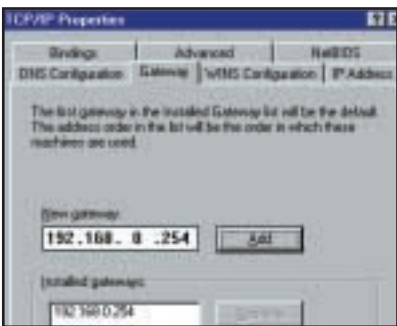
4 The gateway setting is where you enter the address of the router, cable modem or whatever is connecting your LAN to the Internet. Here we've entered the address 192.168.0.254, which is the default address of our ADSL router. If you're connecting to a system that does Network Address Translation, the address to give here is the internal one. Remove any old gateway addresses from other dial-up connections you may have been using.

5 You'll need to configure nameservers too – your ISP should give you the appropriate address to use. If your machines are hidden behind a firewall or NAT, you may need a local nameserver to allow you to access your private systems by name, as well as ones on the public Internet.

6 Finally, when you've made the changes and restarted Windows if necessary, you'll need to connect the network card to the rest of the LAN. If you're connecting directly to a cable modem, you'll most likely need a cross-over Ethernet cable. To connect to a hub, or a router with built-in hub, a standard straight-through cable is used instead. Connect the cables, reboot and you should be able to access the net via your network.

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perform other filtering, acting as a firewall if you wanted. Or it could monitor a group of web servers, for example, and direct web requests to a specific system, based on time of day, load, or other factors.

However, when most people talk about NAT they really have in mind the form of NAT that you'll find, for example, on ADSL connections. Here the mapping is not so simple; it's a one to many translation. That means that multiple systems will

appear to be connected from the same address. For example, take a look on IRC and you'll see all the HomeChoice customers appear to be connected using the machine smtp.homechoice.co.uk.

With this kind of translation, there are certain things that you just can't do, at least, not without the assistance of the people operating the NAT system. You can't, for example, run a web server that people on the Internet can access. The web server usually listens

QUICK TIP

If you're ordering a connection with public IP addresses, remember you need at least three more than the number of PCs – one address is taken up for broadcast messages, one is the network number, and one is needed for the router.

Configuring a Windows gateway

1 For many people, the simplest way to connect their computers to the Internet is by using a Windows-based gateway program. You could use the connection sharing software built in to Windows 98, or you can download a range of different programs that will do similar tasks and offer much more flexibility. One such is WinRoute, which you can find at www.tinysoftware.com.
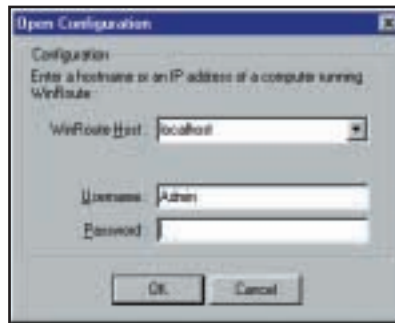
2 After installing WinRoute Pro (a 30-day trial version can be downloaded), you can start it by double clicking on the icon that appears in your computer's system tray. When this screen appears, just choose to connect to localhost – the system the software is running on – and click the OK button.
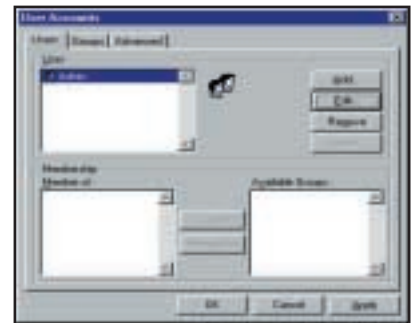
3 Start by changing the password for the administrator. From the Settings menu, choose Accounts, then select Admin, click Edit and type a new password in the boxes provided. The WinRoute engine itself runs all the time, but you'll need this password to access the admin program and change settings.
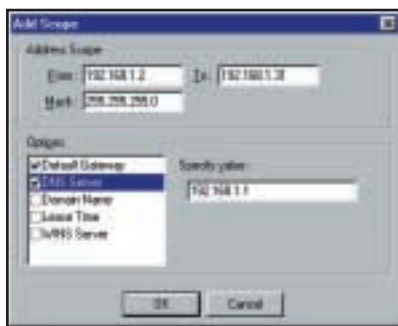
7 To make configuring the client PCs easier, there's also a DHCP server, which means you can automatically allocate IP addresses to each system when it's started up. Choose the server from the Settings menu and click the New Scope button. On this screen, enter the range of private IP addresses to use on the network – remember not to include the address of the WinRoute machine itself – and specify the WinRoute address as the default router and DNS server.
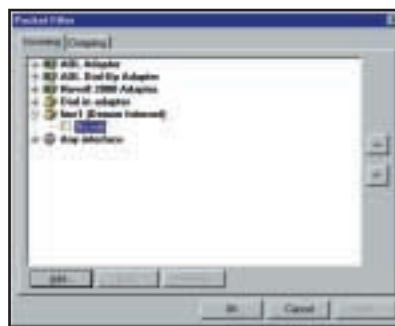
8 You can protect specific systems, or ports on them, using the Packet Filter option. Choose Advanced from the Settings menu, then Packet Filter, and choose to filter incoming or outgoing traffic on one of the interfaces – for example, incoming traffic on the Internet connection. Click the Add button to create a new rule.
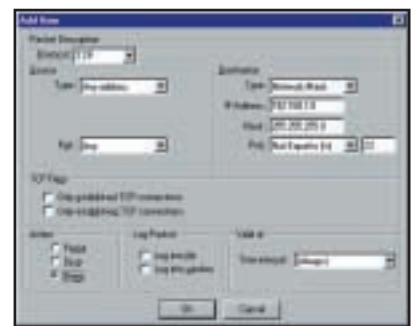
9 This is the rules screen. To prevent any inbound connections except Telnet, for example, add a rule for TCP, denying any connections from any port to any port on your network that's not port 23. You can also prevent just new connections, and filter traffic for other IP protocols. Click OK to add the rule; you can move rules up and down the list, to control the order in which they're checked.

QUICK TIP

To set up a network before you choose your ISP, assign your computers addresses in the 192.168 private range, then use NAT if necessary, rather than renumbering them all when you connect.

on port 80, and there's only one external address, so only one server could be connected, out of potentially thousands of machines. You could, of course, have port 81 on the NAT system routing to your computer, port 82 to a neighbour's, and so on. But it means you'll need to include port numbers in URLs, and lots of people will be confused.

In short, unless NAT is running in 1:1 mode, or you control the translation, there are many things you can't do – anything that

requires your PC to listen on a specific port won't be possible. That means, for example, that you can't make full use of some programs – DCC connections via IRC won't work, nor will some options in chat programs like NetMeeting, or ICQ. If you're concerned about these issues, ask ISPs whether or not you will be able to get them, and whether the connection you are signing up for uses NAT. If it does, chances are that you won't be able to do everything you want.
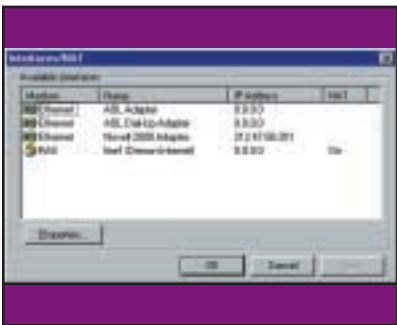
4 From the Settings menu, find the Interface table, which lists all the interfaces installed on your computer. If you're connecting via a cable modem, ADSL or a router, you'll probably have two Ethernet cards. Here we're using a dial-up ISDN connection, which is listed as RAS. You can see the IP address for each interface on the system and whether or not NAT is turned on.
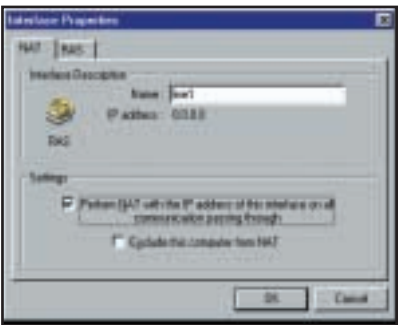
5 WinRoute will try to work out the settings – if you have a dial-up connection, that will be configured for using NAT. To change the s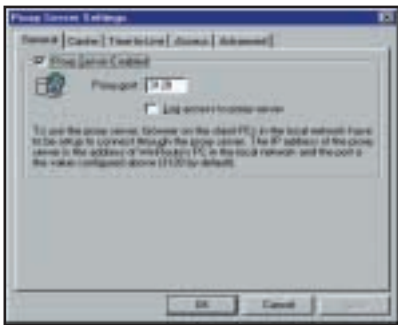ettings, click on an interface, click Properties and this screen appears. You need to turn NAT on for the interface – dial-up or Ethernet – that is being used to connect to your ISP, and off for the other interfaces.

6 WinRoute's proxy server is used to allow all the client systems to access web pages, and it caches pages so that they can be delivered faster. Choose Proxy Server from the settings menu, and make sure that it's enabled. You'll need to configure web browsers with the port number for the proxy that's selected here. The other tabs allow you to decide how much information is cached, or even to restrict access to certain sites.
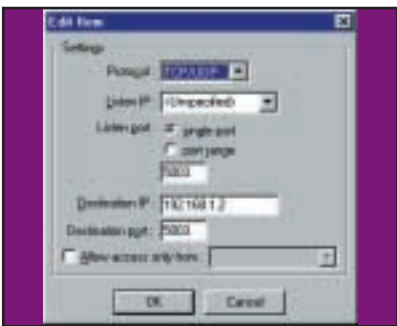
10 The Port Mapping option allows you to direct incoming traffic to a specific system on your network. Choose Port Mapping from the Advanced Settings menu, then click Add. You can fill in the information on this screen, selecting the protocol and port number for requests to be forwarded. Here we're adding a mapping for port 5003 TCP and UDP, allowing people outside the network to access a FileMaker database.
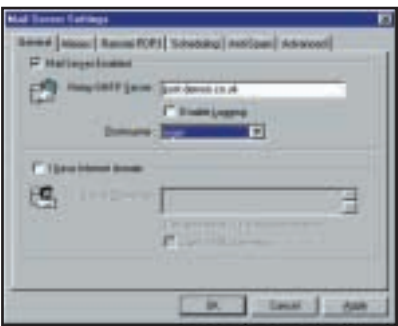
11 If you'd like to distribute email around your network, you can use WinRoute's built-in mail server to collect messages from your ISP. You'll need to create additional users and add passwords for them, then enable the mail server from the Settings menu. The other tabs on this screen allow you to set up aliases, or route mail from specific POP mailboxes at your ISP to local users.
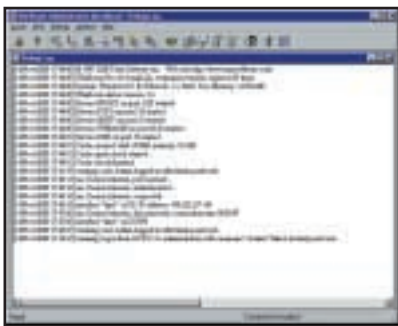
12 For most people, that's about it – if you're using an always-on connection, you're there already. If not, just choose to dial from the Connect menu – or make sure that dial-on-demand is selected in the dial-up settings. Your PCs should be able to connect and access the net transparently – with no need for special proxying software with specific applications.

Protect and survive

One of the most irritating aspects of having a permanent net connection is vulnerability. When your computer is always online, there are people who will attempt to scan for vulnerabilities, and exploit the ones that they find. On a typical NAT connection, they're less likely to be able to find them, since many of the vulnerable ports on systems aren't available via the NAT router.

But don't ever assume that because there is some form of NAT, your computers are secure; if you're using 1:1 NAT, for instance, it may simply be passing all the traffic through to your systems and that could include, for example, some of the currently popular attacks on FTP servers.

Anyone connecting their network to the rest of the world should really be considering using some sort of firewall, either in software or hardware. If you're serious about security, then the best solution is a dedicated computer acting as a firewall; you can either buy one off the shelf, using systems such as the Sonicwall range, or

QUICK TIP

When configuring a firewall, it's simplest to start with all ports blocked, and open them as needed, to ensure there are no holes for people to attack, rather than blocking things you think may be insecure.

Configuring a Linux/Unix gateway

1 As with anything Linux/Unix-based, there's more than one way to do things. We're going to look at using a web proxy and the TIS Firewall Toolkit to hide your network behind a single IP address. You'll need to configure the system first with a connection to the outside world, and if it's connecting via Ethernet, you should really use one card for internal and one for external connections, with each on a separate network.
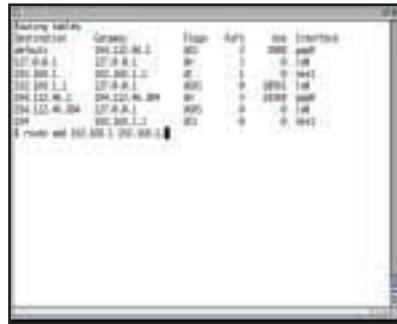
2 If your system gives you the option, turn off IP forwarding, which redirects traffic from one interface to another, and set up routes, for example, if your router has the address 192.168.0.254, you might install one network card with the address 192.168.0.1, and the other with the address 192.168.1.1 for internal systems. Now, type:
```
route add default 192.168.0.1
route add 192.168.1 192.168.1.1
```
(The syntax may differ on some systems).

3 Now the Unix system can talk to the network and to the Internet, but traffic can't pass through. The first thing to do is to enable web access, which you can do using Apache's mod_proxy – you'll need to add it to the server if it's not already enabled. Use ProxyRequests in the configuration file to enable proxying. If the system is running a local web server, you may also want to use the NoProxy directive to allow direct access to those pages.

7 To enable client PCs to use a net-based application, you need to know which port they make a connection on. For example, AmericaOnline uses port 5190 to make a connection. Edit the connection script – it's called tcp.csl in AOL6 – and change the reference to americaonline.aol.com to your own gateway's network address, eg gateway.mydomain.com.

8 Now you need to add an entry in the netperm table for the plug-gateway, which is a part of TIS/FWTK that lets you make arbitrary connections. Add a line that says, for example:
```
plug-gw: port aol ✓
192.168.1.* -plug-to ✓
americaonline.aol.com -port ✓
5190            (Key: ✓ code string continues)
```
You also need to add an entry to /etc/services, listing port 5190 as tcp with the name aol.
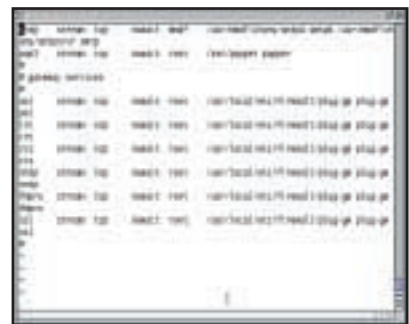
9 Next, the inetd.conf file needs to be updated, so that connections on the appropriate port start the plug-gw program from the toolkit. Add a line that looks like this (syntax varies on some Unix systems)
```
aol    stream tcp    nowait
nouser /usr/local/etc/✓
plug-gw plug-gw aol
```
and then restart inetd using kill -HUP. You can add as many connections as you like, to route specific applications through the gateway.

configure a Linux or Unix box to do the job for you. But remember that while it may be tempting to go for the cheap option, pressing a spare PC into service – and you can see how to do some of it in the walkthroughs – anything with a complex operating system is itself potentially vulnerable. If you're not confident that you can keep a Linux/Unix system secure, you'll probably be better off using a dedicated firewall appliance, which is pretty much just plug and play.

If you have a single user connection, of course, then linking your network will require a little more ingenuity, with some sort of proxy to allow all the systems to access the web; a proxy server is usually used for web access alone, but there are plenty of other things you can do with one, if you take the time to configure it properly – the walkthroughs show how you can use the TIS Firewall Toolkit to set things up if you want a system that you've configured yourself; there are also, of course, solutions such as IPChains for
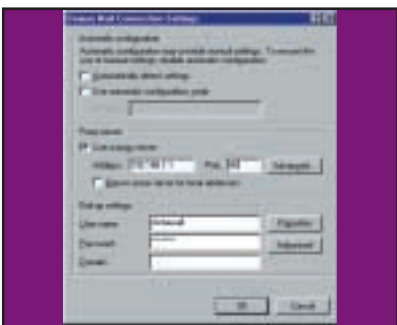
4 All the client systems on the network will need to have the settings for their web browsers updated to use the proxy. Check to enable the proxy, and enter the address of the gateway machine's Ethernet card that's connected to the local network. Once this has been done, you should be able to browse the net from any of the connected PCs.

5 Next, you need to make sure that the gateway system is secure. It's worth checking websites like Cert (www.cert.org) to make sure you're aware of the latest security alerts affecting various Unix or Linux systems. If you want to provide access to the gateway via systems like Telnet, then you should use a tool like tcp_wrappers to restrict which IP addresses can access it, using the /etc/hosts.allow file.

6 To provide more configurable options, download a firewall toolkit or package, such as the one from TIS (www.tis.com). This provides gateways for Telnet, FTP, web and other more general applications, which you can use to proxy just about anything you like. The permissions for all the toolkit gateways are held in the netperm-table file, usually in a directory like /usr/local/etc.

10 As FileMaker Pro uses both UDP and TCP for network connections, on port 5003, you'll need to set up a plug-gw connection, and also route udp traffic with a program like udprelay. A line like
```
relay *.nigelwhitfield.com * ↵
5003 192.168.1.5 5003 any
```
in udprelay.conf would allow any machine in the nigelwhitfield.com domain to contact a FileMaker server on the internal network at address 192.168.1.5.

11 Depending on what other applications you want to run, you may also need to add other proxying software to the system. For example, there are freely downloadable proxy programs for QuickTime and RealPlayer, which you would need to install on the gateway system.

12 Finally, it's worth performing a security check, using tools like this free scanner at www.secure-me.net, which will give you a basic report on your system. Of course, there are plenty of other ways that you can set up a gateway/firewall system too – including some packages that will act much more transparently than the ones we've chosen. But whichever you choose, there's no substitute for understanding what traffic is flowing over your net connection.

Linux which can be configured to route or block traffic, and simpler sharing systems like the Windows 98 Internet Connection Sharing, though personally I wouldn't rely on a Windows system to provide constant network facilities for other computers!

Ultimately, when it comes to linking a network to the Internet, the most important thing is the planning. Before you attempt anything, decide what machines really do need full access, and which programs you will be running that need to accept incoming connections – things like IRC, chat programs, as well as the more obvious web and FTP servers. Even a shared database, like FileMaker, will need configuration of firewall and routing systems if you want people outside your network to be able to connect to it. And if that sort of thing is important to you, remember to ask the right questions before you sign on the dotted line and opt for an ADSL connection that's routed through NAT servers that you can't control.

QUICK TIP

If your ISP is running nameservers, make sure that they include reverse DNS entries for all your IP addresses, even if it's just host-23.mydomain.com – without these set up, many net services may not allow you to connect to them.

64

THE NEXT

The arrival of Intel's long-awaited Itanium processor will mark the beginning of mass-market 64bit technology. Gordon Laing looks at the future and its main players

B Y THE TIME YOU READ this Intel should have launched its long-awaited 64bit Itanium processor. Intel describes Itanium as 'the most significant architecture advancement since 32bit computing', and indeed it seems remarkable that its desktop and server CPUs have been based on 32bit technology since the launch of the 80386 some 14 years ago.

Microsoft is gearing up to launch a brand new 64bit version of Windows 2000 just for Itanium and, despite shaky relations earlier this year, Sun's popular enterprise operating system, Solaris, should also make an appearance for Intel's new baby. With additional support from the legendary AIX Unix, along with a new 64bit version of open-source Linux, the future certainly looks promising for Itanium.

You'd be forgiven for thinking that 64bit computing has only arrived now that Intel and Microsoft are involved. While their involvement will undeniably drive 64bit computing to a wider market, and shake up existing players, it's important to note that 64bit CPUs have been around for many years. Digital's Alpha processor (now owned by Compaq) was 64bit from day one back in 1992, and Sun's 64bit UltraSPARC I arrived just three years later.

If you're used to the dominance of Intel and Microsoft in the desktop PC market, then you'll

platforms are capable of addressing no more than 4GB of memory, which while massive for desktop PC systems, is already becoming far from sufficient for large Internet or intranet databases or complex visualisation applications. Such files could easily be much larger than 4GB, forcing 32bit servers to split and reload data.

However, 64bit platforms are capable of addressing no less than 16TB (Terabytes) of memory, which is four billion times more than a 32bit system. Sun puts this into perspective by saying that current 32bit technology can handle a database big enough to contain the names of every person who has lived in the US since 1977, whereas 64bit is powerful enough to manage the names of every person who has ever lived.

Massive memory support at this level is in theory no different to the significant increase in performance that desktop PCs enjoy when upgrading from, say, 64MB to 128MB.

Big words
Beyond large memory support, the second huge advantage of 64bit systems is their ability to process more information during any given clock cycle. As you may expect, a 64bit CPU is potentially capable of processing twice as much data as a 32bit CPU per clock cycle.

One large 64bit instruction could be processed in a single clock cycle compared to two plus clean-up time on a 32bit CPU. A 64bit CPU

GENERATION

also be surprised to learn how many players are involved in the 64bit arena. IBM, Sun and Compaq each have different 64bit hardware platforms, while AMD has already announced its own proposition due for launch later in 2001. In terms of 64bit operating systems, there's Solaris, Linux, AIX, forthcoming 64bit Windows and more flavours of Unix than you can shake a stick at.

So who is 64bit computing aimed at? Will Intel and Microsoft force existing players out of the market, or perhaps find it difficult to compete at all? Can so many platforms co-exist in the future, and when will 64bit make the move into homes and small businesses?

Why go 64bit?
There are two huge advantages that 64bit has over 32bit: namely the number or size of instructions it can process at any time, and the quantity of memory that can be addressed.

The memory issue has more implications than you'd first imagine. Existing 32bit

could alternatively process four 16bit registers in parallel compared to just two on a 32bit CPU. This is why a 64bit CPU is capable of being faster overall than a 32bit CPU, even if both are running at the same clock speed in megahertz.

Beyond large memory support and the capability of handling bigger or more words, each of the 64bit platforms additionally boasts proprietary architectural enhancements, which the manufacturers claim further improve performance.

64bit hardware
As discussed earlier, there are five main 64bit hardware platforms: Sun UltraSPARC, IBM PowerPC, Compaq Alpha, Intel's soon to be released Itanium, and AMD's forthcoming chip, known only by its codename, Sledgehammer. We'll cover each of these separately.

Intel Itanium
Originally codenamed Merced, Intel's Itanium is a joint effort with Hewlett-Packard (HP),

which abandoned development of its own PA-RISC platform in 1994. Systems built around the Itanium IA-64 architecture should be launched by the end of 2000 and become widely available by the summer of 2001.

The first Itanium is expected to clock in at 733MHz, and already a large number of manufacturers have announced workstations and servers based around the platform. Hitachi, NEC and Unisys are expected to ship 8-, 16- and 32-way Itanium servers by the summer, while Compaq, IBM, Dell, Fujitsu, NCR and HP are also committed. Eight-way refers to a server with eight CPUs working together, and so on.

Intel is quick to cite the unique architectural advantages of Itanium. Rather than tweaking an existing instruction set, as AMD has with Sledgehammer, Intel has instead opted for something completely new. Claiming to boast a long-term benefit in scalability and performance over current architectures, Intel and HP have developed Explicitly Parallel Instruction set Computing, also known as EPIC.

EPIC allows Itanium processors to work on up to 20 operations at once. Intel claims that unlike competitive RISC-based architectures, EPIC can take advantage of advanced compiler techniques and massive processor resources to execute instructions as efficiently as possible.

Of course, without any final systems available at the time of writing, Intel's claims for EPIC and Itanium in general remain unproved. Additionally, while feverish developers ready their software for Itanium, it's also unknown how effectively these will work, especially compared to existing 64bit platforms.

What is certain is Intel's ability to mass-produce CPUs at competitive prices, and market them aggressively. Intel has recognised that in an Internet-dominated future possibly packed with thin clients and information appliances, the real money could be in making components for huge servers. Clearly it hopes the IA-64 architecture debuting with Itanium is going to be its meal ticket in the future.

AMD Sledgehammer

At the Microprocessor forum on 5 October 1999, AMD disclosed details of its forthcoming 64bit x86 architecture and system bus of the future. Both are planned to be used in AMD's eighth-generation CPU, codenamed Sledgehammer, due for launch around the middle of 2001.

AMD plans to extend the x86 instruction set to include a 64bit mode, said to maintain compatibility with existing 32bit software, while boasting the additional performance benefits of a 64bit platform. AMD will achieve this by extending x86 to include a 64bit mode that has both a 64bit address space and a 64bit data

space. Future 64bit processors will be able to detect which mode is needed (32bit or 64bit) and execute accordingly.

AMD's system bus of the future, Lightning Data Transport, is an internal chip-to-chip interconnect that can deliver up to 6.4Gbits/sec bandwidth – around 20 times faster than current 266Mbits/sec system interconnects.

AMD claims that no other 64bit solution has full native x86 32bit and 64bit compatibility. It says that the 32bit emulation modes or instruction sets of other 64bit platforms relegate 32bit applications to second-class status. While a number of independent developers were quoted in a press release claiming AMD's solution would allow faster re-targeting and an easy kernel port, the big question is whether compatibility with today's software will matter to a new 64bit platform in the middle of next year.

As discussed in the section on who should be using 64bit platforms, the support for 32bit legacy software is not one that's particularly relevant in the enterprise market. Then again, while Intel, Sun, IBM and Compaq battle it out for high-end servers and visual workstations, perhaps Sledgehammer will give AMD a unique opportunity to bring 64bit computing to small businesses and even demanding home users.

Such talk is of course cheap, since beyond AMD's initial press release over a year ago, details remain extremely scarce on Sledgehammer.

Sun UltraSPARC

Sun's CPUs went 64bit in 1995, some eight years after the first SPARC station. The first UltraSPARC I RISC CPU ran at 143MHz and was the first 64bit processor to feature MMX-style multimedia extensions. Then 1997 saw the launch of the UltraSPARC II at 250MHz, while in September 2000, the UltraSPARC III made its debut at 600MHz, with 900MHz slated for the first quarter of 2001.

Unlike Intel, AMD and IBM which all have chip fabrication facilities, Sun's UltraSPARC CPUs are manufactured by Texas Instruments. Sun claims this gives it better risk-management, as it doesn't leave the company vulnerable to over-investment or fluctuations in supply and demand. Sun also claims to implement improvements to its CPUs one generation at a time to further reduce risks. Architectural enhancements are apparently made on odd-numbered UltraSPARCs, while finer manufacturing processes are rolled out on even-numbered UltraSPARCs. So saying, the latest UltraSPARC III enjoys a finer 0.18micron process than its predecessor.

Sun claims the UltraSPARC III will run code written for the UltraSPARC II, but that it will scale to 1,000 processors as opposed to the UltraSPARC II's 64. Sun is keen to play the reliability, experience and scalability cards, but companies such as IBM believe its servers using PowerPC processors produce better performance with fewer CPUs.

IBM PowerPC

IBM's PowerPC RISC processor was launched in 1990, but didn't go 64bit until 1998 with the Power3 platform, which includes the PowerPC 604e and PowerPC RS64 CPUs. The latest RS64 IV is available up to 600MHz, and the forthcoming Power4 platform is on target for release in the second half of 2001.

IBM believes its PowerPC platform offers better scalability and higher performance with a smaller number of CPUs than both the Intel Itanium and Sun's UltraSPARC systems. While IBM produces servers and workstations built around its PowerPC platform, the company is also committed to offering Itanium systems depending on customer requirements.

IBM's latest high-end eServer p680 is a powerful successor to its earlier S80, boasting 6, 12, 18 or 24 64bit RS64 IV CPUs running at 600MHz each. IBM claims this 24-way server outperforms Sun's 64-way E10000 server and HP's 32-way V2500 server in the popular TPC-C transaction benchmark – and at a much lower cost.

Compaq Alpha

Launched at 200MHz in 1992, Digital's Alpha was one of the first 64bit CPUs. Compaq now owns the Alpha platform, and in a number of deals and cross-licensing, it's actually fabricated by Samsung, Intel, AMD and IBM.

Compaq claims the Alpha is still the fastest CPU produced since 1992 and, like Sun and IBM, readily quotes benchmark results that place its AlphaServers at the top of the pile. The current top-of-the-range Alpha CPU is the EV67, which has peaked at 667MHz for some time now. Compaq's own high-end AlphaServer SC series scales between 64 and 512 processors, although a recent supercomputer built for the French Atomic Energy Commission consists of no fewer than 2,500 Alpha EV67s.

While Compaq is keen to point out benchmarks that indicate superiority in typical enterprise applications from Oracle, Baan and PeopleSoft, the Alpha seems to have been more widely adopted in workstation configurations by the scientific and special-effects industries. Interestingly, when quizzed about competitors, Sun and IBM always talk about each other, but rarely mention Alpha platforms. Like IBM, Compaq is also committed to making systems based around the Intel Itanium.

64bit software

A 64bit CPU is no good without the right software to drive it, and this ideally means having both a 64bit operating system and 64bit applications. To understand the implications of performance, it's important to remember exactly what an operating system does.

Every time you access a file, be it to open, save or create a new one, you're using the operating system, not the application. The operating system also traditionally handles network, display and printer transactions. Consequently a 64bit operating system plays a vital part in any 64bit platform.

Most 64bit operating systems additionally offer support for existing 32bit applications that may not yet be available in 64bit versions. While the best overall performance will require 64bit software throughout, the fact that a 64bit OS is quickly handling all the background and file management tasks should allow legacy 32bit applications to enjoy some benefits from the faster platform.

While most desktop PC users simply install Windows and rarely worry about software compatibility, application support is a crucial consideration when choosing a 64bit platform. Since each of the 64bit hardware platforms is architecturally different, all software has to be separately ported, which may or may not be an easy task, or one that the vendor is willing to undertake. Obviously those packages and OSs that are easily ported are going to enjoy the broadest adoption.

Typical 64bit applications also require highly specialist support, so it's not ideal to opt for the platform that has the most expensive or least available technicians and analysts. While the enterprise and Internet server world has been traditionally Unix dominated, Microsoft's NT and more recently Windows 2000 offerings are steadily increasing in popularity and wide support.

64bit Windows

Little is currently known about 64bit Windows, except that Microsoft has made its Windows 2000 code base 64bit ready and is working towards delivering a fully featured 64bit OS in time for Itanium's launch. Crucially, it will also be backwards-compatible with existing 32bit Windows 2000 applications, although the performance of these under Itanium is currently unknown. It's certainly likely that for the best 32bit application

performance, you should stick with the Pentium III, 4 or AMD's Athlon and Duron CPUs.

Microsoft is also helping 64bit Windows application development by providing tools to port applications easily to IA-64. The important thing to note is the exclusive support for IA-64. Currently Microsoft has not announced a version of 64bit Windows for any other 64bit platform, including AMD's forthcoming Sledgehammer, although to be fair to all involved, the latter CPU is still quite some way off.

Linux

The Trillian project was founded in April 1999 with the goal of providing a single, unified port of Linux for Intel's IA-64 architecture, which is both optimised for the platform and open-source, in time for the launch of Itanium. Participating in the Trillian project are Caldera, CERN, HP, IBM, Intel, Red Hat (Cygnus), SGI, SuSE, TurboLinux and VA Linux Systems. More information is available at www.linuxia64.org.

CERN is providing glibc (the GNU C library). HP provided the initial kernel and glibc port, and is continuing work on them. IBM is providing performance tools, measurement and analysis. Intel is providing IA-32 support, IA-64 platform port, Apache port, EFI, FPSWA, SCSI, SMP and libm support. Red Hat (Cygnus) will provide the GNUPro Toolkit (GCC, G++, GDB), and GNOME. SGI is providing an optimised C compiler, KDB and kernel support. SuSE will provide KDE support. TurboLinux will provide performance counters. VA Linux Systems is leading the project and providing kernel support, SMP, platform, boot loader, commands and libraries, Xfree86, E, E-Term and IA-32 support.

Caldera, TurboLinux, RedHat and SuSE have already posted test versions of 64bit Linux for Itanium, and it's set to be one of the big operating systems for Intel's new platform. This Itanium version should also allow Linux to break out of the low-end server market where it currently enjoys great success.

AIX5L

AIX is IBM's own flavour of Unix, but the company recently teamed up with SCO, Intel and others to create a unified version that would run on IBM's PowerPC, along with Intel's IA-32 and new IA-64 platforms; codenamed Project Monterey, it was completed this summer, and given the name AIX5L.

The L refers to a certain degree of Linux compatibility. IBM claims that a simple recompilation of Linux code is all that's required for it to run under AIX5L. This allows customers to combine Linux applications with the higher-end scalability and availability of AIX. Unless Solaris arrives, AIX looks like offering the most robust, industrial-strength Unix environment for Itanium.

Sun Solaris

Sun's latest Solaris 8 operating system is available primarily for its own UltraSPARC systems, but Sun claims that an Itanium version is still part of its plans. Sun currently bundles Oracle8i Enterprise Database and Apache Web Server with Solaris, and says it will continue to do so with Solaris on Itanium.

Earlier in 2000, there appeared to be differences emerging between Sun and Intel, although problems now seem to be resolved, with claims of Solaris 8 being available for Itanium at or shortly after launch. However it's interesting to note that most analysts only refer to Linux, AIX and 64bit Windows when talking about Itanium operating systems, and rarely mention Solaris as an option.

Who uses 64bit platforms?

Today, 64bit platforms are designed for high-end servers and workstations. The former are used to power some of the biggest websites or databases in the world, while the latter calculate DNA patterns or render the graphics for movies such as *Titanic* and *Star Wars*. The bottom line, though, is that none are used to play Quake with the highest frame rates or to get the most out of Office 2000.

Despite the fact that many home or small-office power-fanatics like the sound of 64bit computing, it's not designed for them. Well, not yet anyway. Intel has no intentions for IA-64 to be targeted outside enterprise or scientific applications for some time, and certainly few if any users would have an IBM, Alpha or Sun 64bit system in their home.

About the best bet for 64bit computing in the home or small office looks set to be AMD's Sledgehammer, as the company is going to have a hard time making a significant dent in the enterprise market with such huge and established competition. This may lead AMD to turn towards the consumer and small business market.

64bit computing has a huge impact on our day-to-day lives both today and in the future. Not only does it power most of the large websites today, but it'll also be behind the Application Hosting services that are set to revolutionise the way we purchase and execute our applications in the future.

PROJECTING 3D IMAGES INTO SPACE MAY NOT BE QUITE AS FAR AWAY AS YOU THINK

3D or not 3D

IF THERE EVER WAS a sci-fi dream, it's to conjure up images floating in space – true 3D images that you can view from any angle. Who can forget that classic *Star Wars* moment when Princess Leia, projected as a shimmery hologram by R2D2, asks for Obi-Wan's help? Now the dream may be getting closer to reality, with Massachusetts start-up Actuality Systems saying that it has a revolutionary new product shipping 'soon' – a display capable of creating 3D images that hover in space.

Despite much research, especially at MIT during the 1990s (**www.media.mit.edu/ people/lucente/holo**), the kind of projected video holography used by R2D2 isn't yet a reality, but there are other technologies. Most, such as the autostereoscopic displays developed by Dimension Technologies (**www.dti3d.com**) and Sharp (**www.sle.sharp.co.uk/ research**), are based on the principle of presenting each eye with a slightly different view of the same image, and letting the brain perform its miracle of 3D perception.

But such displays aren't truly 3D – the 3D-ness of their image exists only inside our heads. Making 'volumetric' displays that really do display 3D images in 3D space is a much tougher problem. In principle, a volumetric display is an obvious extension to the conventional 2D display. Just as a 2D display lights up pixels in a 2D grid, a volumetric display renders images using a 3D grid of 'voxels'. And like a pixel, each voxel can be assigned a colour and intensity. The hard part is engineering the voxel grid.

Recently, engineers Barry Blundell and Adam Schwarz published the first-ever book about volumetric displays (*Volumetric Three-Dimensional Display Systems*, Wiley, ISBN 0-471-23928-3). Incredibly, the idea dates back to 1912, when two French inventors, Emile Luzy and Charles Dupuis, obtained a patent for their proposed system that created voxels at points in a solution of selenium chloride, illuminated by intersecting beams of infra-red light.

Today, the focus is on using 'swept volume' methods, which use virtual voxels. The voxels don't really exist in space – we only see them at all because of our persistence of vision, which lets us 'see' an image for about one-thirtieth of a second after the actual image is removed from view. The idea is that a rotating 2D screen displays a series of 2D slices of a 3D image, and each image trace left by a pixel becomes the virtual voxel.

It's on this principle that the Actuality Systems display seems to work (**www.actuality-systems.com**). The display takes the 3D image data as a set of 200 or more 2D slices, each of which has a disk diameter of 768 pixels. A rotating mirror reflects each slice in turn onto the moving display screen, which, with the help of our persistence of vision, sweeps out a trail of images that lasts long enough to give the impression of a real 3D image. The system will have 6GB of display memory, to cope with 90 million virtual voxels and there'll be an OpenGL programming interface. 'We expect to begin low-volume production some time in 2001,' said company founder Gregg Favalora.

If Actuality Systems comes up with the goods, and we hope it does, the next step will be to integrate true 3D imagery and realtime interaction using Force Feedback. The glass barrier that separates us from the computer model will disappear forever. One day soon, something like R2D2's hologrammic projections may become commonplace, although the images we'll see are more likely to be drug molecules and CAD designs, than the pleas of an inter-galactic princess.

TOBY HOWARD

Hologram-type images could be a reality soon as research into virtual voxels continues

RESEARCH INTO QUANTUM PARTICLE STORAGE COULD PUT A NEW SPIN ON COMPUTING

Quantum leap

WE'VE REPORTED SEVERAL TIMES on developments in quantum computing – the use of subatomic particles for storing data and performing massively parallel computations. But just when we think we've covered the latest development, something new always pops up. According to the latest research from the University of Michigan, it's possible to store a database as large as the British Library in – wait for it – a single electron.

The humble electron is almost unimaginably small and inhabits that mysterious quantum realm where every 'particle' leads a weird double life – it's also a wave. Particles are fairly easy to picture: they're little blobs of 'stuff', and we can imagine them bouncing around and clumping to form atoms and molecules. But waves? Waves of what, exactly? Here's where it begins to get strange. The waves are purely mathematical constructs, representing probabilities. Yet they have some kind of physical reality too.

Until recently, quantum computing researchers have treated fundamental particles as 'particles' with an associated spin. A given electron can spin 'up' or 'down', so up can

represent a 0, and down a 1 (or vice-versa, it doesn't matter). But, and this is perhaps the biggest 'but' in all of quantum mechanics, until it's actually measured, an individual electron is simultaneously in both states – it's somehow spinning both left and right (don't try to visualise this, it's impossible). Only when you measure the spin does it become left or right. What this means is that if, before you measure it, you can persuade an electron to take part in a computation, you get two results for the price of one: you get the result of the electron representing a 0 (spinning up) and a 1 (spinning down). Do this with a bunch of electrons and you have massively parallel computation. This much has already been demonstrated in the laboratory.

But the latest research is focusing on the wave-like nature of the electron. Physicist Philip Bucksbaum of the University of Michigan is storing data in the waves associated with a single electron, encoding a string of 0s and 1s (http://gomez.physics.lsa.umich.edu/~phil). In the initial experiments, he's working with a single caesium atom, excited by short bursts of laser light. After exposure to the light, the overall energy of the atom is increased, sending its electrons to higher-energy states. It's these states that can be used to encode binary data. The theory was worked out in 1997 by quantum computing pioneer Lov Grover at Bell Labs, but this is the first time it's been demonstrated to work in the lab.

At the moment, Bucksbaum is only storing eight bits in an electron, but according to theory there's no practical limit to the amount of data that could be stored. He's refreshingly honest about his team's experiments: 'It is important to keep this study in perspective,' he said. 'It's a new concept. Most researchers are using the spin of a quantum particle as a storage medium. Our work may turn out to be a step on the pathway to a viable quantum computer system or it could be a complete dead end. The field is still too new to know which approach will succeed.'

Today, quantum computing remains firmly in the research labs, at the 'proof of concept' level, and there are formidable practical difficulties to overcome – like making it all work at anything approaching room temperature. But if it ever goes mainstream, watch out. A single program run by a single quantum computer will pack more processing power than the sum of all the conventional computers ever built.

TOBY HOWARD
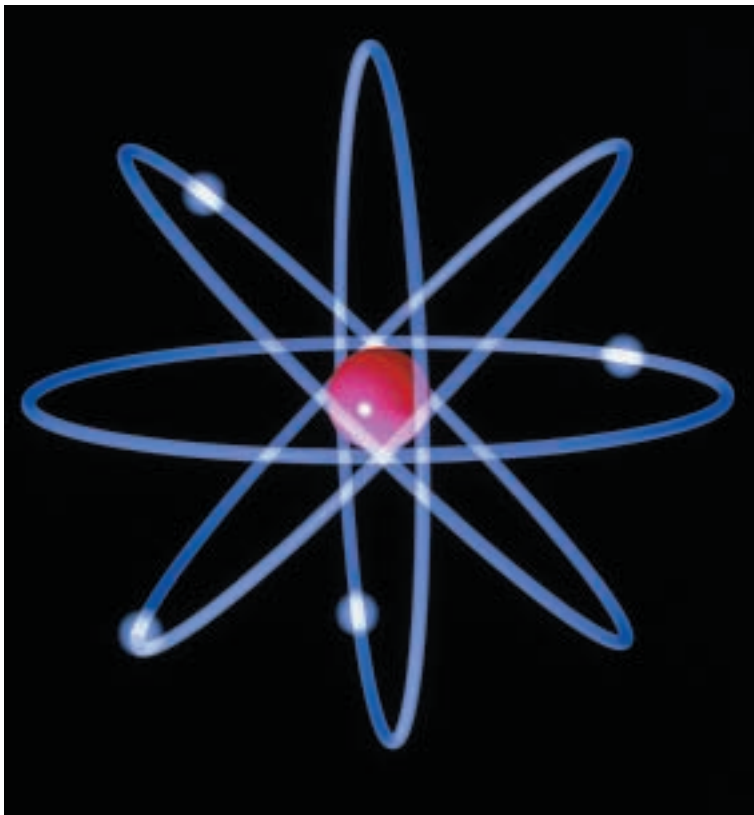
NEW YEAR NEW PC

It's time to check out the January sales, so we've put together 13 value-for-money PCs that won't break the bank at £1,200

Now that the Christmas rush is over, for the bargain hunters among us the start of a new year means just one thing – New Year Sales. If you held back from buying a brand new PC before Christmas in the hope of finding a bargain in the January sales, then this is the group test for you. We invited 13 PC manufacturers to meet the challenge of putting together a fully featured PC that was geared towards value for money.

With a price limit of £1,200 ex VAT, we set the following minimum specification: a 750MHz processor or faster, 128MB of RAM, a 20GB hard drive with some form of backup device, a 17in monitor, 32MB graphics card and Microsoft Windows Me. We also asked for Internet connectivity and reasonable multimedia capabilities. The software bundle was left up to the supplier but the final price had to include delivery, a three-year parts and labour warranty and any credit card surcharges. Most of all, though, we had to feel that we were getting the best value possible for our hard-earned cash.

contents

• PCs tested by Lars-Goran Nilsson, reviewed by Scott Montgomery and Jalal Werfalli

Atlas **Meridian A1000 PW**

ATLAS HAS BASED this system on AMD's 1GHz Athlon processor. This popular CPU is plugged into the socket of an excellent Asus A7V motherboard. As well as supporting both UltraDMA66 and UltraDMA100 standards, the VIA KT133 chipset on the Asus board is compatible with both PC100 and PC133 SDRAM.

Atlas has sensibly opted to install 128MB of PC133 memory in the form of a single DIMM, leaving two DIMM slots free. The quality choice of main components helps Atlas score an impressive 177 points in our SYSmark tests, gaining second place overall.

Two of the three available 5.25in bays are occupied by a Teac CD-RW and Hitachi DVD-ROM drive, and the bundle includes one CD-R and one CD-RW disc. An UltraDMA100-compatible 30.7GB IBM hard disk completes the storage solution.

The supplied Diamond SupraSST internal modem provides connection to the Internet and sound is admirably taken care of by a VideoLogic SonicFury sound card and DigiTheatre LC surround-sound speaker system. Graphics from the GeForce2 MX AGP card are fed to a 17in CTX PR705F monitor. The picture is vibrant and steady and the unit will comfortably handle a resolution of 1,280 x 1,024 at 75Hz. 3D performance is also above average in the group, with the Atlas coming fourth and sixth overall in our 3DMark and Quake III tests respectively. With impressive 3D scores such as these we were pleased to see that Atlas has catered for gamers by including a Genius joystick, and a decent selection of games that includes FIFA 2000. You can connect the MX card to a TV, or receive a TV signal through the Prolink TV tuner.

A copy of Lotus SmartSuite Millennium is bundled, which offers everything you need. The inclusion of a Lexmark Z12 inkjet printer and Umax scanner has helped make this a well-rounded system that offers the best value for money.

DETAILS

PRICE £1,408.83 (£1,199 ex VAT)
CONTACT Atlas 07000 285 275
www.atlasplc.com
PROS Good-quality components; impressive performance; extra peripherals
CONS Not as nifty as some others on test
OVERALL With an impressive array of peripherals and a decent level of performance to boot, the Atlas makes the grade for Editor's Choice

FEATURES	★★★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★★
OVERALL RATING	★★★★★

Dell **Dimension 4100 1000MHz**

DELL'S SYSTEM IS based on Intel's 815E chipset. Plugged into the FC-PGA socket on the Dell-branded motherboard is a 1GHz Intel Pentium III processor. The powerful CPU is backed up with 128MB of PC133 memory in the form of a single DIMM. This leaves only one DIMM slot free.

Performance-wise, the Dell only managed a lower than average SYSmark score of 162. However, most users will find this more than adequate.

Connection to the Internet is via an Aztec V.90 internal modem. This fills one of the five available PCI slots. A second PCI slot is occupied by a Turtle Beach Santa Cruz sound card that feeds a pair of Altec Lansing speakers.

Graphics are handled by the now aging nVidia TNT2 M64 chipset. Connected to the 32MB TNT2 card is a Dell-badged 17in monitor with a maximum resolution of 1,152 x 864 at 75Hz and a rather curved face – not quite in the same league as other screens here. Compared to other PCs here, the poor graphics let this system down.

The Dell only managed to outrank the Gateway in our 3DMark and Quake III tests. We would rather have seen a GeForce2 MX graphics card in the system. That said, the TNT2 card is still capable of running all but the most demanding of games.

A modest 20GB hard disk is supplied and is complemented by an LG CED-8080B CD-RW drive. The latter comes with both a CD-R and CD-RW disc. An NEC DV-5700A DVD-ROM drive completes the optical complement.

Dell has bundled an HP DeskJet 610C printer plus parallel cable with the 4100. Together with the copy of Microsoft Works Suite 2000, this means that you can be productive from day one. Overall, Dell has put together a sensible package that performs adequately in most areas but is let down by its poor 3D performance. However, if a printer and decent office package are your main priorities, then you could do worse than the Dell.

DETAILS

PRICE £1,408.83 (£1,199 ex VAT)
CONTACT Dell 0870 907 5664
www.dell.co.uk
PROS Good overall package; printer and cable included
CONS Poor graphics and monitor let down the rest of the system; small hard disk
OVERALL A machine that fulfils the criteria we set but fails to shine above the others in the group

FEATURES	★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

evesham.com **Origin 1000MX**

AS THE NAME SUGGESTS there's a 1GHz Athlon processor residing on the VIA KT133-driven Chaintech 7AJA motherboard inside this offering. And with 128MB of PC133 memory occupying one of the three DIMM slots, the Origin manages a respectable overall SYSmark score of 169, placing it pretty much in the middle of the pack.

Lifting the lid, the first thing that strikes you is the overall tidiness. Most of the cables are neatly held back, while the power cables are all shielded, indicating that care has been taken during the system build. There's plenty of room for motherboard expansion too, as four PCI slots are free together with a single ISA slot for any older cards you may have kicking about. However, when it comes to adding some extra drives you have only one empty 3.5in bay to play with.

The 3DPower GeForce2 MX card is a cheaper graphics option, but that's not to say it can't do the job. With 3,328 3DMarks and 46.9fps in Quake III, the Origin should handle today's games without any problems. A built-in TV-out also adds the versatility to connect the card to a television if you're after a bigger window.

The Mitsubishi Diamond Plus 73 monitor can only be described as a mediocre example of a Diamondtron NF tube. While it is a flat, aperture-grille tube with an inherently vibrant picture, it did suffer from poor power regulation.

The onboard sound has been disabled and evesham.com has opted for a card that's pretty standard on many of the PCs on test. The SB Live! Value card is good, while the speakers provide four-point surround sound.

A well-sized 30GB UltraDMA100 hard drive from Maxtor, and a Panasonic CD-RW take care of storage, while a 16-speed Pioneer DVD-ROM should do your discs justice.

However, in terms of value for money, the Origin has not got that much to offer, as peripherals are few and far between. Microsoft Works Suite 2000 is bundled, but not much else. So although it is a fine example of a PC we can't recommend it as a New Year bargain.

DETAILS

PRICE £1,408.83 (1,199 ex VAT)
CONTACT evesham.com 0800 038 0800
www.evesham.com
PROS Decent sized hard drive; tidy innards
CONS Limited expansion; no peripherals
OVERALL If the monitor had been better and a few more peripherals were thrown in, this could be a winning PC

FEATURES	★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

Gateway **Performance 1000**

NOW HERE'S A processor you rarely see: a 1GHz Pentium III. Athlon-based systems frequently have this clock speed, but Pentium III-based systems are rare. With 128MB of PC133 memory onboard we would have expected this system to be blisteringly fast, however it is far from a good performer, sitting at the bottom of the 3D graphics tables and in the middle of the SYSmark tables.

The motherboard is Intel 815E-based, which provides the necessary UltraDMA100 support to match the 20GB Western Digital hard disk. Considering all these factors, it is surprising that the Gateway didn't perform better.

The motherboard has four PCI slots and one shared PCI/CNR. Of these, the shared slot is occupied by the PCI modem and one of the PCI slots is occupied by a cut-down SoundBlaster Audio PCI 128D sound card. This card has no joystick port, although this system has four USB ports (two front and two rear) and, considering many gaming peripherals are USB these days, the lack of the port is of little consequence. You won't be able to plug in your old faithful joystick though, without a convertor. The speaker system is a set of Boston BA265s.

The TNT2 M64 graphics card is rather long in the tooth and is just not up to competing with modern cards at resolutions of 1,280 x 1,024, which is why this system did so poorly in the 3D results. With a frame rate well below 20fps, games will be unplayable at this sort of resolution. It is a shame such an outdated component lets this system down so badly.

The monitor is a Gateway-branded EV700 17in unit. The optical drives are a Philips CD-RW providing eight-speed writing, four-speed rewriting and 32-speed reading. A Panasonic SR-8586 DVD drive allows DVD reading at 16-speed and CD reading at 40-speed.

With Works Suite 2000, this bundle has the software you'll need to work from the word go. Overall this system is not too bad, but its performance leaves a lot to be desired. A GeForce2 MX card would have made a huge difference.

DETAILS

PRICE £1,432.32 (£1,219 ex VAT)
CONTACT Gateway 0800 552 000
www.gateway.com/uk
PROS Front USB ports
CONS Very dated graphics card; over budget
OVERALL With an MX card for around £120, this system could be good. As it stands, its graphics performance is awful

FEATURES	★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

Mesh **Matrix 1000T**

THIS IS ALMOST identical in terms of specification to the Panrix, apart from the monitor (a 19in Iiyama) and the case. The Mesh case has an unclippable drive bay (with one bay free) for easy installation or removal of hard disks. The drive is a 30.7GB IBM Deskstar.

One 5.25in bay is free, with the other two occupied by the Teac CD-RW and a Pioneer DVD-115. Both optical drives are on different EIDE cables connected to the two UltraDMA66 sockets on the

Asus A7V motherboard. This is the optimal setup for optical disc copying. The hard disk is connected to the primary UltraDMA100 socket, allowing it to perform at its maximum bandwidth transfer of 100Mbytes/sec. The other socket is free for upgrade.

The processor is a 1GHz Athlon. Memory is in the form of a single 128MB stick of PC133 memory. It is good to see Mesh is now using this faster memory. Two DIMM sockets remain free for memory upgrades. The motherboard has four PCI slots and one shared PCI/AMR slot, two of which are filled. One is occupied by the SoundBlaster Live! Value sound card and the other by a Conexant HCF V.90 modem. The sound card pipes out to FPS1000 speakers.

The graphics card is a 32MB Hercules 3D Prophet 2 MX. This is a brilliant low-cost graphics solution at a fraction of the price of the full-blown

GTS card. The performance is excellent, though, as the Quake III result shows, 41.4fps being a very playable frame rate at 1,280 x 1,024 in 16bit colour.

The SYSmark score is slightly lower than the similar Panrix, with the Mesh scoring 165 overall to Panrix's 176. Considering the similarity of specification between the two systems, this discrepancy is a little odd, and must be the result of the drivers being used or tweaking of the setup of Windows.

With Microsoft Works Suite 2000 this system has software to get you up and running straight away. It is a good solid entrant, just slightly slower than comparable machines.

DETAILS

PRICE £1,408.82 (1,199 ex VAT)
CONTACT Mesh 020 8208 4706
www.meshcomputers.com
PROS Mesh has finally put PC133 memory in this system!
CONS Not as fast the Panrix
OVERALL A good solid system at a good price, although as the Panrix shows, it could be faster

FEATURES	★★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Multivision **Vision Elite Pro GTS**

WITH ITS 900MHZ CPU this is one of the lowest clocked Athlon systems and as a result languishes at the bottom end of all the results graphs – except the Quake III test where it blasted its way to fourth place by producing 69.1fps.

The motherboard is an EPoX EP-8KTA2 with the KT133A chipset. The board has 128MB of PC100 memory, with two DIMM slots free. The speed of the memory is doubtless partly responsible for the lower SYSmark

scores, although the most likely culprit is the lack of VIA 4-in-1 drivers for the motherboard.

There are five PCI and one shared PCI/ISA slots, of which three PCI and the shared slots are free. The inclusion of an ISA slot is unusual these days, and is a welcome feature if you have old cards. The occupied PCI slots are filled with the modem and a Sound-Blaster Live! 5.1 card, which pipes its output to the excellent VideoLogic DigiTheatre LC speaker system. For sound enthusiasts this machine is worth a second glance.

The hard disk is a 30.7GB IBM Deskstar, while for optical storage a Mirai CRD-BP1300P CD-RW and a Hitachi GD-7500 DVD drive are installed.

Sitting in the AGP slot is a 64MB Hercules 3D Prophet II Pro. This is why the Multivision clawed out the frames it did in Quake III. It is distinct from the 64MB 3D Prophet 2 GTS, which has a memory speed of 366MHz, whereas this

Pro version runs the memory at a blistering 400MHz. Not only this, but the card is more stable than the GTS because the core is running at 200MHz – in other words, it is not overclocked to make the card fast as it is in the 64MB GTS. The Pro also has S-Video for connecting your PC to a television. The video card outputs to a Mitsubishi Diamond Pro 720 monitor, which has a fairly sharp image.

The system comes with Lotus SmartSuite Millennium and is an all-round good entrant. The sound and graphics combination is excellent – shame about the 4-in-1 drivers.

DETAILS

PRICE £1,526.33 (1,299 ex VAT)
CONTACT Multivision 0121 550 8000
www.multivision.co.uk
PROS 3D Prophet 2 Pro gives excellent graphics performance
CONS Missing 4-in-1 driver slows results; over budget
OVERALL Apart from the glitch with the drivers, this is a decent system

FEATURES	★★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

NEC Direction SM-1000A

THE NEC SYSTEM IS built on a Micro-ATX motherboard from MSI, the MS-6340. However, this has limited upgrade options, so we're not sure why NEC chose it. The system achieved a SYSmark score of 170, though, which placed it near the middle of the table. The processor is a 1GHz AMD Athlon. The board has two DIMM slots, with a 128MB stick of PC133 memory occupying one. There are also two PCI slots and a shared PCI/CNR slot.

The SoundBlaster Live! Value provides an output signal for the Labtec LCS-2414 speakers. The modem is a Conexant soft U56 model. If you're into upgrading, you will want to steer clear of this machine as only the shared slot is free plus the DIMM slot, and there are three free 3.5in drive bays, but only one free EIDE channel.

The graphics card is a Leadtek 32MB nVidia GeForce2, which allows the system to claw its way to second place in the 3DMark table with a score of 5,215 at 1,280 x 1,024 in 16bit colour. Its Quake III score was similarly impressive at 80.3fps.

The card pipes out to an NEC-branded VR19 19in monitor. The image on this is fairly good; although the lower fascia is a bit big and makes the screen look smaller than it is. The video card has an S-Video output for those who like to connect their PC to a TV.

The hard disk is a 30GB Quantum Fireball, and for optical storage an LG CED-8080B CD-RW is included, giving eight-speed writing, four-speed rewriting and 32-speed reading, while for DVD handling there is a Pioneer DVD-115 with 16-speed DVD reading and 40-speed CD reading.

With a Logitech webcam and a stereo headset thrown in, this system isn't too bad. What hinders it is the lack of upgradability. If you don't need to upgrade though, it is fast for games. And with a pretty good software bundle, including Encarta, Microsoft Flight Sim 98 and Works 2000, you could do a lot worse.

DETAILS

PRICE £1,408.82 (1,199 ex VAT)
CONTACT NEC 0870 010 6322
www.nec-online.co.uk
PROS Good performance results in 3DMark and SYSmark
CONS No real upgrading options
OVERALL This is a good system, although with few options for upgrading it can't offer much in the way of future proofing

FEATURES	★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

Hints and tips for buying a new PC

In the market for a new PC? *PCW* has put together a few guidelines to help you find the one best suited to your needs.

First up, take time to research what you really want. Do you need a PC for gaming? If so, a top-notch graphics card should be high on your list. Or perhaps you want one for business or to use for educational assignments. If so then performance may not be a priority, whereas software will. Either way be sure you know your requirements before you shop, as you might end up spending over the odds on an unsuitable system. A good place to start is the adverts in the pages of *PCW*, which will give you a good idea of what's out there and let you compare prices.

So where should you buy? Nowadays the high-street stores are under heavy fire from Internet retailers. With lower overheads, these mail-order companies are able to undercut their rivals, offering some very tasty deals.

If you do decide to save some money by buying in this way, confirm the order in writing so that you have something you can refer to if there's a dispute. In addition, when buying over the Internet always use a major credit card that offers a buyer's protection/insurance policy.

A new PC will invariably come with an operating system pre-installed – either Microsoft Windows 98, Me or 2000. Sometimes this is all you get, so remember to ask about or make room in your budget for the software you need. An office suite such as Microsoft Office or Lotus SmartSuite Millennium is perhaps the most important.

With today's bloatware software, consider getting the biggest hard drive that you can buy, preferably larger than 15GB. Furthermore, a CD rewriter or perhaps an alternative media drive such as those from Iomega will be useful to back up data.

Memory is important too. Many retailers are still offering 64MB of RAM, but 128MB will handle intensive applications far better. Also, check how many DIMM slots are free just in case you wish to add more memory later.

The monitor and graphics are very important as this is how you interface with your computer. Many monitors come with perfectly flat screens that are very comfortable to use. Graphics cards also have a variety of ports. Look out for S-Video and composite ports and dual D-SUB ports if you want to run two monitors at the same time.

A modem, sound card and speakers should be included, but again the need for these depends on your situation and some manufacturers might not include these at all. Remember – always ask.

JALAL WERFALLI

Packard Bell **ixtreme 9100**

THE TRANSPARENT borders on the monitor, case and keyboard are not to everyone's liking, but it's refreshing to see something other than beige.

Inside is an MSI motherboard sporting an 800MHz Pentium III mounted in the FC-PGA socket. This board uses VIA's Apollo Pro 133A chipset, which supports a 133MHz bus and 4x AGP – handy, as the 128MB of memory in one of the three DIMM slots conforms to the 133MHz standard, and

the nVidia GeForce2 MX card is AGP 4x ready.

The ixtreme does reasonably well in the 3D tests and is up there with the other MX-based systems, but the slower clocked Pentium leaves the system in last place in the overall SYSmark score with a rating of 133.

The 17in Packard Bell monitor just isn't up to the job. With a shadow-mask tube that's curved and reflective it's not very comfortable to look at. Worse still, there's an overall lack of focus across the picture. However, there is a power supply around the back for the pair of Diamond Multimedia speakers.

As for storage, a Philips CD-RW allows backups to be made from the vertically mounted 30.7GB hard drive or directly from the NEC 12-speed DVD-ROM drive. The Creative SoundBlaster Live! Value card processes sounds to the speakers and sits in one of the five PCI slots. Fitted in two other PCI slots are a Hauppauge WinTV tuner for viewing

television on your PC, and a FireWire card that sprouts a total of four ports (one at the front, one internally and two at the rear) – ideal for DV cameras. One PCI slot is available for future additions.

The two motherboard-based USB ports are filled by the keyboard and mouse, but that is not a problem as there are a further two USB ports on the front of the PC. It's therefore a shame that nothing else was included to make use of these ports. No office software was present, either.

The ixtreme has got connectivity sorted out but this is let down by a poor monitor, minimal software and a warranty that extends to only one year.

DETAILS

PRICE £1,499 (£1,275.74 ex VAT)
CONTACT Packard Bell 01628 508 200
www.packardbell-europe.com
PROS FireWire and extra USB ports; good-sized hard drive; different styling
CONS Poor monitor; slower performance; over budget
OVERALL Can't match the others in terms of value for money, performance and software

FEATURES	★★★
PERFORMANCE	★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

Panrix **Magnum 1000W**

THIS SYSTEM FROM Panrix doesn't come in the large case we have seen over the past few months, although it still stays cool with front and rear fans keeping the air moving throughout. The 1GHz Athlon is no longer cutting edge, but is still a very fast processor.

The Asus A7V motherboard has five USB ports as standard, as well as four EIDE sockets (two UltraDMA66 and two UltraDMA100). Connected to one of the UltraDMA66 channels is the Acer

CD-RW, while the other holds the Hitachi DVD-ROM. This may seem a waste of the connectors, but it is actually the best configuration for CD copying software as the two drives don't share the bandwidth on the channel. On one of UltraDMA100 channels is the 30.7GB IBM Deskstar hard disk.

The motherboard has four PCI slots, one PCI/AMR shared slot and an AGP Pro slot, which holds the very fast, inexpensive 32MB Hercules 3D Prophet II MX graphics card. The motherboard also has three DIMM slots of which one is occupied by a single 128MB stick of PC133 memory. Of the PCI slots, two are occupied – one by the SoundBlaster Live! 1024 and the other by the Diamond Supra modem.

The Creative four-point surround speaker system doesn't cater for digital sound, but helps to keep the price down. The monitor is a Hansol 900P. This 19in model provides an excellent image, with

the OSD controlled by a single wheel mounted on the lower fascia. The screen is not the flattest around, but then general image quality is just as important as flatness.

Performance was respectable on the Panrix with a SYSmark score of 176, although we have seen faster scores from 1GHz machines in the past. In Quake III it managed 45.4fps at 1,280x 1,024 at 16bit, which is a more than playable frame rate.

The Panrix is a neat system that is well put together. The components are well set up, although the performance isn't as fast as some previous 1GHz machines we've tested.

DETAILS

PRICE £1,408.83 (1,199 ex VAT)
CONTACT Panrix 0113 244 4958
www.panrix.com
PROS Well configured system with quality components
CONS Performance lower than we expected
OVERALL A good solid PC, with good upgradability and some fine components installed

FEATURES	★★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Polar **Parsec 1100**

A 1.1GHZ ATHLON pounds away in this machine, along with one of the lowest profile heatsink and fan combinations we've seen. The veins of the heatsink remain totally cold and a check of the BIOS reveals a super-cool processor temperature of 29-33 degrees – amazing for an Athlon of this clock speed.

A single 128MB PC100 DIMM is present, which is a pity as this system would have been a bit faster with PC133. There are two DIMM slots free for upgrade. The motherboard is a Jetway 663AS, which utilises the VIA KT133 chipset.

The motherboard has onboard sound, which is not state of the art, but the VIA-based AC'97 is adequate for most purposes. The two Yamaha speakers and subwoofer deliver good sound. The onboard sound shouldn't put you off as it's no worse than a low-end sound card and keeps a PCI slot free. The motherboard has four PCI slots, an AMR and a shared PCI/ISA slot. One PCI slot is occupied by the modem.

The motherboard unfortunately doesn't support UltraDMA100, so the 30.7GB IBM Deskstar hard disk doesn't run at its optimal bandwidth, instead running at UltraDMA66. The optical drives on this system are attached to the other EIDE cable. The Sony CRX140E CD-RW provides removable storage, while for DVD and CD reading, a Hitachi GD7500 is installed.

The graphics card is a Hercules 3D Prophet II GeForce2 GTS. This 64MB version of the card (along with the mammoth processor) has placed the Polar firmly at the top of both the Quake III and 3DMark tables. The monitor is a Mitsubishi Diamond Pro 720 19in model.

With Lotus SmartSuite Millennium, this is a good basic system. There are lots of slots for upgrading as well as a quality graphics card and processor combination for gaming. It's a shame about the PC100 memory and the lack of UltraDMA100 support. Had these been in place, this system could have been the winner.

DETAILS

PRICE £1,410 (1,200 ex VAT)
CONTACT Polar 0161 482 7000
www.polartechnology.com
PROS Fast graphics and an all-round good-quality system
CONS PC100 memory and no UltraDMA100 support
OVERALL The failings lose this system the crown. It is excellent for fast graphics though
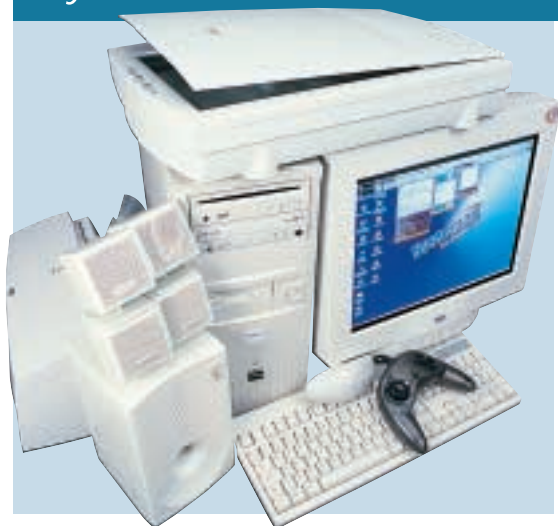
FEATURES	★★★★
PERFORMANCE	★★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Systemax **A1000RV Lifestyle 0250**

DESPITE HAVING A 1GHz Athlon driving it, the Systemax doesn't manage to pull itself out of the bottom half of any of the tables – although none of the scores are really poor. Like Multivision's entrant, the Systemax did not have the correct 4-in-1 VIA drivers installed, so the scores do not reflect the quality of the hardware installed.

The motherboard is a Biostar M7VKB and installed in one of the three DIMM slots is a single 128MB stick of PC133 memory. This system has legacy support in the form of a shared PCI/ISA slot, which may be relevant for those with older cards. There are also four PCI slots and an AMR. The AMR, the shared slot and one PCI slot are free for upgrade. There is one 3.5in and one 5.25in bay free.

A SoundBlaster Live! Value, a Hauppauge WinTV TV tuner card and a Rockwell modem sit in the occupied PCI slots. The sound card pipes out to a set of FPS1000 speakers.

For low-cost fast graphics, the 3D Power GeForce2 MX card is an ideal solution, although in this system the scores don't reflect that. The excellent CTX PR705F monitor has vibrant colours and a good crisp image. Even without the 4-in-1 drivers, a quick game of Quake III at 1,280 x 1,024 soon shows you that this is a good machine.

The hard disk is a 30.7GB Maxtor, which will be sufficient for most users.

As for optical drives, a slot-loading Pioneer DVD-105S sits in the uppermost bay, with an Iomega ZipCD below. This isn't the fastest writer on the market, (with eight-speed writing, four-speed rewriting and 32-speed reading), but it is adequate. Ten blank CD-Rs are also bundled.

With a Umax scanner and a Xerox printer included, this system is ideal for someone looking for a complete setup. It also has a SideWinder gamepad and a games bundle that includes the excellent Homeworld. Lotus SmartSuite covers work needs too. It's not leading edge, but if you picked up one of these in the sales, you wouldn't be disappointed.

DETAILS

HIGHLY COMMENDED COMPUTER WORLD

PRICE £1,408.83 (1,199 ex VAT)
CONTACT Systemax 08707 297 366 **www.simply.co.uk**
PROS Good all-round system with an excellent monitor
CONS 4-in-1 drivers not installed
OVERALL With the 4-in -1 drivers installed, this system will be an excellent all-round purchase for the novice PC user

FEATURES	★★★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Time Machine 1100-7s VQ Pro

ONE OF TWO MACHINES sporting AMD's 1.1GHz processor, Time's entry is also one of the speediest in the test. Its A7V motherboard is also considered by many to be one of the best around. It comes with four EIDE channels, two of which are UltraDMA100 compatible, although surprisingly Time has connected the hard drive to one of the standard EIDE channels, even though the Fujitsu drive supports UltraDMA100.

Plugged into one of the three DIMM slots is a 128MB PC133 module helping the Time to reach the top spot in our SYSmark results with a score of 178. This could have been higher but the memory was configured to run at 100MHz rather than 133MHz.

In terms of expansion, two free PCI slots are available for upgrade, along with another that's shared with the AMR. Two 3.5in and one 5.25in bays are also empty for upgrade and with the potential to add a further five drives to the EIDE channels your options are not limited. Time has used the extra USB backplate on the motherboard to supply three more USB ports. However, the third port was not connected.

A Hercules GeForce2 GTS 32MB graphics card together with its iridescent memory heatsinks, is connected to an LG Flatron 775FT 17in monitor. This card is no slouch as its scores of 77fps in Quake III, and 5,049 3DMarks show. The Flatron is a slotted mask model, but doesn't have damping wires. It provides an image that's bright and in focus across the screen.

A Teac CD-RW can also be used to make backups from Pioneer's 10-speed slot-loading DVD drive.

Audio comes courtesy of Creative's SoundBlaster Live! 1024 pumping sounds out to the retail boxed FPS1000 speakers, also from Creative. An adjustable Saitek Cyborg 3D joystick is thrown in for gamers.

Time has brought together a quality range of components in a quick PC. A candidate for the Editor's Choice, Time instead gains a Highly Commended award due to some small oversights.

DETAILS

PRICE £1,410 (£1,200 ex VAT)
CONTACT Time 01282 777 555
www.timecomputers.com
PROS Fast processor and graphics card; room for expansion
CONS Not configured to its full potential
OVERALL An excellent performer with the added bonus of upgradability, but it could have been even better

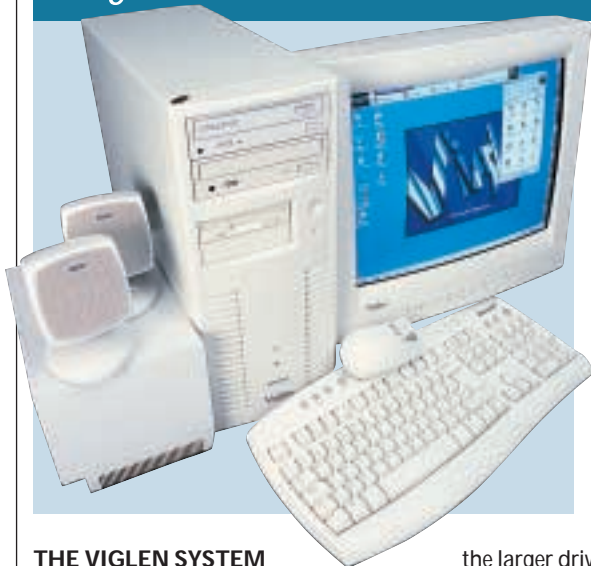|	
FEATURES	★★★★
PERFORMANCE	★★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Viglen HomePro P3-800 FWR

THE VIGLEN SYSTEM has a Pentium III processor driving it along at 800MHz. This is not the fastest-clocked processor in the tests and it sees the HomePro sitting second from bottom in the SYSmark table with a score of 147, some 31 points below the leading system. A single 128MB bank of PC133 memory is included. There are two free DIMM slots available for memory upgrades, although the 815E-based Intel motherboard can only support 512MB of memory, so the limiting factor is not the slots, but the motherboard's capabilities. The board has five PCI slots, of which two are occupied. There are also two free 3.5in bays.

Installed in the PCI slots are a SoundBlaster Live! Value sound card and a Diamond Supra modem. The sound card pumps out to a set of Altec Lansing ACS33 speakers.

The 40GB Western Digital hard disk is one of the larger drives in the test. A Creative RW8435E CD-RW is installed in the top 5.25in bay and a Pioneer DVD-115 below it provides 16-speed DVD and 40-speed CD reading.

The graphics card is an ATi Radeon with Video In and Out. This 64MB card is ideal for the video enthusiast and for those who want to watch DVD movies. This is due to the Radeon being the best non-dedicated card for processing DVD decoding, which along with the Pioneer DVD drive makes a fine combination. Also, with the connectivity options to the rear, a cable can be connected up to a TV for viewing DVDs – and there are loads of cables included to help you hook things up.

A Viglen-branded 17in monitor gives a screen image that is largely OK, although on our test unit the focus in the corners wasn't magnificent. The colour representation was a bit dull too.

If you want to link PCs together, the motherboard has onboard networking. Microsoft Works Suite 2000 is included, but apart from the networking aspect, this system is unremarkable.

DETAILS

PRICE £1,410 (1,200 ex VAT)
CONTACT Viglen 020 8758 7000
www.viglen.co.uk
PROS ATi Radeon card and cables provide video versatility
CONS Monitor wasn't wonderful quality in our test unit
OVERALL The system is aimed more at the working than the home environment with its onboard network capabilities

FEATURES	★★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

How we did the tests

SYSmark 2000

This comprises 12 application workloads and a management program. The workloads are divided into two categories: office productivity and Internet content creation. We run the benchmark at a resolution of 1,024 x 768 in 16bit colour. It loops three times, rebooting between each workload.

It then assigns the system a performance rating for each application, based on a comparison of workload runtimes between the system being tested and a fixed calibration platform. A rating of 100 indicates the test system has performance equal to that of the calibration platform, 200 indicates twice the performance and so on. The calibration platform is based on a Pentium III 450MHz processor, an Intel 440BX chipset motherboard, 128MB of SDRAM, a 32MB Diamond Viper V770 Ultra graphics card, an IBM DJNA 371800 and Windows 98 SE.

Each category rating is a geometric mean of the workload ratings in that category. The overall rating is a weighted geometric mean of the category ratings.
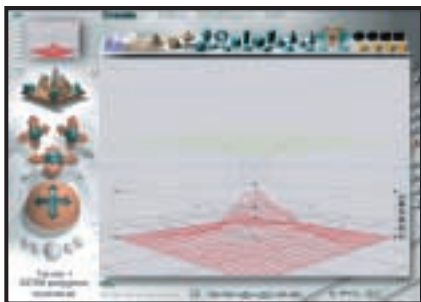
Office productivity

Corel CorelDraw 9.0
This script first takes an abstract design, applies an Art Stroke to it and runs various filter effects. It creates and manipulates a scene composed of vector graphics. Next, it takes a raster image and applies effects. It creates several 3D objects and performs 3D manipulations.

Corel Paradox 9.0
This performs SQL-style queries on a database table and runs a 'find duplicates' query. It imports other text files, formatting and exporting each to HTML. Then it opens up query forms, enters

additional data and produces reports based on queries.

Microsoft Word 2000
This workload invokes word processing functions, including editing, spell checking, search and replace, font change, copy and paste, print preview, mail merge fields, insert hyperlinks, background and table formatting plus opening and viewing HTML pages.

Microsoft Excel 2000
Operations include closing and opening spreadsheets, HTML pages and data in text files, spell checks, formula calculation, plotting data, formatting charts and cells, analysing data in pivot tables, naming a cell and inserting hyperlinks.

Microsoft PowerPoint 2000
Operations include spell checks, editing, formatting and moving pictures, applying templates, formatting tables in slides, inserting hyperlinks, applying header and footer data, formatting

3DMark 2000 tests each system's DirectX performance (above) and OpenGL performance is tested via Quake III: Arena (right)

Bryce 4 script manipulates a wire frame scene and renders it

charts, applying graphics and sound effects, and adding movie files.

Dragon NaturallySpeaking Preferred 4.0
The script plays a pre-recorded wav file into Naturally-Speaking, which then converts the wav file to text.

Netscape Communicator 4.61
This opens a website of plays by Shakespeare and selects and loads the texts several times. Then it loads a page consisting of large tables, thumbnails and images and cycles through viewing the images.

Internet content creation

Adobe Premiere 5.1
This creates an animation of about 16 bmp files and other avi clips and puts transitions between them. It superimposes two audio tracks and runs the audio through filters.

Adobe Photoshop 5.5
The script loads, resizes, zooms out of images, applies filters to the images, changes mode and colour settings, adjusts image brightness and contrast and saves the image to a jpeg file.

Avid Elastic Reality 3.1
The workload sets up and renders a morph between two MPEG2-sized images (720 x 480 pixels, roughly 750KB).

MetaCreations Bryce 4
This script opens an assembled wire frame scene and renders it to the final image. Then a new image is opened and saved in Metastream format. Another image is opened and saved in an HTML-compatible format.

Microsoft Windows Media Encoder 4.0
The input file is an avi clip that is encoded using the MPEG4 Video Codec.

3DMark 2000

Remedy Entertainment's MAX-FX is used to test the DirectX performance of a system. It runs two specially coded games at low, medium and high resolutions. We ran the benchmark at 1,280 x 1,024 in 16bit colour, with each game set to loop three times. The 3DMark is calculated by adding the frames per second for each game together and multiplying the result by 12.

Quake III

We tested each system's OpenGL performance with Quake III: Arena (1.11). The settings were: video mode – 1,280 x 1,024, colour depth – 16bit, full screen, highest texture detail, texture quality – 16bit, texture filter – bilinear, lighting and lightmap. At command prompt we typed:
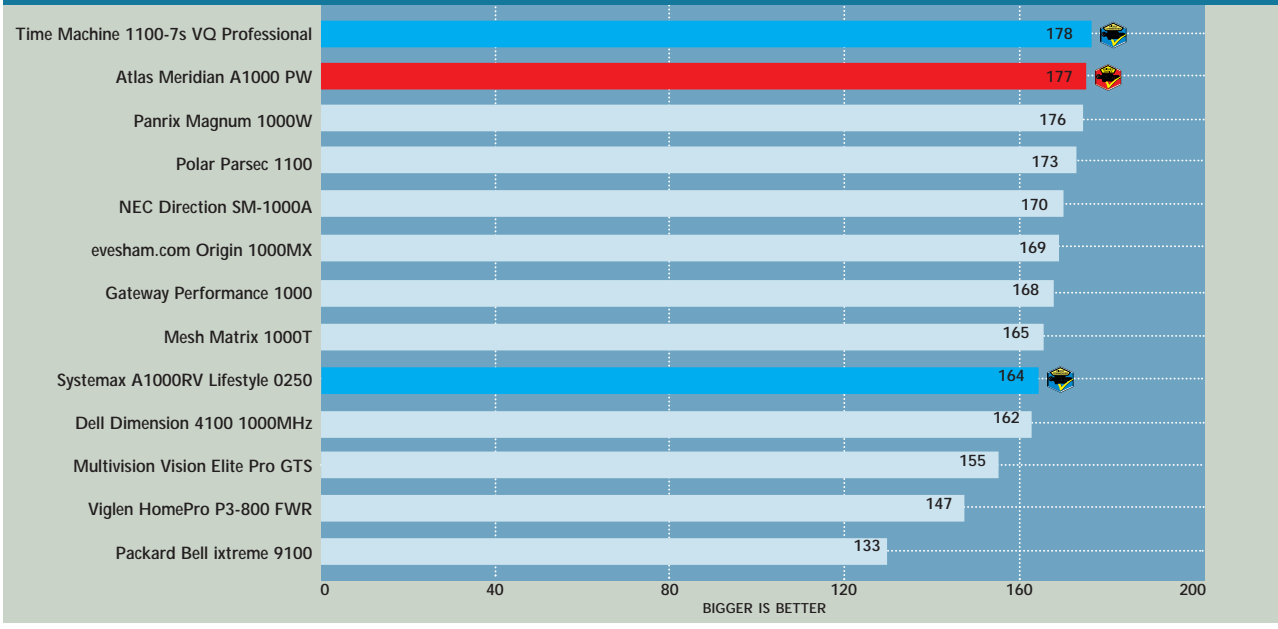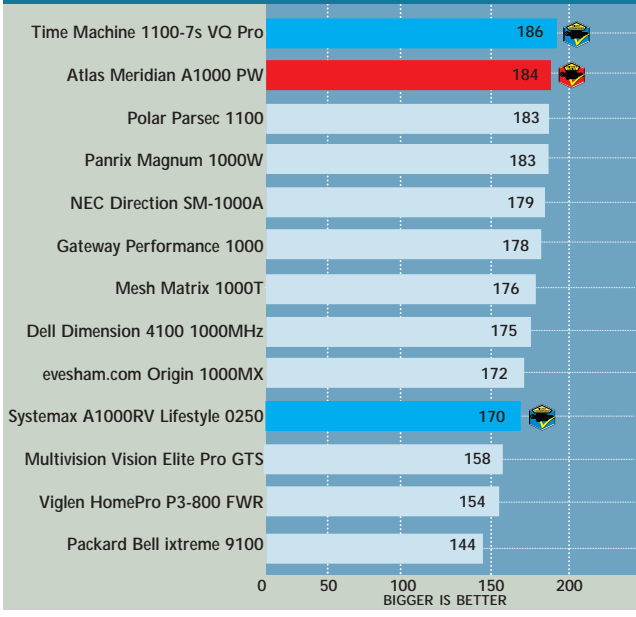```
timedemo 1
demo demo001
```
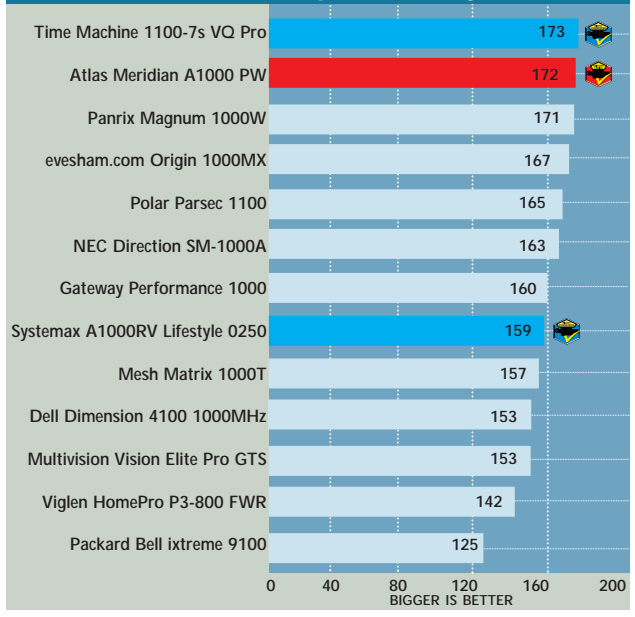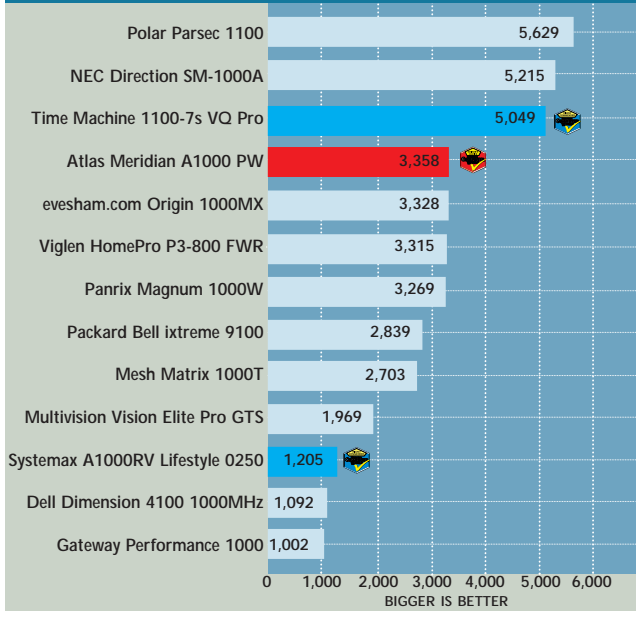This runs demo 1 and records the frames per second.

## SYSmark 2000 overall

BIGGER IS BETTER

| System | Score |
|---|---|
| Time Machine 1100-7s VQ Professional | 178 |
| Atlas Meridian A1000 PW | 177 |
| Panrix Magnum 1000W | 176 |
| Polar Parsec 1100 | 173 |
| NEC Direction SM-1000A | 170 |
| evesham.com Origin 1000MX | 169 |
| Gateway Performance 1000 | 168 |
| Mesh Matrix 1000T | 165 |
| Systemax A1000RV Lifestyle 0250 | 164 |
| Dell Dimension 4100 1000MHz | 162 |
| Multivision Vision Elite Pro GTS | 155 |
| Viglen HomePro P3-800 FWR | 147 |
| Packard Bell ixtreme 9100 | 133 |

## SYSmark 2000 Internet content creation

BIGGER IS BETTER

| System | Score |
|---|---|
| Time Machine 1100-7s VQ Pro | 186 |
| Atlas Meridian A1000 PW | 184 |
| Polar Parsec 1100 | 183 |
| Panrix Magnum 1000W | 183 |
| NEC Direction SM-1000A | 179 |
| Gateway Performance 1000 | 178 |
| Mesh Matrix 1000T | 176 |
| Dell Dimension 4100 1000MHz | 175 |
| evesham.com Origin 1000MX | 172 |
| Systemax A1000RV Lifestyle 0250 | 170 |
| Multivision Vision Elite Pro GTS | 158 |
| Viglen HomePro P3-800 FWR | 154 |
| Packard Bell ixtreme 9100 | 144 |

## SYSmark 2000 office productivity

BIGGER IS BETTER

| System | Score |
|---|---|
| Time Machine 1100-7s VQ Pro | 173 |
| Atlas Meridian A1000 PW | 172 |
| Panrix Magnum 1000W | 171 |
| evesham.com Origin 1000MX | 167 |
| Polar Parsec 1100 | 165 |
| NEC Direction SM-1000A | 163 |
| Gateway Performance 1000 | 160 |
| Systemax A1000RV Lifestyle 0250 | 159 |
| Mesh Matrix 1000T | 157 |
| Dell Dimension 4100 1000MHz | 153 |
| Multivision Vision Elite Pro GTS | 153 |
| Viglen HomePro P3-800 FWR | 142 |
| Packard Bell ixtreme 9100 | 125 |

## 3DMark 2000 (1,280 x 1,024 at 16bit)

BIGGER IS BETTER

| System | Score |
|---|---|
| Polar Parsec 1100 | 5,629 |
| NEC Direction SM-1000A | 5,215 |
| Time Machine 1100-7s VQ Pro | 5,049 |
| Atlas Meridian A1000 PW | 3,358 |
| evesham.com Origin 1000MX | 3,328 |
| Viglen HomePro P3-800 FWR | 3,315 |
| Panrix Magnum 1000W | 3,269 |
| Packard Bell ixtreme 9100 | 2,839 |
| Mesh Matrix 1000T | 2,703 |
| Multivision Vision Elite Pro GTS | 1,969 |
| Systemax A1000RV Lifestyle 0250 | 1,205 |
| Dell Dimension 4100 1000MHz | 1,092 |
| Gateway Performance 1000 | 1,002 |

## Quake III (fps) (1,280 x 1,024 at 16bit)

BIGGER IS BETTER

| System | Score |
|---|---|
| Polar Parsec 1100 | 81.3 |
| NEC Direction SM-1000A | 80.3 |
| Time Machine 1100-7s VQ Pro | 77 |
| Multivision Vision Elite Pro GTS | 69.1 |
| Viglen HomePro P3-800 FWR | 47.4 |
| Atlas Meridian A1000 PW | 47.1 |
| evesham.com Origin 1000MX | 46.9 |
| Panrix Magnum 1000W | 45.4 |
| Mesh Matrix 1000T | 41.4 |
| Systemax A1000RV Lifestyle 0250 | 38.9 |
| Packard Bell ixtreme 9100 | 38.6 |
| Dell Dimension 4100 1000MHz | 14.3 |
| Gateway Performance 1000 | 13.4 |

## Table of features

| MANUFACTURER | ATLAS | DELL | EVESHAM.COM | GATEWAY | MESH |
|---|---|---|---|---|---|
| **MODEL NAME** | MERIDIAN A1000 PW | DIMENSION 4100 1000MHz | ORIGIN 1000MX | PERFORMANCE 1000 | MATRIX 1000T |
| Price inc VAT (ex VAT) | £1,408.83 (£1,199) | £1,408.83 (£1,199) | £1,408.83 (£1,199) | £1,432 (£1,219) | £1,408.83 (£1,199) |
| Telephone | 07000 285 275 | 0870 907 5664 | 0800 038 0800 | 0800 552 000 | 020 8208 4706 |
| URL | www.atlasplc.com | www.dell.co.uk | www.evesham.com | www.gateway.com/uk | www.mesh computers.com |
| **HARDWARE SPECS** | | | | | |
| Processor | Athlon 1GHz | Pentium III 1GHz | Athlon 1GHz | Pentium III 1GHz | Athlon 1GHz |
| RAM/type | 128MB/PC133 | 128MB/PC133 | 128MB/PC133 | 128MB/PC133 | 128MB/PC133 |
| Occupied RAM slots/spare RAM slots | 1/2 | 1/1 | 1/2 | 1/2 | 1/2 |
| Max memory in this configuration (without removing existing memory) | 1.15GB | 512MB | 1.15GB | 512MB | 1.15GB |
| Maximum memory supported by motherboard | 1.5GB | 512MB | 1.5GB | 512MB | 1.5GB |
| Hard disk (manufacturer and model) | IBM Deskstar DTLA 307030 | Western Digital WD200 | Maxtor Draco | Western Digital WD200 | IBM Deskstar DTLA 307030 |
| HD size/interface | 30.7GB/EIDE | 20GB/EIDE | 30GB/EIDE | 20GB/EIDE | 30.7GB/EIDE |
| Storage drive manufacturer and model | Teac CD-W54E | LG CED-8080B | Panasonic CD-RW CW-7585 | Philips CDD 4801 | Teac CD-W54E |
| Size of storage drive media | 650MB (1 x CD-R, 1 x CD-RW inc) | 650MB (1 x CD-R, 1 x CD-RW inc) | 650MB | 650MB (2 x CD-R, 1 x CD-RW inc) | 650MB |
| **MOTHERBOARD COMPONENTS** | | | | | |
| Motherboard manufacturer | Asus | Dell | Chaintech | Intel | Asus |
| Model/chipset | A7V/VIA KT133 | Intel/i815E | 7AJA0/VIA KT133 | Feodora/815E | A7V/VIA KT133 |
| **EXPANSION AND I/O** | | | | | |
| No of 3.5/5.25in bays | 4/3 | 5/2 | 3/2 | 5/2 | 3/3 |
| No of free 3.5/5.25in bays | 2/1 | 3/0 | 1/0 | 3/0 | 1/1 |
| No of PCI/ISA/shared/AMR slots | 4/0/1/0 | 5/0/0/0 | 4/0/1/1 | 4/0/1/0 | 4/0/1/0 |
| No of free PCI/ISA/shared/AMR slots | 3/0/0/0 | 3/0/0/0 | 4/0/0/0 | 3/0/0/0 | 2/0/1/0 |
| No of USB/serial/parallel/PS2 | 2/2/1/2 | 2/1/1/2 | 2/2/1/2 | 4/1/1/2 | 5/2/1/2 |
| **MULTIMEDIA** | | | | | |
| DVD manufacturer/model | Hitachi/GD-7500 | NEC/DV-5700A | Pioneer/DVD-115 | Panasonic/SR-8586 | Pioneer/DVD-115 |
| DVD speed/interface | 12x/EIDE | 12x/EIDE | 16x/EIDE | 16x/EIDE | 16x/EIDE |
| Sound card manufacturer | VideoLogic | Turtle Beach | Creative | Creative | Creative |
| Sound card model | SonicFury | Santa Cruz | SB Live! Value | SB Audio PCI 128D | SB Live! Value |
| Speakers (manufacturer and model) | VideoLogic DigiTheatre LC | Altec Lansing ACS 340 | Creative FPS1000 | Boston Acoustics BA265 | Creative FPS1000 |
| Graphics card manufacturer and model | Leadtek WinFast GeForce2 MX | nVidia TNT2 M64 | 3DPower GeForce2 MX | nVidia TNT2 M64 | Hercules 3D Prophet II MX |
| Chipset | nVidia GeForce2 MX | nVidia TNT2 M64 | nVidia GeForce2 MX | nVidia TNT2 M64 | nVidia GeForce2 MX |
| RAM and type | 32MB SDRAM | 32MB SDRAM | 32MB SDRAM | 32MB SDRAM | 32MB SDRAM |
| Monitor manufacturer and model | CTX PR705F | Dell E770P | Mitsubishi Diamond Plus 73 | Gateway EV700 | Iiyama S900 |
| Monitor size/max viewable diagonal | 17in/16in | 17in/16in | 17in/16in | 17in/16in | 19in/18in |
| Maximum resolution at VESA refresh | 1,280 x 1,024 at 75Hz | 1,152 x 864 at 75Hz | 1,024 x 768 at 85Hz | 1,024 x 768 at 85Hz | 1,600 x 1,200 at 75Hz |
| **OTHER INFORMATION** | | | | | |
| Misc hardware | Genius Flight 2000 Joystick, Umax Astra 3400 scanner, Lexmark Z12, ProLink TV tuner | HP DeskJet 610C, printer cable | | Microphone | |
| Bundled software | Lotus SmartSuite Millennium, games bundle | MS Works Suite 2000 | MS Works Suite 2000 | MS Works Suite 2000 | MS Works Suite 2000 |

| | MULTIVISION VISION ELITE PRO GTS | NEC DIRECTION SM-1000A | PACKARD BELL iXTREME 9100 | PANRIX MAGNUM 1000W | POLAR PARSEC 1100 | SYSTEMAX A1000RV LIFESTYLE 0250 | TIME TIME MACHINE 1100-7s VQ PRO | VIGLEN HOMEPRO P3-800 FWR |
|---|---|---|---|---|---|---|---|---|
| | £1,526.33 (£1,299) | £1,408.83 (£1,199) | £1,499 (£1,275.74) | £1,408.83 (£1,199) | £1,410 (£1,200) | £1,408.83 (£1,199) | £1,410 (£1,200) | £1,410 (£1,200) |
| | 0121 550 8000 | 0870 010 6322 | 01628 508 200 | 0113 244 4958 | 0161 482 7000 | 08707 297 366 | 01282 777 555 | 020 8758 7000 |
| | www.multivision.co.uk | www.nec-online.co.uk | www.packardbell.co.uk | www.panrix.com | www.polar technology.com | www.simply.co.uk | www.time computers.com | www.viglen.co.uk |
| | Athlon 900MHz | Athlon 1GHz | Pentium III 800MHz | Athlon 1GHz | Athlon 1.1GHz | Athlon 1GHz | Athlon 1.1GHz | Pentium III 800MHz |
| | 128MB/PC100 | 128MB/PC133 | 128MB/PC133 | 128MB/PC133 | 128MB/PC100 | 128MB/PC133 | 128MB/PC133 | 128MB/PC133 |
| | 1/2 | 1/1 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| | 1.15GB | 640MB | 1.15GB | 1.15GB | 1.15GB | 1.15GB | 1.15GB | 512MB |
| | 1.5GB | 1.2GB | 1.5GB | 1.5GB | 1.5GB | 1.5GB | 1.5GB | 512MB |
| | IBM Deskstar DTLA 307030 | Quantum Fireball LM30 | NEC (IBM) DTLA-305030 | IBM Deskstar DTLA 307030 | IBM Deskstar DTLA 307030 | Maxtor 53073H6 | Fujitsu MPG 3307AT | Western Digital WD40 OBB |
| | 30.7GB/EIDE | 30GB/EIDE | 30.7GB/EIDE | 30.7GB/EIDE | 30.7GB/EIDE | 30.7GB/EIDE | 30GB/EIDE | 40GB/EIDE |
| | Mirai CRD-BP1300P BurnProof | LG-CED 8080B | Philips CDD 4801 | Acer CDRW 8432 | Sony CRX140E | Iomega ZipCD | Teac CD-W54E | Creative RW8435E |
| | 650MB | 650MB | 650MB | 650MB (1 x CD-RW inc) | 650MB | 650MB (10 x CD-R inc) | 650MB | 650MB |
| | EPoX | MSI | MSI | Asus | Jetway | Biostar | Asus | Viglen OEM |
| | EP-8KTA2/ VIA KT133A | MS-6340/KT133 | MS-6309/ Apollo Pro 133A | A7V/VIA KT133 | 663AS/ VIA KT133 | M7VKB/3 VIA KT13 | A7V/VIA KT133 | Intel/815E |
| | 4/3 | 5/2 | 3/3 | 4/3 | 5/2 | 3/3 | 4/3 | 4/2 |
| | 2/1 | 3/0 | 1/1 | 2/1 | 3/0 | 1/1 | 2/1 | 2/0 |
| | 5/0/1/0 | 2/0/1/0 | 5/0/0/1 | 4/0/1/0 | 4/0/1/1 | 4/0/1/1 | 4/0/1/0 | 5/0/0/0 |
| | 3/0/1/0 | 0/0/1/0 | 5/0/0/1 | 2/0/1/0 | 3/0/1/1 | 1/0/1/1 | 2/0/1/0 | 3/0/0/0 |
| | 4/2/1/2 | 3/2/1/2 | 4/2/1/1 | 5/2/1/2 | 2/1/1/2 | 2/2/1/2 | 4/2/1/2 | 2/1/1/2 |
| | Hitachi/GD-7500 | Pioneer/DVD-115 | NEC/DV-5700A | Hitachi/GD-7500 | Hitachi/GD7500 | Pioneer/DVD-105S | Pioneer/DVD-104S | Pioneer/DVD-115 |
| | 12x/EIDE | 16x/EIDE | 12x/EIDE | 12x/EIDE | 12x/EIDE | 16x/EIDE | 10x/EIDE | 16x/EIDE |
| | Creative | Creative | Creative | Creative | VIA | Creative | Creative | Creative |
| | SB Live! 5.1 | SB Live! Value | SB Live! Value | SB Live! 1024 | Onboard AC'97 | SB Live! Value | SB Live! 1024 | SB Live! Value |
| | VideoLogic DigiTheatre LC | Labtec LCS-2414 | Diamond Multimedia | Creative FPS1000 | Yamaha M20 + MSW5 | Creative FPS1000 | Creative FPS1000 | Altec Lansing ACS33 |
| | Hercules 3D Prophet II Pro | Leadtek WinFast GeForce2 GTS | OEM nVidia GeForce2 MX | Hercules 3D Prophet II MX | Hercules 3D Prophet II GTS | 3D Power GeForce2 MX | Hercules 3D Prophet II GTS | ATi Radeon VIVO |
| | nVidia GeForce2 Pro | nVidia GeForce2 GTS | nVidia GeForce2 MX | nVidia GeForce2 MX | nVidia GeForce2 GTS | nVidia GeForce2 MX | nVidia GeForce2 GTS | ATi Radeon |
| | 64MB DDR SDRAM | 32MB DDR SGRAM | 32MB SDRAM | 32MB SDRAM | 64MB DDR SDRAM | 32MB SDRAM | 32MB DDR SGRAM | 64MB DDR SDRAM |
| | Mitsubishi Diamond Pro 720 | NEC VR19 | Packard Bell A726 | Hansol 900P | Mitsubishi Diamond Pro 720 | CTX PR705F | LG Flatron 775FT | Viglen Envy 17CP |
| | 17in/16in | 19in/18in | 17in/16in | 19in/18in | 17in/16in | 17in/16in | 17in/16in | 17in/16in |
| | 1,600 x 1,200 at 75Hz | 1,600x1,200 at 85Hz | 1,152 x 864 at 75Hz | 1,600 x 1,200 at 75Hz | 1,600 x 1,200 at 75Hz | 1,280 x 1,024 at 75Hz | 1,152 x 864 at 75Hz | 1,152 x 864 at 75Hz |
| | | Logitech Quickcam, stereo headset | Hauppauge WinTV, FireWire host controller PCI card | Gravis BlackHawk Joystick | | Umax Astra 2100U scanner, MS gamepad, Hauppauge WinTV Go, Xerox printer & cable | Saitek Cyborg 3D joystick, PC microphone | Onboard network Intel Pro/100VE |
| | Lotus SmartSuite Millennium | MS Works 2000 & MS Word 2000, multimedia software | Small games bundle and DVD film | MS Works 2000, games bundle | Lotus SmartSuite Millennium | Lotus SmartSuite Millennium, Systemax 6 games bundle | MS Works 2000, Standard & Exec software packs | MS Works Suite 2000 |

# Editor's **Choice**

**W**ith the January sales in full flow, we decided to challenge manufacturers to submit a machine they deemed excellent value for money. With a price limit of £1,200 excluding VAT, the choice of systems submitted is pretty varied. Some included middle of the road graphics cards and cheaper monitors giving a bit of breathing space to throw in a range of peripherals. In contrast other manufacturers went down the speed road at the expense of certain extras. As a result picking the winners was not an easy process and it ultimately came down to finding a balance between performance, features and price.

So if you're in the market to get your hands on a brand spanking new PC, then check out the following three systems for a recommended buy.

## The winners

By taking all the components that came with each PC and comparing them against the system's performance and price, the **Editor's Choice** goes to **Atlas' Meridian A1000 PW**. While it wasn't the quickest PC in the group test, we felt it struck the best balance between cost and features.

One thing we always like to see is a quality monitor as this can make a world of difference to how you feel towards your machine. The 17in CTX model here uses a Sony FD Trinitron tube, resulting in a picture that is a pleasure to view. The audio solution is of a similar high quality and if you're into games or watching movies on your PC, the DigiTheatre LC

surround-sound speakers and the VideoLogic SonicFury sound card are more than capable.

Inside, you can't do much better than the Asus A7V motherboard. With a 1GHz Athlon and 128MB of memory on board the Atlas is no slouch. It also has four separate EIDE channels and you can connect up to eight drives, four of which could take advantage of the UltraDMA100 standard. Unlike some of the other manufacturers in this group test, Atlas has used this feature and hooked up the ample 30.7GB UltraDMA hard drive for maximum performance.

The GeForce2 MX graphics card is not the most expensive around, but you do get decent 3D performance. This leaves some room in the budget to splash out on the peripherals and Atlas has included a TV tuner card for your viewing pleasure. In addition, a printer, scanner, and a joystick are included. In short, the Atlas entry ensures you get a lot of PC for your money.

Deciding on the runners up was equally difficult and it turned out to be a closely fought contest between several manufacturers. Polar, Panrix, Mesh and Multivision all submitted impressive systems, but there were two others that really stood out. Our first **Highly Commmended** award goes to **Systemax's A1000RV Lifestyle 0250**. Taking the same stance as Atlas, Systemax included a range of peripherals that tipped the balance in its favour in terms of value for money. With a Umax scanner, Xerox printer, a gamepad, and a Hauppauge TV-tuner,

this system lends itself well to the first-time buyer.

It's not only the peripherals that count, though, and the A1000RV also comes with a 1GHz Athlon processor, 128MB of PC133 memory and the same quality CTX monitor submitted with the Atlas system. A 30.7GB hard drive together with Iomega's ZipCD CD-RW caters for most users' backup and removable storage needs. Ten blank CD-Rs are also thrown in to get you burning away. As for software Lotus SmartSuite Millennium has everything you need for general work, and is topped off with a decent games bundle. The performance is not at its optimum but it's nonetheless high enough for the demands of everyday computing tasks. Another well-rounded system.

Our second **Highly Commended** accolade goes to the **Time Machine 1100-7s VQ Professional** for its sheer performance. It came top in all our SYSmark charts thanks to the processing power of its 1.1GHz Athlon CPU, and an honourable third in the 3D performance ratings, courtesy of the 32MB nVidia GeForce2 GTS powered graphics card. It was a close run race between this and the 1.1GHz Polar, but the Time clinched it. Unlike the Polar with its PC100 memory, Time's entry has128MB of PC133 rated memory, while its Asus A7V mother-board just has that bit more potential in terms of connectivity and UltraDMA100 support than Polar's Jetway mother-board. The Time also comes with a good 17in LG Flatron monitor, a joystick and a generous software bundle.



*Atlas' Meridian struck the best balance between cost and features*



*The Systemax A1000RV Lifestyle's range of peripherals gave it an award*



*Time's system came close to an Editor's Choice award*

# A scanner in the works

**With the flatbed scanner now a ubiquitous piece of kit we put 11 of the leading models to the test**

# contents

• *Scanners tested by Lars Goran-Nilsson and Scott Montgomery, and reviewed by Scott Montgomery and Jalal Werfalli*

**O**riginally designed as a tool for the graphics professional, the flatbed scanner has broken free of its specialist shackles and become a popular item for home users. With prices falling and the use of images growing, whether they're sent by email to friends or uploaded onto websites, it could be said that the home computer looks lonely without a scanner by its side. A quality scanner can be bought for as little as £100 these days, and with bundled image manipulation software, it can be as much a fun toy as a useful imaging peripheral.

This month we look at 11 USB scanners, some of which also include parallel cables for connection to older PCs. We tested each to find out how well it resolved images, how fast it scanned and also how well it represented colours. We used a professional drum scanner to image our test target and used this to compare with the scans resolved by the devices on test here. The results, especially where colour representation is concerned, certainly split the group, as you'll discover.

## *Acer* **S2W 3300V**

**THE ACER 3300V** looks like any other scanner, or rather how any other scanner used to look – nowadays most manufacturers include manual operation buttons. However, one useful thing Acer has done is to put the unlock switch on the top, so you don't have to precariously hold the unit upside down to unlock the mechanism.

Like most of the tested scanners the optical resolution is 600 x 1,200dpi with a massive maximum interpolated resolution of 19,200 x 19,200dpi there for those who have a machine that could deal with the file this would produce. The colour depth is 36bit.

The software bundle includes PhotoExpress 3 for scanning images and Presto! PageManager for archiving. Ulead Image Editor is also included to manipulate your scanned images.

The performance was middle of the road, with 20 of the 22 greyscales distinguished and a resolution of 95 lines per inch. Scanning the cover of *PCW* took two minutes 50 seconds, but when we repeated the scan after the software locked up the system, times in excess of four minutes were the norm. Resolution on small-font text was passable though.

Ultimately, the Acer is eclipsed by stronger competition.

### DETAILS
★★★

**PRICE** £93.99 (£79.99 ex VAT)
**CONTACT** Acer 01344 392 604
**www.acerperipherals.co.uk**
**PROS** Fair performance across all tests
**CONS** Scan times were a little odd
**OVERALL** Scanners with manual buttons are likely to appeal more than this

## *Agfa* **SnapScan e20**

**AGFA'S SNAPSCAN E20** is all about ease of use. Simply plug in the USB cable and allow a Windows 98/2000 computer to detect it. In addition, after loading the ScanWise software, you can use the SnapScan e20 to scan images either directly to your hard disk, email application, word processor, printer or fax machine. If optical character recognition is more your thing, then the multilingual Readiris software will come in handy when converting printed type into editable text.

The colour depth tops out at 36bit while the optical resolution is 600 x 1,200dpi. Performance-wise it took four minutes to scan the *PCW* cover, making it reasonably quick. In the resolution tests, it managed to resolve around 140 lines per inch, while the small-text test lacked crispness with the dot above the i showing evidence of jaggies and a greying centre. As for greyscale coverage, a shift toward the highlight end of the scale was apparent, making blacks not as black as we'd like to see.

The SnapScan e20 doesn't feel very sturdy compared to others. However, it does come with a choice of translucent handles in the colours of orange, blueberry and graphite to suit your mood or iMac. A copy of Corel Print Office 2000 is also thrown in.

### DETAILS
★★★

**PRICE** £92.83 (£79 ex VAT)
**CONTACT** Agfa 020 8231 4903
**www.agfa.co.uk**
**PROS** Easy to set up; reasonably quick; small
**CONS** Doesn't feel very sturdy
**OVERALL** A reasonable flatbed scanner with a small footprint, but there are better alternatives

## *Epson* **Perfection 640U**

**THE EPSON PERFECTION** is a compact unit that comes complete with a lilac trim and three QuickStart buttons on the front. These are designated Start, Copy and Scan, and they enable you to deliver the scanner's input to an assigned application, to the copy utility in the Epson Smart Panel, or to the bundled Adobe PhotoDeluxe Home Edition software.

A single press of the relevant button is all it takes, making the scanner simple to use. The Perfection 640U is TWAIN compliant.

Setting up this scanner isn't that straightforward, partly because you have to locate the driver file on the CD, install it, complete a screen calibration program and then install the software.

Nevertheless, once up and running the results from this somewhat noisy 36bit scanner are commendable. With a *PCW* cover scan time of three minutes 16 seconds it's a fair performer.

When it comes to resolution the Epson had no trouble picking out 140 lines per inch at its optical maximum of 600 x 2,400dpi.

It also proved to be one of the best scanners for resolving small writing, while the greyscale was only slightly trimmed at the highlight end. A little more expensive than some, but the results make the 640U worth it.

### DETAILS
★★★★★

**PRICE** £119 (£101.28 ex VAT)
**CONTACT** Epson 0800 220 546
**www.epson.co.uk**
**PROS** Commendable resolution results; easy to operate once set up
**CONS** A little noisy and not the quickest
**OVERALL** A well-rounded scanner

# HP ScanJet 3400C

**WITH A LID THAT** wouldn't be out of place at the bottom of the ocean, this scanner certainly draws some looks. A hole in the lid allows access to three buttons for manual operation of the scanner. The optical resolution of the unit is 600 x 1,200dpi, with the scanner having a maximum colour depth of 36bit. The maximum enhanced resolution is 9,600dpi and, although it's more conventionally connected by USB, it comes complete with a parallel cable for those running pre-USB motherboards or early versions of Windows 95.

The PrecisionScan LTX software was very intuitive and manipulation of the scan settings was no problem. Settings allow various scan options, exporting the scanned image to any application or saving it to a file.

Performance-wise, the 3400C wasn't too bad. The *PCW* cover was scanned in two minutes 34 seconds and 20 of the 22 greyscales were recognised. The two lost greys were near the darker end of the scale where the 3400C also struggled.

The best resolution it achieved was 95 lines per inch, with the 140 lines per inch test appearing as alternate grey lines rather than the definite white and black we had hoped to see. Small text was well resolved, though.

## DETAILS
★★★★

**PRICE** £69 (£58.72 ex VAT)
**CONTACT** HP 0990 47 47 47 **www.hp.com**
**PROS** Simple setup and use
**CONS** Unexceptional images produced at 600dpi
**OVERALL** A good scanner for the novice due to its ease of setup and use

# HP ScanJet 4300C

**UNLIKE ITS SIBLING**, the 3400C, the 4300C has the conventional colours of PC peripherals: bland grey. HP has spiced up the unit with the inclusion of a few manual operation buttons and a digital readout on the front that allows you to select the number of printed copies of the scanned image you want to see dropping out of your printer – a sort of copying facility. A button to select colour or monochrome scanning is also on the front. The optical resolution is 600 x 1,200dpi and the maximum colour depth is set to 36bit. The software is the same as the 3400C but also includes Corel Print House 2000.

Performance was fair, with the 4300C able to resolve 140 lines per inch. The resolution of small text was fairly good, although not markedly better than the 3400C. Greyscale representation was the same as many of the scanners, with 20 of the 22 greyscales represented. Like the 3400C, the missing greys were at the darker end, making dark grey and black indistinguishable. Scanning the cover of *PCW* took two minutes 26 seconds; eight seconds faster than its sibling.

Overall, a good scanner with a copying feature that some may find useful. With very simple installation and use, this is another scanner the novice should consider.

## DETAILS
★★★★

**PRICE** £99 (£84.25 ex VAT)
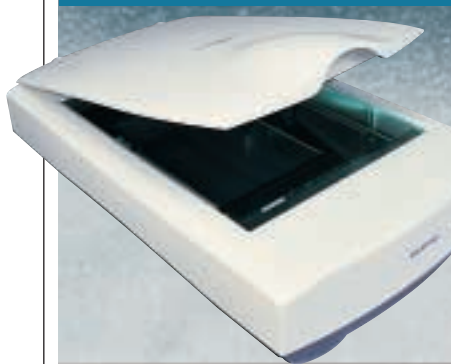**CONTACT** HP 0990 47 47 47 **www.hp.com**
**PROS** Hardware copying feature
**CONS** Slight problem recognising shadows in greyscale tests
**OVERALL** A good beginners' scanner, with a copying option built in

# Microtek ScanMaker 3600

**THE FIRST OF THREE** scanners from Microtek, the 3600 scans at a colour depth of 42bits, ranking it with four others on test here. Although not the most attractive, the 3600 is well built and boasts an optical resolution of 600 x 1,200dpi that can be interpolated to 9,600 x 9,600dpi. With these stats you might think that the 3600 will be one of the best performers, but it falls just short of this. Scanning at its maximum optical resolution, the 3600 put in an average 95 lines per inch in our resolution test, while the appearance of small text was reasonably sharp. As for the greyscale score, this ScanMaker fared pretty well by covering most of the spectrum from white to an almost pure black.

The smaller of the three Microtek offerings, the 3600 is also one of the slowest scanners on test, taking five minutes three seconds to complete our timed scan. Having said that, it is in fact quicker than its stablemate, the Scan-Maker 4600 which is twice as expensive.

We found the 3600 easy to set up, although it is a little bit noisy. It also suffered from the odd software hang. Despite this, at £69 it shares the budget spot with the HP ScanJet 3400C and has a good selection of software.

## DETAILS
★★★

**PRICE** £69 (£58.72 ex VAT)
**CONTACT** Microtek 01908 317 797
**www.microtek.com**
**PROS** 42bit; robust; joint cheapest
**CONS** A bit slow by today's standards; average resolving power
**OVERALL** If you're on a budget then this is good value, although you may prefer HP's styling and performance

## Microtek **ScanMaker 3700**

**THE 3700 HAS** the same optical resolution and colour depth of its cheaper relative, the 3600, but differs in that it comes with three buttons on the front of the sturdy chassis. These give you quick access to the most frequently used functions; scan, copy and email. If you find that these are not to your liking then you can reprogram the buttons through a bundled utility. This provides more flexibility as you can direct the output of a scanning job to any program installed on your PC.

Installation isn't difficult, but it's not what we'd call effortless. The CD that comes with the 3700 contains a number of packages that can only be installed separately, making the task a little slow and perhaps confusing for the novice.

For that extra tenner you don't actually get much more than you get with the 3600. In fact the results are practically the same in that 95 lines per inch were resolved, small text was reasonably sharp and it was rather noisy in use.

On the other hand it was a little quicker at four minutes 54 seconds for our test scan. If you want to add to the 3700's functionality then Microtek does offer the Microtek LightLid 35 for scanning transparencies.

### DETAILS
★★★

**PRICE** £79 (£67.23 ex VAT)
**CONTACT** Microtek 01908 317 797
**www.microtek.com**
**PROS** 42bit; sturdy; quick access buttons; transparency scanning option
**CONS** A tad slow; average resolution; clumsy software
**OVERALL** A little extra cash gets you something better

## Microtek **ScanMaker 4600**
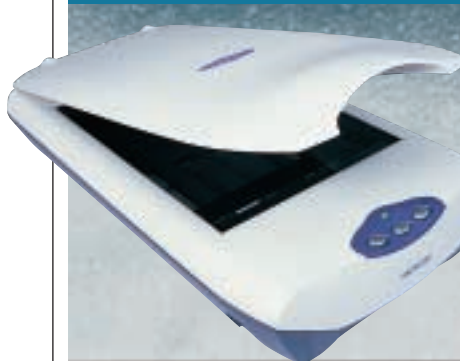
**THE OLD ADAGE**, 'you get what you pay for' can certainly be applied to this Microtek. Priced at £99 ex VAT the 42bit 4600 simply outperforms its two cousins in all the resolution tests, clearly separating out 140 lines per inch at its impressive maximum optical resolution of 1,200 x 2,400dpi. As for the small-text assessment the dot above the i was clearly defined and out of the group came the closest to the drum scanner's results. The greyscale is almost fully spanned apart from the purest of whites and is perhaps the most complete of all the scanners here.

It's not all a bed of roses though as the 4600 falls down badly on scan speed – it was the slowest on test, scanning the *PCW* front cover in six minutes 11 seconds. On top of this, the unit made a high-pitched noise during the scans.

This aside, the 4600 does produce some excellent results and like the 3700 it also comes with the same three programmable buttons that allow you to launch any application with a single press. In addition, the lid, like all of the Microteks on test, can be raised to accommodate thicker media. A generous software bundle is also thrown that includes Recognita OCR 5.1 and Ulead Photo Explorer 6.02.

### DETAILS
★★★★

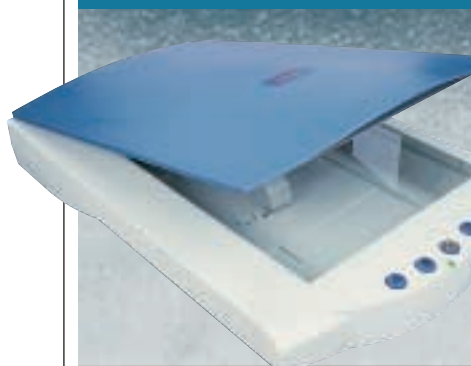**PRICE** £116.33 (£99 ex VAT)
**CONTACT** Microtek 01908 317 797
**www.microtek.com**
**PROS** High optical resolution; good results; 42bit; buttons
**CONS** Slowest; high-pitched scan noise
**OVERALL** A little quicker and an Editor's Choice award would have gone its way. Instead it gets a Highly Commended

## Umax **Astra 3450**

**THE ASTRA 3450** is a fairly standard looking scanner, although Umax has moved away from dowdy grey and opted for a blue lid. The other feature that makes the Astra special is that it comes with a transparency adaptor, allowing transparencies up to 4 x 5in to be scanned. The colour depth on the unit is 42bit and the optical resolution is 600 x 1,200dpi. The maximum interpolated resolution is 9,600 x 9,600dpi.

The scanning software bundle includes Vistascan (for performing the scans themselves) and Presto! Page-Manager for archiving and managing the images. Both are intuitive to use, making this scanner simple enough for novices, while feature rich enough to keep advanced users happy.

Performance was middle of the road, despite a long warm-up time before the first use. The Astra resolved 95 lines per inch and covered 20 of the greyscales, struggling to distinguish very light grey from white. As for the timed scan of the *PCW* cover, completion was around three minutes, although the software crashed every time it tried to make the thumbnail image for PageManager, so no accurate result is available.

The transparency scanning facilities will make this tempting to some, but there are better scanners in this test.

### DETAILS
★★★

**PRICE** £89.99 (£76.59 ex VAT)
**CONTACT** Umax 01344 871 329
**www.umax-europe.com**
**PROS** Transparency adaptor included
**CONS** Software wasn't stable in our tests
**OVERALL** An average scanner with transparency capabilities

## *Visioneer* **OneTouch 7600 USB**

**THIS VISIONEER SCANNER** is not unlike its more expensive counterpart (below) in terms of performance, although its design is more conventional. It is decked out in the non-descript grey of PC peripherals but has a splash of colour in the manual operation button on the front of the unit, including a scan-to-fax option, allowing the scanned image to be sent to your fax software for immediate transmission. The optical resolution is 600 x 1,200dpi and the maximum interpolated resolution is 2,400dpi. The maximum colour depth is lower than its sibling, the 8100, at 36bit. The software is the same as the 8100, with PaperPort Deluxe 6 dealing with image scanning and archiving, and MGI PhotoSuite II SE for manipulation of the images.

The performance of the unit was much the same as the more expensive Visioneer alternative, although the 7600 only managed to resolve 95 lines per inch. It did manage to distinguish 20 of the 22 greyscales and, like its sibling, it was among highlights that it had problems, with three shades of light grey appearing as one colour. Meanwhile, scanning the *PCW* cover only took two minutes and 38 seconds.

Overall, this is almost as good as the 8100, but it's cheaper.

### DETAILS
★★★★
**PRICE** £79 (£67.23 ex VAT)
**CONTACT** Visioneer 01628 628 080
**www.visioneer.com**
**PROS** Pretty good quality and cheaper than the Visioneer 8100
**CONS** Poor recognition of highlights
**OVERALL** A good value scanner, with a decent all-round performance

## *Visioneer* **OneTouch 8100**

**THE 8100's LID OPENS** sideways, setting it apart from the crowd – although considering desk space restrictions, some users may not agree. For those who want a scanner tucked away on a shelf, though, this may be a good solution. Visioneer has also opted for a scan button (along with a few other non-software controls) reducing scanning to a simple case of pressing a button.

The optical resolution is 600 x 1,200dpi and with a maximum enhanced interpolated resolution of 2,400dpi, this scanner has the potential for some fine results. The unit is capable of recognising 42bit colour, although the extra colours will only be in the raw data and not realised on-screen within Windows.

Performance wasn't too bad on the 8100. It resolved 20 of the 22 greyscales and coped fairly well with the 140 lines per inch test target. Scanning small text highlighted a weakness, though the *PCW* cover scan wasn't terrible and completed in two minutes 29 seconds.

The PaperPort Deluxe 6 scanning software is simple to use, and a copy of MGI PhotoSuite II SE is also bundled. Overall, a good looking and fair-performing scanner.

### DETAILS
★★★★
**PRICE** £99 (£84.25 ex VAT)
**CONTACT** Visioneer 01628 628 080
**www.visioneer.com**
**PROS** Length-ways opening means it can be put on a shelf
**CONS** Not the best scanned images
**OVERALL** If space is an issue, this is worth a look

# Drum versus flatbed scanners

A drum scanner works very differently to a flatbed scanner in many ways. However, the most fundamental of these is that the image to be scanned is attached to a spinning drum, rather than being placed on a flat glass plate for scanning.

The reading element of the drum scanner is a Photo-Multiplier Tube (PMT), where the flatbed scanner utilises a Charged Coupled Device (CCD). In a flatbed scanner the CCD moves across the image scanning information from the picture.
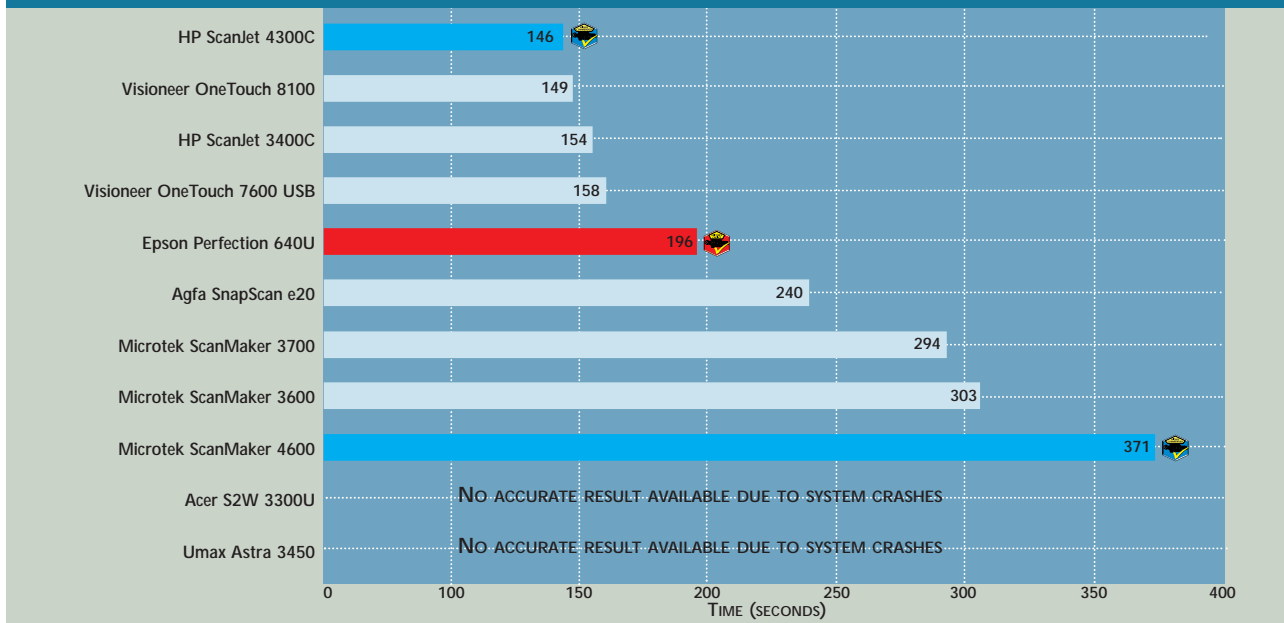
By contrast, the drum scanner reading apparatus slowly scans in the various greys and colours of the image. The information from the reading head hits the tube and is converted into electricity. This is then amplified (thus multiplier) and converted into a digital form. The result is a far denser image quality than can be achieved with a flatbed scanner (maximum optical resolution is up to 8,000dpi), where the CCD array has a far more limited capacity for gathering pixel information – our tested scanners have a maximum optical resolution of 600dpi.

Why don't we all have drum scanners? There are many reasons, but mainly it is because of size and cost. The average drum scanner won't fit on your shelf and would probably require a whole new desk at least, if not part of your room to store. Then there's the cost issue. With the cheapest ones costing in excess of £5,000, they're not really worth buying just to scan your family photos for putting on the web.
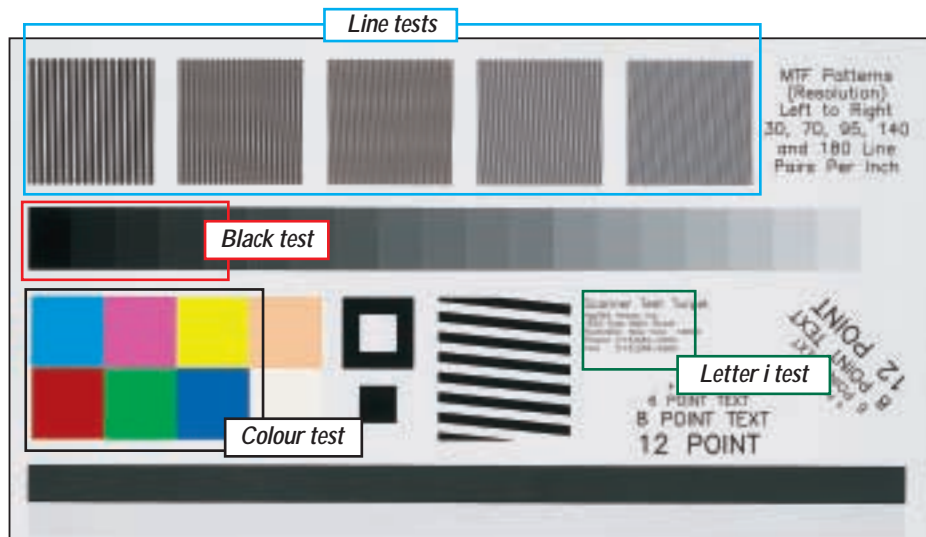
*Drum scanners are far too large and expensive to make them practical to use with a PC*

## Time taken to scan the cover of PCW

| Scanner | Time (seconds) |
|---|---|
| HP ScanJet 4300C | 146 |
| Visioneer OneTouch 8100 | 149 |
| HP ScanJet 3400C | 154 |
| Visioneer OneTouch 7600 USB | 158 |
| Epson Perfection 640U | 196 |
| Agfa SnapScan e20 | 240 |
| Microtek ScanMaker 3700 | 294 |
| Microtek ScanMaker 3600 | 303 |
| Microtek ScanMaker 4600 | 371 |
| Acer S2W 3300U | NO ACCURATE RESULT AVAILABLE DUE TO SYSTEM CRASHES |
| Umax Astra 3450 | NO ACCURATE RESULT AVAILABLE DUE TO SYSTEM CRASHES |

TIME (SECONDS)

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# How we tested the scanners

**E**ach of the scanners was set up and its software installed on a standard reference PC and monitor. Throughout the testing all monitor and PC settings were maintained so that no changes could affect scanner performance. The ease with which each scanner could be set up was noted, particularly in terms of any problems with the installation of the software in relation to the hardware itself.

After installation two images were scanned. The first was of a scanner target, which comprised elements to test colour purity, line resolution, greyscale-distinguishing capabilities and text resolving at a variety of sizes. This first scan was performed at the optical resolution of the scanner. The second scan involved scanning in the front cover of the October issue of *PCW*. This scan was performed at a fixed resolution of 600dpi and was timed so that comparisons could be made.

The first scan was loaded into Adobe Photoshop 5 for analysis. The run of 22 greyscales were masked and Photoshop's histogram function was used to observe the number of distinct scales detected. Each is represented by a peak on the graph returned. In this way, any gaps could also be spotted and the affected areas noted. The second test was more subjective, involving examination at 100 per cent zoom of five sets of vertical lines of decreasing thickness equally spaced over a 1in area.



*The scanner target used as a frame of reference to test each scanner's capabilities*

If the lines appeared as solid black with a white stripe in between each then this was considered a pass. If the white appeared as grey this was a fail. How many lines per inch the scanner could accurately resolve was noted on this basis.

Fine resolution was further tested by examining the dot above a lower-case printed letter i. The level of pixellation, purity of colour and general crispness of the edges was noted for comparison. Finally, sections of each of the pure colours (red, green, blue, cyan, magenta, yellow and black) were cut from the original scanned image for comparative purposes. General observations on using the bundled software that came with each unit were also noted.

This process of comparison allowed the scanners to be assessed, based on all relevant factors, and the winners picked accordingly.
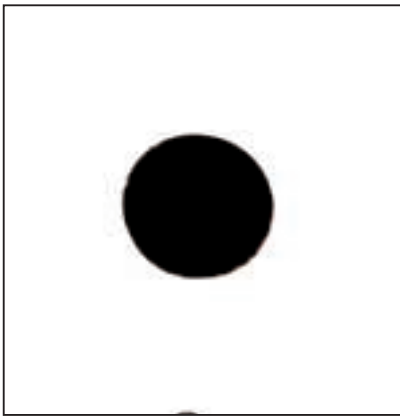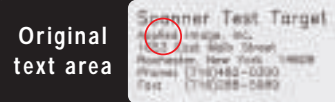
# How the scanners compared: Colour reproduction
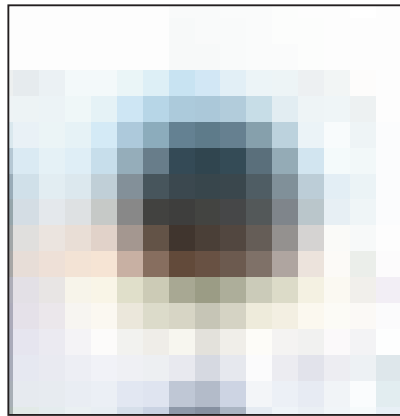
| MANUFACTURER MODEL | R | G | B | C | M | Y | K |
|---|---|---|---|---|---|---|---|
| DRUM SCANNER | | | | | | | |
| ACER S2W 3300U | | | | | | | |
| AGFA SNAPSCAN E20 | | | | | | | |
| EPSON PERFECTION 640U | | | | | | | |
| HP SCANJET 3400C | | | | | | | |
| HP SCANJET 4300C | | | | | | | |
| MICROTEK SCANMAKER 3600 | | | | | | | |
| MICROTEK SCANMAKER 3700 | | | | | | | |
| MICROTEK SCANMAKER 4600 | | | | | | | |
| UMAX ASTRA 3450 | | | | | | | |
| VISIONEER ONETOUCH 7600 USB | | | | | | | |
| VISIONEER ONETOUCH 8100 | | | | | | | |

# Text resolution
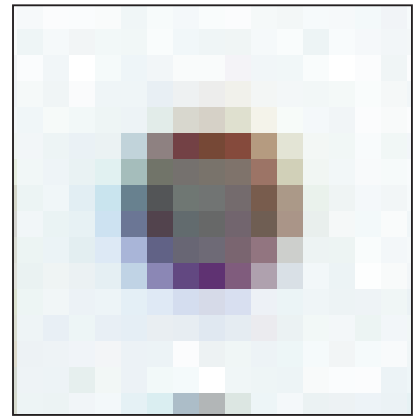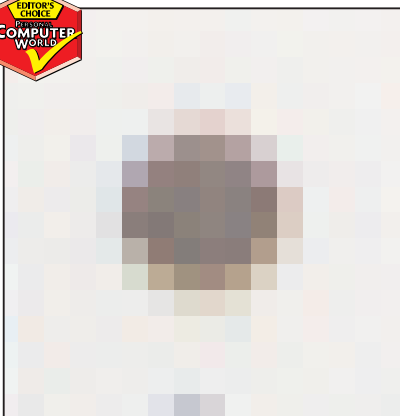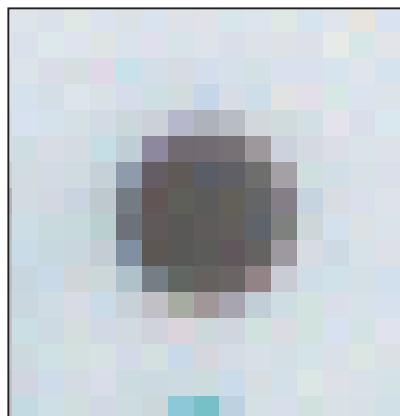
**Original text area**


DRUM SCANNER


ACER S2W 3300U


AGFA SNAPSCAN E20


EPSON PERFECTION 640U


HP SCANJET 3400C
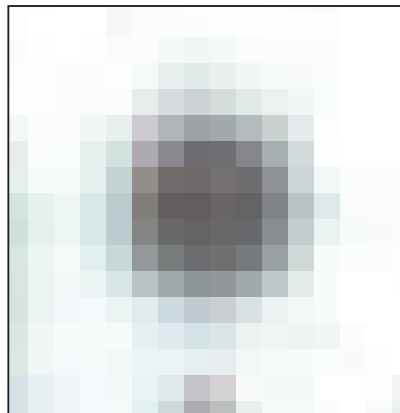

HP SCANJET 4300C
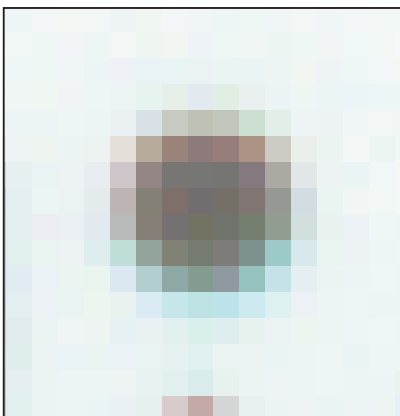

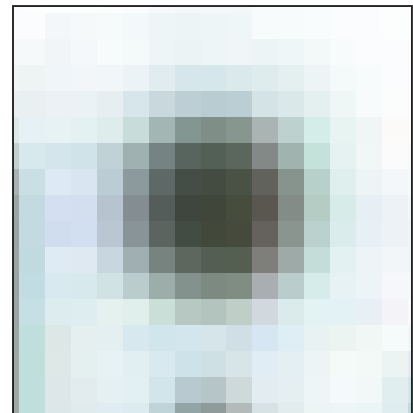MICROTEK SCANMAKER 3600
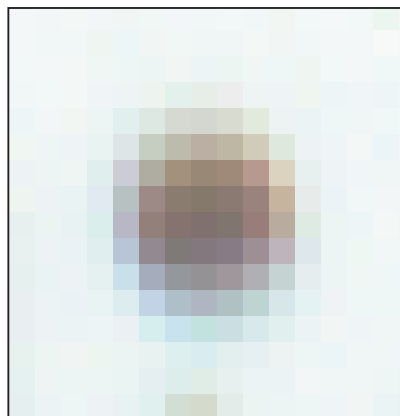

MICROTEK SCANMAKER 3700
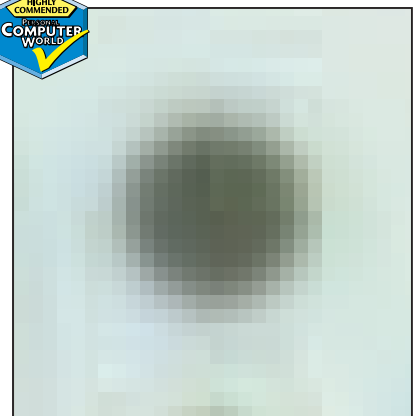

MICROTEK SCANMAKER 4600
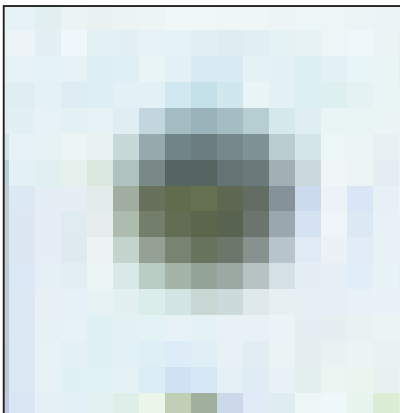

UMAX ASTRA 3450


VISIONEER ONETOUCH 7600 USB


VISIONEER ONETOUCH 8100

# Table of features

| MANUFACTURER | ACER | AGFA | EPSON | HP | HP |
|---|---|---|---|---|---|
| MODEL | S2W 3300U | SNAPSCAN E20 | PERFECTION 640U | SCANJET 3400C | SCANJET 4300C |
| Price | £93.99 (£79.99 ex VAT) | £92.83 (£79 ex VAT) | £119 (£101.28 ex VAT) | £69 (£58.72 ex VAT) | £99 (£84.25 ex VAT) |
| Contact telephone | 01344 392 604 | 020 8231 4903 | 0800 220 546 | 0990 47 47 47 | 0990 47 47 47 |
| URL | www.acerperipherals.co.uk | www.agfa.co.uk | www.epson.co.uk | www.hp.com | www.hp.com |
| **SPECIFICATIONS** | | | | | |
| Optical resolution | 600 x 1,200dpi | 600 x 1,200dpi | 600 x 2,400dpi | 600 x 1,200dpi | 600 x 1,200dpi |
| Highest interpolated resolution | 19,200 x 19,200dpi | 9,600 x 9,600dpi | 9,600 x 9,600dpi | 9,600 x 9,600dpi | 9,600 x 9,600dpi |
| Colour depth | 36bit | 36bit | 36bit | 36bit | 36bit |
| Max scanning area | A4 | A4 | A4 | A4 | A4 |
| Transparency option | ✗ | ✗ | ✗ | ✗ | ✗ |
| Dimensions (l x w x d in mm) | 412 x 258 x 73 | 423 x 273 x 70 | 435 x 269 x 93 | 495 x 305 x 94 | 495 x 305 x 89 |
| Weight (kg) | 2.1 | 2.5 | 2.8 | 3.6 | 3.4 |
| **OTHER INFORMATION** | | | | | |
| Bundled software | Ulead PhotoExpress 3.0, Presto! PageManager, Ulead Image Editor, Club Photo, ABBYY FineReader OCR | ScanWise, Corel Print Office 2000, Readiris OCR software (PC and Mac) | Adobe PhotoDeluxe 4.0 Home Edition, Epson Smart Panel and TWAIN driver | HP PrecisionScan LTX, HP ScanJet Copy Utility, Adobe ActiveShare Image Editing, Trellix Web Creation | HP Precision Scan LTX, HP ScanJet Copy Utility, Adobe ActiveShare Image Editing, Trellix Web Creation, Corel Print House 2000 |
| Scan times in seconds | N/A | 240 | 196 | 154 | 146 |
| Scan times in minutes & seconds | N/A | 4 mins | 3min 16sec | 2min 34sec | 2min 26sec |

# Table of features

| MANUFACTURER | MICROTEK | MICROTEK | MICROTEK | UMAX | VISIONEER | VISIONEER |
|---|---|---|---|---|---|---|
| MODEL | SCANMAKER 3600 | SCANMAKER 3700 | SCANMAKER 4600 | ASTRA 3450 | ONETOUCH 7600 USB | ONETOUCH 8100 |
| Price | £69 (£58.72 ex VAT) | £79 (£67.23 ex VAT) | £116.33 (£99 ex VAT) | £89.99 (£76.59 ex VAT) | £79 (£67.23 ex VAT) | £99 (£84.25 ex VAT) |
| Contact telephone | 01908 317 797 | 01908 317 797 | 01908 317 797 | 01344 871 329 | 01628 628 080 | 01628 628080 |
| URL | www.microtek.com | www.microtek.com | www.microtek.com | www.umax-europe.com | www.visioneer.com | www.visioneer.com |
| **SPECIFICATIONS** | | | | | | |
| Optical resolution | 600 x 1,200dpi | 600 x 1,200dpi | 1,200 x 2,400dpi | 600 x 1,200dpi | 600 x 1,200dpi | 600 x 1,200dpi |
| Highest interpolated resolution | 9,600 x 9,600dpi | 9,600 x 9,600dpi | 9,600 x 9,600dpi | 9,600 x 9,600dpi | 2,400dpi | 2,400dpi |
| Colour depth | 42bit | 42bit | 42bit | 42bit | 36bit | 42bit |
| Max scanning area | A4 | A4 | A4 | A4 | A4 | A4 |
| Transparency option | ✗ | ✔ (optional) | ✔ (optional) | ✔ | ✗ | ✗ |
| Dimensions (l x w x d in mm) | 440 x 290 x 100 | 510 x 290 x 117 | 510 x 290 x 117 | 460 x 295 x 88 | 467 x 254 x 102 | 298 x 425 x 102 |
| Weight (kg) | 3 | 3.6 | 3.6 | 2.9 | 3 | 2.7 |
| **OTHER INFORMATION** | | | | | | |
| Bundled software | Adobe PhotoDeluxe 2.0, Ulead PhotoImpact 4.2, Microtek ScanWizard 5, Caere PageKeeper 3.0, Caere Omnipage LE | Adobe PhotoDeluxe 2.0, Ulead PhotoImpact 5, Microtek ScanWizard 5, Caere PageKeeper 3.0, Caere Omnipage LE and Recognita OCR 5.1 | Adobe PhotoDeluxe 2.0, Ulead PhotoImpact 5, ScanWizard 5, PageKeeper 3.0, Omnipage LE and Recognita OCR 5.1, Ulead Photo Explorer 6.02 | Vistascan, Presto! PageManager | MGI PhotoSuite II SE, PaperPort Deluxe 6 | MGI PhotoSuite II SE, PaperPort Deluxe 6 |
| Scan times in seconds | 303 | 294 | 371 | N/A | 158 | 149 |
| Scan times in minutes | 5min 3sec | 4min 54sec | 6min 11sec | N/A | 2min 38sec | 2min 29sec |

# Editor's **Choice**

**A**s you can see from the previous pages, scanners all pretty much do the same thing to pretty much the same level of quality. We tried as much as possible to be objective with our testing, although by definition, there had to be some subjective decisions, especially concerning line resolution (see How we did the tests, page 194).

Overall, though, we considered there to be the following features that make a scanner good. First is the image quality at the optical resolution of the scanner (600dpi on most of these). We examined the fine-line resolving capabilities of a scanner through its ability to accurately resolve an increasing number of black lines over a 1in width. This was complemented by a look at the dot above the letter i to see how well the scanner interpreted a small pinpoint and how pixellated it was upon completion.

Greyscales were checked with peaks in the Histogram function in Adobe Photoshop, which highlighted not only how many greyscales the scanner could distinguish, but the lack of a peak also told us in which areas it was struggling. Most scanners achieved 20 of the 22 scales, although the problem ends, ie black or white, differed from scanner to scanner and demonstrated how well each could cope when it came to recognising highlights or shadows.

Colour representation was a problem area as none of the scanners produced a pure colour from the test image. We have reproduced the colours for comparison on page 196 with the drum scanned target, but due to the magazine printing process these may not be accurate.

The final test involved timing a standard A4-sized scan at 600dpi. It could be considered that speed of scanning is the most important issue, but in reality this is only of secondary importance to the quality of the image. There is, after all, no point in fast scanning that results in poor quality. Most of the scanning we performed was at 600dpi, which is twice the level at which the average user will scan. This merely gives us an indication of the scan speed for comparative purposes.

## The winners

Of all the group tests of recent issues, this was definitely the most difficult in which to decide on a winner. Why? Because all scanners scan fairly well, and when you fix a price point of around £100, you get a fairly homogenous group with very similar capabilities. As a result, all the cheaper scanners are worth a look as much as the more expensive ones. The HP scanners were the easiest to set up, so if you need a low-cost novice scanner the 3400C is a good bet, although its performance isn't up to the standard of our winners. However, it will be fine for most people's scanning needs. And so to the winners.

Winner of this test's **Editor's Choice** is the **Epson Perfection 640U**. It may be the most expensive scanner in the group, but the extra performance places it a cut above the rest. Ironically, it pipped the Microtek to the post on scan speed. Yes, we said scan time wasn't very relevant, but when all the other factors are fairly similar, a faster scan time becomes a deciding factor. The Epson managed to scan the *PCW* cover in three minutes 16 seconds to the Microtek ScanMaker 4600's six minutes 11 seconds – quite a difference if you have to do several scans at a resolution of 600dpi. Apart from this factor though, both scanners achieved similar results in the tests, and the price difference is less than a fiver.

For general performance, both managed to distinguish 21 of the 22 greyscales, making them slightly better than the other scanners, each of which could distinguish 20. Resolution on both was excellent, with 140 lines per inch appearing relatively crisp, instead of as a series of grey and black lines (as they did in most of the other scanners). The resolution of the dot above a lower-case i was also better than most. Overall, they are virtually identical in terms of performance. So, taking the scan time into consideration, the Epson gets the Editor's Choice and the **Microtek ScanMaker 4600** the first of our **Highly Commended** awards.

The second **Highly Commended** award goes to the **HP ScanJet 4300C**. At £99 inc VAT it is cheaper than the other two winners. Its ability to resolve lines was equivalent at 140 lines per inch, although its greyscale distinguishing ability was one tone lower, with 20 of the 22 greys distinguished. It is also the fastest scanner we tested at 600dpi, giving a completion time of only two minutes 26 seconds. As one of the easiest scanners to set up, though, it is highly recommendable, and the price isn't too bad either. So why does it win over its sibling? Purely on the marginally better image quality it can produce.



*Epson Perfection 640U: a cut above*



*Microtek ScanMaker 4600: a close second*



*HP ScanJet 4300C: the fastest on test*

# Online b@nking

**Are you still going into the local branch of your bank (if you've still got one!) to deposit cash or pay your bills? Well, you're behind the times because online banking is the way forward. Paul Gosling explains the ins and outs and reviews 20 online banks**

T here is one overwhelming reason banks are now pushing online banking: it costs 10 times less for a bank to service customers over the Internet than it does if they call into branch offices. This is great news for consumers if banks pass on the savings, but this isn't always the case.

It is astonishing that in this age of low-cost Internet transactions banks such as Barclays, HSBC, Lloyds-TSB and NatWest believe they can get away with paying around 0.1 per cent on current account balances. Unless they change their approach very quickly then the future is likely to lie with online banks such as Cahoot, which pays 6.5 per cent on its current account, and Smile, which offers 4.85 per cent.

In fact, the economic laws of banking have been reversed. The Big Four banks used to be in the driving seat thanks to heavy marketing and lots of high-street branches that allowed customers to make transactions easily. As a result they benefited to the tune of multi-billion pound annual profits. But in this Internet age of banking small is now best.

Branches are becoming seen more as overheads than assets and the branch closure programmes launched by Barclays and others have been public relations disasters. However, competing against banks operating cheaply over the Internet – which offer good rates of interest on current accounts and even better for savings – requires fewer, better run branches. The alternative to closing branches is to make them work harder, which is one of the factors driving banks such as Lloyds-TSB to diversify more heavily into other financial products such as insurance and mortgages that can be sold out of the expensive branch network.
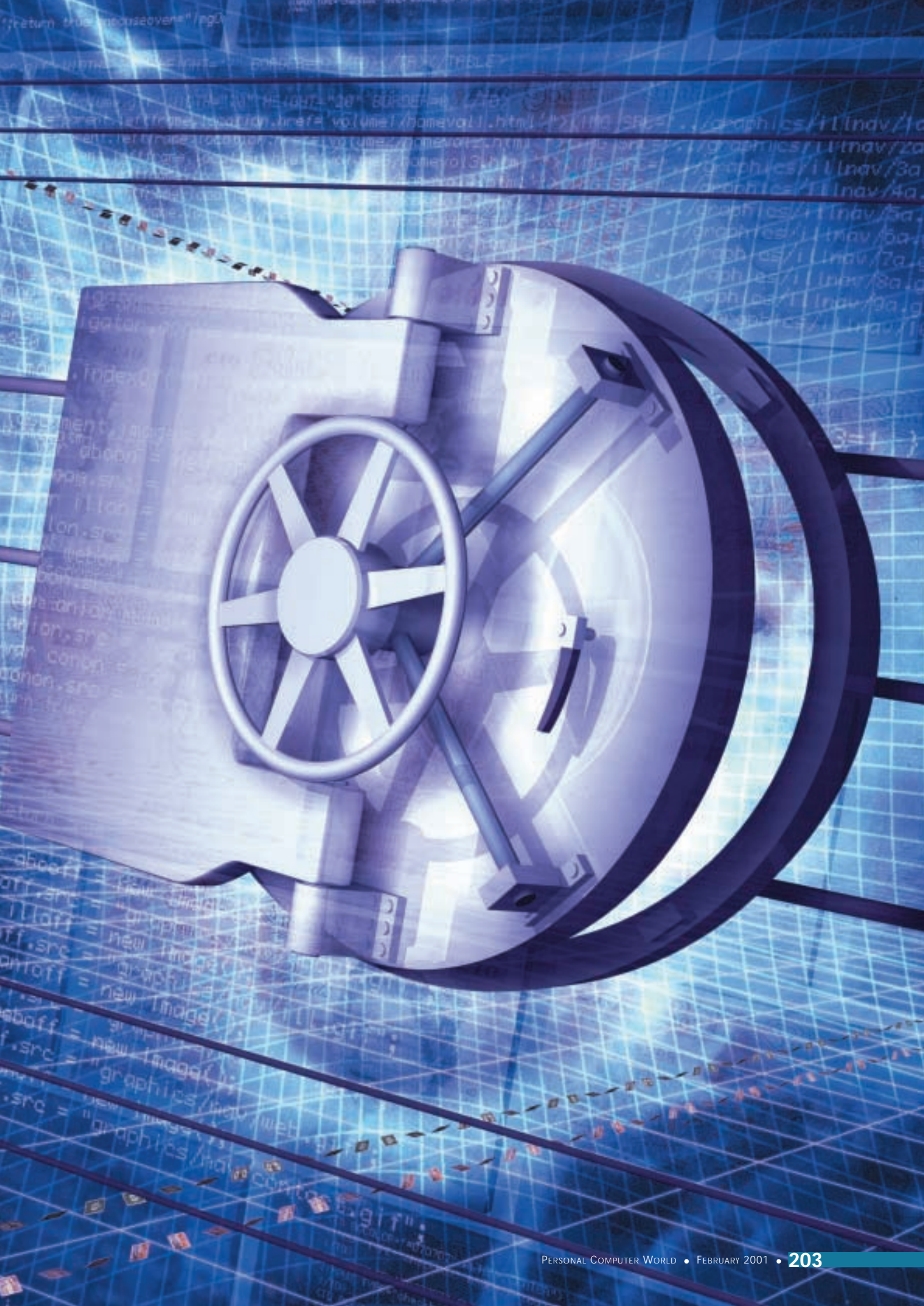
Despite this, more fleet-footed competitors can offer better deals. These new rivals include Abbey National's

ILLUSTRATION MAGICTORCH

## contents

Cahoot; The Co-operative Bank, which operates as Smile on the web; Egg, which was established by the Prudential; and one of the world's largest banks, Citibank of the US, which is now entering new markets including the UK, without the burden of a branch network. Even Credit Suisse, one of Europe's largest banks, has just started targeting customers in all parts of the continent – geography is less of a barrier to banks in the Internet age.

The cost benefits from being based on the Internet are shown most clearly in the savings rates offered by some online banks – at a time when the Bank of England's base rate is six per cent. Smile's mini-cash ISA pays 7.25 per cent on balances from just £1 and Nationwide's e-savings account yields seven per cent, also on £1 plus. The other best buys, according to Moneyfacts (the monthly trade magazine for the personal finance industry), are Abbey National's eSaver, paying seven per cent (including introductory bonus) on balances from £2,000; Bank of Scotland's fixed rate bond which pays seven per cent, with a minimum deposit of £3,000; and Newcastle Building Society, which is offering an interest rate of 6.6 per cent on its Net Savings Account on balances over £10,000. Interest rates change quickly and for the latest information check Moneyfacts' website, www.moneyfacts.co.uk.

### Winning customers

Those banks offering the best Internet deals are likely to win the best customers quickly. Busy, high-earning executives are exactly the type of customers that the banks want. And these people are some of those most likely to be won over by Internet banking, thanks to its convenience for those who are perpetually on the move – just plug the laptop and modem into the hotel room sockets and you can quickly sort out your finances. It is the migration of those top customers from the Big Four to emerging rivals that is likely to transform the banking industry and could wipe billions off the Big Four's profit figures.

As each bank closes its most loss-making branches, so more problems arise for them and their competitors. The first bank to close its branch in a small town will suffer from bad publicity. The last one to close will suffer from even worse publicity as well as bad customers – the costly ones that no-one wants. But

simply turning away expensive customers who cling to branch banking habits can have its own indirect costs. When one US bank did that it found it was throwing out the mums and aunts of many of its best customers, who promptly walked elsewhere with their accounts.

The commercial pressures from the web are already having their impact. Share prices are volatile and Lloyds-TSB and the Bank of Scotland – previously seen as the best managed banks – have seen stock prices fall as investors wonder whether they are fit for the Internet world. The news that Halifax is copying the Internet banks by offering decent rates (four per cent) on current accounts has helped to further damage banks' share prices. And the net was perhaps a major factor in the gobbling up of NatWest by the Royal Bank of Scotland – NatWest had one of the worst Internet sites among the banks, while the offering from RBS was much more competent.

Meanwhile, the Woolwich obtained a good price for its acquisition by Barclays precisely because it had an excellent website, a highly respected strategy for winning customers to WAP banking and a business plan that was seen as capable of effective transference to a larger bank – as well as a healthy mortgage portfolio.

But even those banks that have mature Internet strategies have suffered badly on occasions. Halifax-owned IF's original website was brilliant in design – so much colour, flashing lights and ear-catching music that it could have been a trailer for a *Mission Impossible* film – but flawed in execution. Its launch was seriously delayed by software problems – though its parent the Halifax says firmly that these are not security related.

In contrast, the much publicised problems with Barclays' site were very much related to security. Although the site looks brilliant, it failed the most important test – customers could apparently access other clients' accounts. Barclays reassures us that the glitch has been resolved, but a bad reputation is hard to mend. Similarly, the Egg site looks wonderful but it too had a software failure that theoretically allowed customers to view other clients' information.

This problem is most worrying with Egg because of its hardline attitude to fraud. If someone else accesses your online Egg account and moves money out, even if it is because of an Egg security lapse, then the liability falls on you the customer, says the small print.

'Until you tell us, you will be responsible for any instruction in writing or by telephone or Internet which we receive and act on, even if it was not given by you,' Egg tells its customers. It should be stressed, though, that Egg's spokeswoman contradicts the contract, saying: 'The onus with us [as a company] is definitely not with the customer.'

### Credit card security

But the biggest problem with security continues to apply to credit cards (see box on credit cards later in this group test). There is a rapidly growing problem with fraudulent use of credit cards over the net, but there is also a fast rising tide of counterfeit credit card production that is generating wider questions of card security. Lack of confidence in payment security is the main factor holding back the growth of ecommerce.

As a priority, then, the banks have to find more secure means of paying bills online. The explanation of why they have not already done so may lie in an anti-trust hearing taking place in the US. Manufacturers have been talking for several years about smart card readers imminently becoming a standard feature of PCs. This would be an obvious means of paying bills securely, allowing users to make deductions from smart card electronic purses, the balances on which could be read and adjusted by the PC.

The failure of smart cards to take off is due, says the US anti-trust prosecutors, to a lack of real competition between the two main card issuers Visa and Mastercard. Supposed evidence of this is their joint commissioning of research to examine the potential of the smart card market. At one point Mastercard decided that it was not viable to go ahead with the widespread introduction of smart cards unless Visa also did so, because of the cost. The implication for the consumer has been years of delay to the introduction of a system that could make a dramatic improvement to online security.

A recent report in the US from research firm ActivMedia predicted that there would be a quick decline in the use of credit cards for Internet transactions, replaced by smart cards holding ecash balances. Typically these will be capable of being topped up at cash machines. ActivMedia believes that smart card Internet transactions will jump from virtually nothing currently to $20b (around £14b) by 2002.

Domination of that online payment market seems likely to be fought for

primarily between Visa, which has just launched its VisaBuxx card in the US, and American Express, which has major ambitions in the online payment market.

One of the implications of the fight for domination in the online payments market, as well as the surge in support for online banks, is the prospect of greater promiscuity among the public regarding their banks. Perhaps in the future, fewer of us will be a Lloyds or a Woolwich customer, and more of us will be a Lloyds *and* a Woolwich customer, not to mention a Co-op and an AmEx customer, too.

The Co-op, for instance, boasts of winning 200,000 customers to its highly regarded Smile online bank, 80 per cent of whom were not existing customers. But one suspects that many of these did not jettison their existing accounts first.

## Easy account transfer

It will, though, soon be much easier to transfer accounts, thereby both introducing a more competitive market into the sector and possibly producing a major loss in market share for the Big Four. A pilot scheme is under way, under the control of APACS (the Association for Payments Clearing Services), through which bank customers will automatically have standing orders and direct debits transferred with them when they change banks. No more of the tedious form filling that probably puts off many people from trying to find the best interest rates on their current accounts. That could finally put an end to the oft-repeated statistic used in the banking industry that people are more likely to divorce than to change banks.

If you combine that promised new ease of transferability with the attractive rates of interest available online, and the simplicity and convenience of online banking, then we should soon see a real Internet banking revolution. Several recent reports have concluded that Internet banking will expand at an astonishing rate over coming years. Research from Amacis suggested that the Internet would become more important than branches for banking within three years. And a study by consultants Cap Gemini concluded that Europe is already ahead of the US in Internet banking in terms of market share (four per cent against three per cent), with European Internet banking set to take a quarter of transactions by 2003.

Prepare for lots more branch closures. *Paul Gosling is author of* Changing Money, *published by Bowerdean, which examines the impact of the web on the financial services industry.*

## Alliance & Leicester



**THIS IS AN UNINSPIRING** site that is irritatingly slow to load, hard to navigate and generally confusing. The bank does not offer any Internet-only accounts, just online access to existing or new current accounts. This helps to explain why the interest rates are uncompetitive – just 0.25 per cent on current accounts.

Overdrafts are reasonably charged at 12 per cent if authorised, but steep at 29.8 per cent if unauthorised (plus £3.50 per day and £27.50 per failed transaction). Fewer facilities are available online than from most competitors: you can access balances and recent transactions, but can only make transfers to previously mandated accounts and can't organise or amend standing orders or direct debits.

The ugly colour scheme of orange and light blue helps produce an unfashionable image that does not sit well on the Internet.

The bank also runs a website (www.billpayment.co.uk) for online payment of utility and some other bills, including a few local authorities' council tax charges, through debit card. This is a simple and convenient system for paying bills, which is more attractive and works better than Alliance and Leicester's main site. It would be good if it were better promoted and more councils signed up to it. But it, too, would benefit from more imagination.
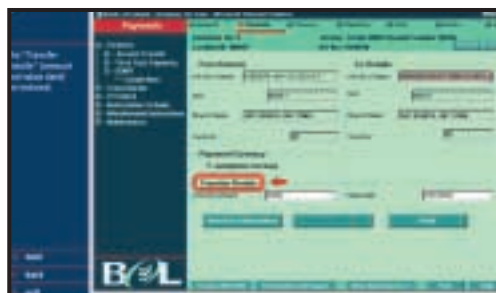
### DETAILS ★
**CONTACT** www.alliance-leicester.co.uk
**PROS** It's better than nothing...
**CONS** ...but only just
**OVERALL** The booby prize

## Bank of Ireland



**THE BANK OF IRELAND** operates in both the Irish Republic and Northern Ireland, and provides Internet banking through its very well organised website. Its Internet presence is unusual in that it works hardest at promoting itself and its history – probably reflecting a lack of awareness of the bank among the wider population.

The website is very stylish, but is short on functionality. One of the attractions of this site is that those considering taking their banking online can run a demonstration to see how it works before committing themselves.

Current accounts are not very attractive, at zero rate for the standard product, 0.15 per cent for the 'advantage' accounts, or 0.5 per cent for students.

There are no high-interest, Internet-only savings accounts on offer, so savings rates are also unappealing, starting at just 1.5 per cent. Premium gold savings accounts pay a better 2.8 per cent to 4.25 per cent, according to size of balance.

The Bank of Ireland (BoI) issues several credit cards, but rates on these are not good, either, at 19.34 per cent to 22.42 per cent. There is also a daily financial markets review, which is useful for business clients. Customers can take advantage of free Internet access through the bank.

### DETAILS ★★
**CONTACT** www.bankofireland.co.uk
**PROS** Attractive and easily navigated site
**CONS** Interest rates are uncompetitive
**OVERALL** Nice website, pity about the products

## Bank of Scotland

**THE BANK OF SCOTLAND** was one of the first to offer online banking with a direct-dial facility, which should be more secure than Internet banking and is still available. An improved Internet banking service is to be launched soon, offering third-party payments and inspection of standing orders and direct debits.

This is a nice looking site, but uninformative. Interest on current accounts is a mere 0.1 per cent on balances up to £5,000. (BoS current accounts will pay up to 2.02 per cent if the balance held is over £50,000, but holding this much in a current account is a crime against personal finances!)



There are no special rates applicable to Internet accessed current accounts. Interest rates on authorised overdrafts are 18 per cent (and 29.75 per cent on unauthorised overdrafts) which helps to explain why the bank has had such healthy profits. BoS i.save, an Internet-only savings account, offers a more reasonable five per cent on balances under £5,000, or 6.1 per cent on larger amounts, but these are still less than those available from competitors.

The impression you get is that the bank took its leading position in online banking for granted, and has now fallen behind its competitors.

### DETAILS ★★
**CONTACT** www.bankof scotland.co.uk
**PROS** Smart, reasonably easy to navigate site
**CONS** Interest rates are not as competitive as others on the Internet
**OVERALL** BoS needs to wake up to the changing realities of net banking

## Barclays Bank

**BARCLAYS CAN'T** be beaten on website design and it is the UK's leading banking site in terms of user numbers. It has great graphics, a simple and smart layout, and a wide range of services.

Although Barclays came to the party quite late, it arrived with a bang – its site has greater functionality than many of its competitors, allowing account inspection, transferring money to other accounts, bill payment and control of standing orders and direct debits.

The site links efficiently to the bank's other activities including online stockbroking and insurance. Barclays promises customers free Internet access for life and has recently announced a tie-up with Vodafone, allowing access to Internet banking through WAP phones. But there are no special rates for clients who exclusively use the Internet for banking, so current account interest rates are a mere 0.1 per cent. The instant access savings account is equally uncompetitive, ranging from 1.5 per cent to 2.5 per cent according to the amount on deposit.

Loans are charged at a whopping 17.9 per cent for amounts from £500 to £4,000, which falls to 11.9 per cent on amounts between £12,100 to £15,000. In short, you could do better by going to one of Barclays' competitors.

### DETAILS
★★★
**CONTACT** www.barclays.co.uk
**PROS** Excellent website with good design and easy navigation
**CONS** Interest rates are uncompetitive
**OVERALL** Looks good, but doesn't deliver the goods

## Cahoot

**ABBEY NATIONAL'S** offshoot is an excellent example of a specialist Internet bank. Its current account is difficult to beat at 6.5 per cent, rising to 7.1 per cent on balances over £5,000. The account comes without a chequebook, so can be compared to an instant access savings account with direct debit and standing order facilities.

For current accounts with a chequebook the rate is still good, starting at five per cent for balances under £5,000 and peaking at 6.4 per cent for accounts holding more than £25,000.

Current accounts also come with an automatic £250 interest-free overdraft facility, or a competitive seven per cent on higher amounts. An attractive alternative for those who generally overdraw is to pay a monthly fee for your overdraft, which is equivalent to an interest rate of 5.6 per cent.

The credit card charges just eight per cent. Interest on credit card bills can be cut further by opting for a monthly fee. One important caveat: can such attractive interest rates really be held over the longer term? Cahoot says they can. Let's wait and see.
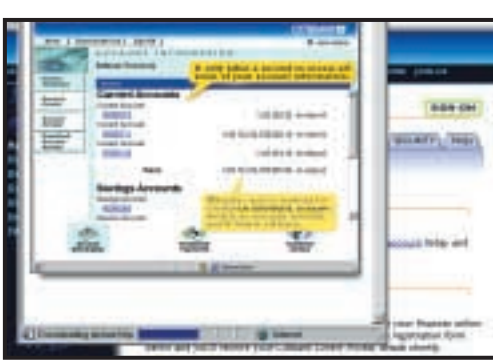
### DETAILS
★★★★★
**CONTACT** www.cahoot.co.uk
**PROS** Quality of site and quality of products
**CONS** The interest rates quoted in the site's headlines do not apply to all accounts
**OVERALL** With a great site and excellent rates, Cahoot is leading the market

## Citibank

**ONE OF THE WORLD'S** largest banks, Citibank has chosen to concentrate on Internet banking for its UK operation and has only four British branches (all in London). The Internet banking is backed up by call centres for customer account control and customers using the Internet can also use the branches free of charge.

Citibank's website is not just smart and informative, but also well laid out with an effective online banking demo system. One plus over most other banks' sites is that customers can also change their cash machine PIN codes online.

Accounts pay a good rate of interest, but do not match some of the emerging Internet banks. The sterling current account pays four per cent on balances over £50,000; accounts in credit by less than £2,000 earn a more sober 0.25 per cent. The best news is that overdrafts up to £500 are interest free. Applicants need to earn more than £20,000 a year to open an account.

The instant access savings account, Citibank Accumulator, pays a more competitive 6.5 per cent, though needs a deposit of £5,000 to open. There are no withdrawal fees.

### DETAILS
★★★★
**CONTACT** www.citibank.co.uk
**PROS** Well organised website with good rates of interest
**CONS** Not so competitive for smaller balances
**OVERALL** Citibank may be a good option if you're a high earner

## Credit Suisse



**CREDIT SUISSE**, one of Switzerland's rich people's banks, launched a pan-European online investment service last September aimed at private banking customers. But this is less of a niche market than it might seem – it aims to have one million customers within five years. The service is initially only available in Britain and Germany, but the personal banking service also run by the bank is not available to UK citizens who live in Britain.

The bank aims to create what it describes as 'a new kind of personal finance advice service', beginning with an information service, and evolving into a realtime share dealing service operating in 15 stock markets around the world. (This is not unique. Fastrade (www.fastrade.co.uk) is a share dealing service that trades on even more exchanges).

Credit Suisse's customers can arrange trades using sterling, US dollars, euros or Swiss francs. The service is aimed at what the bank calls Europe's 40 million 'new affluents'. They are to be serviced not only through the Internet, but also via digital TV and WAP phones. Accounts need a minimum of £600 and most customers will already have £30,000 of assets under management.

It promises a lot for a few, but the site is confusing and fails to deliver what the bank has started heralding.

### DETAILS
★★

**CONTACT** www.credit-suisse.com
**PROS** Nice, simple design.
**CONS** Delivers very little for most people.
**OVERALL** Not relevant to most of us

## Egg

**ONE OF THE** best looking websites around featuring an attractive design, combined with easy navigation. Egg's current account had not been launched as we were going to press, but the bank says it will be highly competitive with attractive interest rates.

The online instant access savings account pays 6.3 per cent, or 5.3 per cent with a cashcard, and has a single rate no matter how small the balance. The credit card charges 11.9 per cent, which is not the best on the market, but balances moved from another card are charged at just 2.5 per cent for the first six



months. So get moving on those card balances, but review your options after six months.

Loans over £10,000 are available at an APR of 9.9 per cent. Mortgages are charged at a good 6.9 per cent APR, with a promise that rates will not rise above one per cent over the Bank of England's base rate.

Egg promises its insurance brokerage service will beat any motor insurance renewal offer. The website also contains an online shopping mall, where if you use the the bank's credit card you'll earn a two per cent cashback reward.

### DETAILS
★★★★★

**CONTACT** www.egg.co.uk
**PROS** Well designed and easy-to-navigate site, with excellent products
**CONS** The websites of the retailers on the shopping mall don't all match Egg's standards
**OVERALL** Excellent, but can the interest rates last?

## First Direct



**HSBC HAS TAKEN** a different approach from its Big Four competitors by establishing a low-cost, non-branch subsidiary bank. Initially First Direct operated, very successfully, as a phone bank, but is reinventing itself as an Internet bank. Its website is well designed, attractive, informative and easy to navigate.

Existing phone customers can use the website to transfer their accounts to the Internet. But Internet customers can still use the bank's call centres.

The current account pays five per cent on all balances, the savings account also pays five per cent on smaller balances, rising to 5.5 per cent for amounts over £5,000; 5.75 per cent over £50,000 and six per cent over £100,000. Overdrafts are charged at 10.9 per cent and all current account customers have automatic use of an overdraft facility without having to pay a facility charge or penalty.

The credit card charges interest at 4.9 per cent for six months, after which it rises to 10.9 per cent.

While the bank also uses its website to promote its mortgage, investment and insurance products, these are not currently available over the Internet. The account management demonstrator was not working when this site was reviewed.

### DETAILS
★★★★

**CONTACT** www.firstdirect.com
**PROS** Well designed and easy to navigate site
**CONS** Not all the bank's products yet available online
**OVERALL** A good site but still in development

## First-e

**THE FIRST EUROPEAN** Internet-only bank, launched in November 1999, First-e is the UK Internet operation of France's Banque d'Escompte. It has a simple design that is easy on the eye and backed by an excellent navigation system.

Rates are excellent – 4.88 per cent on current accounts and six per cent on savings accounts. A shopping mall is also attached to the site with special offers, including PCs, which First-e claims are significantly cheaper than on the high street.

Internet banking can also be conducted from Nokia 7110 WAP phones.

As this is not run by a UK bank, it is not a member of the Banking Ombudsman scheme, but it has established its own customer complaints procedure run by an independent solicitor.

First-e also provides an investment account, through which customers can share trade on the London exchange with settlement taken straight from a First-e account.

The site has had a bad press over suggestions of weak security, but the bank says that complaints have been overstated. We were worried that First-e failed to respond to an email question on its depositor protection scheme, as most Internet banks respond very quickly to email enquiries.

### DETAILS
★★★★
**CONTACT** www.firste.com
**PROS** Pleasant website and good interest rates
**CONS** Not a full range of financial products; customer support seems poor
**OVERALL** Good rates makes this one to watch

## Halifax **IF**

**HALIFAX'S INTERNET** bank is rapidly becoming an inadvertent case study of how not to launch an online operation. Announced with a big fanfare in July, it was pulled days before its launch, another date was set for August and then its appearance was delayed again. At the time of going to press there was still no date for the final launch.

What is even stranger is that before the phone element went live, the website looked great. Then the website was changed from an exciting zappy format, accompanied by music, to a boring set of still pictures. The whole venture threatens to badly damage the Halifax's reputation – despite the parent's website itself being highly regarded, with good functionality and support for online share dealing.

The plus point for IF is that the current account pays a good five per cent and the savings account pays up to 6.25 per cent. Loans will be available at 10.5 per cent and the interest on credit card balances is 10.8 per cent.

There is a good online demo facility of how IF can improve your personal finances. But the bank declines to explain the problems that have caused the Internet site's launch delays, saying only that they are 'capacity problems' and are definitely not security related.

### DETAILS
★★
**CONTACT** www.if.com
**PROS** Products look good
**CONS** Website isn't currently up to the job
**OVERALL** Not much to be said thanks to the delays

## Lloyds-TSB

**LLOYDS-TSB HAS** belatedly entered the Internet age with a revamp of its website. This is a single gateway not just to Lloyds-TSB banking products, but also to those of subsidiaries – Cheltenham & Gloucester for mortgages and Scottish Widows for pensions and life assurance, as well as a car leasing scheme.

The site is professional and smart, but like Barclays and NatWest, Lloyds-TSB is finding it hard to move from its role as a branch-based bank offering low interest rates, to a virtual bank with more attractive products. Consequently, the current account interest rate of 0.1 per cent is uncompetitive compared with the standalone Internet banks.

Interest on loans from £500 to £3,000 is 19.8 per cent; from £3,000 to £5,000 is 17.7 per cent; and over £5,000 is 15.9 per cent. Interest on current account overdrafts is 16.8 per cent, but 29.8 per cent when unauthorised, or just 7.4 per cent for students.

APRs on Cheltenham & Gloucester's mortgages range between 7.4 per cent and eight per cent according to size and term of loan. One of the benefits with Lloyds-TSB is that deposits and withdrawals can be conducted through Post Office branches.

The site would benefit from easier and quicker navigation between the main bank site and related activities – such as the InsureDirect service.

### DETAILS
★★
**CONTACT** www.lloydstsb.co.uk
**PROS** Site is smart and interest rate for loans to students is good
**CONS** Most products are uncompetitive
**OVERALL** If Lloyds-TSB is to succeed on the web then it needs to improve its offering

## Nationwide

**BUILDING SOCIETIES** are unfashionable, but having a chief executive who is a former IT director has paid dividends for Nationwide. It claims to have the most heavily visited financial services website, thanks to its sponsorship of the England football team and the Football League; it's hosting the very successful Football Now website (www.footballnow.co.uk) which has links to Nationwide's web pages.

We found Nationwide's website a touch too busy in design, but on the whole it's reasonably well organised and effective. It also offers an extremely good interest rate, at 7.25 per cent on its Internet-accessed e-savings account, even on balances as small as £1.

Interest on current accounts is not so good, at 1.45 to 2.75 per cent according to the balance. Mortgage rates are competitive at 7.7 per cent on the standard variable rate or between 5.69 and 6.44 per cent on the fixed rate.

There is also an online house valuation service and the building society promotes insurance products on its site, though these are sold over the phone, not the web.

Personal loans are available with interest rates from 8.5 per cent, where secured, rising to a top rate of 16.7 per cent for unsecured loans of less than £3,000. Nationwide also offers customers a subscription-free Internet service.

### DETAILS
★★★★
**CONTACT** www.nationwide.co.uk
**PROS** Some products are excellent
**CONS** Some products are not
**OVERALL** Proves that you can be a traditional business and adapt to the web

## NatWest

**BEFORE ITS PURCHASE** by the Royal Bank of Scotland, NatWest's website was about as primitive as a corporate's site could be. But RBS has begun galvanising the old bank into the new virtual world. It's not all there yet, but at least it now looks good. Particularly impressive is the quality of its navigation system.

The online account management system also scores highly, as it is simple, clean, easy to understand and use, with a good range of functions. There is an excellent online guide to house buying, which is useful for the first-time buyer.

An online application form for a mortgage is attached to a repayment calculation facility. We now have to wait for evidence that RBS can turn round the quality of NatWest's products, too.

Interest rates on current accounts are, like the other major banks, just 0.1 per cent. However, NatWest has now launched e-savings accounts, which pay interest at a reasonable 4.95 per cent on balances up to £10,000, rising to 5.95 per cent for sums over £250,000.

Overdraft rates are 16.06 per cent or 18.38 per cent, or 7.5 per cent for students. The interest rates on loans range from 9.9 to 20.9 per cent, according to the size of loan. The standard variable rate on mortgages is 7.74 per cent. You can also do online share dealing from NatWest's website.

### DETAILS
★★★
**CONTACT** www.natwest.com
**PROS** Website looks good and is easy to navigate
**CONS** Some products need radical surgery
**OVERALL** Improving, but needs more work

## Newcastle Building Society

**THIS IS A BASIC** website that will win no design awards. However, the society runs an Internet-only instant access savings account, Newcastle NetSavings, from the site, which pays a competitive 6.1 per cent on balances from £1,000 to £10,000, or 6.6 per cent on larger deposits – this compares exceptionally well with the non-net instant access savings account, interest on which peaks at 3.85 per cent.

It is more attractive than the society's Nova ISA, which pays 5.9 per cent. Only the NetSavings account is a genuine Internet-based facility, but you can contact the society by email about any of its products. This service has been recognised in a recent survey as one of the most efficient in the financial sector.

Mortgage rates are good at 7.3 per cent. Quotes for motor and household insurance can be requested online. The Society's Platinum credit card has no annual fee, charges interest at 14.9 per cent and comes with a chequebook. This may be a useful way to use one of the various high-interest instant access savings accounts on offer and survive without a current account.

Personal loans are available at a rate of 9.9 per cent. But the society does need to invest in improving the website and providing more online functions.

### DETAILS
★★
**CONTACT** www.newcastle.co.uk
**PROS** Attractive savings rate and chequebook attached to credit card
**CONS** Website has few functions and poor design
**OVERALL** Not bad, given the society's small size, but needs some improvement

## Royal Bank of Scotland
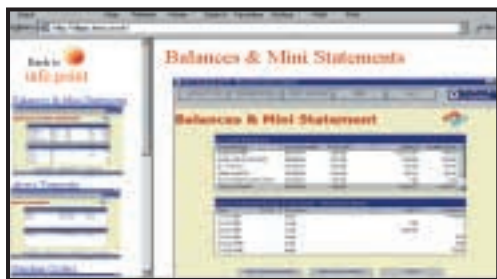


**THIS IS A VERY** impressive, attractive website with good navigation. RBS has recently upgraded the services available for current account management, to include bill payment, payment transfers, setting up or cancelling standing orders and cancelling direct debits.

Unfortunately the interest paid on its current accounts is uncompetitive – at 0.1 per cent on basic current accounts, 1.5 per cent on top-tier accounts and three per cent on student accounts.

The new Direct Saver instant access account is competitive, though, at five per cent on sums under £5,000, rising to six per cent with deposits over £50,000 – a minimum of £50 is needed to open an account. There is also a lower interest loan, starting at 7.5 per cent, for those applying online, and the bank promises a decision in principle in seconds.

However, the RBS does still need to increase its online functionality to compete with the Internet banks –

enabling credit cards and mortgages to be applied for over the web, for instance.

On the plus side, there is an excellent A-Z guide of products, which explains in some detail all the products offered by the bank and the costs and benefits.

Having recently joined the Big Four of UK banking, the RBS has a wonderful opportunity to become the market leader in Internet banking.

### DETAILS
★★★★

**CONTACT** www.rbs.co.uk
**PROS** Excellent website and good online savings rates
**CONS** Current account needs to pay decent interest
**OVERALL** RBS is going places with this excellent site

## Smile

**SMILE IS THE INTERNET** operation from The Co-operative Bank. The site is so colourful that it comes across as being garish, but it has been widely praised for its high-quality navigation system and the excellence of its products.

The site is easy to use and pays interest at 4.85 per cent on current accounts, six per cent on savings and 7.25 per cent on a mini-cash ISA – no matter how small the balances. The special student current accounts pay 4.85 per cent on balances, but also come with an interest and charges-free overdraft facility that rises to £2,000 by the last year of university.

A credit card is available online
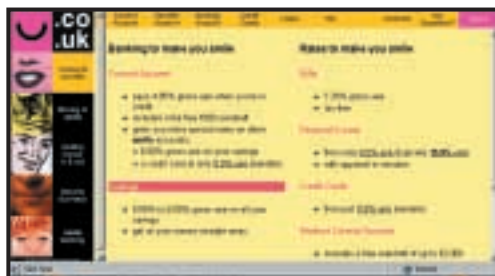


which charges a good 9.9 per cent APR. Interest on personal loans starts at 9.5 per cent, but most loans cost 15.9 per cent. The bank promises rates are long-term and sustainable, not just there as loss leaders to draw in customers.

There is an online demonstration of how to manage your account – and full online functionality, including control over direct debits and standing orders; transfers to other accounts including those held with any other bank; requests for bank statements; bill payment; cancellation of bank card and request for replacement; foreign currency ordering; change of PIN number and personal contact details.

This is how an online banking operation should be.

### DETAILS
★★★★★

**CONTACT** www.smile.co.uk
**PROS** Excellent website and products
**CONS** Colour scheme might give you a headache
**OVERALL** Smile shows how Internet banking should be done and is currently a market leader

## Tesco



**TESCO IS CONSTANTLY** reinventing itself, and its online banking service is part of that process. The banking is conducted in Tesco's name by the Royal Bank of Scotland – extending the principle of own-branded products from baked beans to banking.

Tesco's website is smart, efficient and seamless. You can move quickly and easily from ordering supermarket shopping for home delivery to its personal finance site, which contains the online banking service. The Instant Access Savings and Clubcard Plus accounts can be accessed over the Internet, with balances checked and money transferred to other accounts.

Interest rates on the instant access savings accounts range from 4.85 per cent to 5.75 per cent, according to the size of balance. Five-year loans of £15,000 to £25,000 are available at 8.8 per cent interest; other loans are charged at 9.9 per cent. Applications for loans can be made over the Internet.

Tesco also issues Visa cards, which charge interest at the exceptionally good introductory rate of 4.9 per cent, before rising to the less attractive rate of 15.9 per cent from April 2001.

Other products sold via Tesco's personal finance pages include an ISA, bonds and insurance, while there is also an online mortgage brokerage run for Tesco by the respected John Charcol Brokers, including offers of special Tesco and Charcol mortgage deals.

### DETAILS
★★★★

**CONTACT** www.tesco.com
**PROS** Easy to use; wide range of services
**CONS** Graphics are rather naff
**OVERALL** Strong site, helping to build Tesco as a multi-sector retailer

## Virgin

**VIRGINONE'S WEBSITE** is attractive, easy to navigate and explains a complex product well – a bank account that acts as a current account plus mortgage loan (the flexible mortgage).

Rather than earn interest on current and savings accounts – a lower interest rate than you pay on your mortgage – you roll the products together. You can pay off the home loan early and save thousands of pounds over the years.

The downside is that these accounts are no good for people without strong financial discipline. The risk is that people will take advantage of comparitively cheap borrowing facilities (7.1 to 7.95 per cent, according the proportion of the home's value you are borrowing ) to borrow too much, threatening the mortgage repayment. But it is a good product when in the right hands as it helps avoid running up high interest bills on credit cards. (However, if you run up large bills on your credit card, this account is probably not for you anyway.)

Woolwich offers the same type of account at the lower interest rate of 6.75 per cent. The accounts are administered for Virgin by the Royal Bank of Scotland. Insurance and pensions products can be bought from the sister VirginDirect website.

## DETAILS
★★★
**CONTACT** www.virginone.co.uk
www.virginmoney.com
**PROS** Pleasant and well-designed website
**CONS** Too many photos of Richard Branson; can buy similar products better elsewhere
**OVERALL** Interest rates need to fall

## Woolwich

**THE WOOLWICH'S** website is clean, attractive and functional, with a good design and easy-to-use navigation controls. The website offers not only Internet banking, but also WAP banking – Internet banking via WAP mobile phones. Woolwich even provides free WAP Vodafone mobiles to customers.

Woolwich is a pioneer of multi-channel banking – branded as Open Plan. Accounts can be accessed by Internet, interactive TV, phone or branch; there are no Internet-only accounts; and there is a common, poor, interest rate on current accounts, starting at 0.25 per cent, rising to 0.5 per cent on balances over £5,000. Instant access savings accounts pay 4.75 per cent on balances from £50 to £25,000.

The bank also offers a flexible Open Plan Offset Mortgage, through which balances on the current or savings account are taken off the mortgage balance for calculating interest payments. Mortgage balances under the Offset plan are 6.75 per cent, against the 7.5 per cent payable on the standard variable rate mortgages.

Woolwich offers 6.25 per cent on £500-plus in its one-year fixed-rate bond. Credit cards are offered at an introductory six-month rate of 6.9 per cent, before rising to a poor 16.9 per cent. Mortgages and loans can be applied for online.

## DETAILS
★★★★
**CONTACT** www.woolwich.co.uk
**PROS** Attractive site and customers can use phone and branches, too
**CONS** Current account rates uncompetitive
**OVERALL** Technically it is excellent, but the bank needs to pay its customers more in return for using their money

# So what's the downside?

The world of online banking is not without its share of problems. The Foundation for Information Policy Research (FIPR) recently slammed web banks for acting irresponsibly by not developing adequate security and holding customers responsible for online fraud.

This follows the arrest of three hackers who attempted to set up false accounts with online bank Egg in August and were detected by anti-fraud software. The bank claims it only lost a 'minimal' amount of money.

These events occurred just five months after the FBI swooped on a farming village in west Wales and arrested two 18-year-olds said to be involved in a £3m global Internet fraud. The FBI had been investigating the case for months after banks and businesses in the US, Canada, Thailand and Britain were hacked into and credit card details stolen.

Even James Bond has been affected by online bank blunders. Roger Moore, who played the British secret agent in the 1970s and 1980s recently had his Swiss bank account details published on the web. Moore and other customers at Credit Suisse had their secret account numbers and residential addresses exposed inadvertently on the bank's website.

The victims of these crimes and blunders will be glad to hear that home secretary Jack Straw has just proposed a

*The FIPR has lambasted online security*

£25m cash injection to set up a specialist online group of 'cybercops' who will deal with such matters.

**BEN LEWIS**

# Online credit cards

**F**ancy saving £435 easily and quickly? Well if, like eight million others, your credit card is a Barclaycard and you have a regular monthly debt of £5,000, then you could save £435 by moving to an Egg credit card for six months. Balances transferred to the Internet bank's Egg credit card from an existing card earn just 2.5 per cent interest for the first half year. This compares with the heavy 19.9 per cent interest rate levied by Barclays. And there is no interest charged on items bought in that introductory period.

After six months you might want to change again, as Egg's credit card interest rate jumps to 11.9 per cent – not the most competitive on the market.

A similar situation applies with Capital One's Premier Visa card, which was offering interest-free deals for six months on new spending – but not transferred balances – at the time of going to press. However, these deals change very quickly. For the latest information on the best credit card interest rates visit the Moneyfacts website, **www.moneyfacts.co.uk**.

Too many of these highly attractive introductory offers turn sour after the honeymoon. Capital One, for instance, charges a rather high 12.9 per cent when the six months are over. Even worse, the RBS Advanta card offers a very good 2.9 per cent until June 2001, but then jumps to an excessive 17.9 per cent. The online Marbles card (**www.marbles.com**) charges 4.5 per cent on transferred balances for six months, before rising to a 'competitive' (but less than brilliant) 15.9 per cent.

One of the best ongoing deals available is from the Internet-only bank, Cahoot (owned by Abbey National), which is giving new customers a five per cent cashback on transferred balances. So that £5,000 moving from Barclaycard to Cahoot will earn its new owner some £250. Cahoot's interest rates are a very reasonable eight per cent, for low-risk customers. This is one of the best standard rates on the market, though not the very best. Northern Rock offers a credit card attached to some of its mortgage products, which brings its credit card interest rate down to a mere 6.99 per cent.

But interest rates are not the only consideration. If you are able to treat your credit card as a charge card – paying off the balance in full each month – there are other factors that might guide you. Barclays, for instance, is to copy Egg by launching an ambitious online shopping mall. Barclaycard is already Europe's largest credit card issuer, but its credit card site has just 300,000 users – less than four per cent of its customer base. The bank hopes to boost this to half a million regular visitors through the online shopping mall, which might eventually accommodate as many as 350 retailers and five million products.

And Gomez, a US publisher of online consumer guides, has recently produced league tables of the nine UK credit cards that can be applied for and run over the Internet. They were tested according to ease of use, customer confidence, online support resources, relationship servicing, total cost, Internet transactions, interest rates and for shopping facilities.

The best three, in order, were Cahoot, Egg and Smile – all Internet banks – and all were consistently good for online use. Their qualities are that Cahoot is easily the cheapest card; Egg is top for Internet transactions; and Smile is the best for convenience. Egg also has the benefit of a two per cent cashback for use on its own shopping mall. Barclaycard, though, was ranked best for online support, where Cahoot and Smile were poor, while Egg failed the test for ease of use.

But credit cards come – or rather should come – with health warnings attached. Drawing cash on a credit card is expensive and cards come with a whole stream of possible hidden charges. One of these is the transaction charge for non-sterling purchases, which could be significant given both the global character of the Internet

## Table of features

| CREDIT CARDS | BOOTS | CAPITAL ONE BANK | MARBLES |
|---|---|---|---|
| URL | www.bootsadvantage.com | www.capitalone.com | www.marbles.com |
| Card type | Advantage Visa | Premier Visa | Mastercard/Visa |
| Introductory rate (monthly) (per cent) | 0 | 0 | 0.37 |
| Annual percentage rate (per cent) | 0 | 0 | 4.5 |
| Until | First 6 months | First 6 months | First 6 months |
| Standard rate (monthly) (per cent) | 0.87 | 1.02 | 1.24 |
| Annual percentage rate (per cent) | 10.9 | 12.9 | 15.9 |
| Interest-free period | 45 days | 54 days | 52 days |
| Fee | Nil | Nil | Nil |

| INTERNET CREDIT CARDS | BOOTS | CAHOOT | EGG |
|---|---|---|---|
| URL | www.bootsadvantage.com | www.cahoot.com | www.egg.com |
| Card type | Advantage Visa | Visa | Visa |
| Introductory rate (monthly) (per cent) | 0 | N/A | 0 |
| Annual percentage rate (per cent) | 0 | N/A | 0 |
| Until | First 6 months | N/A | First 6 months |
| Standard rate (monthly) (per cent) | 0.87 | 0.64 | 0.94 |
| Annual percentage rate (per cent) | 10.9 | 8* | 11.9 |
| Interest-free period | 45 days | 46 days | 45 days |
| Fee | Nil | Nil | Nil |

* Low risk rates quoted and guaranteed until 30.06.01; APR dependent on credit rating; three options available per account.

and the UK's resistance to euro membership. Marbles charges a 2.75 per cent 'administration charge' for non-sterling transactions as does Smile: Egg charges two per cent and Cahoot just 1.25 per cent.

There is also a downside to dealing with a virtual bank. Egg expects to communicate by email and telephone – it charges £2 for each paper statement and 'non-standard services' will be charged. It also promises to charge customers the cost of chasing unpaid bills as well as a £20 charge for paying late or exceeding your limit. There is also a £2 fee for receiving payments to clear credit card balances other than by direct debit.

An area that causes considerable anxiety is security. There is a growing level of credit card fraud, both through the physical copying of cards for use in high-street shops and restaurants, as well as with the fraudulent use of card details for phone and online transactions. Marbles has a strong guarantee published on its website that its customers in no circumstances will be liable for

any fraudulent use of their cards on the Internet. The exception to Marbles' acceptance of liability is where the customer knows of its fraudulent use, or has allowed someone else to use their card.

Following strong criticism of Egg's liability policy in a recent report from the Foundation for Information Policy Research, the online bank has now made its position clearer regarding customers' liability – there is none for the fraudulent use of their cards by others, and that includes (contrary to the fine print of its contract) where cards are stolen and used before the customer notifies the bank. Cahoot similarly commits itself to fully accepting liability for fraudulent card use. The exception here is with Smile, which reserves the right to pass on the first £50 of any losses.

But this is by no means the end of the story. We can expect enormous efforts by the banks to sort out the security problems that are holding back the growth of ecommerce. It's a shame they didn't start this job rather earlier.

*Cahoot offers one of the best deals – five per cent cashback*

*Egg is listed as one of the best by Gomez, but failed the ease of use test*

*Marbles customers will not be liable for fraudulent use of their cards*

*Royal Bank of Scotland's 2.9 per cent deal ends in June*

| NATIONWIDE BS | RBS ADVANTA | TESCO |
|---|---|---|
| www.nationwide.co.uk | www.rbs.co.uk | www.tesco.co.uk |
| Visa | Mastercard/Visa | Visa |
| 0.29 | 2.24 | 0.34 |
| 3.5 | 2.9 | 4.9 |
| First 6 months | 1.6.01 | 1.4.01 |
| 1.14 | 1.39 | 1.24 |
| 14.6 | 17.9 | 15.9 |
| 56 days | 56 days | 56 days |
| Nil | Nil | Nil |

| MARBLES | NATIONWIDE BS | SMILE |
|---|---|---|
| www.marbles.com | www.nationwide.co.uk | www.smile.co.uk |
| Mastercard/Visa | Visa | Visa |
| 0.37 | 0.29 | N/A |
| 4.5 | 3.5 | N/A |
| First 6 months | First 6 months | N/A |
| 1.24 | 1.14 | 1.02 |
| 15.9 | 14.6 | 12.9 |
| 52 days | 56 days | 46 days |
| Nil | Nil | Nil |

Figures compiled on 15.11.00

# Editor's **Choice**

**I**f you're looking to open an online bank account, make sure you know what facilities you want. Some banks simply offer an online version of the traditional high-street bank, whereas others have gone further and really make use of the Internet. Some offer better rates of interest for both accounts and credit cards. Some sites are imaginative and fast – others are plain slow and dull.

## The winners

Our **Editor's Choice** award goes to **Cahoot** for its matching of style with substance. It has one of the best Internet sites available in any field of commerce. It features a series of arresting images together with an innovative design that is easy on the eye, simple and allows effective navigation of the site.

The web pages complement the ideas behind Cahoot – that it is different and rewards its users. This message is illustrated, too, by the bold emphasis on the extremely attractive products – when logging on to the site, Cahoot uses about a quarter of the screen to shout 7.1 per cent (interest on current account balances over £5,000) at the viewer. Quite simply, Cahoot's products are – taken together – the best available, either on the net or off it. High interest rates for savers are allied to good-quality services.

With the eight per cent interest rate on its credit card, Cahoot comes out best in this market, too (at least when ignoring low interest rate introductory

offers). And then there is the five per cent cashback on credit card balance transfers. The £250 interest-free overdraft facility is yet another plus.

All this comes as a bit of a shock to bank watchers. Cahoot's parent is Abbey National, which has never had much of a reputation for innovation. What Abbey has illustrated here is that established and largely traditional businesses can see off the new start-up dot coms. There is also a facility for automatic notification of account information either by email or text message to a mobile. Cahoot is about as good as it gets.

Our first **Highly Commended** award goes to **Egg**. It is without question the best of dot com banks. Initially started by the Prudential as a telephone bank, the higher than expected pull of the Internet among customers has pushed it into becoming an Internet bank. If anything, it is more ambitious than most of its competitors. Although, at the time of going to press, Egg had not yet launched its current account, it did have a very advanced shopping mall attached to the bank's website.

Several years ago, when the Internet was in its infancy, both Barclays and NatWest attempted to host online shopping malls, without success. The idea seemed to die, and banks were pushed back to their original roles. Egg has changed that. There is, after all, a way in which banks can be online hosts to retailers and earn income from the

guests. The integration of shopping with banking is illustrated by Egg's beneficial two per cent cashback on expenditure in the shopping mall attached to Egg's website when you use the bank's credit card. There are 270 retailers operating from Egg's online shopping mall.

Egg's products are excellent. Interest rates on savings, and interest charged on credit cards, are extremely competitive. Mortgages, too, are well priced, as is insurance. And the web design is smart and focuses attention on Egg's range of excellent products while producing an uncluttered and relaxed feel to the site.

A **Highly Commended** award also goes to the third of the market-leading Internet banks, **Smile**. Like Cahoot it is a 'concept' site, focusing on making the customer happy. With this in mind the screen is dominated by a range of smiling faces, from Marilyn Monroe's to that of a soft toy doll. It scores very highly on functionality and ease of navigation and the products are excellent – with great interest rates. Smile is a good instance of a small bank – the Co-op – using the Internet to compete more effectively against the bigger banks. It is currently signing up nearly 20,000 new customers a month.

Smile's online accounts management function is one of the simplest, smartest and most comprehensive of all the banks. The website has deservedly and consistently won awards and positive reviews.



*Cahoot's site has an innovative design and the bank offers some of the best products around, including an eight per cent interest rate on its credit card*
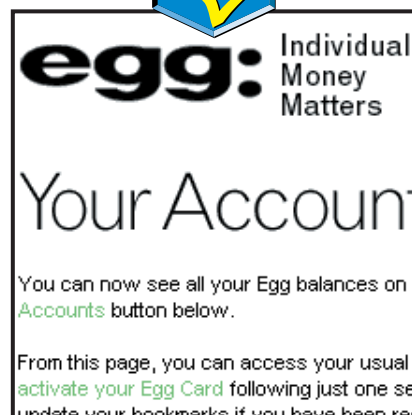


*Egg is the best of the purely dot com banks and it also has a shopping mall attached to its website where you can shop 'til you drop among 270 retailers*



*Smile, which is signing up 20,000 new customers a month, has good products and its website has good functionality and is easy to navigate*

# pcwexpert

PHOTOGRAPH PATRICK LLEWELYN-DAVIES

We may take digital audio for granted, but it's taken a while to get here. This month's **pcwexpert** delves deep into the technology that enables us to listen to and produce great music on a PC. And three workshops explain how to put your PC's sound card to good use

# digital audio

Written by Niall Magennis

# Sounds amazing

## Nowadays we take digital audio and sound card technology for granted, but it's taken us a long time to get here

**W**e've come a long way from the days of sitting around a fire listening to our uncle Ugg bang out a few tunes on his primitive bongo drum. These days, of course, we take for granted the ability to listen to audio or music just about anywhere we want, whether it's from a CD player or a portable, lightweight MP3 device.

There are really two elements that we need to look at to track the arrival of digital audio and sound card technology. The first of these is the digital recording and playback of sampled waveforms and the second is the birth of synthesis.

Both these elements are called into play on modern sound cards. The ability to play back digital samples is used in games for sound effects and speech, while the synthesis capabilities of sound cards are mostly used for working with MIDI files.

The concept of digital audio all kicked off with the invention of Pulse Code Modulation (PCM) way back in 1937. Developed by Alex H Reeves while working for the International Telephone and Telegraph Company in France, it is now the most prominent method of storing audio in a digital format. However, the technology did not come into

practical use until around 1962 when the development of integrated circuits made it possible for PCM to be used for telephone transmissions.

Recording of PCM audio was still some way off and it took until 1972 for a group of clever bods at Nippon Columbia, now known as Denon, to come up with a PCM recorder. Developed for recording movie soundtracks, this device used video tape as the storage medium and had a dynamic range of 87db – quite an achievement for the time. Then in 1976 the first 16bit recording (the bit depth used for recording audio for CDs) was made at the Santa Fe Opera on a handmade digital tape recorder called the Soundstream, created by Dr Thomas G Stockham.

While all this work was being carried out on digital audio, there were also a number of advancements in synthesis technology taking place. The first

electronic instrument arrived courtesy of Russian inventor Leon Theremin in 1919. The Theremin was a strange instrument played by moving your hands in the vicinity of two metal rods attached to a large wooden cabinet. The movement of your arms controlled the pitch and volume of the instrument. However the Theremin was difficult to play and today is mostly

only heard on the soundtracks of old sci-fi movies.

It was US company RCA that introduced the first modern synthesiser. However, like early computers, the machine was huge and needed lab technicians to keep it running. It worked by manipulating electrical waves to denote timbre, pitch and volume.

The world didn't really get excited about synthesis until a young physics student named Robert Moog began experimenting with voltage-controlled synthesis in the early 1960s. Moog had begun his entrepreneurial career selling Theremin kits at $49.95 a pop. This proved hugely successful and he was

## pcwexpert timeline

| 1877 | 1887 | 1919 | 1937 | 1955 | 1965 |
|---|---|---|---|---|---|
| Thomas Edison creates the first device capable of recording and playing back sounds. It used a very simple mechanism to store an analog wave mechanically. | Emil Berliner takes Edison's idea and produces the gramophone - a mechanical device that uses a needle and diaphragm to play back sound. | Leon Theremin develops the first electronic instrument, the Theremin. You can still buy Theremins today from companies such as Bob Moog's Big Briar. | Pulse Code Modulation is invented by Alex H Reeves while working for the International Telephone and Telegraph Company in France. | RCA introduces the first synthesiser. It's huge, and needs lab technicians to keep it running. | Bob Moog unveils his first voltage-controlled modular synthesiser. |

inundated with orders, which led to the young student accruing $13,000 in the bank. However, Moog had his sights set on a higher goal.

At the time, the only synths in existence were huge beasts that could be found in the physics labs of universities. These synths didn't have keyboards, instead they were designed to produce a single note and you could change the tone and characteristics of the sound for experimental purposes.

Moog, however, realised that if these machines could produce a single note, then they could be coaxed into producing multiple different notes and tones. If you then added a keyboard, he figured, you'd have an interesting musical instrument. Ten years after RCA introduced the mechanical synthesiser, Moog launched his first synthesiser – the Moog Modular. This was a very large machine made up of a collection of different electronic boxes that patched together in different configurations with cables to create a range of sounds. However, due to the cost and the size of the instrument only very rich musicians could afford the asking price.

Moog decided that a much smaller instrument was needed for practical purposes, so he came up with the Minimoog, which was a single box instrument with a built-in keyboard. This synth became a huge success and ended up being used as the basis of synth design all through the 1970s.

In fact, it wasn't really until the arrival of another revolutionary instrument that the legacy of Moog was overtaken. This instrument was to be revolutionary because it was about to meld digital recording and playback technology with synthesis technology.

In the mid-1970s two young Australians were getting frustrated by the limits of analog synthesis. Peter Vogel, an electronics designer, and Kim Ryrie, a synth enthusiast, were old school friends. In December 1975 they founded Fairlight with the aim of producing a digital synth. However, it wasn't until they met Tony Furse, a consultant for Motorola, who had built his own digital synth using two 8bit Motorola 6800 processors, that they really got going.

Despite the fact that Furse's synth didn't sound very good, Vogel and Ryrie still licensed the design of his dual-processor system. Just over a year later they produced the Qasar M8. Sadly, the synth was large and costly and unsuitable for mass production. More importantly it still didn't sound very good.

It was at this stage that Vogel and Ryrie started experimenting with digital recording of real-world sounds. This move was more a desperate attempt to try to produce a decent sounding synth, rather than an inspired move into digital recording.

Sampling real-life sounds gave the two the complexity of sound that they had failed to create digitally. In 1979, Vogel set off around the world to demonstrate the Fairlight CMI to prospective buyers and distributors. The response was overwhelming as no-one had ever seen or heard anything like the CMI before. People gasped in astonishment when they heard the real-world sounds it reproduced.

The sound quality of the CMI was extremely crude by today's standards as it only offered 8bit sampling and a mere 208KB of RAM for storing sounds. Nevertheless it was hailed for its ability to emulate real instruments and even appeared on *Tomorrow's World*. The unit was hugely expensive; the bottom of the range model was around £18,000 upon its release in 1980.

Over the years, both analog synthesis and digital synthesis were refined until digital synthesis gradually took over due to cost and ease of implementation. Nevertheless, analog concepts still shape how synth sounds are programmed today, with ideas such as envelopes and filters still a major part of digital synthesis.

Over the years, the technology that had started life in the CMI was refined, updated to 16bit resolution and gradually, with the march of technology filtered down into consumer PCs in the form of the sound card.

Early attempts at sound cards didn't feature digital playback of samples at all. Instead they relied on synthesis to produce sound effects and music. Examples of these cards include the SSI 2001 from Innovation Computer Corporation, which used the SID sound chip from the Commodore 64, and the Game Blaster from Creative, which used CMS-301 sound chips.

But it wasn't until the first Adlib card appeared in 1987 that consumers really warmed to the idea of adding a sound card to their PCs. This card featured the YM3812 sound chip from Yamaha, later known as the OPL2, and was stunning for the time. It could play back up to 11 different notes at the same time and struck a good balance between features and price. As a result it flew off the shelves and it was only when Creative found out what sound chip Adlib was using and released a new Game Blaster card that Creative started to make an impact on the sound card market.

Creative then went on to add 8bit digital audio playback and released the first of the SoundBlaster series. The 16bit SoundBlaster 16 followed later and Creative's cards became the *de facto* standard that other cards had to be compatible with under DOS and Windows 3. This lasted until the release of Windows 95 when Microsoft introduced the DirectSound API (Application Programming Interface) for use under Windows.

Cards have gradually become more complicated, adding powerful onboard processors that can handle multiple outputs and 3D processing for games. The audio fidelity of cards has also greatly improved and most now rival the fidelity of a high-end stereo.

We've come a long way from the £18,000 Fairlight CMI. These days a card costing under £100 will deliver much more than Vogel or Ryrie could ever have imagined.

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**1970**

Moog develops the small and lightweight Minimoog. Muscians love it and it sells in droves.

**1972**

Clever bods at Nippon Columbia (now Denon) develop a PCM recorder. Developed for recording soundtracks it used video tape as the storage medium.

**1979**

Fairlight introduces a stunned world to the CMI. It combines synthesis and sampling in a truly revolutionary instrument.

**1982**

Sony unleashes the first CD player, the CDP-101, in Japan. There are 112 different CD titles available at launch.

**1987**

The Adlib sound card appears. The card sounds great thanks to its reliance on FM synthesis and goes down a storm with punters.

**1989**

Creative releases the first sound card to support digital audio, albeit at 8bit resolution. It's called the SoundBlaster.

# The architecture of sound

**Despite early PCs not having sound functions, today's sound cards offer more features than most of us could ever use**

**S** ound has never been a built-in requirement of PCs. The original IBM-compatible PC was designed as a business machine, so it's hardly surprising that sound was not thought a necessity. As a legacy of this original design, a vast number of sound cards are now on the market all offering different features. However, most sound cards share a basic architecture, so let's take a look at these basic elements.

## The basics

Sound cards typically contain two main subsystems. The first is for the capture of digital audio and the second takes care of both the replay of digital audio and any synthesis the card may offer. Older cards tend to offer Frequency Modulation (FM) synthesis while newer cards use wavetable synthesis.

## Converters

The digital audio element of a sound card consists of a matching pair of digital-to-analog (DAC) and analog-to-digital (ADC) converters plus a programmable sample-rate generator. These converters are usually 16bit, but some newer cards have 18bit converters and some professional sound cards even come with 24bit converters.

The PC reads sample data to or from the converters and then the sample rate generator, under the control of the host PC, clocks the converters to the desired sample rate. This can be anything above 5KHz, but is usually a fraction of 44.1KHz (the sampling frequency used by audio CDs).

## DMA

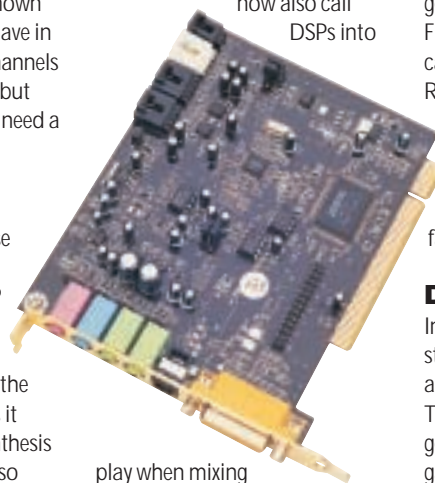PCI sound cards tend to pass digital audio to and from the host PC using Direct Memory Access (DMA) channels. This allows transfers of audio data between the card and the PC to occur without the PC's CPU getting involved. Sound cards that can record and play back audio at the same time (known as full-duplex operation) have in the past used two DMA channels making installation tricky, but newer cards generally only need a single DMA channel.

## DSP

You'd be hard pushed these days to find a sound card that doesn't include a DSP (Digital Signal Processor) chip. This little lump of silicon is the workhorse of the sound card. Not only does it generally look after the synthesis side of the card, but it is also called into play when effects such as reverb and delay are needed.

For wavetable synthesis, the card's DSP produces the required notes by multiplexing reads from different areas of the sound card's wavetable memory at differing speeds to produce the required notes. For FM synthesis, the DSP takes care of complex algorithms used to produce FM timbres. The maximum number of notes a card can play, often referred to as a card's polyphony, is dependent upon the power of its DSP chip.

DSPs are also used to create effects such as reverb, delay and chorus. Complex algorithms are run on the DSP to simulate these real-world effects. Most cards now also call DSPs into play when mixing multiple channels of audio for games or multitrack recording applications. Some sound cards carry out this type of processing internally at 24bit or 32bit resolution. This allows for more headroom when mixing multiple tracks of audio and stops mixed audio from distorting. If the cards didn't offer the extra bits, then distortion would creep in when the card tried to mix multiple loud streams of audio.

## Frequency Modulation

Early sound cards such as the SoundBlaster series used FM synthesis, which creates sound by generating a pure sine wave (a carrier) and then mixing it with an additional waveform (a modulator). If the two waveforms are close in frequency, a new more complex waveform is produced. By manipulating both the carrier and the modulator it's possible to create quite complex sounds.

While FM can create very good synthesiser-type sounds it is not so great at recreating real-life sounds such as pianos and guitars. This is why most modern sound cards use wavetable synthesis.

## Wavetable synthesis

Wavetable synthesis uses samples of real instruments as the basis of its synthesis power. This means that wavetable synthesis generally sounds a lot better than FM synthesis. Older ISA-based cards stored these samples in ROM, but newer PCI cards use the host PC's system RAM. Because of this, new cards generally allow you to load in new sounds to replace the factory sounds.
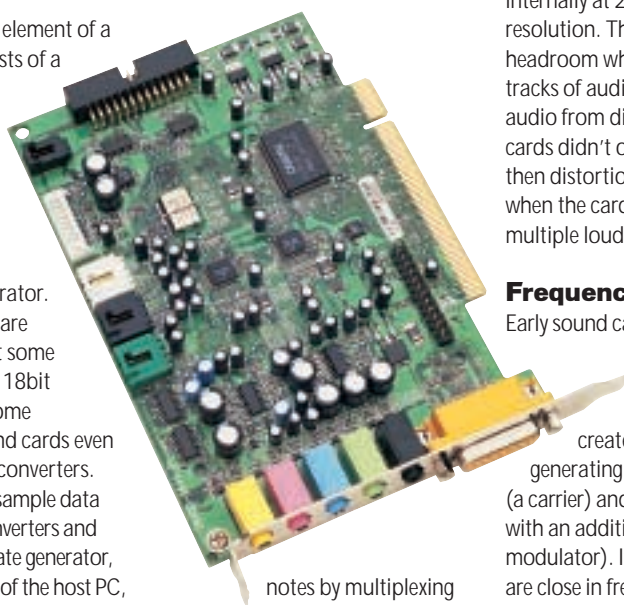
## Digital connectors

In the past year some cards have started appearing with four analog outputs rather than two. This extra pair of outputs is generally used for 3D audio in games (see 3D audio section overleaf), but the four outputs can also be used to simulate a 5.1 channel system. However, because there are only four outputs and not five, a psuedo centre channel has to be created in software and this can lead to quiet dialogue in some movie scenes.

Most four-channel cards also come with an S/PDIF (Sony/Philips Digital InterFace) digital out connector that can be used in conjunction with an external surround sound decoder for full 5.1 Dolby Digital or DTS audio playback. Digital outputs can also be used to transfer audio between two devices with S/PDIF connectors for lossless copying of digital audio. One example would be the transfer of audio between a PC and a DAT machine.

## The irony of it all

Ironically, the fact that sound wasn't included in the original specification of the IBM-compatible PC has been a bit of a blessing for audio enthusiasts. We can thank this initial design flaw for the fact that most modern sound cards now have such a wealth of features that most of us never bother to use half of them!

# Wired for surround sound

## Developments in 3D sound have been confined to a few large companies, but new open standards could be set to change that

**A**fter years of sound cards being shackled to SoundBlaster compatibility, Diamond finally dared to be different with the release of the MonsterSound PCI in 1997. There were two reasons Diamond felt brave enough to take this giant leap. Microsoft had just introduced its DirectSound API which meant that SoundBlaster compatibility was no longer needed for games running under Windows. However, Diamond also had another reason thanks to technology it licensed from Aureal. The MonsterSound could produce 3D sound thanks to Aureal's A3D API.

In the past other cards claimed to offer 3D sound but the MonsterSound was different in that it allowed sound sources to be placed around the room rather than just giving a more general overall 3D effect.

The technology came out of work that Aureal was doing with clients such as NASA and the US Navy. The older cards had relied on two methods to produce 3D sound: interaural time difference (ITD) and interaural intensity difference (IID) (see diagrams).

Humans can perceive the direction a sound comes from because sound reaches each of our ears at slightly different times. This difference is known as ITD. Audio vendors can make use of this effect by creating variable delay in stereo channels to create the perception of left or right movement. IID, on the other hand, is the effect created by the audio shadow of the head. Sound waves that come from one side of the head are much quieter at the far ear after passing through the head. Using IID it is possible to broaden the perception of left and right audio control. It acts in much the same way as a balance control on a hi-fi.

These two effects were used in many sound cards, but they tend only to be able to place sounds along a 2D arc. For true 3D you

**Interaural intensity difference**

**Interaural time difference**
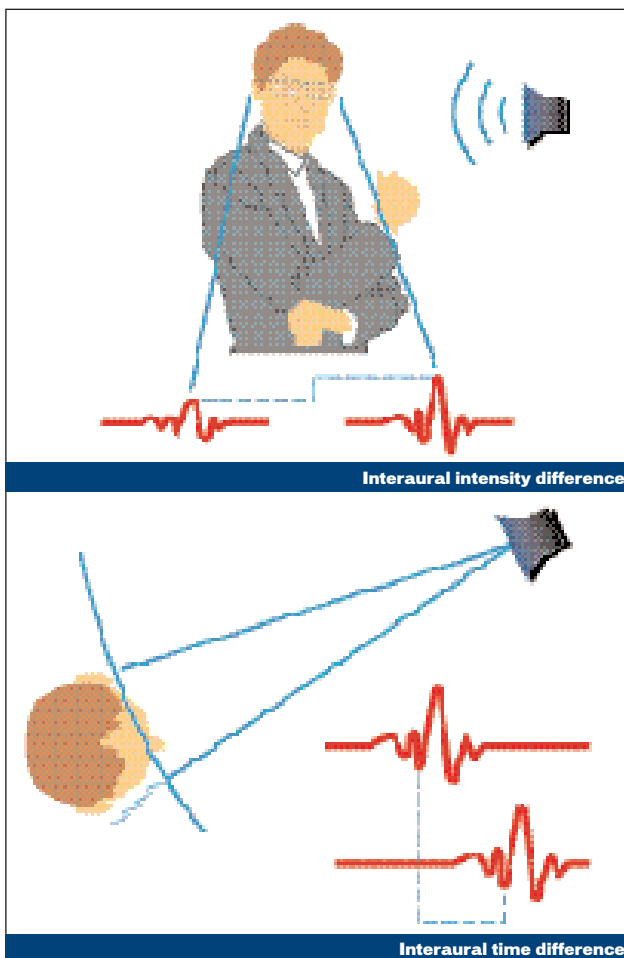
need to be able to place sounds above and below your head. This is where A3D differed from other 3D technology used in sound cards at the time.

A3D used HRTF (Head-Related Transfer Function) to offer true 3D sound. HRTF describes the difference between the source sound and the actual sound that reaches the inner ear. This is mainly caused by the asymmetrical shape of the outer and inner ear. Using HRTF it was possible for Aureal to add up/down and front/back sound control to A3D.

The original MonsterSound card was one of the first to break away from having just two outputs for stereo playback. It featured twin stereo outs which allowed you to connect four speakers to the card. The

addition of two rear speakers greatly enhanced the 3D effect.

There are various 3D sound formats on the market now, but pretty much all of them use ITD, IID and HRTF algorithms to alter game sounds so your brain interprets them as coming from different locations.

However, placing objects in 3D space is only part of the problem. Sound changes according to the size of the room it is being heard in and what part of that room it is emanating from. This is why 3D developers use reverb. Reverb is the effect that happens naturally as a sound bounces around in a room, reflecting off different surfaces before it reaches your ears. The final sound will be affected by both the size of the room and the types of surfaces present. For example, an empty

room will have more reflections from hard surfaces such as the walls and ceiling, than a room full of soft furnishings that tend to absorb sound and reflections.

Other effects used to create more realistic 3D sounds include occlusions and refractions. An occlusion is the alteration of a sound according to the surfaces near to where the sound originated. Refractions are caused by the effect of materials that carry sound waves at different speeds. These two are used in association with reverb to better represent the environment from which the sound is originating.

The use of 3D placement technology alongside reverb, occlusion and refractions obviously creates a much more realistic sound environment for 3D games, but it's not the most accurate method of modelling the behaviour of sound in 3D game environments. That honour goes to a technique known as wavetracing. However, this can be extremely complicated and processor intensive, because it tracks each individual reflection of a sound during its path to the listener. The results are much more accurate than just applying reverb presets to a sound.

For example, if you are standing in front of a stone column, this will have a huge effect on how you hear sounds that are emanating from objects behind the column.

Wavetracing is by far the most accurate way of modelling 3D audio and in the future all audio in 3D games will be modelled in this way. However, there are drawbacks to wavetracing. It requires quite a lot of processing power and as a result you generally suffer a drop in frame rate. This is because the wavetracing algorithms are quite complex and the entire geometry of the 3D space needs to be fed into these wavetracing algorithms.
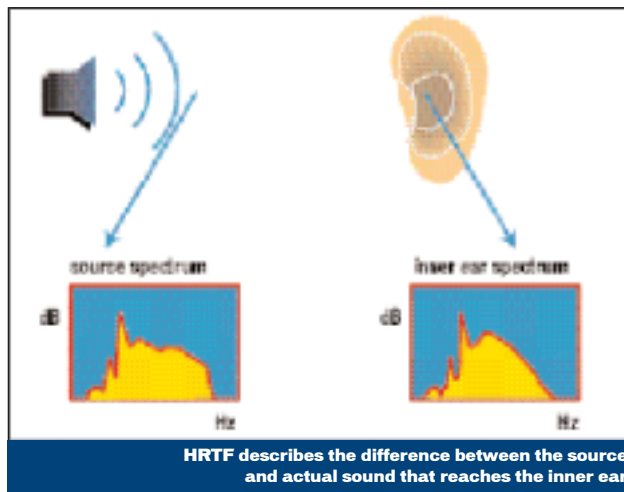
Up until recently there were two main proprietary standards

battling it out for supremacy in the world of 3D audio: A3D from Aureal and EAX from Creative. Aureal's technology was more advanced than Creative's and produced much more convincing environmental audio effects thanks to its support for wavetracing, reverb, occlusions and refractions. It did require a significant amount of processing power, although Aureal was reducing this need with better performing drivers. Also, not many games supported A3D 2.0.

Creative's EAX (Environmental Audio eXtensions) technology is a lot simpler and acts as an extension to Microsoft's DirectSound3D API. It relies much more on simple reverberation effects to represent the 3D space in which a particular part of a game is taking place. For example, an explosion in an outdoor environment will sound very different to an explosion in a tunnel. EAX is, however, much less processor intensive.

Creative has announced EAX 3.0 but hasn't given much detail on what it will include. It has



**HRTF describes the difference between the source and actual sound that reaches the inner ear**

shipped Eagle, a development tool, to developers that allows sound designers to import geometry from game levels and visually map EAX effects to different parts of each amp.

The war between the two technologies ended on 5 April 2000 when Aureal ran out of money and filed for Chapter 11 protection. The company has now been bought by Creative, but it's not clear whether Creative will continue developing A3D or gradually integrate some of its

wavetracing technology into some future release of EAX.

While Creative and Aureal are the two best-known 3D audio companies, they are not the only ones that possess innovative 3D audio technology. For example, UK company Sensaura, while not producing hardware itself, is pushing its technology through licensing agreements with sound card manufacturers. Sensaura's 3D implementation is compatible with both A3D and EAX, but also includes enhancements to

Microsoft's DirectSound3D API. For example, its MacroFX technology allows sound designers to simulate sound sources very close to the user's head.

Another company, QSound, has been around since the DOS days. It uses a process known as azimuth positioning, which allows one or more monaural sound sources to be positioned along a 2D arc that can extend to as much as 270 degrees. This should, for example, simulate the effect of sound coming from over your shoulder.

All these APIs are pretty much tied together by Microsoft's DirectSound3D API. When Microsoft first came up with DirectSound3D it was less than stunning. It also upset manufacturers such as Aureal and Creative because it locked out their technologies. However, Microsoft was forced into opening up the standard and by Direct X 6 it was quite a rich API, while also offering support for extensions such as A3D and EAX. DirectSound3D does support enough 3D effects to cater for most gaming needs, but a large number of sound cards also support supplementary APIs such as EAX or Sensaura.

Recently a group of companies, including Creative, Electronic Arts, IBM and Trident, joined together under the title Interactive Audio Special Interest Group (IA-SIG). The aim is to develop a new API independently of Microsoft that will allow all companies to release advancements.

This new API is called I3DL2 and it looks like Microsoft may license it for Direct X 8. This rumour has been fuelled by Bill Gates' acknowledgement that the X-Box, which will use a build of Direct X in its OS, will have an I3DL2-compatible audio chip.

While it's unfortunate that the war between Creative and Aureal has ended, hopefully the pace of development in the world of 3D audio will not slow. With any luck, open standards such as I3DL2 will be enough to let smaller companies with fresh ideas thrive in an area dominated by a few big players.

# Speaker setups

If you're going to opt for a four-channel output sound card supporting 3D audio, then one of the problems you may come up against is finding a suitable speaker setup that can be used for both DVD surround sound playback and 3D gaming.

Until recently most speaker setups catered for either one or the other. This meant if you opted for a four-channel setup you were compromising DVD surround playback because the speaker system had to create a pseudo centre channel. This can lead to noticeable ghosting on dialogue in certain movie scenes.

However, if you opted for a 5.1 surround sound speaker package suitable for DVD playback, you could become stuck when it came to using your sound card for 3D gaming, because most surround sound
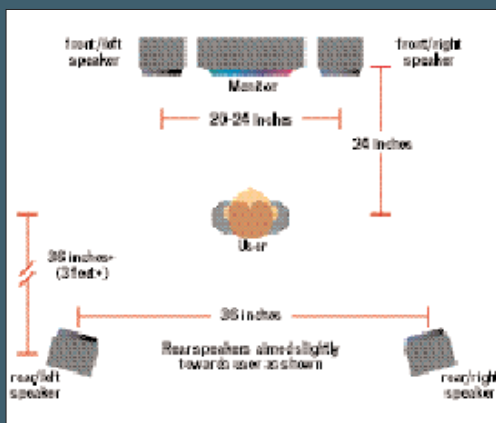


amps didn't have four analog inputs.

Thankfully more speaker setups are currently appearing on the market that have both digital connections for AC-3 as well as four analog inputs for 3D gaming. An example of such a speaker setup is the DTT3500 from Creative.

# Understanding MP3

**After recent events with Napster everybody's talking about MP3, but where did this technology come from?**

**T**he record industry may think MP3 is the spawn of Satan, but most computer users simply view it as a rather neat, cross-platform way of carrying their music files around in a compressed format.

Because of the recent furore surrounding MP3, it may seem that the format has only been with us for the last couple of years, but it's actually been around since 1987. MP3 is an abbreviation of MPEG1 Audio Layer 3 and MPEG itself is an abbreviation of Moving Pictures Expert Group – the official name of the body tasked with coming up with international standards for the compression of video and audio data streams.

The portion now known as MP3 is the audio half of the MPEG1 standard. Actually, it is really one-third of the audio portion of the standard as it defines three different layers or methods of compressing audio, each being more complex than the last and each offering a higher level of compression. The layers are also backwards compatible, so a device capable of decoding Layer 3 audio should also be capable of playing back Layer 1 and Layer 2 audio.

The Layer 1 compression method can compress audio at a rate of around 4:1, so a stereo CD quality datastream would take up around 384Kbits/sec of bandwidth. Compression increases with the use of Layer 2 to around 6:1 or 8:1 leaving a datastream of between 256 and 192Kbits/sec. Layer 3, or MP3 as it is now most commonly known, compresses audio at a rate of 10:1 or 12:1 creating a data-stream of around 128Kbits/sec or 112Kbits/sec while maintaining CD-like audio quality.

It's easy to see why MP3 was adopted by the Internet generation. A song stored in MP3 format could be downloaded 10 times quicker than one stored in normal PCM format. When downloading a song from the net that is a massive saving, not only in time, but also in money. It also means the tune will only take up a tenth of the space on your hard disk or MP3 device, which is important

with expensive Flash media.

This is all great, but how can MP3 compress audio by such a massive amount without the results sounding like a dodgy AM radio transmission? The secret lies in a method of encoding audio called perceptual coding.

The human ear is an amazing device and linked to the human brain it can decipher a huge amount of audio information. However, human hearing is not perfect and it's by exploiting these imperfections that MP3 achieves its stunning results.

Human hearing is essentially a biased process: a number of factors, such as the frequency content of the sound and the presence of background noise, affect the way audio is perceived by the ear. For example, a doubling in the amplitude of a sound does not necessarily correspond to a doubling in the apparent loudness of a sound. It quickly becomes obvious that it's not so important to reproduce every characteristic of a sound's waveform as the human ear can't distinguish every detail present in

that waveform. Instead we could decide which aspects of the waveform are most important to the listener, prioritise these, and dump the information that is not going to be registered by the listener. The end result, of course, will be much smaller sound files.

This all sounds simple enough, but the real problem lies in deciding what is important to the listener and what goes unnoticed. Those working on MP3 compression decided to use a 'psychoacoustic model'. This is a set of rules that


**MP3 players galore**

describes what is meaningful to the human ear and what can be removed without degrading the quality of the listening experience.

Perceptual coding works by analysing the audio file in reference to the 'psychoacoustic model' and then storing only the data that is detectable by the human ear. The 'psychoacoustic model' heavily depends on a peculiarity of human hearing known as masking. This is the way human hearing tends to prioritise certain sounds at the expense of others, according to the context in which they occur. For example, stamping your foot in a quiet room would seem extremely loud, but if the foot

stamp was immediately preceded by someone hitting a snare drum extremely hard then the sound of your foot would not seem so loud. If two sounds occur almost simultaneously we tend to only hear the louder one.

Masking is what allows perceptual encoding to remove much of the data present in a normal sound file. It doesn't throw away the sound that is masked, but uses fewer bits to represent masked elements and so fewer bits are needed overall to represent the sound file.

MP3 is a hugely popular format for audio files and there are hundreds of players available. However, MP3 is quite an old compression scheme and no longer offers the best audio quality or highest compression ratio of perceptual encoding schemes.

Since the development of MP3 in 1987, the MPEG committee has gone on to adopt newer compression techniques for audio such as the MPEG2 AAC (Advanced Audio Coding) scheme that provides higher-quality audio at lower bit rates than MP3. However, it's not backwards compatible so it hasn't been seriously adopted by those who use MP3s now.

There are two other challengers. One is called MP4, which actually has nothing to do with MPEG4, but is a proprietary format based on MPEG2 ACC technology. The other is Microsoft's Windows Media Audio (WMA) format which is also capable of producing pretty much the same quality audio as MP3 but at half the file size.

However, these codecs have a long way to go before they are anywhere near as popular as MP3 and despite their technological advancement, MP3 still has more tools available for encoding and decoding across more platforms. It's also an open standard, which most of the new codes aren't. It's going to be quite some time before MP3 disappears.

# The home of music

**Thanks to modern sound card technology there's very little to do with sound processing that you can't do on your PC at home**

**U**ntil recently, few people could afford their own recording studio. But now it's possible to create a sophisticated recording setup using just a PC.

Early PCs didn't come with a sound card, but once sound cards did start appearing on the market with game ports that could double as MIDI adaptors, software companies reacted by releasing sequencing packages.

A sequencer is a piece of software that allows you to record and play back music using a standard called Musical Instrument Digital Interface (MIDI). This has been around since the early 1980s and is a communications protocol that enables MIDI-equipped electronic instruments to be linked together to exchange musical information. MIDI devices are connected to each other via standard MIDI cables that have 5pin DIN plugs on either end. You can buy a special adaptor lead that will allow you to use your sound card's game port as a MIDI adaptor giving you a MIDI out and MIDI in port.

Instead of recording and playing back waveforms, MIDI devices send short commands to each other that instruct the receiving instrument or device to play a particular note in a certain way. A MIDI message will tell the instrument which note to play, when it starts, when it stops and how loud it is. These commands are much smaller than sending audio files between devices.

Musicians like sequencers because they allow you to record multiple tracks in order to build complex arrangements. They also allow you to edit individual notes and correct sloppy playing by using quantise functions that automatically shift out-of-time notes back into time.

Onboard synth sounds on early sound cards left a lot to be desired, so most musicians used MIDI sequencers run on PCs to trigger external synths rather than the sounds on their sound cards. But high-quality wavetable cards made it possible to create good-quality music using just a PC with a wavetable sound card. Wavetable cards store samples of instruments in ROM rather than trying to synthesise instruments using techniques such as FM.

These cards also had 16bit recording and playback capabilities and this, coupled with the growing size of hard disks, paved the way for sequencer companies to develop products in an exciting direction.

Soon companies such as Cakewalk, Steinberg and Emagic started to add multitrack audio recording capabilities to their sequencers that could previously only record MIDI tracks. This meant musicians could record real instruments and sounds such as guitars and vocals to disc and then mix them with MIDI tracks.

In 1997 Steinberg ported its Virtual Studio Technology, which had created quite a stir on the PowerMac, to the PC. Steinberg had taken the audio and MIDI sequencer and added realtime effects processing. Now you could add effects such as reverb and delay to your recordings in real time. Soon other sequencer manufacturers such as Cakewalk and Emagic added plug-in support to their sequencers. Two variants of audio plug-ins emerged. VST plug-ins used Steinberg's technology and Direct X plug-ins were based on Microsoft's standard. Both formats work in real time and behave in much the same way.

Now you can add virtual instruments to sequencers. Again Cubase VST was the first piece of software to support plug-in instruments (see box). But they are also supported on Logic Audio and although Cakewalk doesn't support the VST plug-in format you can get a Direct X plug-in that will allow you to use VST instruments inside Cakewalk.

With the addition of virtual instruments it's now possible to compose, arrange and mix music inside your PC. You can even master it to CD-R.

## Virtual instruments

With version 3.7 of its Cubase VST software, Steinberg introduced the concept of virtual instrument plug-ins. Virtual instruments are not a new idea; the SoundBlaster AWE64 included a virtual synthesiser as part of its software bundle. The AWE64 card could only produce 32 notes of polyphony in hardware, the other 32 notes were produced in software on the host PC and piped as digital audio to the sound card outputs. A number of other companies such as Propellorhead with its Rebirth 338 software and Native Instruments with its Generator package had also been producing virtual instruments in software, often called soft synths.

The difference with Cubase VST's virtual instruments was that they were integrated within the sequencer application, so each instrument was perfectly synchronised to the MIDI timing of the sequence that was triggering it. This is important with virtual drum machine and sampler plug-ins as it means those programming rhythms can be sure that their beats will have very tight timing. Many producers, especially in the hip-hop community, complain of sloppy MIDI timing when triggering drum machines across MIDI. Integrating the plug-in into the sequencer produces much better timing.

VST instruments also open up a whole new era in the virtual studio where it is possible to create an entire mix purely in software.

This is all well and good, but if you don't have a VST 2.0 plug-in-compatible sequencer such as Cubase VST or Logic Audio you don't have built-in support for VST instruments. Luckily a company called FXpansion has produced a software adaptor that allows you to run VST 2.0 plug-ins and instruments with programs that only support Direct X plug-ins. The software costs around £40 and is available from www.fxpansion.com/.
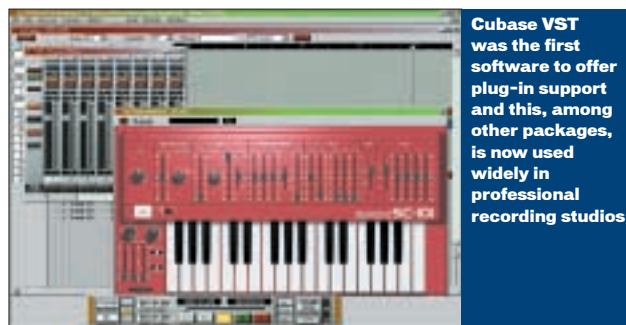
Cubase VST was the first software to offer plug-in support and this, among other packages, is now used widely in professional recording studios

# Music to your ears

### There may not be much that modern PCs can't do with sound, but there's still a lot of potential for development

**D**igital audio on PCs has come a long way in a short time. There's little that a modern PC can't do with sound. It can encode audio into MP3s on the fly, act as a sophisticated multitrack studio, handle speech recognition and create synth sounds in real time.

In fact, PCs can do so much with audio, it's difficult at first glance to see what could be improved. But there's still quite a lot of room for development.

For one thing, Windows could be rejigged to better handle audio and general multimedia tasks. Audio latencies and general prioritising of multimedia events under Windows could be improved substantially. An operating system, such as BeOS, which was designed from the ground up specifically for multimedia tasks shows just how well modern PCs can cope with digital audio and video when using the right OS.

Unfortunately, Windows users are being less than adequately served – suffering such woes as stuttering playback of MP3s when trying to open a new application, or having to deal with latency problems when recording multitrack audio.

There are other areas that could be due for an update. Modern sound cards generally record and play back audio at a resolution of 16bits and a sampling rate of 44.1KHz – the same sampling rate used for audio CDs. Some sound card manufacturers choose to use a 32bit signal path internally on their cards. This is because processing sounds with digital effects can cause a reduction in the resolution of a sample unless you resample the sound at a higher bit rate first.

Resampling a sound to 32bit before any internal processing is carried out should make sure that the sound quality remains true. It also gives more headroom when mixing multiple streams of audio.

Many professional musicians currently use high-end multichannel cards that can record and play back audio at 24bit resolution and sample rates up to 96KHz. However, it is very difficult to gain benefits from these sample rates when recording in a consumer environment – you are likely to start picking up the noise of a truck rumbling by outside or even the hum of fans in your PC.

With DVD audio on the way, we may see consumer cards appearing on the market with 24bit audio playback capabilities. However, there is no guarantee that DVD audio will take off, as in a move reminiscent of what killed the DAT (digital audio tape) format, some manufacturers are disabling support for digital out connections from DVD audio players.

The next generation of audio cards is likely to have even more onboard DSP power. This, matched with the increasing speed of processors, means we're likely to see 3D sound implementations supporting complex wavetracing algorithms. In fact, sound cards in the future may resemble the highend Pulsar card available from Cre@mware.

This card features four powerful onboard DSPs. Developers can code plug-ins that can be downloaded into the DSPs to make the card behave in different ways. One plug-in could turn the card into an FM
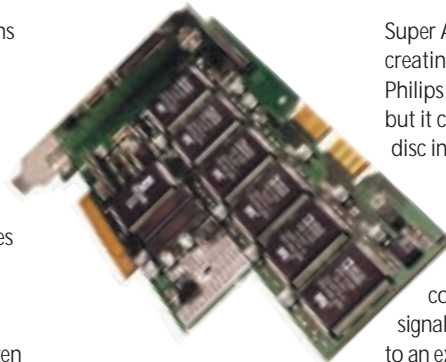


**Is Pulsar the future?**

synthesiser while another could program the card to act as a professional reverb unit. What's more the card can run multiple plug-ins at the same time.

Perhaps in the future we'll see computer audio moving away from PCM audio and towards newer methods of recording sound. There are inherent limitations to PCM – sound quality can be improved by using extra bits and higher sampling frequencies, but those tweaks do not provide linear improvement.

In other words, the more you increase the bit rate and sampling rate used, the more the jumps in perceived audio quality diminish. It's very difficult to hear any noticeable difference once you go past 20bit resolution, so there isn't really any point in developing PCM audio further than 24bit at 96KHz.

Perhaps the next step could be Direct Stream Digital, a new way of recording audio developed by Sony for use on the



**Mobile phones that can play MP3s already exist**

Super Audio CD format it was creating in conjunction with Philips. DSD still samples sound, but it codes the audio onto the disc in a different way.

Since DSD's 1bit signal is sampled at such a high rate, it is closer to a continuous stream than a conventional multibit PCM signal. This makes it more akin to an extremely high-quality analog system than other digital systems that have gone before.

However, in listening tests consumers have found it extremely difficult to tell the difference between 24bit/96KHz audio playback and DSD playback, although recording engineers tend to favour DSD. Nevertheless, it's early days for DSD and it may well become the preferred format for non-compressed audio in the future.

However, the real future of the distribution of music is likely to lie with compressed audio. Broadband is coming, however slow it may seem, and record companies are really going to have to offer some service similar to Napster. Anything less and the public will feel cheated.

This will pave the way for digital distribution of music across other devices such as mobile phones. The maximum theoretical bandwidth of third-generation mobile services using UMTS is 2Mbits/sec. This is more than enough to distribute audio and even if real-life bandwidth only approaches a data rate of 128Kbits/sec it's still enough to allow mobile phone companies to act as distributors of MP3 music.

In fact, companies like Ericsson and Samsung are already producing phones that can act as MP3 players, but current GSM rates at 9.6Kbits/sec are too low to allow for the distribution of audio.

Whatever happens in the future, the only thing you can be sure of is that the pace of innovation will not slow.

# Digital audio terminology

**This month's pcwexpert Glossary uncovers the world of digital audio and sound recording**

**A/D Convertor:** An electronic circuit that transforms an analog signal into a digital form that can be used by a computer.

**DAT (Digital Audio Tape):** A digital recording format that uses magnetic tape to record audio at 16bit quality with a sampling rate of up to 48KHz.

**D/A Converter:** An electronic circuit used to transform a digital signal into analog form so it can be processed by analog circuitry.

**Dolby AC-3 (also known as Dolby Digital):** A digital audio coding technique capable of delivering multichannel digital surround sound. It provides six independent channels: left front; right front; centre; left rear; right rear; and sub-woofer.

**DTS Digital Surround:** Originally developed for use in cinemas as a consumer format, DTS is a competing 5.1 surround sound standard to Dolby Digital. It has arguably better sound quality than Dolby Digital and is gradually gaining a foothold in the consumer market.

**DVD Audio:** A DVD-Audio disc can hold up to 400 minutes of two-channel stereo sound at 16bit/44.1KHz. Or it can hold up to 74 minutes of six-channel sound at 24bit/96KHz, or two-channel sound at 24bit/192KHz.

**FM (Frequency Modulation) synthesis:** A form of synthesis that mimics musical instruments, drums and special effects by mathematically manipulating simple sine waves. FM synthesis uses one signal to modulate the frequency of another. If the modulating signal is in the audible range, there will be a significant change in the timbre of the modulated signal.

**HRTF:** Head-Related Transfer Function. HRTF refers to the difference between a source sound and the actual sound that reaches the inner ear. The main contributor to the HRTF phenomenon is the asymmetrical shape of the outer and inner ear. HRTFs are used in the development of 3D sound algorithms to determine what filters need to be applied to audio to simulate 3D sound placement.

**MIDI:** (Musical Instrument Digital Interface) A standard interface used by musical equipment manufacturers to allow devices to transfer musical information from one device to another. Rather than representing music as waveforms, MIDI transmits information about how music is produced. The command set includes note-on, note-off, key velocity, pitch bend and other methods of controlling a musical instrument.

**MPEG (Moving Pictures Expert Group) Committee:** An international standards body tasked with developing standardised methods of compressing audio, video and still images.

**MP3:** Short for MPEG1 Audio Layer 3. A standardised method of compressing audio that can typically reduce the size of an audio file by a factor of 10.

**MP4:** A proprietary audio compression format based on MPEG2 ACC technology created by Global Music Outlet. Not to be confused with MPEG4.

**Occlusion:** The alteration of a sound according to surfaces near to where the sound originated.

**PCM:** (Pulse Code Modulation) A method of recording audio in a digital format. In PCM, the audio's amplitude is sampled at regular time intervals in much the same way a movie camera takes multiple snapshots of a scene. When these samples are played back it creates the illusion of a seamless recording.

**Perceptual coding:** A method used in audio compression that exploits weaknesses in human hearing to reduce the amount of data needed to represent an audio file.

**Polyphony:** A term used to describe the number of voices a synthesiser can play at once.

**Quantisation:** The sequencer equivalent of a word processor's spellchecker. A spellchecker fixes bad spelling. The quantise function in a sequencer fixes badly timed playing.

**Refraction:** Natural changes imposed on a sound as it travels through objects, due to the effect of materials that carry sound waves at different speeds.

**Reverb:** An effect created naturally in the real world as a sound bounces around in a room, reflecting off different surfaces before it reaches the ear. The final sound will be affected according to both the size of the room and the types of surfaces. Can be simulated by complex computer algorithms.

**Synthesis:** The artificial creation of sound through either analog or digital means. An example of digital synthesis is **Frequency Modulation** which was used on the early SoundBlaster cards.

**Sample:** A piece of audio recorded using **PCM** and stored as a data file. The term sample is usually applied to short recordings such as drum loops and synth sounds used in music creation.

**Sampler:** A device capable of recording and playing back snippets of digital audio. Professional samplers usually take the form of rackmounted units and have advanced synthesis capabilities for manipulating samples. The first sampler was the Fairlight CMI.

**Sequencer:** Software designed to record, edit and play back **MIDI** music. Most sequencers can now also record audio alongside MIDI tracks.

**Solid State Music Player:** A hardware device that can store audio on various types of memory for playback while on the move. The Diamond Rio was the first device of this kind and sparked a court case with the RIAA. Diamond eventually won the case.

**S/PDIF:** Sony/Philips Digital InterFace. A standard interface that allows users to connect sound equipment via a pure digital signal.

**Wavetable:** A set of soundwaves usually stored in ROM on a sound card, although more recent cards tend to store wavetables in system RAM. Wavetable sound cards can reproduce the sound of real instruments more accurately than synthesis-based sound cards because they use sound snippets of real instruments.

**WMA:** A compressed audio format that Microsoft introduced with Windows Media Player 7. It offers similar quality to **MP3**, but produces much smaller file sizes.

# Converting MP3s into wav files for burning to CD

### If you want to play your MP3 audio files in a standard CD player here's what you need to do
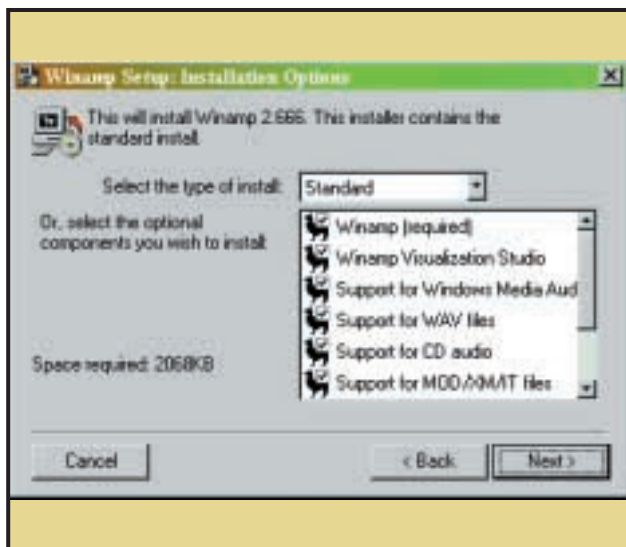


**1** Download Winamp from www.winamp.com. It's a fully functional MP3 player that's completely free, so there's no need to worry about shelling out any dosh. It's also a great audio player to have on your machine as it supports a number of different file formats as well as MP3. But what we're really interested in is its ability to convert MP3 files into wav files. However, it's less than obvious that Winamp actually includes this capability.



**2** Install Winamp and then launch the application. You'll be presented with a clean uncluttered interface, but behind this front end lies a number of configuration options. Click on the button in the top left-hand corner of the display that looks like an hourglass tilted on its side. This will bring up the main menu, from here you need to select Options and then Preferences. There is also a shortcut for jumping to this screen: Just press Ctrl & P. You'll now be presented with the Preferences window which will look something like the one in the next screenshot.



**5** You'll now find yourself back at the Preferences window. You can return to the main Winamp interface by clicking on the Close button at the bottom of the window. It's now time to select the MP3 tracks that you want to convert into wav files. If the playlist window isn't open already, open it by pressing Alt & P. Click the Add button at the bottom of this window. This will show two options: Add Url and Add Dir. Choose Add Dir and then from the resulting Explorer-type window choose the directory where your MP3 files are held.



**6** To actually convert the files from MP3s into wavs all you have to do is press Play. You won't actually hear any audio coming out of your speakers; this is because Winamp is now set up to stream audio to your hard disk rather than sending it to your sound card. When you've finished converting your tracks, hit Ctrl & P and click on the output tab in the left-hand window. Then re-select Nullsoft Direct Sound plug-in. This will set Winamp to send audio to your sound card again. If you don't do this then every time you try to play a track it will stream it to disc.
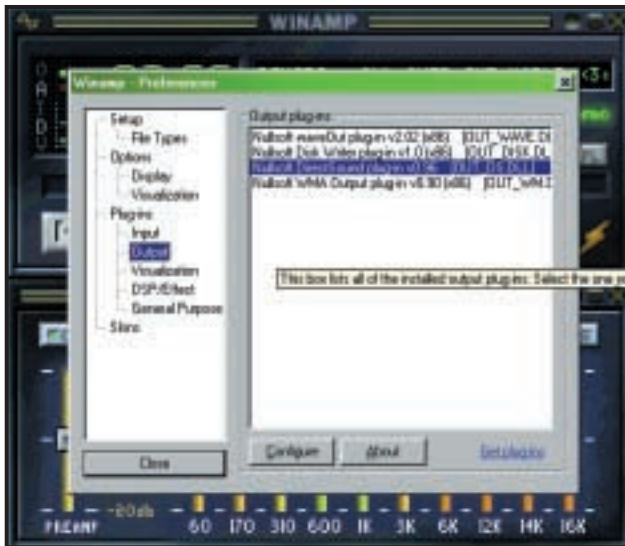
**3** In the left-hand pane of the Preferences window you'll find a number of options such as File Types, Display, Visualization, Input and Output. The one we're after here is Output, so click on that and you'll be presented with the window you see in the screenshot. What you see in the window is a list of plug-ins that serve as the basic functions for Winamp. You'll probably find that the Nullsoft DirectSound plug-in is selected. This is the plug-in that interfaces between Winamp and your sound card. For our purposes we need to change this.

**4** Just above the Nullsoft Direct Sound plug-in you'll find the Nullsoft Disc Writer plugin. This is the plug-in that we want. It changes the output path of Winamp so that when you press Play Winamp streams the output to disc rather than sending it to your sound card. Click on the Nullsoft Disc Writer plug-in and then click on the Configure button. This will bring up an Explorer-type window. Select the folder where you want the your wav files to be placed. Here we've chosen c:\music\wav files. Close this window by clicking on OK.
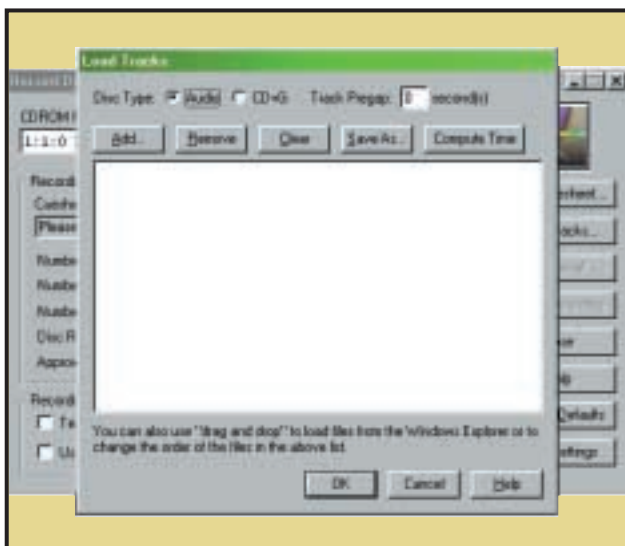




**7** You'll find the audio files in the folder you selected in step 4. These are in standard Microsoft wav format and can be loaded into any standard CD writing software package. There are many of these on the market and you'll usually get one bundled with your CD recorder. Just remember to set your burning software to audio CD mode. Otherwise you'll end up with a disc that can only be read in a CD-ROM drive. Here we're using CDR Win, which comes bundled with many CD recorders. Notice that we've ticked the create Audio CD option.
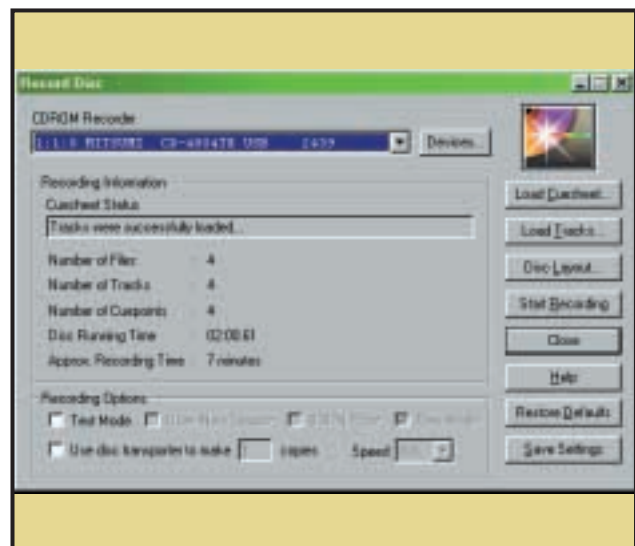
**8** Add your tracks to the CD from the directory where the wav files are saved. Just make sure that you don't add more tracks than the CD is capable of storing: 74 minutes on a standard disc. Most burning applications will warn you if you are going over the limit, but some will not and you'll end up with a coaster instead of an audio CD. If everything goes to plan you'll end up with an audio CD that you can play in any CD player.

# Adding your own samples for MIDI playback

**Here's how to create a Soundfont using the Vienna software that comes bundled with Creative's AWE and Live cards**
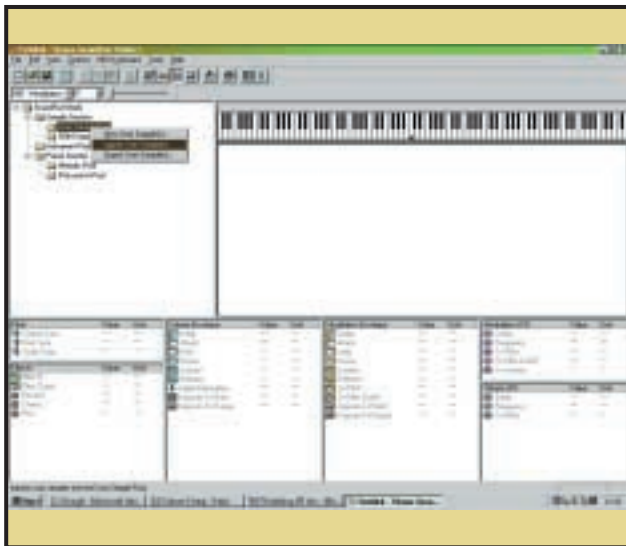


**1** Vienna isn't installed by default, so you'll probably have to install it from the CD that came with your sound card. One you've installed the software, load up Vienna. We're going to create a pad sound from a raw sample that we have already looped. Let's start by creating a basic Preset without any extras such as modulation. Right-click on the User Sample Pool and choose Import User Sample to load your desired sound. We're using a mellow looped stereo sample called zynx.wav.
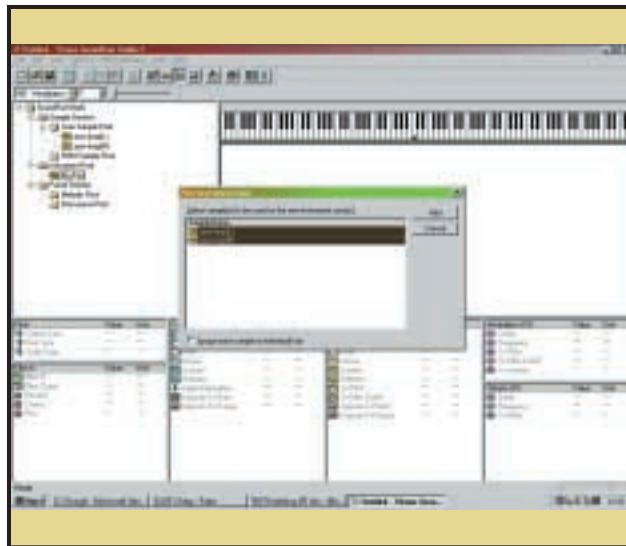


**2** Now it's time to create a new instrument. Right-click on the Instrument Pool and select New Instrument. You'll be asked to enter a name for your new instrument. We've chosen Big Pad as our name. You'll then be asked to select samples to be used by your new instrument. Since this is a stereo wave file we have two samples, one for the left side and one for the right. You can select both of them by holding down the Control key and clicking on both.
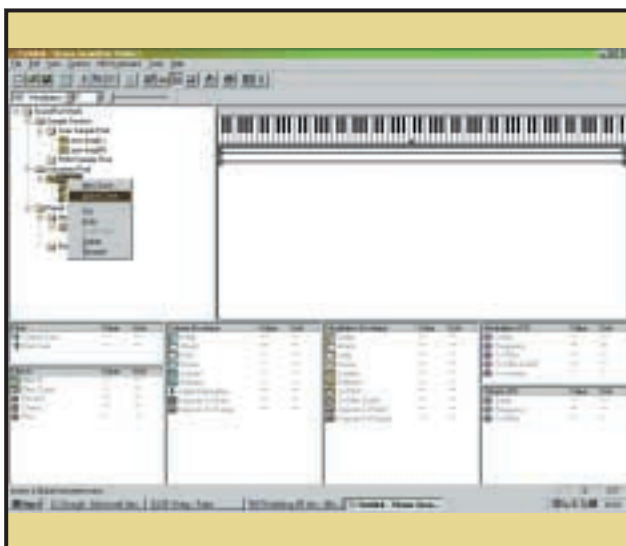


**5** Vienna treats each side of a stereo sample as independent sounds. However, we need to treat both of our samples as a single entity. We can do this by creating a global zone. To do this right-click on our Big Pad instrument and select Global Zone. Any edits we make as part of the Global zone now affect both samples. This makes it a lot easier to program sounds as you don't have to enter all values twice.
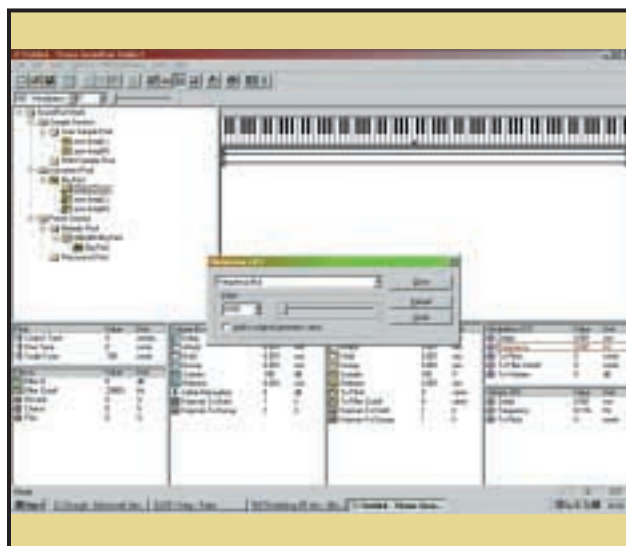


**6** We're now going to use the LFO (Low Frequency Oscillator) to modulate the cut-off frequency. We're going to use this to produce a slow filter sweep effect that will add a touch of character to our pad sound. In the box at the bottom of the screen marked Modulation LFO click on Frequency. A dialog box will pop up. Enter a value of 0.691 by either typing into the Value box or using the slider. This will give us a nice slow LFO. Close this box.
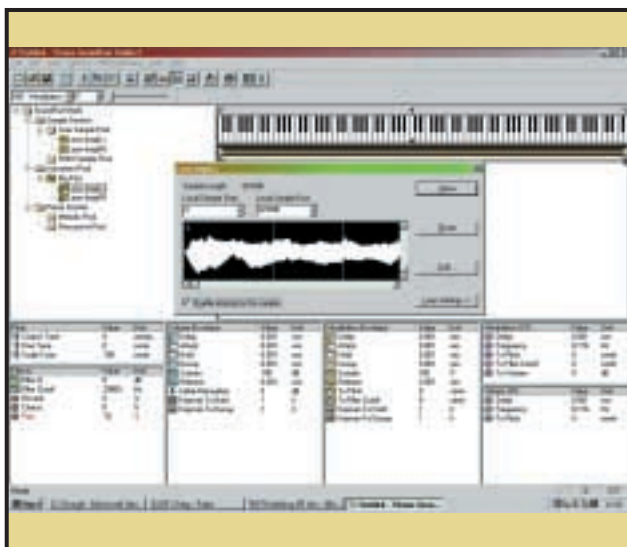
**3** If you expand the instrument you'll see that it's now using both samples to produce a stereo sound. You can hear what we've done so far by clicking on the virtual keyboard at the top of the screen. Let's now turn on looping so that the sound repeats over and over again when you press a key. We've already set loop points for this sample in our audio editor so all we need to do is turn on looping. To do this right-click on each sample and select Loop. Then select Enable Looping for this sample in the box that pops up.
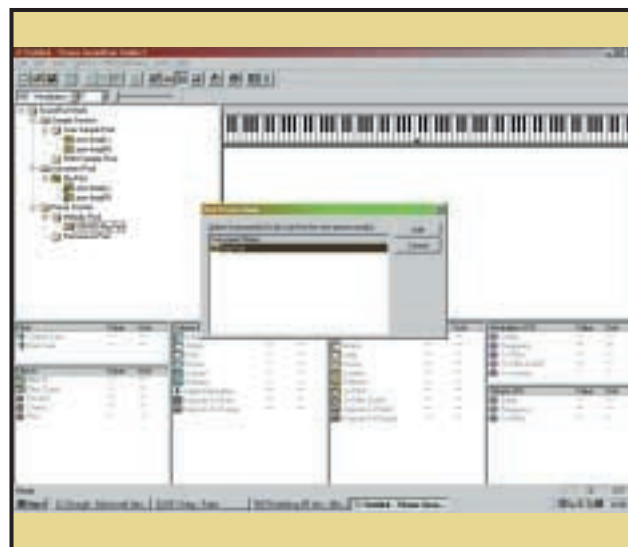
**4** Presets are created in pretty much the same way as Instruments. Under the preset section right-click on the Melodic Pool and select New Melodic Preset. You'll be asked for a name, use Big Pad again and then select the Big Pad instrument. You now have all the elements needed for a basic Soundfont and if you saved the Soundfont at this stage you could load it into memory and play it like any other MIDI instrument. However, we're going to make it a bit more interesting.
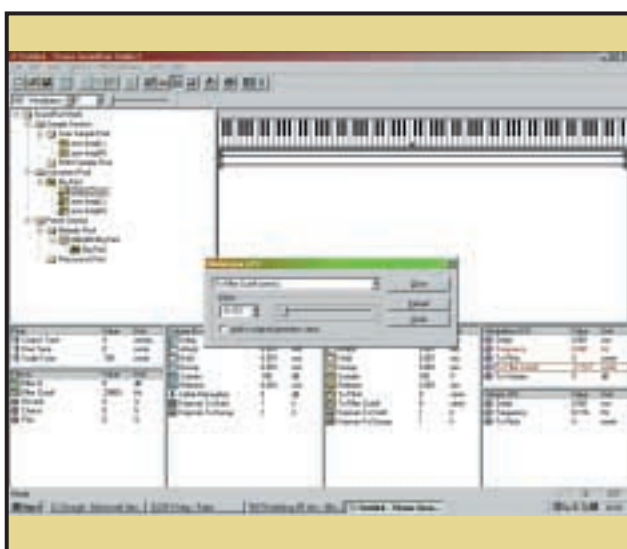
**7** We now need to set the level of the filter that will be affected by the LFO speed. Click on To Filter Cutoff in the Modulation LFO panel and in the dialog box that pops up enter -11172. Next we need to set the To Filter Cutoff settings in the Modulation Envelope box to the left of the Modulation LFO box. Click on To Filter Cutoff and enter -10345. If you now play the note on the virtual keyboard you'll find that the sound varies a lot more over its duration, thanks to a kind of pulsating effect introduced by the LFO controlling the filter.
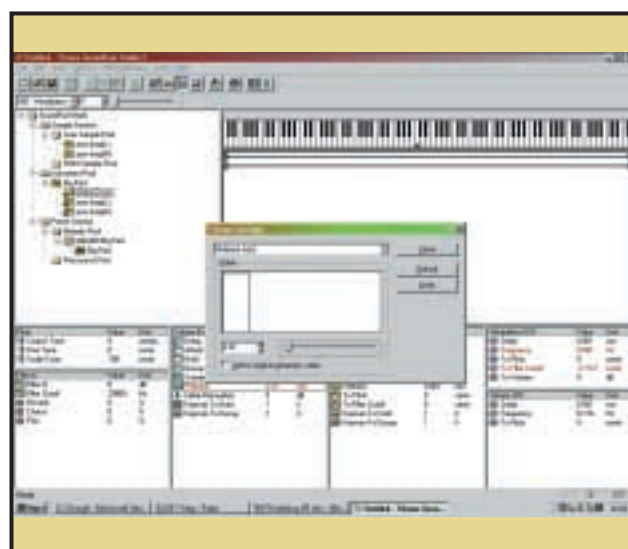
**8** When you play a note on the virtual keyboard you'll notice that it stops playing as soon as you release the key, but pad sounds usually have a release time where the note fades out. It's easy to add a longer release. In the Volume Envelope box click on Release. In the dialog box that pops up enter a value of 2.07. Next click on Release in the Modulation Envelope box and set this to 6.208. The sound will now gradually fade out when you release the key. Save the Soundfont and load it into your sound card by using its configuration application.

# Using a sequencer

**Audio and MIDI sequencers such as Cubase VST allow you to truly realise the full music potential of your sound card**
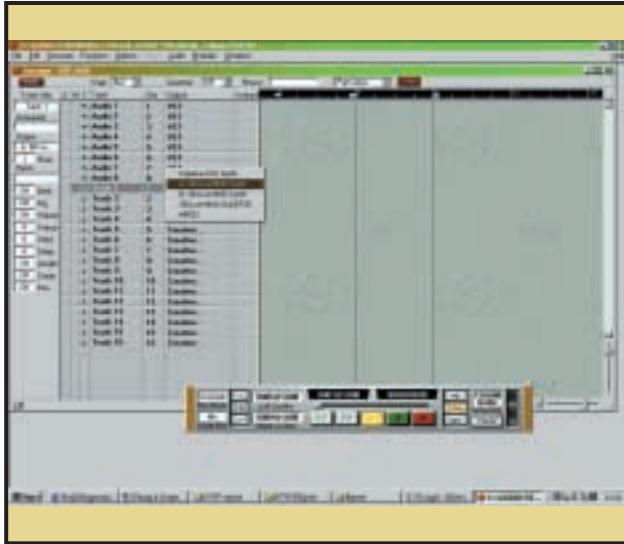




**1** Sequencers allow you to put together musical phrases to create arrangements easily. Here we're going to use Cubase VST to create a short dance music refrain. All the sounds we're going to use are General MIDI sounds so they should be available on all consumer sound cards. Open Cubase and click on the track marked Track 1. Make sure that the output column is set to the built-in MIDI synth on your sound card. You can set this by clicking on the output column of Track 1. Here our built-in MIDI synth is called A: SB Live MIDI Synth.
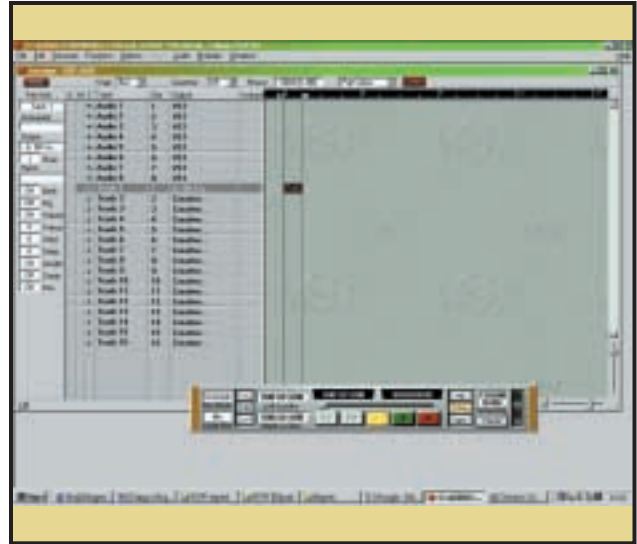
**2** Next we need to create a track. At the top of the Arrange window you'll see a timeline with two locators marked with L and R, used to mark the start and finish points of any part you create. We're going to make a single bar to use for our refrain. Click at the start of the first bar on the black area of the timeline with the left mouse button to move the Left locator to the start of the first bar and then click on the right mouse button in the black area at the end of the first bar. Now double-click on the space between these two locators next to Track 1 to create a one-bar part.
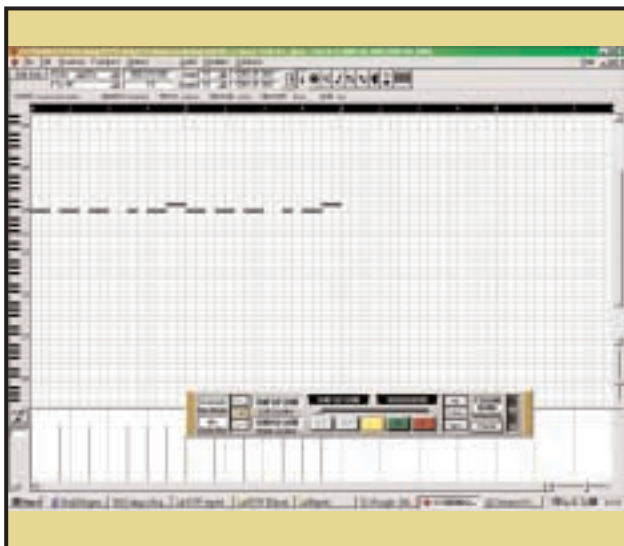




**5** Now to enter a bassline. Create a single-bar part by resetting the right marker to the end of bar one and double-click on the Arrange window next to Track 3. Open the part in the Key Edit window and enter the notes as in the screenshot. Our bassline is actually not very bassy, so we need to transpose it down a couple of octaves. Open the Part Info window by clicking on the button in the bottom left-hand corner of the Arrange window. Click on the bassline part and then left-click on the Transpose box in the Part Info panel until the number reaches -24.
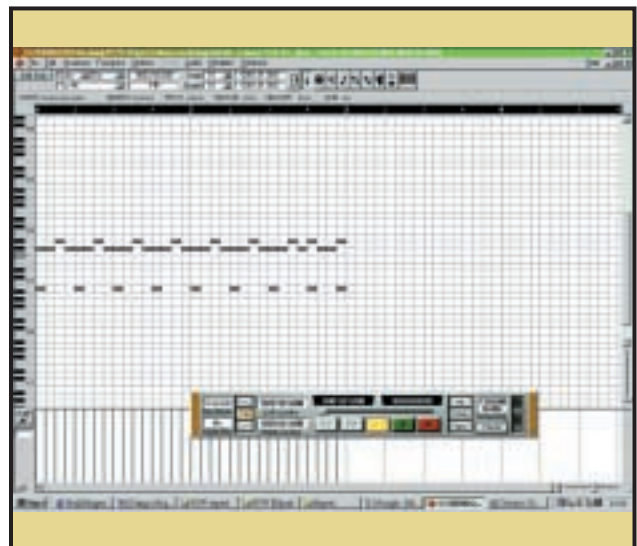
**6** To create a drum part we're going to use a two-bar pattern. This time we're going to record it on Track 10, because General MIDI reserves this as a drum track. Follow step 4 to make your two-bar pattern. Don't forget to reset the left locator to the end of bar two. Now double-click on the part to open it in the Key Edit window. You can trigger the drum sounds by clicking on the keyboard at the left-hand side of the Key Edit screen. Enter the notes as they appear in the screenshot. This will give you a simple bass drum and high-hat loop.
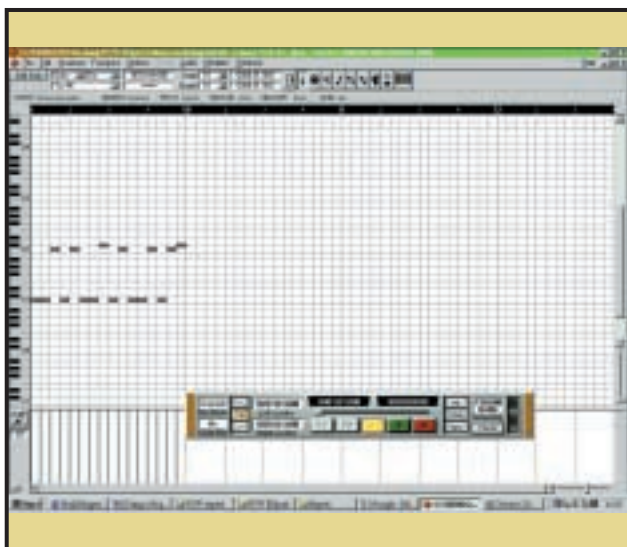
**3** Double-click on the part you have just created to open it in the Key Edit window. Click and hold the right mouse button to bring up the tool box. Then select the pencil tool. Enter the notes exactly as shown in the screenshot by clicking on the appropriate place on the grid. If you make a mistake, hold down the right mouse button and select the eraser tool and then click on the errant note to delete it. Once you've finished entering the notes, close the Key Edit window. You're now back in the Arrange page.
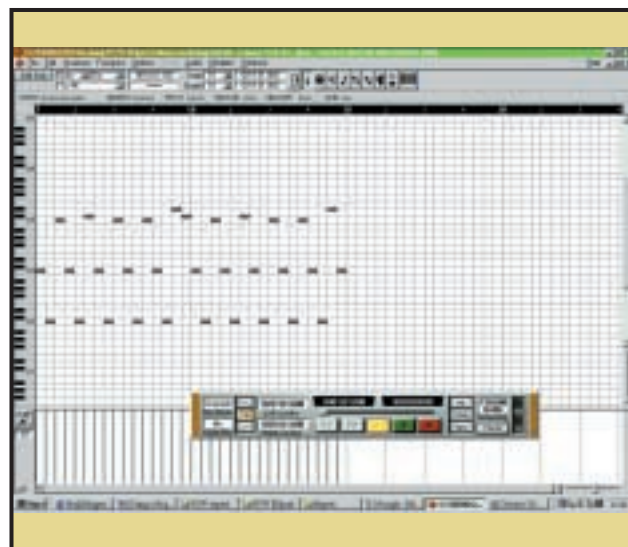


**4** We're now going to create a two-bar part. Move the right locator by clicking the right mouse button at the end of the second bar on the black timeline at the top of the Arrange window. Double-click the left mouse button in the area next to Track 2. Double-click on the resulting two-bar part to open it in the Key Edit window and then enter the notes as shown in the screenshot. Close the Key Edit window to return to the Arrange page.
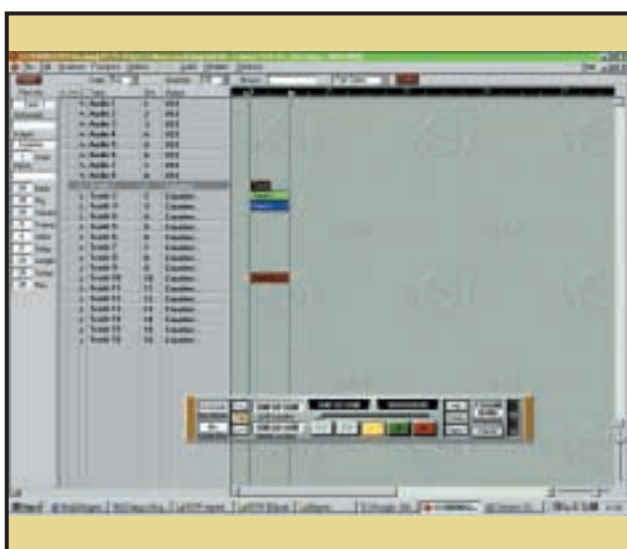


**7** We now need to assign sounds to our parts. Otherwise every part is going to play back using piano sounds. Select our first part on Track 1 by clicking once on it. In the Part Info box set the number in the box marked PRG to 39. This is a synth bass sound. Now select the part on Track 2 and change its PRG number to 45. This is a tremelo string sound. Finally, select the bassline part on Track 3 and give it a program number of 18. This is actually an organ sound, but because we've transposed it down by two octaves, it sounds more like a mellow bass sound.
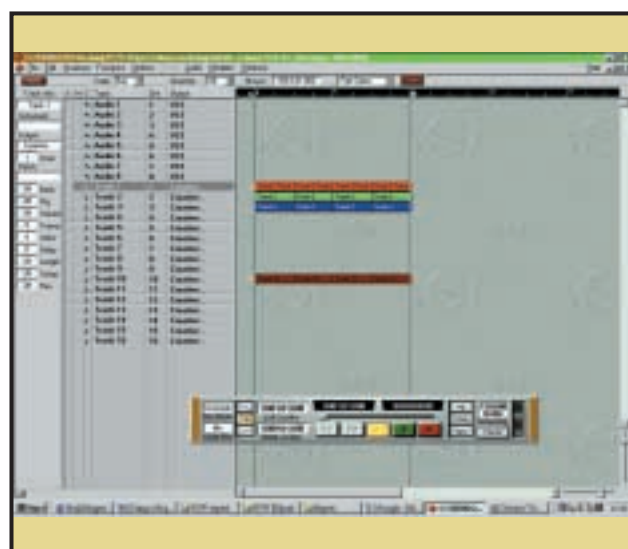


**8** Now that we've got our three parts and assigned them to sounds, it's time to create copies of each part to flesh the piece out to eight bars. You can create copies of each part by holding down Alt and then holding down the left mouse button while you drag the new part to the desired destination on the Arrange page. Now set the right locator at the end of bar eight and hit the loop button on the transport bar. You can play about with the different parts to create a simple arrangement by copying parts and dragging them around the Arrange window.

# hands on

## contents

You might have thought it would be very expensive to create your own ecommerce site, but in his Ecommerce column (p285) Nigel Whitfield shows you how to create a professional, commerce-enabled site for a lot less money than you might think.

In Hardware (p264), Gordon Laing has one last stab at trying to get his BP6 motherboard to run two FC-PGA processors and shows you how to add an IrDa port to your desktop PC to stop the search for cables when you're ready to sync your PDA.

Benjamin Woolley (p276) discusses the thorny issue of converting 3D file formats and warns that conversion is never a straightforward process.

Security is the theme in both Networks (p291) and Windows 2000 (p256) this month as Roger Gann shows you how to keep your emails private by using PGP encryption and Terence Green sidesteps Windows 2000's group policy deficiencies.

There's lots more too. Mark Whitehorn shows you how to capture keystrokes in Access and Stephen Wells has tips on extracting all the records for a given month in Spreadsheets.

**NIALL MAGENNIS, FEATURES EDITOR**

NIALL_MAGENNIS@VNU.CO.UK

# hands on
## *question time*

# Advice from our experts

**Got a problem? Our Hands On experts answer your questions and solve your problems**

## Windows

**Q** *A while back I upgraded to Internet Explorer 5 and lost the facility to show the URL at the bottom of a printed web page. Do you know where the option is to tell Internet Explorer to print it?*

*Thomas Chapman*


*Including the URL on a printed web page*

**A** Go to File, Page Setup. In the Headers and Footers section the Footer box should contain the characters &u, and by default, the full entry is &u&b&d. This puts in the URL on the left, followed by a centred date: note that this can get pushed out by long URLs. For a list of the various codes and what they do, click the question mark button at the top right of the dialog box, then click in the Headers and Footers section. You might also want to make sure that the margin settings are appropriate for your printer.

**Q** *How do I create a clean floppy boot disk in Windows Millennium Edition, in order to boot to 'real mode' MS-DOS?*

*Graham Vallon*

**A** In the words of Microsoft, 'the ability to create a clean system disk is no longer available within Microsoft Windows Millennium Edition. This is by design.' However, there is a workaround. Create a Windows Me Startup disk (Control Panel, Add/Remove Programs, Startup Disk). Now delete everything from it except command.com, io.sys and msdos.sys. You will be able to access your hard disk with the built-in DOS commands, but not CD-ROM drives. You should not attempt to start Windows Me from the DOS prompt.

**Q** *Do you know where I could get something that would record every time a computer was booted up? I thought that maybe something could be put into the autoexec.bat file, but I don't know what.*

*Nick Bearman*

**A** There are doubtless more sophisticated tools available, but for Windows 98 and earlier, putting the following three lines in autoexec.bat will do the trick.

```
echo BOOTING UP>>c:\blog.txt
echo. |time>>c:\blog.txt
echo. |date>>c:\blog.txt
```

The >> symbols redirect the output to append to a file, rather than appear on the screen. The dot-space-bar 'pipes' a dot to the time and date commands, so the user doesn't have to press Return. Note that if you are using Notepad to edit the file then the pipe symbol is found at Shift & \.

Q *I have recently created a large PowerPoint file that I have copied to a CD. I would like to make the CD autorun. I'm sure I've read something about this in PCW, but can't remember when or where.*

David Turner
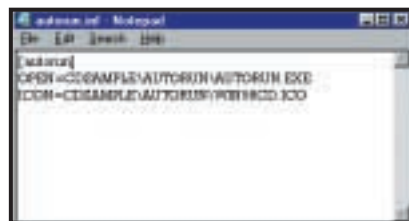
This is how Microsoft does an autorun on the Windows 98 CD-ROM

A Create a plaintext file with the name autorun.inf. It needs to contain the following three lines:

```
[autorun]
icon = (path to icon)
open = (path to program you ✓
want to run)
```
(*Key:* ✓ *code string continues*)

Copy the file to the root of the CD-ROM. The paths above refer to the CD-ROM, so if, for example, the program you wish to run is in the folder RUNTHIS on the CD, the line would read:
```
open = runthis\myprog.exe
```
You should not specify a drive letter, as this could vary between PCs.

Word Processing

Q *I have a list of names in the form Initial Surname, eg G Brown, A Blair. Each name is on a separate line and has a single space between the initial and the name. I'd like to be able to change this so I can sort the list by surname, eg Blair A, Brown G. Can this be done in Word?*

Geoff Rose
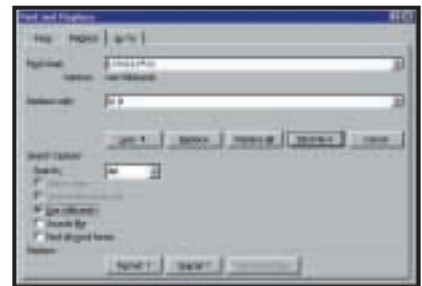
It can be done — reversing a list of initials and names

A Yes, this can be done with the magic of search and replace, and many thanks to Patrick Heeson for furnishing this solution. First make sure you have the 'More' options open in the Find and Replace dialog box, and tick 'Use Wildcards'. In the Find box type (<?>) (<*>) exactly as you see it here, with all the brackets and a space between the two terms. This will search for any single letter, followed by a space, followed by a word. In the replace box, type \2 \1 again with a space. This will replace the found text (initial-space-name) with the second found term, ie the name, followed by a space, followed by

the initial. Sorting the list is then just a matter of going to Table, Sort: note that the list doesn't have to be in a table to be sorted. Also note that this technique will only work with single initials, so if you had a few J P Sartres in the list, you'd have to do a preliminary search for (<?>) (<?>) and replace with \1 in order to delete the second initial.

Hardware

Q *I want to upgrade my 2GB SCSI drive to 18GB. How do I copy everything off my existing drive then remove it and boot from the new one?*

Andrew Balfour

A If your new drive is also SCSI, then remember that the drive with the lowest ID will boot first – most SCSI drives are set to ID 0 as standard. Try setting your old SCSI drive to ID 1 using the jumpers at the back, and leave your new drive as ID 0. Your SCSI card will now call your new drive C and your old drive D. Insert the Windows boot floppy and install Windows on your new drive C – if your system is getting confused with drives, temporarily remove the power or data cable from your old drive. Once Windows is installed and booted from your new drive, you'll simply be able to copy across any data from your old drive (now labelled as D).

You could subsequently reformat this drive for additional storage, but unless you have a recent Adaptec SCSI controller with SpeedFlex technology, then you may find your old drive hindering the performance of your new one.

Q *Would it be possible to use a camcorder for taking decent still images as well as moving pictures? Are there camcorders available with better resolution than PAL?*

JB Drake

A Yes. Over the past year, many higher-end Mini DV camcorders have featured still capabilities higher than PAL resolution. Check out Sony's DCR-PC100 and PC110 models, which both feature one megapixel still facilities, recording images up to 1,152 x 864pixels onto removable Memory Stick cards. The newer PC110 even has a pop-up flash and built-in USB interface for transferring stills to your PC.

Q *I have built a PC based on a Gigabyte GA-5AA motherboard, but I can't find USB ports for it anywhere.*

Tony Gallagher

A The GA-5AA is a Socket 7 motherboard using the Ali Aladdin V chipset. It has support for a pair of USB ports, but requires an optional cable. Contact your motherboard supplier to get hold of this cable.

Q *I have twin 500MHz Celerons and quite liked the look of those fancy Titan Majesty coolers. Will they work on the older PPGA Celerons?*

Mark Schaefer

Titan Majesty coolers

A Sadly not. The Titan Majesty is designed for FC-PGA processors only, which means any socketed Pentium III, or Celerons from the 533A upwards. FC-PGA CPUs have their actual die facing upwards as opposed to downwards on a PPGA CPU, which makes them thicker than a heatsink. Check out www.overclockers.co.uk for a wide range of alternative coolers.

Q *Is there any way I can add a SCSI scanner to my new computer which has USB sockets and spare EIDE channels?*

Jim Ander

A If you're after a simple solution that doesn't involve opening your PC, then consider a USB to SCSI converter, which is essentially a cable with USB at one end and SCSI at the other. Belkin (www.belkin.com) does one for around £75 but remember you'll get the best performance and flexibility

USB to SCSI converters are available from Belkin

if you install a PCI SCSI card instead. Adaptec PCI SCSI cards start at around £35, with top of the range workstation versions costing up to £250.

Windows 2000

Q *I have Windows 2000 and lots of peripherals. I've added a network card, but it doesn't work because it needs more resources. When I try to select new ones quite a few resources are 'Unavailable Resources'. What does this mean and can I reclaim resources? Is there any way to get more or to share resources?*

A It's hard to be specific without knowing how the BIOS is set up, whether plug and play is enabled in the BIOS, whether all peripherals are plug and play, or whether some are configured with jumpers. Some plug and play cards come with software configuration programs to set the resources and even to enable or disable plug and play.

Assuming all peripherals are correctly configured according to their plug and play support, and that any required legacy resources have been reserved in the PC BIOS, try to set the resources manually in Device Manager. Highlight a resource type, untick 'Setting based on', and click on 'Change Settings'. Cycle through the available options looking for 'No Conflicts' in the Conflicting device list.

Failing this, you may be able to disable unused devices that may be using resources, eg if there's no secondary EIDE device, disable that in the BIOS. Likewise, disable USB support in the BIOS if not required.

Most VGA cards only need an IRQ if they are being used for video capture so try disabling the VGA IRQ if set. Parallel printers set to ECP use up resources that

can be regained by setting them to EPP or bi-directional, and so forth. Sometimes, however, you will simply run out of resources and nothing can be done. In this case, the only solution is to invest in an ACPI system and PCI plug and play cards as these can usually share resources.

Windows NT

Q *I have been using NT4 for about two years with my modem using COM3. I have a graphics tablet on COM1 and COM2 free but my modem insists on being on COM3. The modem is a plug and play internal Diamond SupraExpress V.90. The graphics tablet and modem co-exist quite happily apart from a couple of seconds when the pointer freezes as the modem is dialling out. In the Event List three lines relating to a COM port conflict appear every time the machine is booted.*
Any thoughts?

Steve Smith

A The conflict error messages you're getting stem from the fact that typically COM1 and COM3 share the same IRQ and as we all know, NT doesn't support 'partying on the hardware'.

Your problem is down to the fact that you have a plug and play modem and Windows NT4 doesn't officially support plug and play. Unofficially, Microsoft does, however, provide a plug and play driver but this isn't installed by default – if you want it, then you have to install it manually. To do this, install the modem, boot the computer and log in as Administrator. Insert the Windows NT4 CD-ROM and drill down to the \drvlib\pnpisa\x86 directory. Right-click on the pnpisa.inf file. From the pop-up menu, select Install.

Once this is done, you must reboot the computer to load the driver and log in as Administrator. The new plug and play driver will then start looking for 'new' hardware.

It should find the modem and set it up with no conflicts and may request a driver or inf file to be used with the modem. If Windows NT asks for a driver, you may use the Windows 9x driver that came with the modem. The ISA plug and play driver may also find any other ISA devices on the bus such as sound or network cards.

Another possible solution to your problem is to assign different IRQs to each COM port. First of all, view what interrupts are being used under Windows NT by loading Windows NT Diagnostics and clicking on the Resources tab. All the IRQs will be listed beside the device they are assigned to.

Next, to change these resources, open Control Panel and double-click on Ports. Highlight the COM port to change and click Settings-Advanced and change the I/O address and/or the interrupt for the COM port. If you're using pnpisa.sys there will be a resources tab under the Advanced settings of the COM port. In this case, to change the resources the default settings must be overridden, so uncheck the 'Use automatic settings' check box and select one of the 'basic configurations' that now become available. In order to change the IRQ, double-click on Interrupt Request.

In order to change the I/O address, you will need to change to a different basic configuration. Depending on the basic configuration selected, Windows NT may or may not allow the Input/Output Range or IRQ to be changed.

Several different basic configuration selections may need to be tested in order to obtain the desired I/O address range and IRQ – you'll be told, of course, if your selection gives rise to any conflicts.

Databases

Q *I have set up a small Access database, and when I query one table it seems to give the right answer. However, when I query more than one table at a time I certainly do not get the right answer as some of the customer records appear repeated over and over again.*

Al Graham

A My best guess is that you haven't set up any joins between the tables. Although it sounds counter-intuitive, if you don't have joins between the tables Access (and any other relational database) will match each record in the first table to every record in the second. So each record appears a multiple of times.

The result, called a Cartesian Table, can be huge as well as meaningless! Given 1,000 records in one table and 10,000 in the other you get 10,000,000 records in the answer table.

Graphics and DTP

Q *I have a large number of graphs that were produced in Microsoft Excel 2000 from spreadsheet data that I want to include in a report I am producing in PageMaker. The report is being printed in colour by a commercial printer who wants me to supply four-colour separated film — the report has a number of colour photographs as well as the charts. I also want to change the colour of the bars on the charts to match our company colours.*

Excel doesn't have any way of specifying CMYK colours for the bars or any kind of option that will allow me to export the graphs so that I can place them in the PageMaker document. Is there a simple way to do this?

Giles Adams
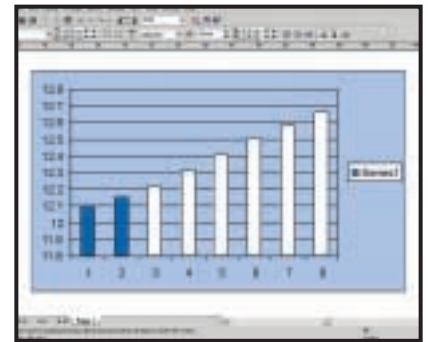
Making Excel graph colours CMYK

A You need to get the chart into a vector-editing package so that you can make any changes you want and ensure all the colours are CMYK – Corel-Draw is the only program that will do this, so you're going to have to buy a copy. First select the chart in Excel (the entire chart, not just the plot area – it will say 'chart area' in the name box in the top left of the worksheet).

Copy the chart and then create a new CorelDraw document and choose paste special from the edit menu. In the dialog box select picture (enhanced metafile), then arrange/ungroup all and you should now be able to edit individual elements of the chart including replacing RGB fill and stroke values with CMYK ones.

It may be that parts of the chart seem to have disappeared when you pasted it into Draw. They're still there, you may not be able to see them because the chart is made up from many overlapping elements – The white

plot box for example will be made from two rectangles, an unfilled stroked one and an unstroked filled one! The easiest way to sort things out is to select wireframe mode from the view menu and delete the bits you don't need. When you're finished you can export the chart from Draw as an eps for placing in PageMaker.

Networking

Q *In Windows 95/98 using a LAN system we frequently map a network drive. Some students forget to click off the 'Save Password' checkbox and I can't find a way to delete the recent list of users. Consequently, their file storage is insecure. Do you know of a way to set the default to 'NoSavePasswords' and where I can find the file to which the list has been saved. I deleted all .pwl files and searched the Registry for the mapped computer, but no luck.*

Rob Barnes

A What you need is the Windows 98 Resource Kit. Actually, you already have it: the guts of it are supplied free of charge, on the Windows 98 CD-ROM – look in the \tools\reskit folder and you can install it all from there. As well as a cornucopia of useful utilities and goodies you also get the System Policy Editor and it is this that you can use to centrally control logons to a network as well as a wealth of other useful network features. One of its logon options is 'Don't show last user at logon'. Another is 'Disable password caching'.

System policies allow you to override local Registry values for user or computer settings. Policies are defined in a policy (pol) file, usually called Config.pol. When the user logs on, Windows 98 checks the user's configuration information for the location of the policy file. Windows 98 then downloads the policies and copies the information into the Registry, overwriting any default settings.

You can also set system policies to contain additional custom settings specific to the network. For example, you can restrict what users are allowed to do from the desktop and what they are allowed to configure using Control Panels. Also, you can use system policies to centrally configure network settings, such as the network client configuration options and the ability to install or configure file and printer sharing

services. Finally, you can use policies to customise such parts of the desktop as Network Neighborhood and the Programs folder.

By default, the System Policy system expects to pull the appropriate .pol file from an NT or NetWare server – in this case you'll have to manually specify a location for them, eg the network administrator's PC.

Although much of the text of the Resource Kit is included in the online help file, the printed version has a much more detailed description of system policies – you can buy the Windows 98 Resource Kit manual online from http://mspress. microsoft.com/prod/books /1340.htm – it's about £50.

It has to be said that the security mechanisms employed in Windows 98 are basic and Microsoft recommends that users with tougher security needs should look to Windows NT4 or 2000 Server as these provide much more sophisticated protection. Nevertheless, the devil is in the detail and if you take the trouble to familiarise yourself with what's on offer, you can tighten up Windows 98 security considerably.

Unix

Q *I'm running the new version of the Gnome desktop that uses the Sawfish Window Manager. It works without a problem until I click on the Sawfish Configuration button in the Gnome Control Centre. Nothing happens. Worse than that, when I try to call up the Sawfish Window Manager, Appearance menu I get a message that says Sawfish isn't running. But ps ax | grep sawfish definitely shows that it is.*

Amanda Berry

A Sawfish (previously called Sawmill), by John Harper (john@dcs.warwick.ac.uk), is becoming an important UK contribution to the Gnome effort. Our resident Unix expert, Chris Bidmead, is using it at the moment – the 'rusty iron' window decoration you'll see in his column's screenshots this month is a Sawfish port of a classic Enlightenment theme by Dean Scott
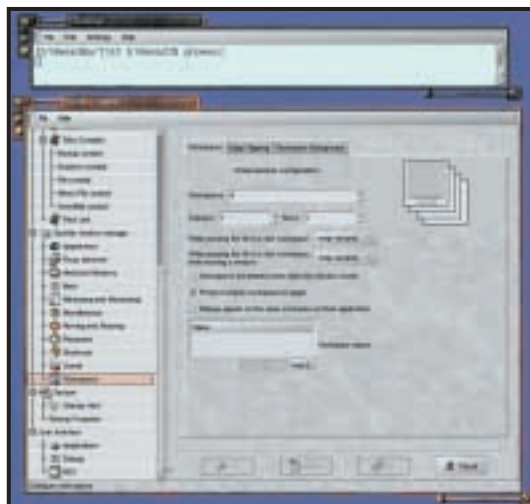
The Gnome Control Centre incorporates configuration for whatever window manager you're running. Here's where you set the number of Sawfish workspaces and define their behaviour

(dean@thestuff.net). When debugging a problem like this it's a good idea to evoke the Gnome Control Centre from the command line. Typing gnomecc in an xterm window brings up the Control Centre, and then displays whatever error messages are being thrown up when things go wrong. In this case I'll bet you see something like:

```
error--> (error "can't ↵
connect to sawfish on ↵
display" ":0")
```

The connection from the Sawfish configurator to the running Sawfish process is through a Unix socket (see the Sawfish FAQ, which you should find in your /usr/share/doc/sawfish<version> directory). Chances are this socket has 'gone stale' – a change of permissions or ownership. For some reason John has chosen to hide the socket inside a dot-named directory called something like /tmp/.sawmill-amanda (assuming amanda is your user name).

The fact that the socket is created under /tmp is a pretty strong hint that you can just delete it and it'll get recreated automatically. Go back to the Gnome graphical login and Sawfish configuration should now be working again.

Sound

Q *I will soon be getting Cubase VST5 along with Fruityloops, Rebirth, Pro52, Model E and other software. I compose dance tracks and TV soundtrack music. I'm hoping to integrate the ability to*

record live vocals and non-MIDI instruments into my setup. I have two questions:

1) Does the sound card that I use affect the quality of the audio produced by these programs? Or does the software make considerations about the quality of the sound card redundant?

2) Creative SoundBlaster Live! Platinum is very highly rated by your magazine. Is this a good choice for use with the above software or should I be going for something like the Yamaha DSP Factory or TerraTec EWS88D. If I go for the latter option will there really be a noticeable difference between the SoundBlaster and the Yamaha/TerraTec?

Mustafa M Choudhury

A Audio software does not make any considerations for the quality of your sound card. Audio software simply processes the audio at varying rates from 16bit to 24bit, and then spews the resultant audio data to your sound card. What type of digital to analog converters are used on the card will affect how good the resultant audio sounds. If you've got poor converters on your card the audio is going to sound poor, and if you've got great converters the audio should sound very good indeed. The better the card the better the sound quality you'll experience from these programs.

As for what sound card you should choose, this really comes down to how you are planning to work. If you are going to record multiple instruments at the same time onto different tracks then you're really going to need a card with multiple inputs. However, you're going to have to opt for the EWS88MT instead of the EWS88D as the MT has analog inputs whereas the D version of the card only has digital connectors designed for use with equipment such as professional ADAT players and hardware digital mixers. On the other hand, if you are planning to record instruments and vocals one track at a time and mix them together later then either the Creative or the Yamaha card would be fine.

To answer your last point on whether you'd be able to tell the difference between the SoundBlaster and the Yamaha or TerraTec, it's really a case of how well tuned your ears are to sound quality considerations. Put it this way, the average person who just listens to music on their hi-fi won't be able to perceive any difference, a recording engineer, on the other hand, will pick up on the differences very quickly.

Q I have been composing piano music for many years, but it was not until I acquired a Roland K570 that I was able to record and notate my music using my laptop with a piece of software called Music Time. I have recently converted the ensuing MIDI files to wav files and made a CD. I have also recorded some other pieces through my laptop and, although these pieces are ready for CD creation, I would like to be able to convert the wav files to the MIDI format to enable me to send them to friends via email. Is it possible?

Tom Wright

A There is a piece of software available from AudioWorks called Sound2Midi that can convert sound such as wav files into MIDI. However, before you get too excited the software is tricky to set up and can only deal with sound sources that just play one note at a time. This means that if your music has any chords in it (as it almost certainly has) the software is not going to be able to convert it. It would be a much better idea to compress your wav files into RealAudio or MP3 format and send them that way. Nevertheless, if you want to try out Sound2Midi you can download a demo from www.audioworks.com/s2m/s2m.htm.

Spreadsheets

Q Is there a formula I can use in Excel 5 to convert an international date so that it is displayed in a d/m/yy format?

E Hoyle

A If you're entering the date into cell B1 in the conventional international format, YYMMDD, you can use this formula in another cell:
```
=DATE(B1/10^4,MOD(B1,10^4)/
100,MOD(B1,100))
```
Excel will assume that the entry in B1 is a number and will use the General format. When it reads the Date function in the other cell, it will use your default format for a date, which is usually d/m/yy. If you enter 010203 in B1, meaning 3 February 2001, the formula in the other cell will display as 3/2/01. The carat mark (^) is above the 6 on a regular keyboard and means 'to the power of'.

Q I have an Excel file, on my hard disk, Exp2000.xls, which is 325KB. I want to back it up onto a floppy and replace a 323KB older copy of the file which is already there. I can see from Explorer that there is 100KB of space left on the floppy but when I try to save the new version of the file I get a message, 'Disk Full'. What's the problem?

W Hodge
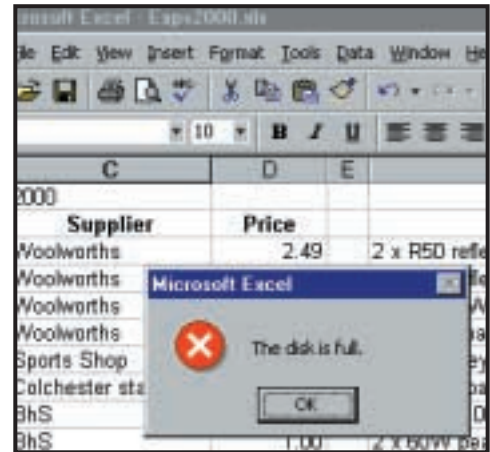
Copy and Paste can avoid disk-full error

A This is actually a safety feature. For protection, another temporary copy of the file is laid down at the same time, just for the duration of the operation. The way around this is to save the latest version to your hard disk in the normal way and close the file. Then look for it in Explorer, Copy it and then Paste it onto the floppy.

Word to the wise

Richard McPartland introduces two sides to Word that you might not have been aware of

Microsoft Word may be the *de facto* word processing package but its talents extend much further than mere word processing. Word can also do some pretty mean impressions. Meet Word the desktop publisher and Word the web page creator.

But hang on just a second. Why would you want to use Word when you could use the dedicated Publisher or FrontPage programs that form part of Office's publishing arsenal? Well, for starters, not everyone has a full version of Office but even Works Suite owners will have a copy of Word.

But with budget web design and DTP packages in plentiful supply just what does Word offer that, say, the latest version of A N Other Publisher 12 doesn't? A familiar, easy-to-understand interface for one thing and, of course, with Word's spell, grammar and style checkers at your disposal there's no excuse for producing a sloppy website or a lacking newsletter. Basically, when it comes to manipulating text, as most of us grudgingly admit, Word is hard to beat.

Word as a web page creator
So, you've decided to give Word a whirl as a web page creator. First, a word of warning: If you're planning a complex website packed with links that will constantly need updating, using Word could be a bit of a chore. However, if you just want to turn Word documents (lecture notes for example) into a simple site, or create a basic site from scratch, it is a good option.

As you'd expect, how much web functionality you have at your disposal varies depending on which version of Word you are using. Word 2000 boasts a host of web-related features and Word 97 is also pretty web savvy. Earlier versions are lacking in comparison, although you can download Internet Assistant from the Microsoft site to provide more web functionality.

Expert coders may be surprised by how much control Word gives you over your web page. Save a blank document

Word the web page creator: choose a template and you're away

as a web page and then select HTML Source from the View menu. You can now tweak the created code to your heart's content. You can also add forms and JavaScript using the Web Tools toolbar (View, Toolbars, Web Tools). Have your Office CD-ROM handy though, as you may need to install these utilities the first time you attempt to use them.

For those with a little less experience, Word works very well as an almost WYSIWYG web package. I say almost WYSIWYG as, unless your visitor's browser supports Dynamic HTML, your standard page layout will differ slightly in terms of the positioning of text and other elements, when viewed in a browser. To keep things as accurately interpreted as possible, as with a 'proper' web package, it's best to make full use of frames (Format, Frames) and tables (Table, Insert Table).

When it comes to fonts, unlike many web page editors, there's no Variable font setting, so Word leaves the font 'unspecified'. This is the case even if you use Times New Roman (the default font for most browsers). For most users this won't matter too much. In fact, Word tends to add a font tag for every new piece of text, adding significantly to the size of your HTML file, so if you can stick to one font, so much the better. Thankfully, Increase and Decrease font size buttons are provided and these can be used with no problems as they both

default to standard HTML sizes.

You should also be aware that some text effects (shadowed text for example) are not available when you switch to HTML. No matter – this should make for a much neater, more consistent site anyway. That said, you can still alter font and background colours and add bold, underline and italic styles to your text in the usual ways. Don't forget the Insert sound and animation options (Insert, Picture, Clipart) for extra multimedia pizzazz and there are also tools for creating menus, forms, lists and even scrolling text on the Web Tools toolbox (View, Toolbars, Web Tools).

As you'd expect, hyperlinks are well supported (simply type an address and it's translated to a hyperlink) but you can also add a hyperlink or mail link to plain text by selecting Insert, Hyperlink. To change the colour of a hyperlink, right-click on the link, select Font and alter the colour and line style from the resulting dialog box. Anchors to key parts of your document can also be created using the Insert, Bookmark feature.

Finally, a word of advice. When using a word processor it's easy to treat your web page as if you were writing a letter – don't. Good web pages are well structured and don't go on for miles and miles. Break reams of text into several sections and create several shorter pages instead.

Word as a DTP package
In many ways, using Word as a desktop publisher is much easier than using it as a web page creator. You don't have to worry as much about positioning of text and elements – at least not as much as you do with a web page. All you do is drop text and graphical elements into place and then adjust the text wrap to suit.

Desktop publishing in Word

1 We've already saved some text as an A4 Word document – now we have to turn it into an impressive looking newsletter! Text that spans the width of a page is fine for a short letter but it is difficult to read. A good starting point would be to place our text in columns. Highlight all the text and select Columns from the Format menu and enter the required number of columns – two or three should be sufficient; tweak the sizing if necessary. Limit yourself to two columns for an A5 page.
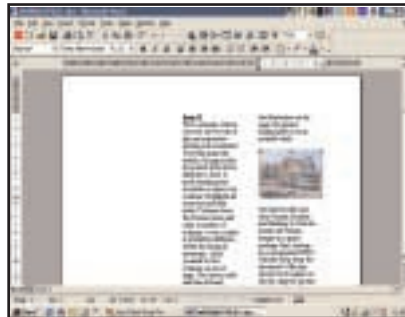
2 Pictures and illustrations form a key part of any newsletter – you can place a picture using Insert, Picture from File. However, rather than just placing it on the page, for greater control place it within an invisible table. Use Table, Insert, Table and then Format, Borders and Shading to turn the border off. Resize images in a paint package first, but to adjust on the fly drag the picture from the bottom right corner. Press Ctrl and double click on the image to reset the proportions.
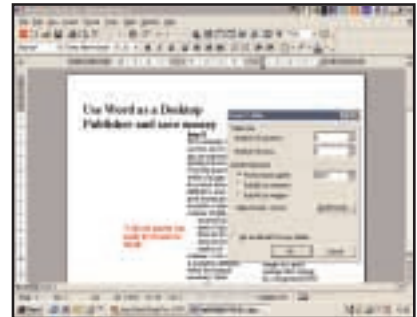
3 Next we want to create some headlines and a pull quote. Select Table, Insert, Table. To free the table from the confines of your column, right-click on the table, select Table Properties, Positioning. Make Horizontal and Vertical positioning Relative to page. To position the table, right-click in the top left corner and move the table to the required position on the page. You can also alter Text Wrap properties from this dialog box.

4 We've made use of the Drawing Tools to create a box for our masthead. Notice how we've sent a second box to the front so that we can position text on the right-hand side of the box. We've also moved the headline across to tie in more closely with the story underneath and added another picture to the left. Make use of the Grid, Display gridlines on screen tool – select this from the Draw Menu on the Drawing Tools toolbar.
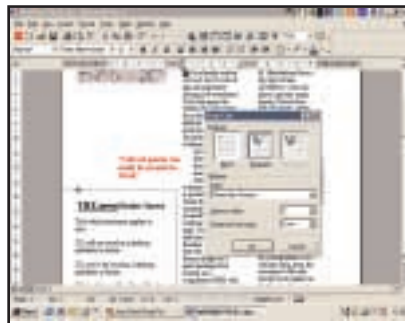
5 To make the newsletter look really professional, why not add a drop cap by selecting the first letter of the first paragraph and then selecting Drop Cap from the Format menu. Next, we want to add a cut out form on the left. This is easily done using a couple of text boxes. Make sure their borders and fill styles are both transparent. We've inserted tick boxes using the Symbol on the Insert menu. We've also added a pair of scissors using the Wingdings font in a transparent picture box.

6 A quick tweak here and there and the front page is almost complete. To get a better idea of how the page is shaping up, use the Print Preview facility from the File menu. The bare bones of the page are complete and while it probably won't win any design awards, it gets the job done and wasn't too tricky to achieve.

As you'd expect, columns (Format, Columns) and tables (Table, Insert, Table) are well used. While to add page furniture, Word's Drawing Tools come in to play, allowing you to insert boxes, lines, simple shapes and alter line thickness and fill types.

When working with text boxes you've created yourself it can be tricky to make sure they're accurately aligned. Don't panic – just use Draw, Grid from the Drawing Tools toolbar and check the Display gridlines on-screen option. Once your tables or boxes are in place, you may decide you want an advert or banner at the top or bottom of the page. The easiest way to do this is to insert a break (Insert, Break, Continuous) to split the page into sections and work on the top and bottom of your page separately.

Inserting pictures is a simple matter of choosing Insert, Picture, From File. As when creating a web page, it's worth remembering that the clever use (in terms of file type and size) of a paint package before you start will help keep your Word file size down.

Creating a web page with Word
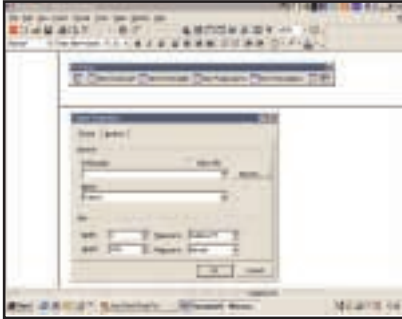
1 You could cheat by turning an existing Word document into a web page or by using one of Word 2000's web templates or even the Web Page Creation wizard. We're starting from scratch though. Save your page using the Save as Web Page option in Word 2000, or Save as HTML in earlier versions of Word. We're going to start by using frames to split our page into sections. Click Format, Frames, New Frame Page. You can alter any settings using Frame Properties.
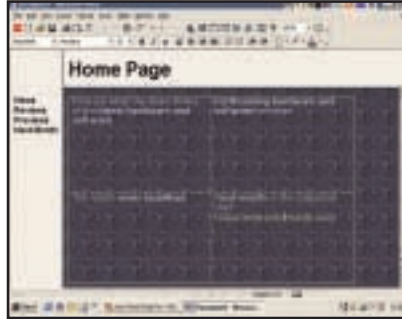
2 We've set up a table in the main frame to allow us greater control over the web page's layout. Select Table, Insert, Table. Time to add some content to the different areas of the page. With some text drafted in from another Word document, it's important to give our site some consistency when it comes to font sizes and styles. We're using one of Word's themes (select Theme from the Format menu). We've also added a background image.
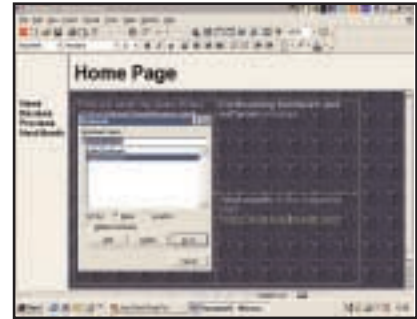
3 Any URLs included in our text have been automatically changed to hyperlinks. We also want to link a list of points to relevant web pages. To do this we're making use of the Bookmark feature. From the Insert menu, select Bookmark to add an anchor from a table of contents. You can link to other documents using Place In This Document.
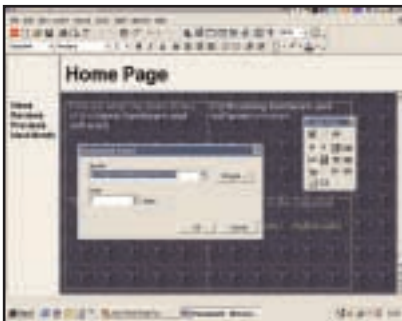
4 We're feeling adventurous so we feel like adding some music to our page. To do this we've opened the Web Tools tool bar (View, Toolbars, Webtools) and clicked on the Sound icon. We could also add scripts or build forms if we were so inclined.
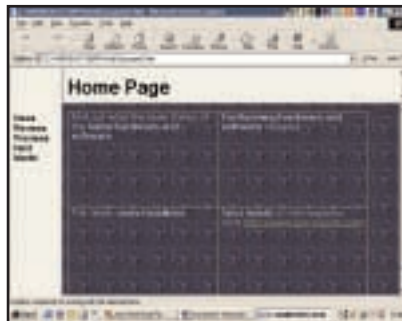
5 Time to see how our masterpiece is looking – select Web Page Preview from the View menu. (For a web view while working, select View Web Layout). Proficient coders might like to take this opportunity to tidy up the HTML code Word has produced – Select HTML Source from the View menu. When you're finished save your work and the page will open in Word once more.

6 Time to save or even publish the finished page. You could select Save as Web Page or Save as HTML and publish your page using your usual FTP program. Don't forget to give your page a name that will be displayed at the top of your browser in this dialog box. If you're running Word 2000 you could use the Web Folders facility. Select File, Save as Web Page and then create a new Web Folder on the Places bar. You'll need to enter the destination URL into this box. *Voilà*! Your finished web page.

With your text pasted into place, you may be left with stray text here and there. Format, Paragraph, Line and Page Breaks allows you to control these widows and orphans and keep text together. Job done!

Word play

The key to getting the most out of Word, whether you are using it as a desktop publisher or a web page creator is to experiment. Play around, see what the different functions do and think how you can apply these to the kind of documents you want to create. Our two workshops should give you an idea of what is possible and point you in the right direction.

Tweak and be joyful

Tim Nott joyfully hails the return of TweakUI and bemoans the addition of Media Player 7

Good news – TweakUI has risen from the grave! For those of you who have spent the past five years on another planet, the story so far is that TweakUI was originally offered as a free, but unsupported, utility from Microsoft as part of its Power Toys package for Windows 95.

It enabled users to carry out all sorts of interface tweaks that would otherwise involve dabbling in the arcana of the Windows Registry, or worse. So popular was TweakUI that when Windows 98 launched, Microsoft included it as an optional extra, tucked away on the CD under \tools\reskit\powertoy.

Then the unthinkable happened. Windows 98SE launched without TweakUI on the CD and it was nowhere to be found on the Microsoft website. Windows Me launched in a similar tweakless manner, but now TweakUI is back; bigger and brighter than ever at www.microsoft.com/ ntworkstation/downloads/powertoys/ networking/nttweakUI.asp.

Note that despite the NT in the URL this is for all current versions of Windows. The first good news is that the baffling disappearing tabs (see December's *Hands On: Question Time*) have been replaced by the original multi-row tabs, so you can see all the tweakable categories at once. There are a number of new options; one is to stop applications stealing focus and another is to manipulate an HTML file and all its supporting files – eg when you save a web page – as a unit.

You can change the location of more 'Special' folders: most of these are Windows Me additions such as My Pictures, My Video and My Music, but you can also change the installation path from here. This last means you no longer have to scrabble about browsing when adding Windows components should you have changed your CD-ROM drive letter or copied the installation files to hard disk – formerly this took a Registry edit to cure. Note that these settings have migrated from the General tab to the My Computer tab, just to keep everyone on

their toes and to give me something to write about.

Now you may remember – or have discovered for yourself – the rather cute places bar in the Windows Me standard File/Open dialog, which I mentioned last month. Naturally, the customisation

It's back and it's bad: changing places in the Windows Me Open/Save

potential of this attracted your columnist as mountains attracted Mallory, so equipped with a pair of stout boots and a copy of Regedit, I went in search of the settings that let you change the destinations for each slot. And, sad to relate, I couldn't find them.

Imagine my delight, then, on discovering the 'Open' tab in the new TweakUI, which has an option to do exactly this. At first it looks rather limited: in the drop-down lists you only have the five standard places available: Desktop, History, Favorites, Network

Neighborhood and My Everything. But much to my delight I found you can type the path to any folder you like into each box and that folder will then appear as a 'place', using its folder name, rather than the path you typed in. It will even work over a network.

Checkers and chat

You may remember I touched briefly on the new Internet games bundled with Windows Me, and in particular the limited conversational abilities of the 'Chat' feature, which apparently only lets you choose from a list of rather stilted phrases such as 'Good move!' and 'Are you still there?' when what you really wanted to say was 'You ****' and 'Get a move on!'

I've now found out why. The list of Microsoft officially sanctioned phrases for use in Internet gaming is hard-coded into a file. To be specific, the file is C:\Program Files\MSN Gaming Zone\ WINDOWS\CMNREM.DLL and the phrases are in two-byte format, which is why a File Find doesn't unearth them. It would be highly irresponsible of me to suggest that

There are some that just want to spoil it for the rest

one could cause widespread alarm and puzzlement by using a hex editor to create a custom version of this file, so I won't.
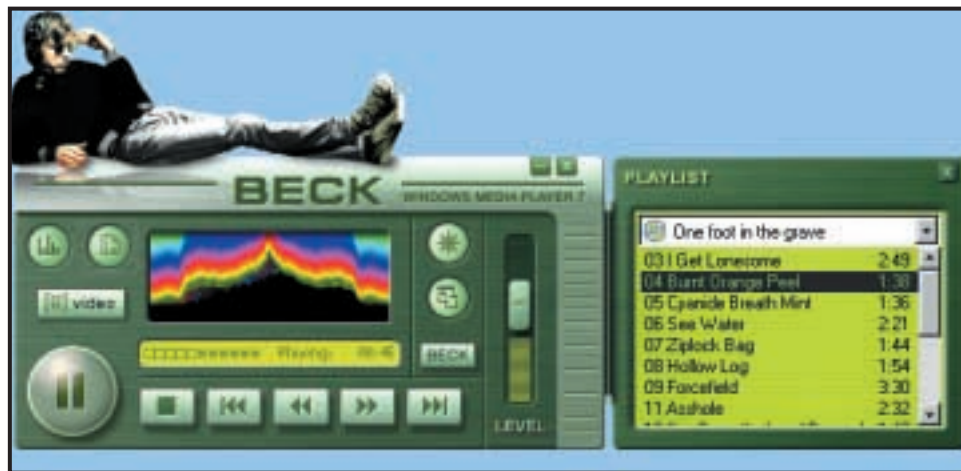
Get Real
Time, perhaps, for a second look at the Media Player 7, which ships with Me and

I also listened to some blues and some Beethoven on the 'radio' that morning, before moving on to my collection of MP3s. The radio may have been a bit iffy in terms of quality but the MP3s sounded absolutely vile, and no amount of control twiddling would make them sound any better. Checking the

it. Out of five CDs, it got just one absolutely right first time. Another it eventually got right after leading me through a lengthy Wizard-like succession of choices. For one CD it got the right artist, but the wrong album and two it couldn't manage at all. To cap this poor performance, having finished its look-up, it maintained the dial-up connection indefinitely.

Star turn: A recumbent Beck is just one of the downloadable 'skins' you can get for Movie Player 7

is also available as a free download. As this column reported last July, it features 'skins' – custom makeovers – and as well as those that come with the player there are more available for download including one of a recumbent Beck. How cool can you get? As mentioned last July, it offers a compressed audio format that claims to outperform MP3, and has more bells and whistles than a sleigh full of football referees.

Now when Microsoft gives so lavishly and so freely, as it did with IE, MSN and Hotmail, it usually means only one thing: it is out to clobber a rival, be that Netscape, AOL or, in this case, RealNetworks and/or the MP3 format.

I thought I'd give the Radio Tuner a whirl first, and went scurrying off to find the BBC World Service. A little later, two IE5 windows on Yahoo opened. I selected BBC World Service for Windows Media and the player started buffering away merrily. Total silence ensued: then came a Security Warning. Did I want to download the MetaSound Voice Codec signed by Microsoft Corporation? You mean the wonderful Media Player isn't all there? So I did, and in no time at all was listening to an advert from Yahoo, followed by a station identity message from the Beeb, and after a pregnant silence, some news.
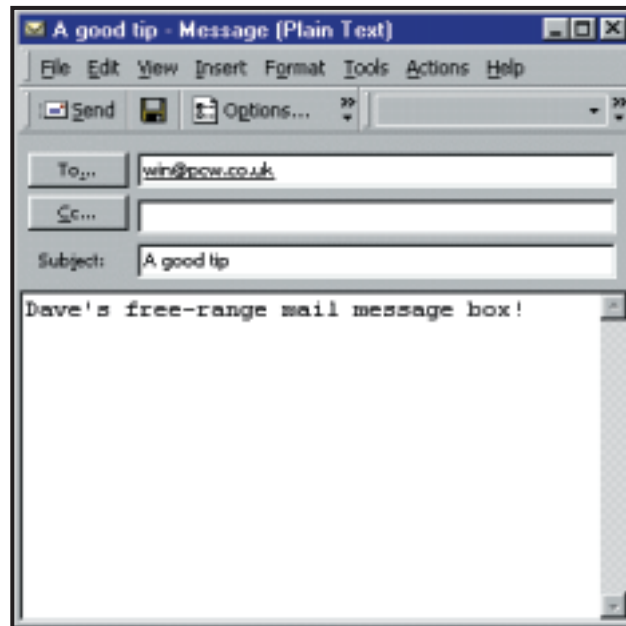
Dave Spathaky's tip for a free-range message box

same tracks with another MP3 player revealed nothing wrong with them.

So, on to the CD player. Sticking a music CD into the drive fired up the Media Player automatically. It also, rather oddly, fired up an Internet connection. It transpired that it was trying to download some album information, but it isn't terribly good at

Now, I'm all for bright ideas, decently executed, but this didn't seem to qualify on either count. At the risk of stating the obvious, a good tip in CD-playing situations is to examine the case: you'll usually find the artist's name, album title and a list of tracks. So, I went to Media Player's Tools, Options (isn't it wonderful how Microsoft is so consistent in these things?) to turn off the 'Dial up my ISP and dither about for ages trying to download album info' setting, as well as unchecking the 'Stay connected after doing all that' option. But my search went unrewarded. It seems that the trick is to tick the 'Work Offline' option in the File menu. And no, this isn't saved between sessions.

So, still undaunted, I went to find the old faithful wind-up version of cdplayer.exe. There it was, nestling like a little jewel in my Windows folder. Except that it had been hideously mutated and instead of playing CDs as in Windows 95 and 98, it now launched the monstrous Media Player 7. It can be hard to stay calm when the red mist forms before one's eyes, but somehow I made it.

Rename cdplayer.exe to something more appropriate (I'll leave this up to you), copy cdplayer.exe from a Windows
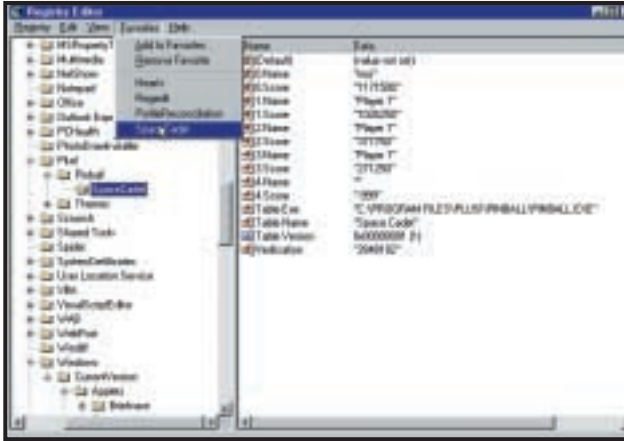
Anorak's delight — favourite places in the Windows Registry

98 machine and run the useful little .reg file given in November's issue to re-associate Audio CDs with CDPLAYER. All is now sweet and simple. CDs now autoplay in a twinkling with the old player, without having to phone home. MP3s have been restored to Soritong, and after I finish this month's column I am going to do two things. One is to uninstall Media Player 7 completely and the other is to buy a radio: 24/7 multichannel streaming audio.

Positive feedback

Here's a neat little tip from Dave Spathaky. Create a shortcut on your desktop with the command MAILTO:? This will open a blank email message window without having to load Outlook. And another cool one from David Gentle: with the focus on the desktop, press the first letter of any icon to select it. Keep pressing if more than one icon share the same initial. In fact, you'll find this works in any folder.

A very big thank you goes to Nick Cheesman, who followed my bafflement as to where IE5 stores its autocomplete entries for forms and passwords. They are to be found in Windows\ Application Data\Microsoft\ Internet Explorer\UserData.

Jonathon Watters replied to the problem of making the Open Folder icon more prominent in Regedit (December's *Question Time*), and recommended the free Regedit Extensions from www.dcsoft.com. This doesn't actually solve the problem stated – not for me, anyway – but it does provide a rather useful Explorer-style Address bar, showing a drop-down history of keys visited.

Speaking of Regedit, the Windows Me version has a couple of new features. First it remembers the last key visited, and reopens at that place. Second it has a Favorites menu, just like Internet Explorer, so that power users can surf to their dearest locations in a couple of clicks.

Another tip we've had before, but not for ages, concerns the Recycle Bin. If you want to bypass the recycle bin, then, as Alex Pounds points out, you can do so by holding down the Shift key as you drag the selected items to the bin or press the Delete key.

Cute and cuddly

Heartfelt thanks to all of you who rose so magnificently to the mascot challenge. For those who missed it, in November's

Clip-art contenders vying to become the new Windows mascot

column I suggested that the crucial thing Linux had that Windows lacked was a cuddly mascot. You have risen so splendidly to this challenge, that I don't have room to mention all the suggestions, so here's the pick of the best.

Someone who signs him or herself Chortle suggests the armadillo for its impenetrability. Nice one, but the French game software house Infogrames already has that animal as a trademark, and after October's legendary hack on Microsoft, perhaps its armour isn't so good after all. David Gentle (slug) and S Humphreys (*Jaws II*) didn't quite get the 'cuddly' side of things across. Steve Smith suggested a gannet, given that bird's legendary appetite.

David Reynolds suggested a doll called Windy Wendy: this bimboesque creature, like Windows, is expensive, costs you a fortune in phone bills, sulks for no reason, leaves stuff lying around, forgets the things you need to remember and remembers the things you would sooner forget.

I hope one of our female readers can match that with a male counterpart, as we do like to be unbiased when it comes to gender politics.
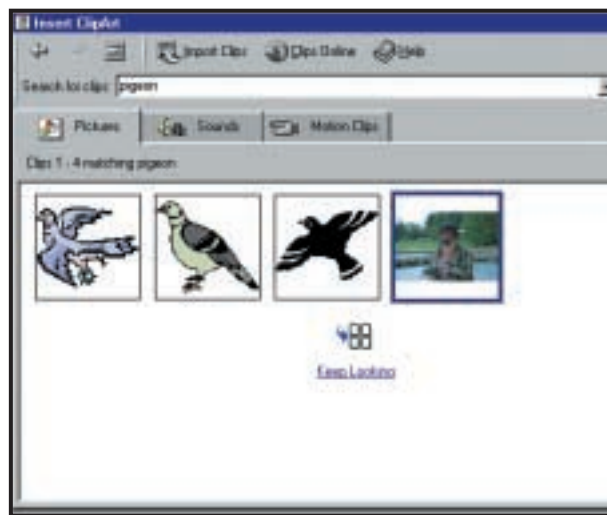
Dave W suggested a Windows Pigeon, because:
1) They exist in huge numbers, centred around public buildings, but can be found almost anywhere.
2) They turn from being a novelty to a pest in about a week of regular contact.
3) Their young seem to get larger every time you see them.
4) They will dump on you from a great height given half a chance.
5) They are very bad at clearing up after themselves.
6) How they actually deliver mail to the correct place is a mystery to most people.

Finally, an apology to all those who couldn't get the link to Transparent to work (December's column). Our fault – a printer's devil stole the hyphen from www.bit-net.com/~jadamg/ transparent/. Alternatively, try www.pobox. com/~jayguerette/ transparent.

Access all areas

Terence Green investigates the problem of creating user groups for Windows 2000 Professional

Welcome to the 21st Century. First up, Steven Harston, describing himself as an exasperated *PCW* reader, says Windows 2000 is driving him mad. Gee… different century, same old stuff.

Steven's aggravation stems from an attempt to use Windows 2000 Group Policy to set up a computer used by several people so that only the Power User and Administrator groups are able to open the Control Panel. In general terms, policy-based administration constrains what users may do and should be an inherent part of a grown-up operating system designed to support multiple users, an operating system like, er… Windows 2000.

Sadly, the big brains at Microsoft have implemented Group Policy as bait for Active Directory with Windows 2000 Server and Group Policy is hamstrung on standalone Windows 2000; it is the Microsoft marketing department's equivalent of 'batteries not included'.

In the absence of Active Directory, Windows 2000 Professional can only have a single group policy that applies to every user. There's no provision for excluding users or groups from the effects of the policy. This is a retrograde step from Windows NT system policies where an administrator can 'lock down' individual accounts or groups.

In order to circumvent this foolishness one can either use a quick hack with Group Policies or take a step back and install Windows NT System Policies. Both have their pros and cons. The Group Policy hack is just that – a hack offering limited control. You can remove users or groups from the effects of Group Policy but you can't assign different policies on a per-user or per-group basis because of the restriction of a single group policy in the absence of Active Directory.

If you want the freedom to assign policies on a per-user or group basis you need System Policies. Actually, you can achieve similar effects by getting down and dirty with the Registry but that's
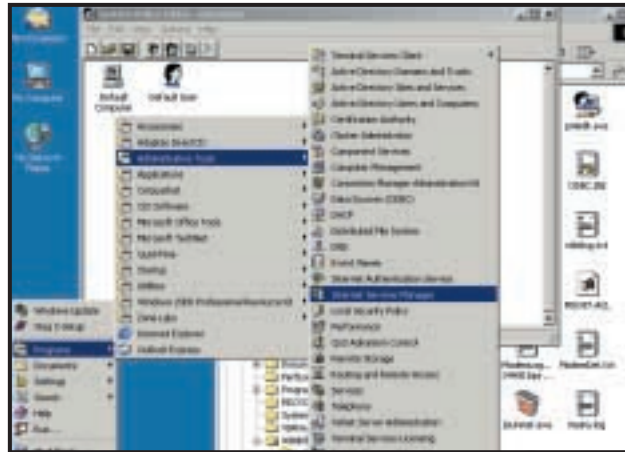
Policy Editor isn't added to the Start menu but it's there all the same

another story and not much fun for people who like to have a life as well.

To create System Policies you need the System Policy Editor, poledit.exe, and a couple of pre-cooked policy templates, common.adm and winnt.adm. You can write your own templates, they are text files, but once you've seen one you'll probably decide against reinventing the wheel. Now the fun begins. Policy Editor isn't included in Windows 2000 Professional. That would be too easy, right? It's not in the Windows 2000 Resource Kit either. But it is in Windows 2000 Server. Locate the file named adminpak.msi in the Windows 2000 Server distribution, copy it to Windows 2000 Professional, and install by double-clicking on it.

Now you have Policy Editor. Strangely, it doesn't show up in the Program Menu along with the other two dozen administrative tools that you just installed from adminpak.msi but look in your \WINNT and there it is – poledit.exe. This is so easy to

use it doesn't need further explanation. If you want a bit more, look at Knowledge-Base article Q269799. Don't give up hope if you don't have access to Windows 2000 Server. By an act of great charity adminpak.msi has been slipped into the Windows 2000 Service Pack 1 distribution, the full CD version or 90MB download but not the small Express download.

As a final quirk, if you don't have Service Pack 1 you can also grab the Policy Editor by downloading the Office 2000 Resource Kit at www.microsoft.com/office/ork/2000/ download/ORKtools.exe. This 9MB download includes poledit.exe but not the policy templates. If you don't fancy handcrafting the templates you may be able to find some on the web; the only ones I found were older than the ones in the Service Pack that are dated September 1999.

If you don't want to download anything and the limitations of Group Policy are acceptable, here's (the slightly rushed version of) how to set it up. Open Start/Run, enter gpedit.msc and hit OK
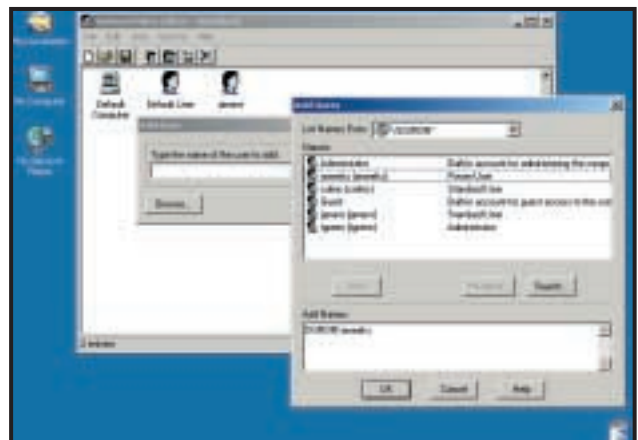
Don't edit the default policies until you've practised with users

to open the Group Policy editor. Concentrate on the Administrative Templates. Don't mess with the other stuff until you've had a chance to read the Online Help, know your way around Windows 2000 and have a very good idea of the consequences of editing stuff like Security Settings. Mess up and there's every chance you'll have to reinstall Windows 2000. Remember when you are making changes to the Administrative Templates that every edit will apply to every user except those you specifically remove with the hack explained next.
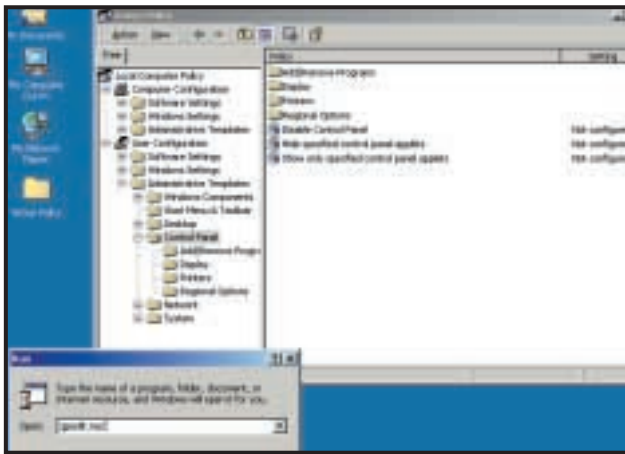
Run gpedit.msc to open the Group Policy Editor to change security settings

Close the Group Policy editor, open Windows Explorer, and navigate to X:\WINNT\SYSTEM32\GroupPolicy folder (where X:\WINNT is the root of the Windows 2000 system files). Right-click the GroupPolicy folder, select Properties to open the GroupPolicy Properties window, and click on the Security tab. The Name window lists users and groups. Group qualifiers in parentheses, eg 'Administrators (COMPUTERNAME\Administrators)' and 'Power Users (COMPUTERNAME\ Power Users)', mark them as local users and groups, in other words the ones in which you are interested.

The list entries depend on how you set up users, whether the machine is part of a workgroup or domain, and so forth. If the users or groups you want to exclude from the effects of the group policy are not listed, use the Add button to open the 'Select Users, Computers or Groups' window and add them. Return to the GroupPolicy Properties window.

The lower pane of the 'GroupPolicy

Properties' window labelled Permissions lists basic permissions for the users and groups in the Name window. Highlight a name in the upper pane to see its permissions in the lower pane. The Permissions window lists Full Control, Modify, Read & Execute, Read and Write. The only one we're interested in is Read. All we need to do to exclude a user or group from the Group Policy we have configured is to set the Read permission to Deny. You'll see grey backgrounds in some checkboxes meaning this user or group has inherited permissions from further up the folder hierarchy.

Since we're only interested in changing the permissions on the GroupPolicy folder and because Deny takes priority over Allow, don't worry about inheritance. The 'inheritable permissions'
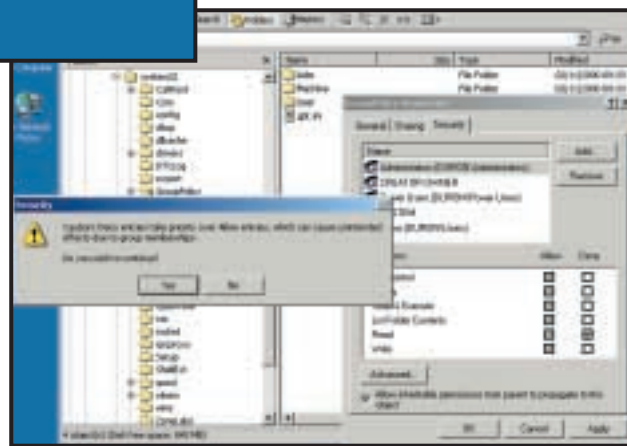
Deny Read permission will enable you to exclude individual users and groups from Group Policy

checkbox is likewise irrelevant and can be left unchecked. Ignore the Advanced button.

In fact, don't play with it unless you know what you are doing. Permissions rapidly become quite confusing if you haven't previously worked with them and bad things can happen if you click on a whim.

For more information on the subject, look up 'permissions' in Online Help and read through the related material

on folders, files and special permissions.

Now select in turn the users and/or groups to be excluded from your chosen Group Policy, click on the Deny permission for the Read right, and click Apply. A security warning pops up. Click on OK to continue and you're done. The users and groups to which you have applied the Read Deny permission will not be affected by your chosen Group Policy.

When they log in to Windows 2000 it attempts to open the policy but the user is denied read access to the policy directory so the policy cannot be applied. It's a hack, but it works and is recommended by Microsoft if you read through the *Group Policy* White Paper on the Microsoft website.

There's a downside. By denying read access to the Administrator account you prevent it from opening the Group Policy Editor. In order to change policy you have to remove the Deny permission. If you have tinkered with other permissions you may inadvertently have prevented yourself from removing the Deny permission. To avoid this major hassle, the one permission you must not disable is 'Take Ownership' which happens to be under the Advanced menu.

If you have followed the instructions above and only ticked the Deny permission you won't hit this snag. However, when you navigate back to the GroupPolicy folder in Windows Explorer and click on it you will be denied access. Don't panic! Simply right-click on the folder, choose Properties from the pop-up menu, click on Security, remove the tick from the Deny permission, click on Apply and you're back in business.
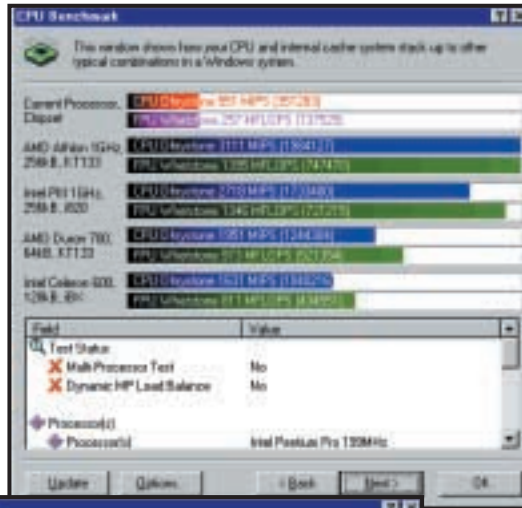
New lamps for old

Roger Gann looks at upgrading his processor to give his workstation that little bit extra

It seems like only yesterday (October, actually) that I was wrestling with my HALs, trying to install a second Pentium Pro processor in my venerable Compaq Professional Workstation 5000. Adding a second Pentium Pro to an NT Workstation isn't a bad idea – it's a cost-effective power upgrade and as the P6 and Windows NT were made for each other, you've got a marriage made in digital heaven.
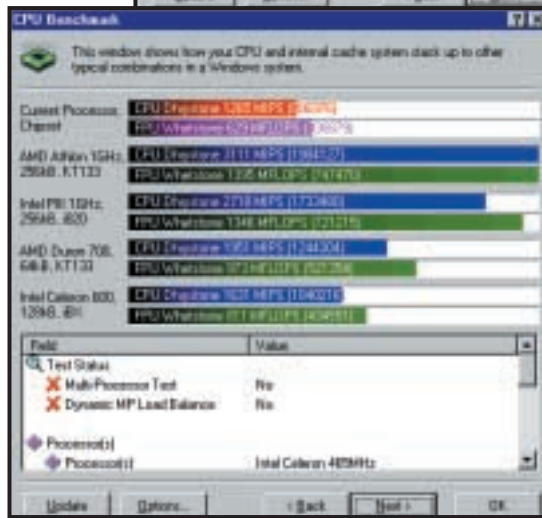
The Pentium Pro may have maxed out at 200MHz and gone out of production years ago but the solidness of its technology can be gauged from the fact that the guts of the P6 core is still to be found, albeit somewhat updated, in the Pentium III. So, it's not too surprising then, that the Pentium Pro and NT Workstation were a winning combination that's stood the test of time. Even today, there's plenty of kit out there running quite happily on this dynamic duo.

But of course time and processor technology wait for no man, and the once cutting-edge performance of the 200MHz Pentium Pro now looks decidedly ho-hum compared to the current crop of lightning-fast CPUs. OK, if your PC has a second CPU socket, you could (if you can get hold of one) add a second Pentium Pro and this would undoubtedly boost performance. However, it wouldn't give you MMX/SIMD support, which puts the Pentium Pro at a distinct disadvantage when performing multimedia tasks.

Rather than add a second Pentium Pro, you could replace the one you've got with a processor upgrade, such as the Hypertec HyperRace Pro – details at www.hypertec.co.uk. This essentially shoehorns an Intel Celeron processor onto a Socket 8 adaptor. So at a stroke you get a much faster processor, with an on-die cache (just like the Pentium Pro)

and support for MMX. As far as I know, this is the only Pentium Pro processor upgrade on the market – Intel stopped selling its Pentium II OverDrive some time ago.

Left: The 200MHz Pentium Pro looks decidedly ho-hum compared to current CPUs

Below: The HyperRace Pro – one final life extender

Three versions of the HyperRace Pro are available – the Celeron 466 costs £129 ex VAT, the Celeron 533 £149 ex VAT and when the Celeron 700 comes out, that version will sell for £169 ex VAT or thereabouts.

Processor upgrades are normally a cinch and the HyperRace Pro was no exception – having first removed the heatsink, you simply lift the Socket 8 ZIF lever to free up the old Pentium Pro and lift it out. You then drop in the HyperRace Pro. The number and arrangement of the pins on a Socket 8 processor can make it a little awkward to locate the CPU in the socket. Once inserted, you simply drop the ZIF lever to clamp the CPU in place. The HyperRace, which comes with its own heatsink and cooling fan, draws power, not from the normal VRM but from a separate power supply lead instead – a 'Y' power lead is provided for this purpose.

As my Compaq PWS-5000 had two Pentium Pros already fitted I had to reconfigure Windows NT4 to use only one processor – sadly, although the HyperRace does support SMP working, it doesn't support it in the PWS-5000. Time was of the essence and so I simply

PSW-5000 benchmark results using SiSoft's Sandra 2000

Figure 1		1x PP 200MHz	2x PP 200MHz	HYPERRACE 433MHz
CPU				
Dhrystone	MIPS	551	1,091	1,265
Whetstone	MFLOPS	257	509	629
MMX				
Integer	it/s	388	776	1,442
FPU	it/s	288	575	671

used the boot.ini switch, as detailed in my October column. For new readers, you edit your boot.ini file to add a /ONECPU switch the 'NT' line thus:

boot.ini before:

```
[operating systems]
multi(0)disk(0)rdisk(0)↵
partition(1)\WINNT="Windows ↵
NT Workstation Version 4.00"
multi(0)disk(0)rdisk(0)↵
partition(1)\WINNT="Windows ↵
NT Workstation Version 4.00 ↵
[VGA mode]"
```

(*Key:* ↵ *code string continues*)

boot.ini after:

```
[operating systems]
multi(0)disk(0)rdisk(0)↵
partition(1)\WINNT="Windows ↵
NT Workstation Version 4.00" ↵
/ONECPU
multi(0)disk(0)rdisk(0)↵
partition(1)\WINNT="Windows ↵
NT Workstation Version 4.00 ↵
[VGA mode]"
```

boot.ini is a Read-only system file, so don't forget to uncheck the Read-only tickbox in its properties before opening it in Notepad.

When you reboot, don't be surprised if your BIOS still tells you that you have the same (old) processor fitted – it's just old and can't see into the future. But all your diagnostic software will reveal the true identity of the CPU you've just installed.

The proof of the pudding

So what sort of difference does the HyperRace Pro make? Well, I had the slowest version, which uses a 466MHz Celeron, and it still managed to blow a single 200MHz Pentium Pro out of the water. Using the latest version of SiSoft's Sandra 2000 (www.sisoftware.co.uk) to benchmark the PWS-5000 I obtained the scores shown in figure 1.

The gains over a single Pentium Pro are striking – the HyperRace is as much as 140 per cent faster. And its multimedia performance is even better – it's as much as 270 per cent faster. Fitting a HyperRace in lieu of a second Pentium Pro still makes sense – the CPU gains are about 20 per cent, MMX as high as 85 per cent. Don't forget: these are pure processor performance scores and slow memory and hard disk sub-systems will drag down the overall boost to the system.

Nevertheless, if you've got NT
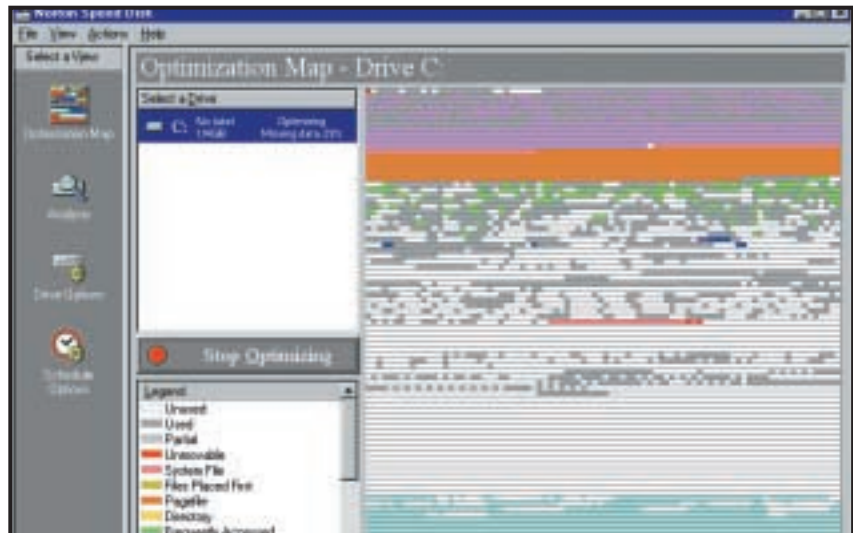
Norton Utilities 2001: the familiar System Doctor control panels lets you track problems

Pentium Pro workstations that are built like a tank and show no signs of wanting to head skip-wards, the HyperRace might be one final life extender you would want to consider.

Norton Utilities 2001

Although Symantec did bring out a version of its famous Norton Utilities for NT (known unceremoniously as NUNT) a couple of years ago, it never kept pace with the versions for Windows 9x. As a result, it got a wee bit stale and in my experience it has caused a few problems, particularly with Microsoft BackOffice Small Business Server for some odd reason.

Now, at long last, Symantec has finally released a 'unified' version, Norton Utilities 2001, which works on all Windows platforms – ie Windows 9x, Me, 2000 Professional and NT4. Now this version of Norton Utilities doesn't bestow any extra functionality for Windows 9x users but it adds shed-loads for the NT user, so for this reason, it's a useful addition to your NT toolbox.

Like all previous versions, Norton Utilities 2001 has a laundry list of capabilities, though compared to a Windows 9x install, the laundry list for NT is quite a bit shorter, as plenty of NU 2001 components won't run or aren't applicable to Windows NT4. The familiar System Doctor control panel lets you monitor your system for problems while the Disk Doctor can diagnose and repair disk problems. You can recover deleted files with the UnErase Wizard and the new SpeedDisk

defragmenter is a vast improvement over its predecessor – no other disk optimiser on the market comes close in terms of speed, reliability and functionality. The CD-ROM is also bootable – handy when your hard disk goes west, though its value on NTFS partitions is debatable. You also get the System Information tool, which displays useful info about your PC. All these tools are accessible from the front-end 'Integrator'.

But you don't get other goodies, such as File Compare, the Registry tools or Image, nor do you get the WinDoctor tool, which can automatically fix the knicker-twists that Windows regularly gets itself in.

On the plus side, there is the overhauled and improved LiveUpdate service. If you have other '2000 series' Norton packages installed on your NT machine, such as Norton AntiVirus 2001 or Internet Security 2001, you can now use LiveUpdate to update all of them in one fell swoop. You can even set it to update invisibly (ie behind your back) – it simply waits until there's an Internet connection and checks to see if updates are available. If there are any, it'll silently download them and install them. Which is spooky, but convenient.

Linux by wireless

This month Chris Bidmead goes from printing with CUPS to unravelling the eccentricities of SuSE

Dave Koberstein's Linux code for the Proxim RangeLan2 wireless hardware arrives in a tarball called rl2_driver.tgz, and comprises (mostly) source code that needs to be compiled into a loadable module. In earlier days I used to just expand and compile source tarballs wherever they happened to arrive, which would either be my home directory as a user, or /root. Things can get pretty messy if you do this, so these days my regular place for source that isn't kernel code or installed from a source RPM is in a directory under /usr/src/other. But you could argue that its close relationship to the kernel implies that rl2_driver.tgz should be expanded directly under /usr/src, in the same location as the PC Card (PCMCIA) tarball we discussed last month.

Expanding the Koberstein tarball gave me a directory called ../rl2-1.7.0. It turns out to contain a precompiled rlmod.o (the module I need for my Proxim RangeLan2 PC Card wireless network card) but I knew that the chances that this would actually work with my current kernel were pretty slim. The best bet is to compile a fresh binary against the current running kernel, and the directory contains instructions and tools to help you do just this. Much of what follows goes for many other kinds of source code tarballs you may want to compile.

First read the READMEs. In the Koberstein tarball a file called README.1st carries a few notes about changes since the previous version, and directs you to more documentation in a subdirectory called docs. There's a general README here, describing how to compile the module, together with separate notes for the variety of Proxim hardware the Koberstein code covers.

The main README lists a set of steps that have to be carried out:

● Make sure your kernel supports loadable modules.
● Install the kernel sources – we need the header files.
● Execute 'make dep' on your kernel (we covered that last month).
● If you are using PC Card, be sure to 'make config' your PC Card sources.

I skated over this last month, but there are full instructions in the PC Card package. The chances are you already have the PC Card package installed, but I think the essential point is to have the PC Card sources in place and configged because the rlmod compilation will be looking for PC Card header files.
● Do 'make config' on the driver and answer the questions.

Ah! At this point it all threatened to come unravelled. I had compiled and installed my tailored kernel, and then rebooted into that kernel and compiled the PC Card stuff to go with it. But now when I ran the config script in the Koberstein package, here was an error message telling me that it was all no good because: 'PC Card support is not compiled in.'

'Right,' I shouted back. 'That's because the PC Card stuff is modular

CUPS comes with its own miniature web server, and all its configuration can be done through web pages. The second printer here, 'Acrobat distiller', is a pdf file creator that uses GhostScript. The smaller window in the bottom right is an additional utility for maintaining the Lexmark Optra 45 which was generated automatically when I set up CUPS

these days, dummy'. I carefully repeated all the preliminary steps to make sure I had them right and then returned to the rl2 config. Same message. Duh!
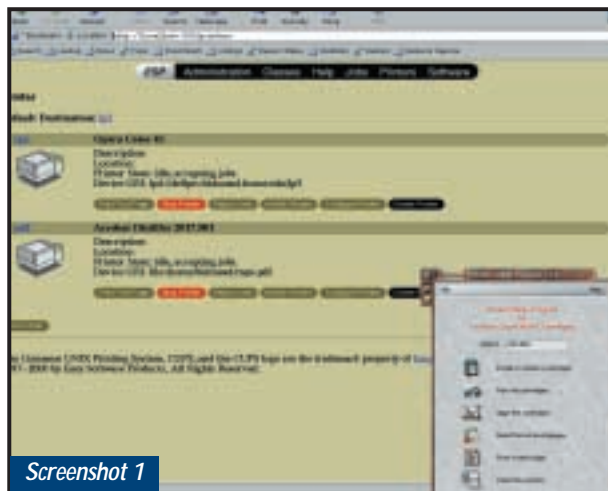
No PC Card support, no rlmod.o. No wireless link and no working down the end of the garden when the sunny weather comes. Eventually it dawned on me. One invaluable tip I can pass on here can be summed up as: 'Take error messages seriously, but never literally.'

This is because the kind folks who write the error messages are usually programmers with more important things on their minds than explaining literally and succinctly the nuances of each and every error situation. In this case the distinction between kernel-compiled PC Card code and a running PC Card kernel module is of little interest to the programmer. The error message could more helpfully have read: 'PC Card support not compiled in, or module not running'. I hadn't started the PC Card services, and the rl2 config had no way of knowing they were lying about on my hard drive raring to go.

The PC Card installation creates a script called /etc/rc.d/init.d/pcmcia as part of the SysVinit runlevel services. I ran /etc/rc.d/init.d/pcmcia start and returned to the rl2 config. This time – hooray! – I read: 'PC Card support compiled in'. I wasn't going to argue with that. Next month we'll get the Proxim wireless LAN all up and running.

Printing with CUPS

Printing is pretty easy to set up on Linux machines these days, but traditionally getting the Berkeley lpd (line printer daemon) to behave on Unix systems has been a source of endless hours of, er, amusement. As with other 'standard' Unix features, each vendor has its own variant of lpd, and even the one distributed with most versions of Linux has its quirks and bugs.

Alternative generic Unix printing systems are around, notably the upcoming GNUlpr (http://lpr.sourceforge.net/) and the longstanding LPRng (www.astart.com/lprng). But this 'new generation' printing system, although a complete recoding, is more a clean-up than a fresh start, and it doesn't make use of the latest printing standard proposed by the Printer Working Group of the macho-sounding Internet Engineering Task Force (IETF). This Internet Printing Protocol (IPP) defines remote printing extensions to the HyperText Transport Protocol (HTTP), and seems to be widely supported.

In fact, says Michael Sweet, of Easy Software Products, 'IPP is poised to become the standard network printing solution for all operating systems'. Easy Software is the company behind CUPS, and it holds the trademark and the copyright, although the core code is licensed under the Free Software Foundation's GPL and LGPL. This means that CUPS can be freely downloaded and distributed with operating system software (see screenshots 1 and 2). Easy Software also sells a universal printing software suite based on CUPS called ESP Print Pro, which includes over 2,300 printer drivers.

I was delighted with the GPL'd CUPS (see screenshot 3), which I received with Mandrake 7.2 (it's also a component of the current versions of Debian), as it gave excellent results with my Lexmark Optra 45 colour inkjet printer. The support is through industry-standard PPD files, which provide a detailed definition of the printer capabilities. Actually the Optra 45 isn't a fair test – it's a standard PostScript 2 printer and therefore very easy to run at full capability with practically no support from the operating system. If your particular printer isn't so tractable CUPS may still be able to provide what it needs. If it doesn't, you can upgrade to the commercial ESP Print Pro, or try the (still experimental) PPD generator, Cupsomatic, at www.linuxprinting. org/cups-doc.html. I'd love to hear from anyone who makes use of this.

CUPS has been out for a while, but to date I've stuck with the rough'n'ready lpd
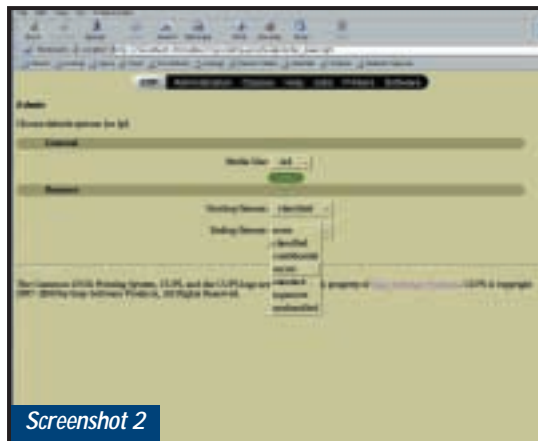
Screenshot 2

The CUPS web page for setting the page size and choosing separation sheets
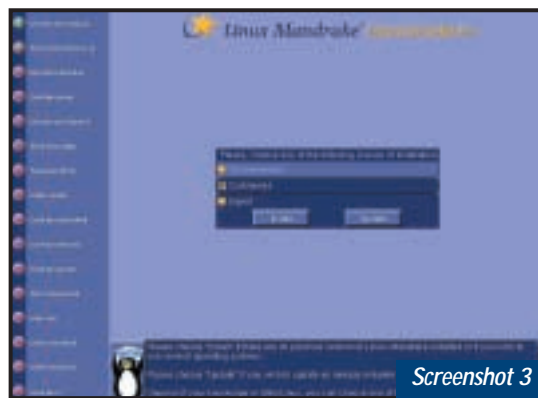
Screenshot 3

I've just upgraded to version 7.2 of Mandrake, a great desktop distro with a number of special features like CUPS and the 'supermount' automatic CD-ROM and floppy disk mounter. Very easy to install, too

because it's simple and it's a standard, and I wanted to be sure I understood it thoroughly before getting into a more exotic substitute. Now that Mandrake and Debian have embraced CUPS I think it's time I got stuck in. Of course users of other Linux distros and indeed other operating systems needn't feel left out: precompiled binaries for Solaris, HP-UX, Digital Unix and IRIX can be downloaded from www.cups.org/software.html, and full source is there too if you want to port it elsewhere.

Mount that drive

One of the commonest questions I get from Linux newbies is about mounting drives. Here's a variant from Jonathan Weir: 'I am new to Linux and I would love it if you could tell me using the linuxconf tool how to set up a hard drive to enable me to mount it. You will have to be quite basic as I don't know a lot yet.'

OK, Jonathan, Linuxconf will do the job (see screenshot 4), but like most GUI aids it tends to leave you guessing as to what is actually going on underneath. Better to start at the bottom and work up.

Mounts that you make regularly or permanently are set up in a config file called /etc/fstab. The installation will have created one for you: take a look at it. To add new mounts the command-line way, here's a good way to proceed:

1) Mount the device manually using the mount command. You'll need to become root and you'll have to know the correct device name of the partition or drive you want to mount. Running fdisk -l on the whole device name will show you the individual partitions. For example, my ThinkPad T20 is partitioned as in Figure 1.

Once you know the partition device name (let's say it's a DOS partition on /dev/hda1) create a mount point (an empty directory) with the mkdir command (say /mnt/dos) and run the mount utility like this:

```
mount /dev/hda1 /↵
mnt/dos
```

(*Key:* ↵ *code string continues*)

Strictly speaking mount needs more information, like the type of filesystem it is mounting, but it's pretty good at guessing if you don't supply this. For more details see man mount.

2) Current mounts are logged in a file called /etc/mtab. If you want to make such mounts permanently or regularly, copy the relevant line from /etc/mtab into /etc/fstab. A non-permanent mount entry in /etc/fstab will have the non-auto tag.

3) Entries in /etc/fstab without the non-auto tag will automatically be mounted at boot time (strictly speaking whenever mount -a is run). You can mount non-auto entries with an abbreviated mount command that only includes the device name or the mount point, eg:

```
mount /mnt/dos
```

SuSE eccentricities

Towards the end of last year a press release from the German Linux distributor SuSE announced that its SuSE 7.0 distribution demonstrated closer
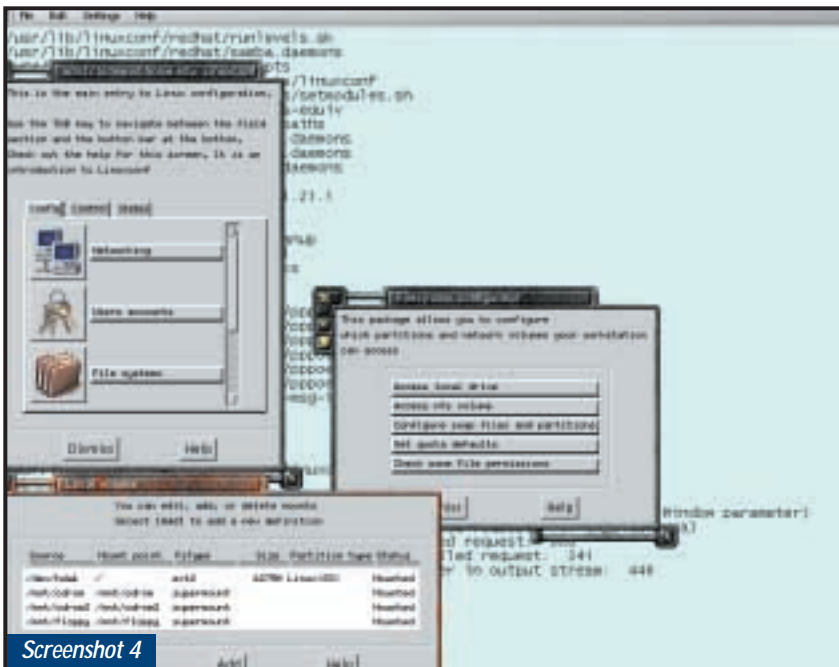
compliance than any of its competitors to the Linux Standard Base. I was surprised. The otherwise much appreciated SuSE distribution of Linux has always struck me as being riddled with eccentricities.

The LSB (see www.linuxbase.org/) is an evolving standard aimed at increasing compatibility between the different Linux distributions. Because the LSB is still a work in progress, SuSE seems to have jumped the gun here, and LinuxBase has since added a rider to the test suite on which SuSE bases its claims:

'This is a work in progress, no claims of LSB compliance or passing these test suites should be made. These are unapproved test suites and issues remain both with the test suites and the specifications under test.'

One long-standing oddness about SuSE is the way it chooses to name RPM packages. Red Hat and other RPM-based vendors include the revision number and target processor in the name – so an RPM will be called something like libstdc++-2.95.2-7mdk-i586.rpm, showing that this particular package is compiled for a 586 class processor and is the seventh packaging revision of version 2.95.2 of the code. In this case the optional vendor designation mdk stands for Mandrake.

Figure 1

```
[root@t20 /]# /sbin/fdisk -l /dev/hda

Disk /dev/hda: 240 heads, 63 sectors, 1559 cylinders
Units = cylinders of 15120 * 512 bytes

Device Boot   Start    End      Blocks      Id   System
/dev/hda1     1        300      2267968+    83   Linux
/dev/hda2     301      303      22680       83   Linux
/dev/hda3     304      1559     9495360     5    Extended
/dev/hda5     304      700      3001288+    83   Linux
/dev/hda6     701      768      514048+     82   Linux swap
```

The advantage is fairly obvious. You can see at a glance which of two packages is newer, and you know what processor it will run on. SuSE has never bothered with any of this. RPM packages are distributed under their base names only, and sometimes even these differ from everybody else's.

The SuSE version of the package mentioned above isn't called libstdc++.rpm, it's distributed by SuSE under the name gppshare.rpm.

Of course you can always check the nature of an RPM package without installing it by running:

```
rpm –qip <packagename>
```

In the case of SuSE's gppshare.rpm you get something like the following:
Version: 2.95.2

Vendor: SuSE GmbH, Nuernberg, Germany
Release: 51
Build Date: Fri Apr 28 01:13:17 2000
Install date: (not installed)
Build Host: tait.suse.de
Group : Development
Source RPM: gcc-2.95.2-51.src.rpm
Size: 6280209
License: GPL
Packager: feedback@suse.de
Summary: C++ shared libraries
Description: Needed for dynamically linked C++ programs.
The sources are available in the libgpp_s package. On the distribution CDs SuSE provides symlinks from these short-name RPMs to fully versioned names, but this doesn't help much (shouldn't it be the other way round, with long real names symlinked to short names?)

This departure from RPM convention is irritating enough, but this particular package, gppshare.rpm, causes SuSE to come a real cropper. For some reason the internal versioning as shown in the first line above isn't consistent with earlier versions. For example, using rpm to learn about my existing installation by running:

```
rpm –qi gppshare | grep ↵
Version
```
returns: Version: 990708.

In other words the earlier package is versioned by date and the newer package employs the more conventional dotted sequencing. Attempts to install the newer package produce the erroneous message: 'Package gppshare-990708-6 (which is newer then gppshare-2.95.2-51) is already installed.'

Screenshot 4

This is how Linuxconf handles mounting. As root you bring up the Filesystem Configurator from the Linuxconf main windows and then click on Access Local Drive. The table shown in the 'Local Volume' window is /etc/fstab, which Unix aficionados would probably prefer to edit directly

More power to the people

Gordon Laing turns to readers' advice to solve the problems with his dual FC-PGA

Welcome to another packed *Hands On Hardware*, and this really has to be the people's issue! Since my last column, I've received loads of emails, but rather than asking me questions, most have been offering helpful tips, tricks and advice. Later in this column I'll revisit configuring dual FC-PGA Pentium IIIs in old dual Slot 1 BX motherboards with some very interesting pointers from those who've had much more success than I!

Buzzing sound cards

Before launching once again into dual CPUs, the first bit of advice I've received concerns an earlier letter from a reader complaining of a buzzing sound card. Tony Flaherty also had a similar problem, 'which got worse after I upgraded the motherboard, processor and video to a 650MHz Athlon and a GeForce 256 graphics card,' he said. 'I eventually tracked the problem down to a non-shielded analog sound cable between the CD-ROM and the sound card. It was picking up interference from the high-frequency processor and/or GPU as it ran over the top of both of them. The solution was to fit a shielded cable or, if the CD and sound card support it, to use a digital link.'

Mike Sullivan alternatively suggests that the problem is with the speakers, not the internals. 'A customer of mine had placed a scanner power adaptor next to his speakers and this caused audio feedback. Mobile phones are also a terrible cause of interference on speakers and feedback during a phone call can be deafening on powerful speakers.'

BX chipset and dual FC-PGA

Back in December's *Hands On Hardware* I tried to build a dual FC-PGA Pentium III system using a dual Slot 1 Asus P2B-D motherboard with a pair of Iwill Slocket IIs. My standard system employs a single Slot 1 Asus P2B with an 866MHz FC-PGA PIII inserted into an Iwill Slocket II and it works fine, so my hopes were high with the dual system. However, as reported in that column, the P2B-D would happily boot with a CPU in either slot, but not while both were connected at the same time – it wouldn't even get as far as the BIOS screen. Having also failed to get a pair of FC-PGA PIIIs talking to my Abit BP6 motherboard with the help of PowerLeap's adaptors, I concluded that the aging BX chipset just couldn't have its arm twisted to handle dual FC-PGA processors in any configuration.

Well, it appears I'm wrong. Thanks go to the unprecedented number of people who wrote in with advice on how to get such a configuration up and running – I've not seen such a large response since building a dual PPGA Celeron Abit BP6 system! Tony Munday has two PIII 700 FC-PGAs running on a SuperMicro P6DBE (BX chipset), using relatively new Abit SlotKET IIIs (yes, Abit spells it SlotKET). Jeff Tope has two Slot 1 PIII 600Es in a SuperMicro P6DGU (GX chipset), and also suggests clearing the CMOS after building a new configuration. Malcolm Nicholson advised to avoid the early FC-PGAs which weren't certified for dual CPU operation. Andrew Hodges suggests using a
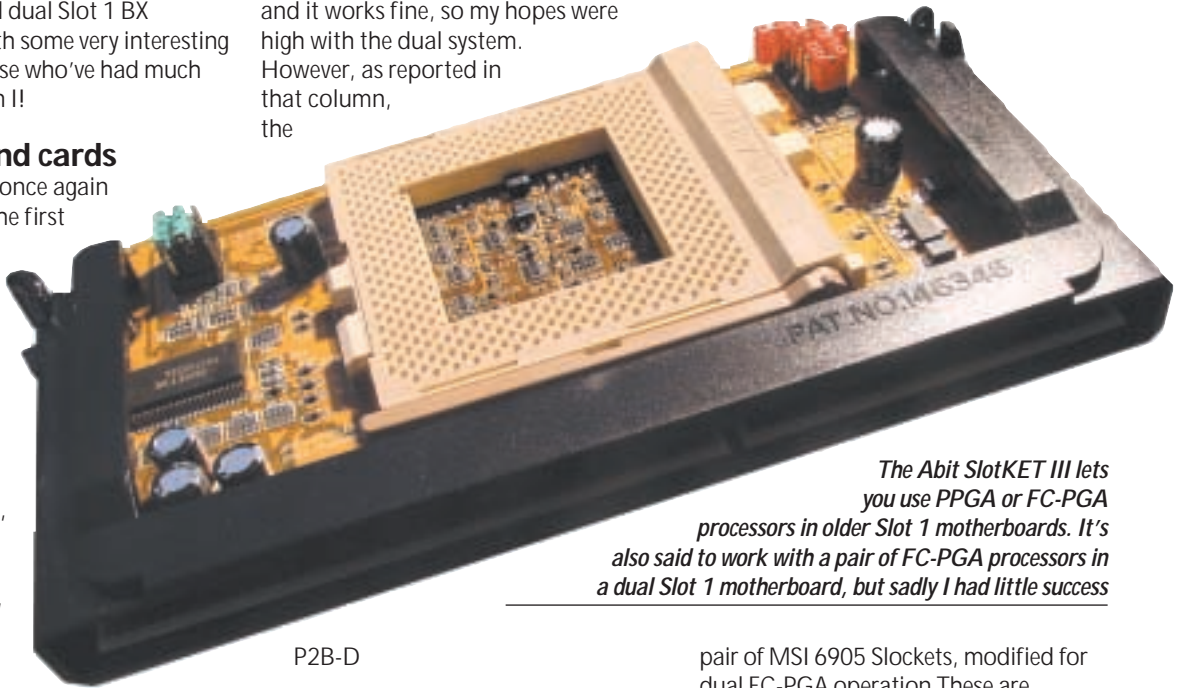
The Abit SlotKET III lets you use PPGA or FC-PGA processors in older Slot 1 motherboards. It's also said to work with a pair of FC-PGA processors in a dual Slot 1 motherboard, but sadly I had little success

pair of MSI 6905 Slockets, modified for dual FC-PGA operation These are available from www.computernerd.com/futu36-1.html, and there's also loads of information on running dual FC-PGA CPUs on BX motherboards here.

Thanks to Thomas Lankester who forwarded some extremely useful information he'd received from fellow enthusiast James Lothian. Head over to www.hardwarecentral.com/hardwarecentral/reviews/1673/2/, where there are instructions on modifying Iwill Slocket IIs for dual FC-PGA action. It's an extremely fiddly process, involving a fair amount of soldering and circuit track breaking. It appears to work though, and James reports having a dual PIII 700 system with his SuperMicro P6DBS (BX chipset) motherboard.

Ian Coombs' email interested me the most as he reported running a pair of PIII 700MHz FC-PGA processors in an Asus P2B-DS (BX chipset) motherboard, which is the same model as mine, albeit with an onboard SCSI controller. I was even more relieved to hear we were running the same 1012 BIOS and that my revision was fractionally newer at 1.06 compared to 1.04.

Ian says 'the voltage regulator on my board is unable to produce a core voltage below 1.8v. Using an Abit SlotKET III I found that when the jumpers are set to 1.65v, the motherboard only produces 0.7v, which is clearly not enough to boot. However, as running processors at a higher voltage is a common overclocking trick, I decided to try running the two processors with the jumpers on the Abit SlotKET set to 1.8v.'

To start with the system only found one of the processors, but after removing a wayward inspection sticker on the edge connector on one of the Slockets the system booted with the BIOS finding both processors and it managed to load Windows 2000 with no problems. I have even increased the FSB to 112MHz and despite running CPU torture tests it has been stable for the past three months.

The highest processor temp I have seen is 55 degrees Centigrade during the summer after several hours of 100 per cent load, which is within Intel spec.'

Ian's only problem was finding adequate heatsinks and fans to fit in the tight gap between the slockets on the dual Asus board. Online supplier Computernerd (www.computernerd.com) stocks proprietary high-performance CPU coolers, which are especially suitable for dual systems: the Cool-It Dude! FAT6X1S-U Tornado looks like the best bet for slocket mounting, and costs $29.95 (£19.99). Computernerd's MSI Slockets modified for dual FC-PGA operation cost $27.50 (£18.35) each. Delivery for a pair of each is about $25 (£16.70) by air Parcel Post (no tracking, 10 days to two months delivery) or $35 (£23.35) by Express Mail (tracking, five to 10 days delivery).

So, fuelled up with these words of encouragement I ordered a pair of Abit SlotKET IIIs from dabs.com for £12 ex
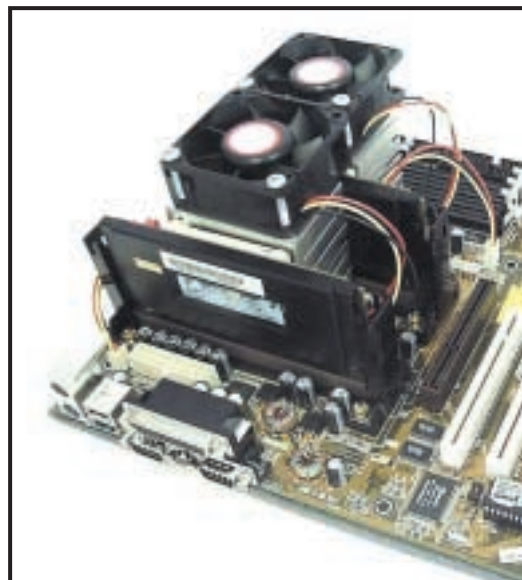
One problem with using Slockets and FC-PGA processors in a dual Slot 1 motherboard is finding adequate room between the slots for decent cooling. Computernerd — see main text — sells specially designed heatsinks and fans designed just for this purpose. Pictured here are a pair of its Tornado fans cooling a pair of FC-PGA processors, running on an Asus P2B-D motherboard thanks to modified MSI slockets

Long-exposure noise

When digital cameras first hit the market, you were lucky to get exposure times any longer than about one second. Fans of sparklers, fireworks and trailing car headlamps were not impressed. Today, however, most decent digital cameras boast relatively long exposures of eight or 16 seconds. Nikon's CoolPix 880 and 990 take this one step further by offering an electronic cable release which connects to their USB ports for 'bulb' exposures up to 60 seconds.

Impressive stuff, or is it? As astrophotographers know, funny things start to happen with long exposures. Film, for example, suffers from

reciprocity failure, where beyond a certain point, the sensitivity rolls off and longer exposures make little if any difference.

Electronic imaging sensors, like the CCDs used by most digital cameras, also suffer from long exposure artefacts. In their case, it's increased electronic noise, that manifests itself as random speckles on the image. These begin to appear in pictures taken under very low light, and get worse as exposures lengthen.

To illustrate this, I took my Sony S70 out on bonfire night to take some pictures of fireworks. On exposures up to around the two second

mark, the images were fairly clean, but those taken at four or the maximum eight seconds, suffered from considerable noise.

Notice the many bright random speckles in the

enlargement of the fireworks. This may or may not bother you, but you should always expect to find CCD noise in your images when making long exposures with digital cameras.
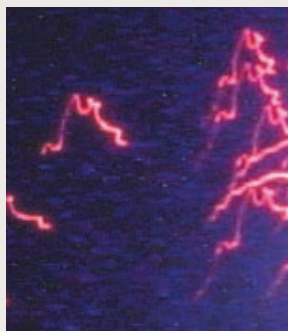
A four-second exposure taken with a digital camera looks fine at a distance, but look closer and you'll see it marred by the random speckling of CCD noise — common with longer exposures

Budget infra-red upgrade

A couple of years ago, I wrote a short review in *PCW* about fitting infra-red to your PC. This involved having a motherboard with the right connectors on it, along with support for IR in the BIOS itself. I've normally only found this option on Taiwanese motherboards, which sadly eliminates those in most Dell systems.

The reason I'm mentioning it again, is that rarely a month goes by when someone doesn't ask me how it's all done! The latest was James Melville, who wants to fit infra-red to the IR connector on his Gigabyte GA-7ZM motherboard, but can't find anyone who stocks a suitable module.

The first thing to do is see if there's an option in the BIOS (usually in chipset features), for one of your serial UARTs to be used as infra-red. If you have this option or something similar, and you've got a connector on your motherboard, then you're almost sorted.

I tracked down a suitable IR module from Asus, called a Pent II 440LX/BX IrDa module, which consists of little more than a small circuit board with two IR LEDs and a length of thin ribbon cable to the motherboard. Despite being from Asus, I've found this module has worked on all the motherboards I've tried it on, which support IR. I bought mine from dabs.com for £15 ex VAT, and you should be able to find it by entering 'Pent II 440LX/BX IrDa' into the website's Fast Search section at **www.dabs.com**.

With this module connected, and the UART switched to IR in the BIOS, I found that Windows 95, 98, SE and 2000 all automatically detect the new infra-red capabilities and install the right drivers for it. Bingo! Now I can synchronise my Psion 5 or Windows CE PDA to my PC without cables, although it has to be said the module still unceremoniously dangles out the front of my case.
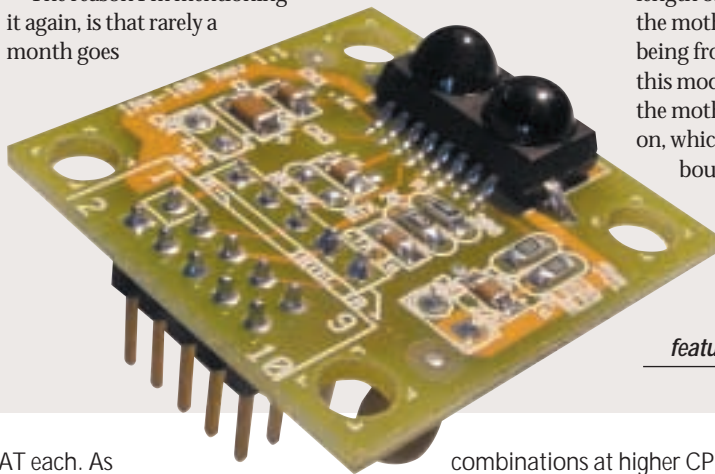
When fitting infra-red to your PC the first thing to do is see if there's an option in the BIOS (usually in chipset features) for one of your serial UARTs to be used as infra-red

VAT each. As described in December's issue, my earlier Iwill Slocket IIs simply wouldn't let my system even get as far as the BIOS screen when both were used on the Asus P2B-D. Things looked promising the instant I connected up the newer Abit SlotKET IIIs though, with the BIOS screen reporting my two 866MHz Pentium III processors.

However, they took a considerable turn for the worse as soon as I tried to install Windows 2000. Everything was fine until just after the first restart, when the system would halt with a nasty kernel message.

I tried everything I could think of, including installing the OS with one CPU, then popping in the second and running the dual update utility. Again, the OS simply halted every time I had both CPUs fitted.

I'm really not sure where to go from here with the Abit SlotKET IIIs, as I would appear to have essentially the same components as Ian Coombs, above. Computernerd's website, however, suggested that the Abit SlotKET IIIs were unreliable in dual FC-PGA/BX combinations at higher CPU clock speeds. Since I was running my CPUs at 866MHz, compared to Ian's at 700MHz, perhaps this was where my problems lay. However, even when switching the FSB from 133MHz to 100MHz, thereby driving the CPUs at 650MHz, I had no more luck.

I'm certainly puzzled, and a little disappointed that I couldn't crack it. Then again, there are those modified MSI slockets which I may just give a try. Either way, I've droned on enough about dual FC-PGAs under BX chipsets over the past few issues, so I will leave it entirely – unless I miraculously get my system going, that is!

And finally…

Just before wrapping up my column for this month, here's one final question on the subject of dual systems I received recently. Both Alan Clunnie and Steve Jeffery emailed me asking whether it is possible to fit a pair of old PPGA Celerons in a dual FC-PGA motherboard such as the MSI 694D Pro.

The simple answer, I'm pleased to report, is a big yes!

Unlike the huge problems incurred when trying to run FC-PGA CPUs in older PPGA sockets with various adaptors, an FC-PGA motherboard should be able to support both old PPGA and new FC-PGA CPUs without complaint. You'll probably have to change a jumper or a setting in the BIOS to choose between PPGA and FC-PGA, but otherwise, you should be perfectly OK.

Certainly, I have run my pair of old 366MHz PPGA Celerons in my MSI 694D Pro motherboard with the same success as a pair of newer 866MHz FC-PGA Pentium III processors. Obviously Intel does not certify the Celeron for dual CPU operation, but I've had them running fine in this new motherboard. Now if only I could get those FC-PGAs working on my dual BX board.

CONTACTS
Gordon Laing welcomes your comments on the Hardware column. Contact him via the *PCW* editorial office or email: **hardware@pcw.co.uk**. Please do not send unsolicited file attachments.

Printing by numbers

Tim Nott looks at the problem of getting Word to print out sequentially numbered documents

A frequent word processing request is for a template that produces sequentially numbered documents. These could include forms, invoices, certificates or even raffle tickets.

The basic task is simple: each time the template is used, it should retrieve the last number used, add one, insert this number in the document and store the new number for the next retrieval. One way is to use a {MERGEREC} field, but this is limited to a mail-merge run.

There are a number of other techniques available, but the choice is rather dictated by what you want to do

```
Formnumber").Value = currnum$
   ActiveDocument.Bookmarks✔
("Numberbox").Select
   ActiveDocument.Attached✔
Template.AutoTextEntries✔
("Formnumber").Insert _
Where:=Selection.Range
   ActiveDocument.✔
AttachedTemplate.Save

   End Sub
```

(*Key: ✔ code string continues*)

You could obviously enhance this with the current date, automatic printing and so on, but I'm sticking to the essentials here. For many situations, however, this isn't enough.

A macro to automatically number forms

with the documents. If, for example, you want a template to print off a numbered form that is destined to be filled in by hand and returned, you probably don't want to save each instance of the form. A neat way of doing this is to use an Autotext entry. Create a new template and type in the starting number wherever you want it. Select this, go to Insert, Autotext, New and give it a name: Formnumber. While the number is still selected, bookmark it, with the name Numberbox. Now go to Tools, Macros and create a new macro named Autonew: this name ensures it is run each time the template is used. The code is:

```
Sub Autonew()

   lastnum$ = ActiveDocument.✔
AttachedTemplate.✔
AutoTextEntries("Formnumber")
   currnum$ = Str(Val✔
(lastnum$) + 1)
   ActiveDocument.Attached✔
Template.AutoTextEntries("✔
```
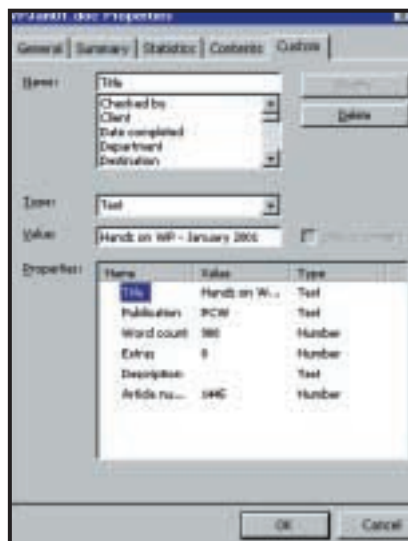

Custom document properties

To take one example that affects me personally, I need to give every article I write a unique, sequential number. Since the articles can be based on a variety of templates, the method above won't do:

I need to store the number somewhere globally accessible. The best way to do this is to use a Settings File: this is a plain text file in the old Windows 3.x .ini style. However, this is really limited to storing one set of data that is regularly updated.

If you want to store other information about the document, you can store practically any kind of information you like as a Document Variable, and recall it from a macro. It's better, though, to use Custom Document Properties, as these will also appear on the Custom tab of the Properties sheet. This snippet of VBA shows how to create and store custom properties, and prompt for their values.

```
   Who$ = InputBox("Who is ✔
this for?", "Document Info")
   Numwords$ = InputBox("How ✔
long is it?", "Document Info")
   ActiveDocument.Custom✔
Document Properties.Add _
   Name:="Who for", ✔
LinkToContent:=False, ✔
Value:=Who$, _
   Type:=msoProperty✔
TypeString
   ActiveDocument.Custom✔
DocumentProperties.Add _
   Name:="How long", ✔
LinkToContent:=False, ✔
Value:=Numwords$, _
   Type:=msoProperty✔
TypeString
```

Were you doing this for real you'd probably want to do it via one dialog box, but this shows the general principle. This doesn't solve the problem of storing/retrieving the document number, however, and if you want a central store of other document-related information, the simplest way is to use a Word table in a document by itself. Next month, I'll demonstrate how to get custom properties in and out of a table.

Sorting by dates

Stephen Wells looks at sorting by field in Excel and getting path names onto your workbook files

A long-time reader of this column, retired weatherman Cedric Roberts, poses a problem that can apply in many other applications: 'I'm using Excel and have a full sheet of data. One field in each record is the date. I wish to extract all the records in September, no matter what the day or year. How can I go about this?'

Here's one quick way to do this. Say your dates are in column D, as in screenshot 1. Make sure there are clear rows and columns around your list so Excel recognises it as a list. If the top row doesn't have field names, add them. Highlight the cells with the dates and choose Format, Cells, Custom and enter mmm. Clear the highlight. Click in the list and choose Data, Filter, AutoFilter. This adds arrows by the field names.

Click the arrow at the top of column D and choose Sep and your list will be filtered as required. To show the full list again, click the arrow and choose All.
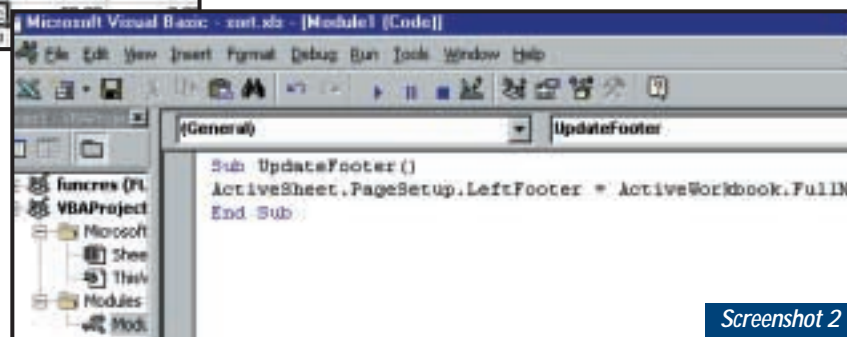
On the Header, son

One of the regular requests to this column is for a macro that will include the name of the workbook file and path (its location) in the header or footer. Always looking for ways to avoid resorting to macros, I usually suggest a variant like entering the path under Title in the Properties Summary on the File menu. Then you can go to View, Header and Footer, drop down the Header or Footer list and select the path. But if you really want a macro, here are two that Microsoft suggests.

The first one is for Excel 5 or higher. In Excel 5 or 7 (which is also called Excel 95. There was no Excel 6), select Macro and then Module on the Insert menu. In Excel 97 or 2000, press Alt & F11 and choose Insert,

Screenshot 1

It's no problem finding the weather records for September using Custom formats

Screenshot 2

You can add a macro that inserts a workbook's file name and path in a header or footer

Module enter this:
```
Sub UpdateHeader()
ActiveSheet.PageSetup.Left✔
Header = ActiveWorkbook.✔
FullName
End Sub
```
(*Key: ✔ code string continues*)

You can put the path and file name in the footer using LeftFooter, as in screenshot 2. You can call the macro (the Sub name) whatever you like. To centre the header or footer, substitute CenterHeader or CenterFooter (use the US spelling). To position it to the right, use RightHeader or RightFooter.

Save the file. You can now run the macro by choosing Tools, Macro and then UpdateHeader or UpdateFooter or whatever you called it.

Another way

The alternate macro is for Excel 97 or 2000. Press Alt & F11 (or choose Tools, Macro, VBA). Double-click ThisWorkbook in the current project in the left window. In the right window, click the left down arrow and select Workbook. In the Procedure list click BeforePrint, then change the code to:
```
Private Sub ✔
Workbook_BeforePrint(Cancel ✔
As Boolean)
ActiveSheet.PageSetup.✔
LeftFooter = ✔
ThisWorkbook.FullName

End Sub
```
Save the file. If you click the Print Preview tool, you'll see that the path and file name has been added to the footer.

You can use CenterFooter, RightHeader and so on, as above. An animation showing how to enter this macro is at http://officeupdate.microsoft.com/2000/focus/articles/anxlfilepath.htm.

To create a keyboard shortcut key for any Excel macro, press Alt & F8, choose the macro name and click Options. In the Macro Options dialog box, enter your chosen key combination. Easy.

Pressing problems

Mark Whitehorn looks at the key issues of adding code and functionality to your Access database

This month's column, strangely, seems to be all about detecting and utilising key presses from the keyboard. I didn't design it like that, it just happened. Strange, isn't it?

It all started when Arron Jones emailed in with a question. He is developing an Access application but is also an avid user of a home and personal finances manager called Quicken. One of the features of Quicken that he really likes is that he can increment a date field by a single day simply by highlighting the field and pressing the plus and minus keys respectively. He says that for him this is a killer piece of functionality and wants to know if it can be replicated in Access.

I replied with some code and he replied to the effect that he was sure that this was really great code, but where, exactly, in Access, was he supposed to put it? This is a perfectly fair question, so, in addition to answering this question, we'll also make this a more general 'how to add code to Access' tutorial.

We'll assume that you have a table complete with a date field and have auto-generated a form (screenshot 1). Swap to design mode for the form, double-click on the date field which should open up the properties box. Flip to the Event Tab, select the 'On Key Press' field and press the ellipsis button that appears (the one with three dots, screenshot 2). From the 'Choose Builder' box that appears, choose the Code Builder option and the following should appear (screenshot 3). (You know,

when I write all of this down I really can see why people can't intuitively find the place to put the code!)

This is simply a place where code is

Screenshot 1

Above: A perfectly normal table
Below: In design mode, the properties box allows you to see the events that can be associated with an object like a text box

Screenshot 2

placed; the code will be carried out when a particular event occurs. Which particular event? Well, that was determined by the route we used to get here. We went from the date box on the form, via the On Key Press Event tab, so the code will run when the date box has the focus and a key is pressed.
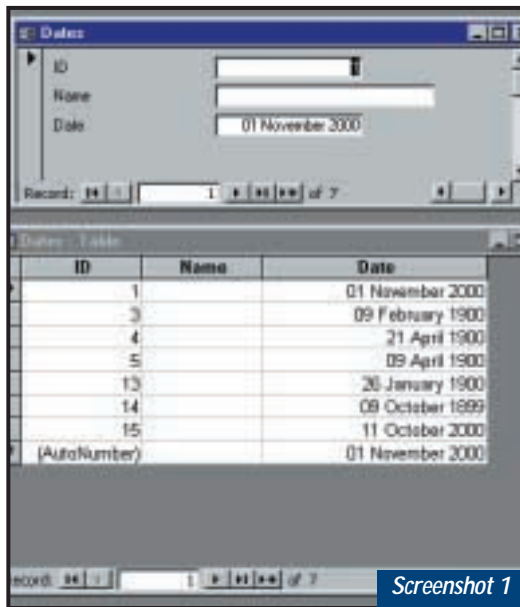
The code we need is:

```
Private Sub ↙
Date_KeyPress(KeyAscii As ↙
Integer)
Select Case KeyAscii
    Case 43
        KeyAscii = 0
        Screen.ActiveControl ↙
= Screen.ActiveControl + 1
    Case 45
        KeyAscii = 0
        Screen.ActiveControl ↙
= Screen.ActiveControl - 1

End Select

End Sub
```

(*Key: ↙ code string continues*)

This event is triggered by a keypress event. Pressing a key sends an ASCII code from the keyboard to the program. Access traps this ASCII code and sends it here in the variable called KeyAscii.
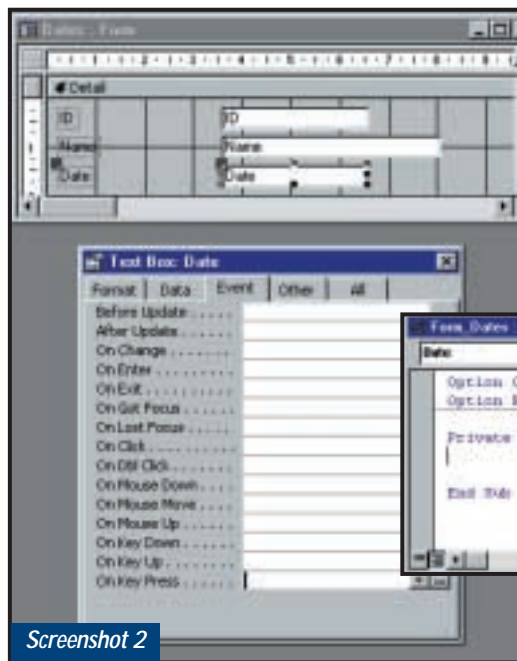
It so happens that the ASCII code for the plus key is 43 and for the minus key is 45. So the code says: look at the key that was pressed. If it was the plus key, then eliminate the keystroke by setting KeyAscii to zero (this is important, see below). Then increment the value in the currently active control (which is the date one) by one. Essentially the same happens when the minus key is pressed,
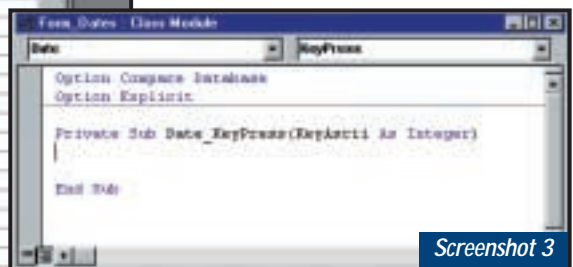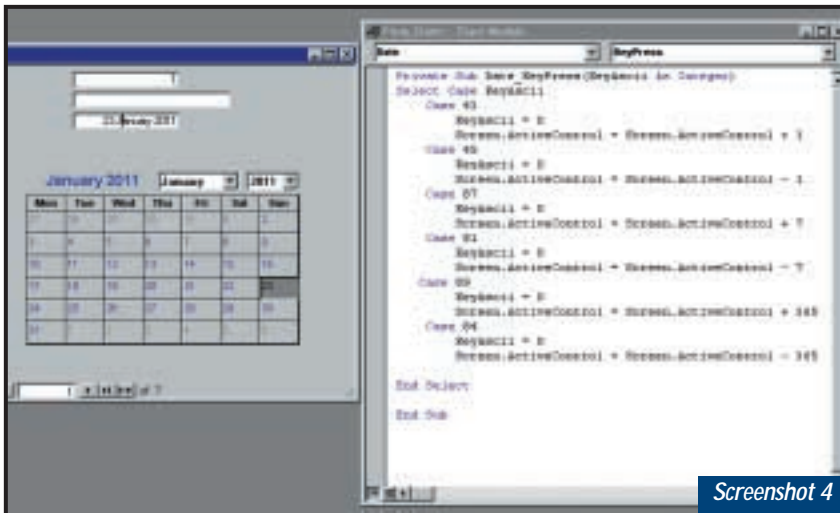

Screenshot 3

Above: Here is where you can add code that is triggered by the event in question

Screenshot 4

And here is the completed form. The Calendar is nothing to do with the code, I just added it to make the form more interesting

except that the value is decremented.

This works (although, of course, in practice we would want to add some error trapping) but it rapidly becomes apparent that it could be applied in a whole variety of ways.

As long as you know the ASCII code of the key, you can trap any keystroke. And you can use that keystroke to trigger any change you like to the underlying data. So, we can quickly add the following:

```
Case 87
    KeyAscii = 0
    Screen.ActiveControl ✓
= Screen.ActiveControl + 7
  Case 81
    KeyAscii = 0
    Screen.ActiveControl ✓
= Screen.ActiveControl – 7
```

This increments/decrements dates by a week on pressing upper case W and Q respectively. The world is, as they say, your oyster. The sample file, dbcfeb00.mdb, is at www.penguinsoft.co.uk/ and I've added a calendar control just to make it all the more fun.

And now for something strangely similar: Tim Hoare also emailed in about key pressing. He was trying to use a function key to insert a specific piece of text into a memo field on an Access form.

The idea is simple. The user is dealing with records that already contain text in the memo fields. He/she moves to the point in the text where the insertion is to take place. Then they press the nominated function key and the text appears at that point.

Tim's code used the on keypress event to detect the function key being pressed and then used selstart/seltext to insert the text.

His problem was that the code was misbehaving, but before I had even read his email he found the solution. Tim was using the KeyDown event, but essentially the problem is the same. Here is his final code:

```
Private Sub ✓
Text_KeyDown(KeyCode As ✓
Integer, Shift As Integer)
Select Case KeyCode
  Case vbKeyF5
    Dim toinsert As ✓
String, pos As Long
    pos = Me!Text.SelStart
    toinsert = vbCrLf & ✓
"Insert text here" & vbCrLf

    Me!Text = Left(Me!✓
Text, Me!Text.SelStart – 1) ✓
& toinsert & _
        Mid(Me!Text, ✓
Me!Text.SelStart)
    Me!Text.SelStart = ✓
pos + Len(toinsert) – 1
  Case vbKeyF9
    'Do something else
End Select

KeyCode = 0 'THIS IS THE KEY ✓
MOVE –
        'RESET KEYCODE TO ✓
PREVENT ANY OTHER ACTION ✓
BEING TAKEN
        'SO LEAVING THIS ✓
AS THE ACTIVE CONTROL
```

End Sub

I've modified the code slightly and added it to the sample file so that you can have a play.

The key (sorry) point in both of these examples is that the code is executed before the keystroke is passed into the field in question. However, no matter how long it takes for the code we have written to run, Access still remembers which key was pressed. And if we don't do something about that remembered keystroke, Access will still end up putting it into the field. That can be a major problem.

For example in the first code sample, if the plus key was pressed, the date will be incremented by the code and then immediately overwritten by a plus symbol. In fact it happens so fast that you don't see the date updating.

So we use a construct like:

```
KeyAscii = 0
```
or:
```
KeyCode = 0
```

to essentially remove the keystoke and stop it being inserted.

Now, consider the location of the 'KeyCode=0' in Tim's code. Every time a key is pressed inside the memo field the keystroke is examined to see if it is Function Key 5 and, if so, the text is inserted (along with two carriage returns and line feeds). If the keystroke is anything else then it is 'neutralised'. The net result of this is that the memo field becomes un-editable from this form, except for the insertion of the text as described.

This isn't a problem (indeed it is what Tim intended) and you can use another form to enter data into the memo field. However, you might want to have a go at modifying the code to enable the text to be edited from the same form.

You will, of course, have to do something about the position of that KeyCode=0 line, but you may find that simply moving it is not enough to produce the required result. I'll leave this as an exercise for the reader.

Hardware choices

Niall Magennis looks at the best way to go about building your own audio workstation

Over the last few months I've received lots of questions via email that share a similar theme. The latest came from Adam Sanderson.

Adam is planning on building his own PC to use primarily as an audio workstation and he wanted to know what type of audio hardware he should opt for. The main core of any PC designed for audio applications is, of course, the sound card, but with so many cards on the market, all offering different features, it can be difficult to make an informed decision.

For example, Adam says he wants to record high-quality audio, but he didn't specify how he was going to go about this. He didn't say whether he wanted to do multi-track recording and needed to mix his tracks with an external hardware mixer, or whether he was planning on keeping everything in the digital domain and mixing in software inside his new computer.

We've often sung the praises of the SoundBlaster Live! series of cards in *PCW*. This is indeed a great card as it's really a rejigged version of the EMU APS semi-professional sound card. Creative bought EMU a few years ago and has been using much of the technology it developed for its professional recording gear in its consumer cards.

If you just want to record a few tracks of audio and add synth sounds and samples over the top then a card like the Live Platinum is a good choice, but you may be able to get away with the cheaper non-Platinum version if you don't need the digital input. The non-Platinum Live! uses exactly the same technology, but doesn't include the Live Bay breakout box. If you don't need the extra digital outs that are part of the Live! Bay then you'll be getting the same audio quality and features for a much lower outlay. You'll still be able to download soundfonts into the card and have access to the MIDI inputs and outputs if you use a standard game port to MIDI cable. The sound quality will also be the same as the

digital-to-analog converters that are housed on the card rather than in the Live Bay.

Even better is the fact that the latest version of Cubase now comes with an ASIO driver that supports the Live! series of cards. This
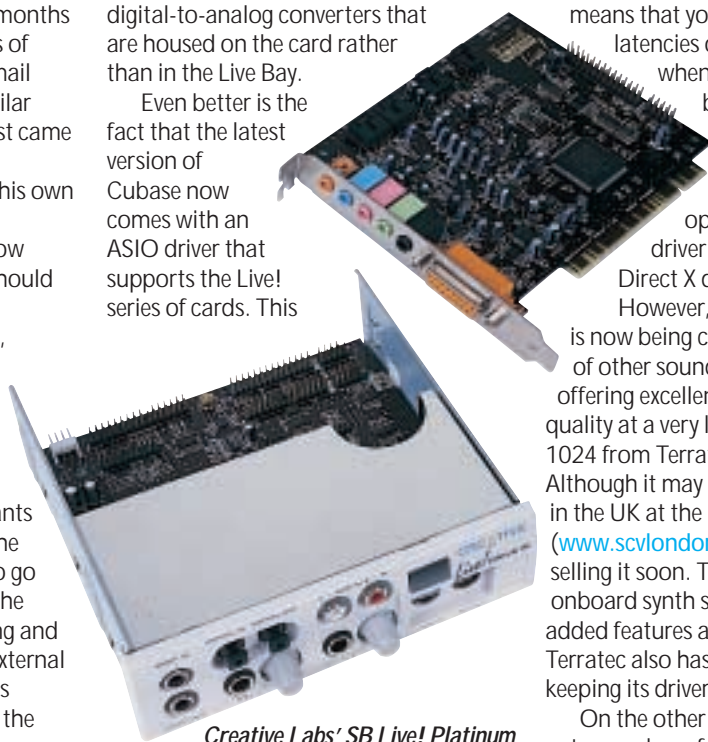
Creative Labs' SB Live! Platinum 5.1 is built upon EMU technology

means that you'll be able to achieve latencies of as low as 27msec when recording and playing back audio. Basically this means that Cubase will feel much more responsive in use when operating with an ASIO driver than with standard Direct X drivers.

However, the Creative Live! series is now being challenged by a number of other sound cards that are also offering excellent features and sound quality at a very low price. The DMX Xfire 1024 from Terratec is one example. Although it may be difficult to get hold of in the UK at the moment, SCV in London (www.scvlondon.co.uk/) should be selling it soon. This card has very good onboard synth sounds, a whole range of added features and a good set of drivers. Terratec also has a good reputation for keeping its drivers up to date.

On the other hand, if you've already got a number of external sound sources such as synths and effects boxes, or if you

Something old and something new

Here's how get the new ASIO driver for Cubase v5 working in older versions. I haven't tried this myself, so proceed with caution.
1) Back up your current ASIO folder.
2) Download and install the Cubase 5 demo.
3) Backup the ASIO folder from the Cubase 5 demo (call it something like 'Cub5asio.zip').
4) Uninstall the demo.
5) Replace the contents of the ASIO folder of your full version of Cubase with the contents of the version 5 demo ('Cub5asio.zip').

6) Next drag the file 'AsioDxFd.dll' on to 'Regsvr32.exe' (you'll find it in your Windows system folder).
7) Launch Cubase 3.7 (or whatever version you are running).
8) Go to the Audio menu/ System and select 'ASIO DirectX Full Duplex Driver' from the ASIO device menu.
9) Click 'ASIO Control Panel'.
10) For DirectSound (SB Live! Wave Out) and SB

A demo of Cubase v5 is available from http://service.steinberg.net/ webdoc.nsf/show/demos_pc_e

Live! Wave In, set the buffer size to 1,200, and hit return. If you continue to have problems with this setting you can always increase the buffer size.

Creating soundfonts

If you've read this month's workshop on soundfonts in *pcwexpert* then your appetite should have been whetted for a bit of soundfont skulduggery.

Creating a soundfont from scratch is a great way of getting to know what your sound card is capable of, and is also ideal for creating soundfonts with stacks of your own drum loops, but you don't always want to start from scratch. In truth most musicians tend to avoid starting from scratch when programming their own sounds; instead they usually start with a preset that is roughly similar to the sound they are trying to achieve and then edit that preset into something more original. This can save an enormous

amount of time, especially when you are setting up a multi-sampled patch where each octave or half octave uses a different core sample.

There are a load of resources on the net for soundfonts. A great place to start is at

www.hammersound.net/. This site has an enormous library of soundfonts ranging from straight piano sounds to Hip Hop Construction kits. There's also a good range of dance sounds available at http://tribe.ultimoprezzo. com/dancefonts/.

Have a look around the net and you'll find loads of free soundfonts available from individual users. However, seeing as most of us in the UK are still stuck with slow modems and given the fact that soundfonts are generally quite large in size, you may want to go to a commercial developer of soundfonts. They'll usually sell you a CD containing a large selection of ready-made soundfonts that you can then tweak to your heart's content in Vienna or another soundfont editor.

Check out the following websites for some soundfont CDs:
www.emu.com/online_shop /sfont_lib/sfont_lib.html
www.sonicimplants.com
www.soundburst.com/

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are planning on recording real instruments such as guitars and vocals simulanteously, you really should be looking for a sound card with multiple inputs and outputs. This type of card will also allow you to send individual tracks to their own outputs so you can use an external hardware mixer for your final mixdown. There is a huge selection of multi-channel sound cards available now and musicians are really spoilt for choice,

With a huge selection of multi-channel sound cards, musicians are spoilt for choice

with multiple output cards starting at around £250 and going all the way up to thousands of pounds.

However, most of these sound cards, with the notable exception of Guillemot's ISIS, don't offer onboard synth sounds – instead you're paying for the multiple outputs and high-quality A/D and D/A converters. There are plenty of high-quality multiple output cards on the market. One example that springs to mind is the EWS88MT from Terratec. This card has great sound quality,

excellent driver support, including drivers for Windows 2000, and a nice price to match at around £399. The ISIS from Guillemot, at around £250, is also a good option, especially if you're on a budget and looking for a card with an onboard synth. Other cards worth checking out are those from Echo, Emagic and Midiman.

However, a word of warning if you are planning on building your own system:

you may find that a manufacturer will be able to build you a similar system, minus the high-end sound card, for a cheaper price than you can buy all the components yourself.

This is because you're likely to be picking quite high-end components in order to build a fast PC capable of handling multiple tracks of audio with ease. Because manufacturers buy items like graphics cards and hard drives in bulk, they get them for a much lower price than you'll be able to find.

If you do decide to go ahead with building your own PC, check the websites of sound card and graphics card manufacturers for compatibility problems with certain types of motherboards and chipsets. You'll usually find these mentioned in the support area of the website. Don't take it for granted that there won't be any difficulties. For example, Echo audio cards used to have problems with motherboards that use VIA chipsets and Echo won't currently guarantee that its cards will work with Athlon systems.

Also, if you do have problems once you've installed the components, try swapping the cards around in the slots. Some motherboards, such as Abit's BP6, are fussy as to what cards go where. This is usually to do with the way the motherboard handles IRQ sharing.

So if I haven't scared you off building your own PC, then good luck!

CONTACTS

Niall Magennis welcomes your comments on the Sound column. Contact him via the *PCW* editorial office or email: **sound@pcw.co.uk**. Please do not send unsolicited attachments.

Using displacement maps

If Photoshop's filters leave you a bit cold, Ken McMahon unravels the mysteries of displacement

The problem with many of Photoshop's effects filters is that having seen them once, they fail to inspire. There can't be too many Photoshop users (or is it just me?) who haven't wasted an entire afternoon playing with every filter in the effects menu just to see how things turn out. But once you've been there, done that, there really aren't too many situations where you think, 'hey, this image is crying out for the cont crayon filter with burlap texture followed by a smidgeon of artistic fresco'.

But one seldom travelled road to filtrated fulfilment can be found via probably one of the least understood, and consequently

Figure 1

least used of Photoshop's filters – the displace filter. This might have something to do with its low fun index, by which I mean you can't get instant gratification by messing around with sliders and watching the results in a preview window.

The dialog box you get when you select filters/distort/displace doesn't give much away. If you click OK, the next dialog box asks you to choose a displacement map. You can find a small selection to try out, (there are 12 altogether) in /Plug-Ins/Displacement maps, although looking at the displacement map files and the results they produce probably won't provide you with too many clues about how they work.

A displacement map moves pixels in the image to which it's applied according to the greyscale value of the correspond-ing pixels in the displacement map image. Black areas in a displacement map move pixels in the target image to the right and down by 128pixels. White areas move target pixels left and up by

128pixels. Mid-tone grey areas in the displacement map leave target pixels unaffected and anything in between causes a proportionate pixel shift in the appropriate direction depending on whether it's darker or lighter than mid-grey.

Mostly, displacement maps are single channel, ie greyscale images, but in a multi-channel map, be it a colour

image or one with an alpha channel, the first channel shifts pixels horizontally and the second vertically (additional channels are ignored). Displacement maps must be saved as native Photoshop files with no layers.

So much for the theory; the best way to see displacement maps at work is to try them out for yourself. Most of the

Photoshop supplied displacement maps produce effects similar to glass or ripple distortion filters. Displacement maps with lots of contrast – those with instant transitions from black to white and lots of fine detail – tend to break the target image up and produce texture effects. But if you use graduated fills, or soften the map using Guassian blur the distortion too becomes smoother and similar to Goo or image warp filters.

Figure 1 shows the results of applying some of Photoshop's displacement maps to the Eiffel Tower with the default setting of 10 per cent for both horizontal and vertical scale. The percentage value relates to the pixel shift I described earlier – 100 per cent results in a 128pixel shift for black or white mapped pixels and so on, but, at the maximum setting things tend to get blown apart, so it's best to stick to the lower end of the scale.

You can get a good idea of what's going on with the displacement filter by creating a new greyscale displacement map image and using the linear gradient tool to create a white to black horizontal gradient. Save the image in Photoshop format (call it map1.psd) and then open
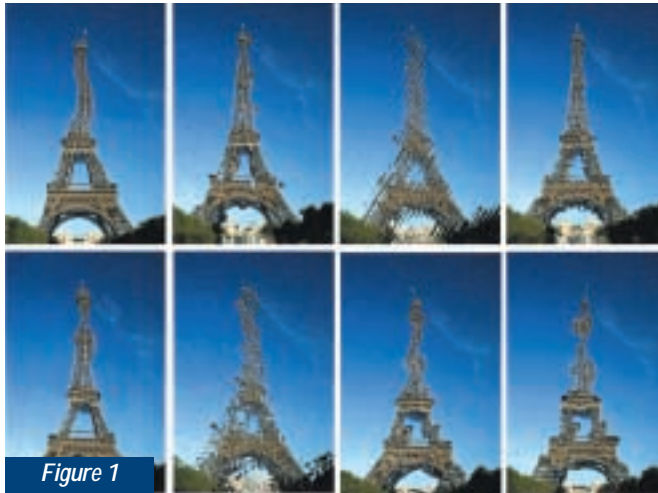

Figure 2

your target image and select filter/distort/displace. Select 30 per cent in the horizontal scale field and zero per cent in the vertical scale field and, unless you created the image map file exactly the same size as your target, click the stretch to fill radio button.

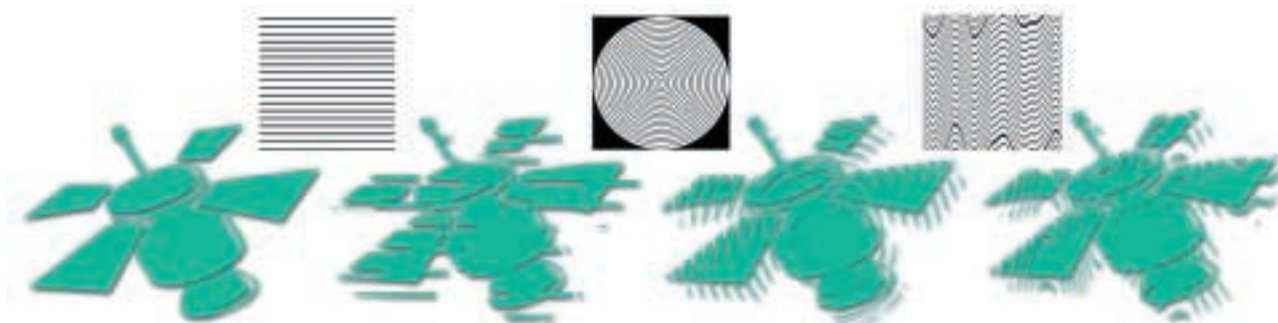What you should see is something like the second image in figure 2, (the one on

the left is the original) the image stretches horizontally from the centre as if it were being pulled from either side. The white pixels on the right of the gradient move the pixels in the target image left by a decreasing amount as you approach mid-grey in the centre, then start pushing pixels to the right by an increasing degree as the gradient approaches solid black.

If you were to transpose the settings in the displace dialog box and set 30 per cent vertical scale and zero horizontal, you might expect to produce a similar stretch in the vertical plane, but you'd get a surprise. Remember, it's the pixel value in the displacement map that determines the direction and degree of movement, the horizontal and vertical scale fields simply allow you to reduce the degree of movement in either plane.

As you can see from the third image in figure 2, you do get vertical movement, but it's upwards on the left of the image, where the white to grey map pixels are, and downwards on the right, where the grey to black map pixels are.

While gradients can be used to create stretch distortions, noise can be put to good use to produce textured effects. Figure 3 shows what you can do with a displacement map made by applying Gaussian noise to a white canvas. The first telephone is the original and the second from the left has had a displacement map with Guassian noise applied.

There are two things to note here. First, the direction of movement is diagonally from top left to bottom right and vice versa. Also the image has fragmented with pixels that were originally adjacent moving a long way apart. This is dependent on the contrast of the displacement map. To take an extreme example, if two adjacent pixels in the map were black and white (and the displacement was applied at 100 per cent) the corresponding target image pixels would move 256pixels apart along a diagonal axis. So you can increase the fragmentation by increasing the contrast of the displacement map.

Displacement maps often produce unpredictable results and experimentation is always worthwhile. The third telephone shows what happens if you apply a Radial Zoom blur to the Guassian noise, ideal for that furry telephone look. In the final image, the glass distortion effect was achieved by blurring the Guassian noise displacement map.

By creating a displacement map consisting of geometric patterns, type or even another illustration or photograph with strong shapes and contrasts you can achieve some interesting effects. For figure 4 I first produced a pattern of repeating straight black lines in Illustrator, opened it in Photoshop and blurred it to soften the edges before applying it to the satellite graphic on the left of figure 4. Next I applied the polar co-ordinates filter to the straight lines image to produce the concentric circles and finally the wave filter to create the wavy lines version on the right.

All of these examples have been produced either using displacement maps the same size as the image, or by scaling them to fit, but you can also achieve interesting results by using a map that's smaller than the target image and checking the tile option in the displacement map dialog box.

CONTACTS

Ken McMahon welcomes your comments on the Graphics & DTP column. Contact him via the *PCW* editorial office, or email: **graphics@pcw.co.uk**. Please do not send unsolicited file attachments.

3D file conversion

Benjamin Woolley gets stuck in to 3D imaging's most thorny problem... data conversion

One question that is typical of many I receive from readers, goes something like this: 'What is the easiest way to transfer textured, low-poly models from Lightwave 6 modeller to 3D Studio MAX 3. I have a MAX plug-in that will import Lightwave 6 models, but it doesn't transfer the texture co-ordinates. Do you have any suggestions?'

This touches on one of the most irksome aspects of 3D work: data conversion. In other fields of computing, conversion is not such an issue. Most have *de facto* if not industry-agreed standard file formats. In word processing, for example, the Rich Text Format is widely supported, and if you are really stuck, there's always ASCII. With spreadsheets, Excel has established itself as a pretty universal standard, and if need be, you can use one of the simpler formats, such as CSV (comma-separated values).

In the world of 3D, life is not so easy. When it comes to achieving successful conversions, a missionary would have more chance in a lap-dancing club than a 3D artist using standard graphics software.

The nearest equivalent to an ASCII or a CSV file format is DXF, the format originally developed by Autodesk for
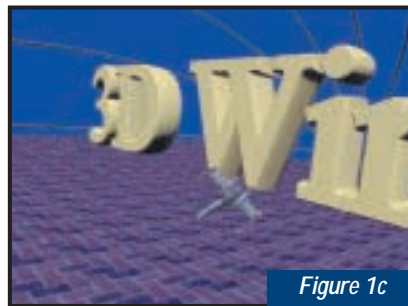
Figure 1a
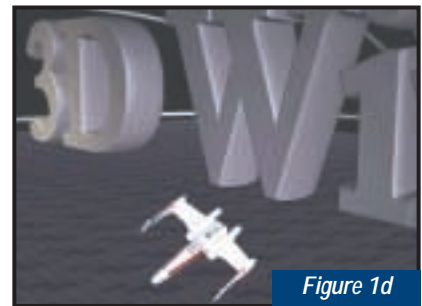
Figure 1b

Figure 1c

Figure 1d

Versions of the same 3D scene converted into different file formats by 3DWin. The original was created using 3D Studio (Figure 1a). The converted graphics were rendered using files in POV-Ray 3 (Figure 1b), DirectX 3 (Figure 1c) and Open GL (Figure 1d) formats

There is no straightforward, method of converting 3D data from one format into another

AutoCAD. It is widely accepted as a 3D data conversion standard, but has several shortcomings. To begin with, it was designed to describe CAD objects rather than 3D scenes. There are minimal facilities when it comes to rendering and animation.

A further problem is that the practices used to create CAD objects are unfamiliar to most 3D users (myself included). Most CAD work is done at the level of faces and polygons rather than complete objects. AutoCAD can organise groups of faces into 'layers', which most 3D conversion software will treat as representing individual objects. However, layers, unlike objects, are arbitrary entities defined by the user, so it is not always possible to treat them as objects.

The truth of the matter, as DXF shows, is that there is no straightforward, risk-free method of converting 3D data from one format into another. No matter what software you are using, if you decide to stray outside the confines of its native file format, you will encounter problems.

This month, I want to have a look at the causes of some of these problems. Next month, I will look at some of the products that aim to provide solutions. One of these products is 3DWin, which I

mention now because on the product website (www.stmuc.com/thbaier/index.html), there is a series of screenshots (figure 1) that show the results of converting a 3D Studio file into three other formats: POV-Ray, OpenGL and DirectX.

The images are interesting, first because they show an unusual honesty on the part of 3DWin's author (Thomas Baier) in demonstrating the limitations of his software, second because they show that no conversion can produce a perfect match with the original.

The reasons for this are many and complex, but some of them are important to understand if successful conversions are to be made.

The most basic issue is the sheer multiplicity of 3D file formats. Comprehensive listings can be found at www.swin.edu.au/astronomy/pbourke/3dformats/ and www.neutralzone.org/home/faqsys/cates/formats.html. The former identifies more than 70. It also provides detailed descriptions of the specifications of nearly all of them, and a

brief scan reveals that no two are the same. Even different versions of the same format (DXF included) differ according to the version of authoring software used to generate the file.

Some methods of encoding 3D data are common to most formats. For example, almost all include a list of co-ordinates that plot the position of the corners of (usually triangular) faces that make up a 3D surface. This is, in a sense, the raw geometrical data of a 3D file.

However, different formats store that data in different ways. For example, in a Lightwave Object file (LWOB), it is distributed between at least two 'chunks', one comprising a points list, an index of all the points that make up an object, and a face (or polygon) list, which describes how those points make up the faces of the object's surface.

There can also be lists specifying curves and patches, surfaces which are described in terms other than as a collection of faces. These lists are provided to support more advanced 3D modelling techniques, such as NURBS.

Just to confuse the issue, there is also a surface list, but 'surface' here is used in the Lightwave sense of shading attributes, determining such parameters as an object's colour.

When it comes to data about the ways objects should be rendered, the differences become even greater. Some of these differences are obvious. For example, one file format may support transparent textures while another does not. Procedural textures such as marbles and woodgrains may be supported in two packages, but described using different parameters.

Some of the differences are more subtle. Most packages support the concept of a 'smoothing group', grouping together faces that are to be rendered as a continuous, smooth surface. Whether or not a particular set of faces belongs to such a group is usually determined by a preset parameter. Any faces joined together at an angle less than this parameter are automatically smoothed.

However, different packages will default to different angles for the smoothing parameter, so an object that appears as a continuous curved surface in one package will appear as a faceted one in another. Similar problems can arise when trying to convert other data,
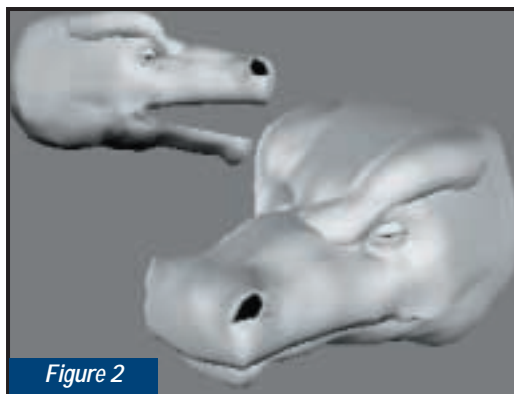

Figure 2

A choice of three heads for creating DIY dragons courtesy of the Dragon Factory

such as 'normals', the parameter that determines the direction a face is facing. If the normals are not properly converted, an object could completely disappear when the scene is rendered, as its outer surface will be treated as an inner surface, and consequently ignored by the renderer.

Finally, even when you have two files that are functionally identical, describing precisely the same objects, textures and environmental parameters such as backgrounds, you can still end up with different results simply because of the peculiarities of a particular renderer.

Despite all these obstacles, conversion is often essential to successful 3D, and next month I will look at a range of software that promises to pull off this difficult trick.

Click and Dragon

The 'Dragon Factory' (http://dragonfactory.3dmenagerie.com) must rate as one of the most curious 3D packages on the market. Curious, indeed, is the word, because the site offers a way of building your own dragons for use with Poser 4, the 3D character software formerly published by Metacreations and sold by Curious Labs (www.curiouslabs.com).

The creatures produced by Dragon Factory come in all sorts of shapes and sizes, allowing you to use any combination of six heads, four pairs of forelegs, four pairs of hind legs, five sets of wings and four types of bodies. You can also add extra digits, whiskers as well as neck and tail extensions. Horns are apparently in development.

Dragon Factory costs $80 (£53) (you can pay online using a secure payment form), and I have to say that going by the website examples it is quite expensive. There are no bump maps to texture the dragon's skin (though tileable bit map textures are included), and several features, such as animated eyes and heads that can be morphed to produce different expressions are still in development. Nevertheless, dragon lovers everywhere will find plenty to grab their interest in the website gallery.

Back to Basic

Tim Anderson looks at what is happening to Visual Basic, and checks out a programmer's editor

It's Visual Basic, but not as you know it

Language changes in Visual Basic.Net — it pays to take note

Windows programming will never be the same again. Microsoft's new Visual Studio.Net, now in public beta, represents a dramatic change of direction for the company. Visual Basic itself, said to be the most popular programming tool ever, is in effect a new language in this version. It is not compatible with Visual Basic 6.0, nor does it target the same platform.

Visual Basic 6.0 compiles Win32 executables, with a little help from the VB runtime library. By contrast, Visual Basic.Net compiles to Microsoft Intermediate Language (MSIL), and runs only on the Common Language Runtime, an execution engine that provides a number of runtime services. For the time being it runs only on Windows, but the Common Language Runtime is in essence portable and there may eventually be implementations for other platforms, including Unix.

Once compiled to MSIL, classes created by any .Net language can be used by any other .Net language, providing deeper language interoperability than any previous programming environment. This feature is enabled by a common type system, so that all .Net languages understand the same data. The runtime also provides security services, previously a glaring deficiency in technologies such as ActiveX controls.

Visual Basic was originally developed as an easy way into Windows programming. The first version lacked any database API, which is an indication that Microsoft did not foresee how important it would become in the business community. Some early design decisions – which no doubt seemed to make sense in the context of what VB was originally intended for – have left VB with a legacy of programming peculiarities that have damaged its reputation among professionals.

Ask any programmer what is wrong with VB and you will get mutters about unexpected type conversions, primitive 'On Error Goto' error handling, classes that cannot be inherited, struggles calling the Windows API and other strange features. On the other hand, VB has continued to prosper for two reasons. One is its ease of use, particularly for beginners and for small projects. The other is the power of COM components, which are easier to create in VB than in any other language.

When VB.Net was being designed, Microsoft decided to break with the past, preserving the essence of VB but without its legacy of frustrations and odd behaviour. It was a fair decision, but the transition is going to be painful. In particular, bringing old code into the new VB is dangerous.

Here is an example. A feature of Visual Basic is that when you pass an argument to a subroutine, it is passed ByRef by default. When you pass an argument ByRef, the subroutine receives a reference or pointer to the same bit of memory used for the variable in the calling function. If the subroutine modified the variable, the modifications stick around after the subroutine exits. By contrast, if you pass an argument ByVal, the subroutine receives a copy of the variable. Modifications made to the variable do not persist. In Visual Basic.Net, the default has changed to ByVal.

The following VB code compiles perfectly in both VB 6.0 and VB.Net:

```
Sub ShowUpperCase(ByRef ↵
value as string)
value = upcase(value)
MsgBox(str(value))
End Sub
...
Dim s as String
s = "this was a lower case ↵
string"
ShowUpperCase(s)
MsgBox("Value is now: " + s)
```
(*Key:* ↵ *code string continues*)

Looking at the code, and noting that the argument is passed ByRef to the function, you might think that the value of the variable will be modified. In VB.Net that is what happens. But in Visual Basic 6.0 the string remains unmodified when it is displayed in the calling function. This is because it is passed in parentheses, which in VB 6.0

converts the variable to an expression. It is as if you had passed the literal string as an argument, rather than the variable itself. Therefore, the ByRef modifier has no effect.

If you remove both ByRef and the parentheses, you get the opposite effect. VB.Net defaults to ByVal, and helpfully inserts this in the function's argument list. Visual Basic 6.0 silently defaults to ByRef. The variable therefore gets modified in VB 6.0, but not in VB.Net.

The example is trivial; but if this behaviour were assumed in the depths of some financial processing module, the effect would be different, and presumably wrong, results when the same code is run in VB.Net. This kind of difference is more dangerous than code that needs modification before it will compile, since the problem is disguised. While most Visual Basic code will port easily to VB.Net, cases like this make careful testing essential for mission-critical applications.

There are plenty more changes to consider. Another big one is that Visual Basic classes are radically different in VB.Net. If you declare an object variable As New, then in VB 6.0 the object is created on first use. In VB.Net, it is created when it is declared. That means any code in the Initialise event (changed to Sub New in VB.Net) runs at a different time. In addition, VB.Net objects hang around for longer.

Older versions of VB terminate objects when the last reference to them is lost. In VB.Net, object disposal is in the hands of the garbage collector. If you have a frequently called routine that creates and disposes a local object, then in VB 6.0 there will never be more than one instance alive. In VB.Net there could be many instances. If the object does something expensive like keeping a database connection open, performance will suffer.

The above is not meant to put you off Visual Basic.Net. There are many advantages to the new language, and once you have adjusted to it, it will be hard to go back to the quirks and foibles of Visual Basic 6.0 or earlier. VB.Net is more powerful, more consistent, more professional, and more up-to-date than its predecessor, and opens up new
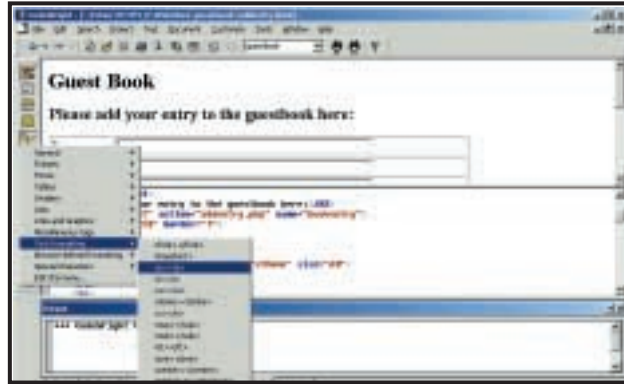
Now with better support for standard web languages, Codewright is the editor to beat

options such as true object-oriented development and multi-threaded applications. It also appears that the command-line VB compiler will be part of the .Net Framework SDK and available for free download.

That is good news, but VB developers with existing code also need to face up to what the lack of backward compatibility means. In many cases, the sensible option will be to stick with VB 6.0 for existing projects, using VB.Net only for new work.

Codewright 6.5

Despite the impact of visual programming, use of programmers' editors is growing rather than decreasing. The web is one reason, with straight text editing widely used for HTML, XML, ASP and other web formats. Java is another, where the speed and transparency of a simple text editor has advantages over slow and complex integrated development environments.

Those who have Linux or another Unix-like operating system on their network also have constant need for text editing, and need an editor that understands Unix line endings. Even Visual Basic developers may find themselves making use of text editors, since the new VB.Net comes with a command-line VB compiler and in general is more text-editor friendly than previous versions.

Codewright 6.5 is the latest version of a favourite editor, originally produced by Premia, which is now owned by Starbase Corporation. The best features of the product are unchanged. It will load files up to 2GB in size (although it defaults to a maximum of 500MB), and provides a right-click menu with options to display as normal text, wrapped text, or Hexadecimal. The Hex view shows

numbers and text side by side. If you select a number the corresponding text character is highlighted, and vice versa.

Codewright is also smart about Unix and Macintosh line endings. They display correctly, and you can easily set the editor to type the preferred line ending character when you press Enter. Another strong feature is differencing, where you want to see the differences between two similar files. You can view differences side by side or interleaved, and set options to ignore white space or to show only parts of files that are different. Next, the built-in scrap buffer offers a multiple clipboard, in place of the measly single clipboard offered by Windows.

These are text editor basics. Codewright is far from basic, and is highly extensible and customisable. Source code is provided, for both Microsoft and Borland compilers. There is colour-coded syntax highlighting for most languages, CodeSense which auto-completes function names and pops up suggested parameters, and support for macros in Basic, Perl or a C-like macro language. There is even a spell checker and a WYSIWYG HTML editor, although these last are features that do not belong in a programmer's editor. New features in this version also include better support for Java, Perl, Python and XML.

Depending on how you use Codewright, it may not be worth upgrading from 6.0, but new users should check out the 30-day demo version on the Starbase site.

Web logs unravelled

Web servers generate huge log files, but making sense of them is a struggle says Tim Anderson
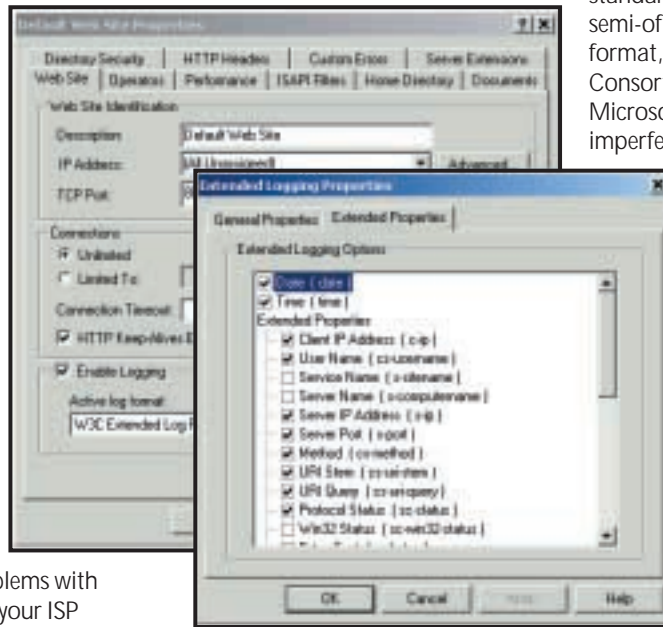
All web servers are able to keep detailed logs of their activity, and there are lots of good reasons to examine them. Among other things, they tell you how many people are visiting your site, so you can tell the world how many hundreds of thousands of hits it has received. Other important information includes what browsers are used, so you know how many people will be upset if you use features specific to Internet Explorer or Windows, and whether any requests have triggered a 'not found' error, indicating a broken link on the site.

There are a couple of problems with site logs, though. One is that your ISP might not let you see them. From an ISP's point of view, the only good reason to prevent customers seeing logs is the amount of space they take up. A busy website generates megabytes of logs every day. Some ISPs use logs as an opportunity to add value, or make an additional sale, by providing them as an extra-cost service. On anything other than free web space, my view is that full logs should come as part of the deal, since they are so useful in planning and maintaining a site.

Another snag with logs is that in the raw they provide too much data. Scrolling down pages and pages of logs can be interesting, but it makes sense to do some automated analysis, so you can answer those high-level questions like, 'how many unique visitors', 'which broken links', and so on. Logs are not perfect, and you should bear in mind

that some visitors will not be reported because they are viewing your pages via a cache, and not actually hitting the site.

Setting properties for extended log file format in IIS. There is also an option to output logs direct to an ODBC-compliant database for analysis

Another issue is that browsers may lie about how they present themselves. Ultimately, all the logs have to go on is what turns up in the HTTP header they receive. Some browsers or search engines may choose to present themselves as a particular version of Navigator or IE, in order to get full access to sites that redirect visitors according to the browser they use.

What's in the logs

All logs are not equal. Potentially, each web server may have its own log format, and there is usually a way to customise logs so that different configurations of

the same server produce different logs. This makes life difficult for log analysis tools. Fortunately, there are some standard log formats. There are two semi-official ones, the old common log format, and the W3C (World Wide Web Consortium) extended log format. Microsoft IIS supports both, although imperfectly.

The basic Common Log Format creates a separate line for each HTTP request, which looks like this: host ident authuser date request status bytes.

Here is an example, generated by Apache on BSD:

```
 62.253.64.5 - - ↵
[09/Oct/2000:13:01:↵
43 -0700] "GET ↵
/pcw/menu.html ↵
HTTP/1.1" 200 541
```

(*Key:* ↵ *code string continues*)

Note the hyphens, which indicate a missing value.

The meaning of the items is as follows:

Host: This is the IP address of the client, or the fully qualified domain name when available.

Ident: Not often used, this is the identity information of the client, as reported by a daemon such as identd. It is little used because it slows performance and does not provide secure identification.

Authuser: On a password-protected site, this is the user id.

Date: The date and time of the request. This might be GMT or local time.

Request: The HTTP request.

Status: The status code returned to the client. 200 means the request succeeded. The standard codes are part of the HTTP specification and listed at the W3C website. Other common codes are 304 (which tells a cache that the file is not modified), 403 (access forbidden), 404 (not found) and 500 (internal server error).

Bytes: The number of bytes transferred in response to the request.

This basic log omits two of the most interesting pieces of information. One is the referrer, in this context often spelt

Despite their flaws, logs are extremely valuable for both developers and authors
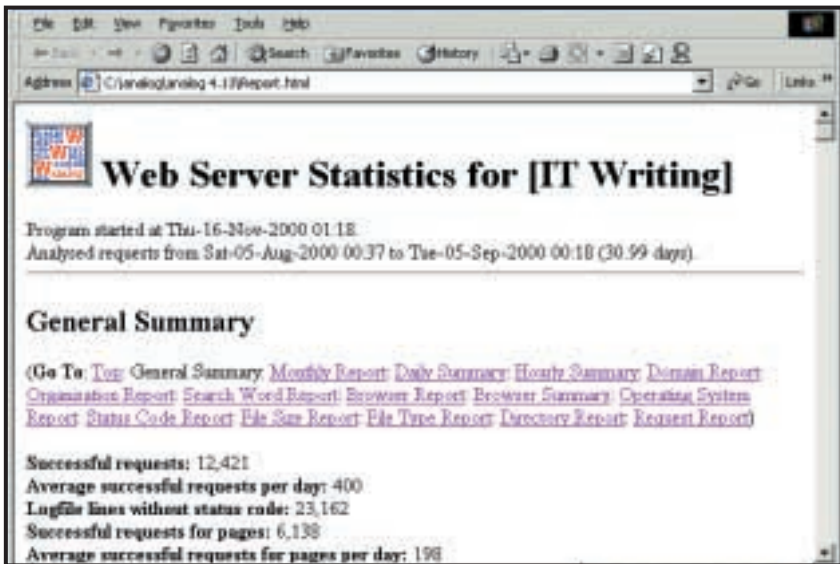
The Analog report is an HTML file with sections indexed by hyperlinks

'referer' for obscure reasons, which tells you which web page has the link that was clicked to create the request. This lets you track how users move through your site, and which external links or search engines are generating visits.

The other is the user agent, which identifies the browser type and version. This information may be included in separate logs, such as Apache's agent_log and referer_log, or else included in a combined log, or in the extended log format that allows custom fields. For example, in Internet Information Server 5.0 you can configure log file fields by opening the property sheet for a website, selecting W3C Extended Log File Format, and clicking the Properties button to specify which fields are required. These include User Agent and Referer.

Analysing logs

Trawling through log files manually is not viable, so to make sense of them you need to enlist a log file analyser. One of the best is Stephen Turner's Analog, which you can download and use free of charge. Analog can be tricky to configure, although in essence it is easy to use. When you run the Analog executable, it looks at a configuration file, analog.cfg, to discover which log files it should analyse and what kind of report to create. It then processes the logs and outputs a report in HTML format.

The nice thing about this approach is that you can install Analog on a website and run it from a script, so that you can

view a dynamically generated report online. A Perl script and an HTML form for this purpose are provided. Analog comes as a zip file that uncompresses into a small directory tree. There is no need to run a setup routine. Source code is also available.

A short example shows how you can configure Analog. The ITWriting website generates four log files: access_log; agent_log; referrer_log; and error_log. The information in error_log is also in access_log, so I wanted Analog to

analyse the other three files. Step one is to copy the three log files into the Analog directory. Step two is to open the default analog.cfg and to make some changes. The line:

```
LOGFILE logfile.log
```
was changed to
```
LOGFILE access_log,referer
_log,agent_log
```

This asks Analog to process all three log files, each separated by a comma without a space. I also changed the HOSTNAME directive, which forms the heading of the report. Then I ran analog from a command window. It worked, but reported several errors:
Warning F: Can't auto-detect format of logfile agent_log: ignoring it
Warning R: Turning off empty operating system report

These two warnings are related. When Analog sees a log file, it tries to detect its format. Since it is a mature product, it is fairly good at it, but while it understood two of my log files, it could not detect what agent_log contained. In fact, agent_log contains a simple list of user agents. The user agent line includes the operating system, hence Analog's second complaint, that it had no data to provide a report on which operating system clients were using.

The fix is to tell Analog the format of the logfile. This is done by adding a

Favourite errors

Shortly after the release of a new version of Internet Explorer, log watchers began to see 404 errors for a file called favicon.ico. It turns out that this icon is used by Internet Explorer 5 to put a custom icon into the Favourites menu, making it easier to spot and more likely to be clicked. Of course a request for favicon.ico also tells you that someone put your site into their Favourites, which can't be bad.

You don't have to put favicon.ico into every

directory. This tag tells IE where to find it:
```
<LINK REL=
"SHORTCUT ICON"
href="/path/
favicon.ico">
```
Using this tag you can also use a different name for the file if you want. The main advantage of using a single favourites icon comes when you need to update it.

Another common source of 404 errors is robots.txt. This file is used by web crawlers or spiders, software that traverses the web downloading pages for indexing. If there are

pages that you don't want indexed, then including a Disallow command in robots.txt should prevent it. For example:
```
User-agent: *
Disallow:
/testsite
```
would ask the web crawler to ignore pages in the testsite directory.

It is a good idea to have a robots.txt in the top level of your website, if only to eliminate a source of spurious error reports. Note: this isn't a security feature, and there is nothing to stop the robot from ignoring the instructions in the file.
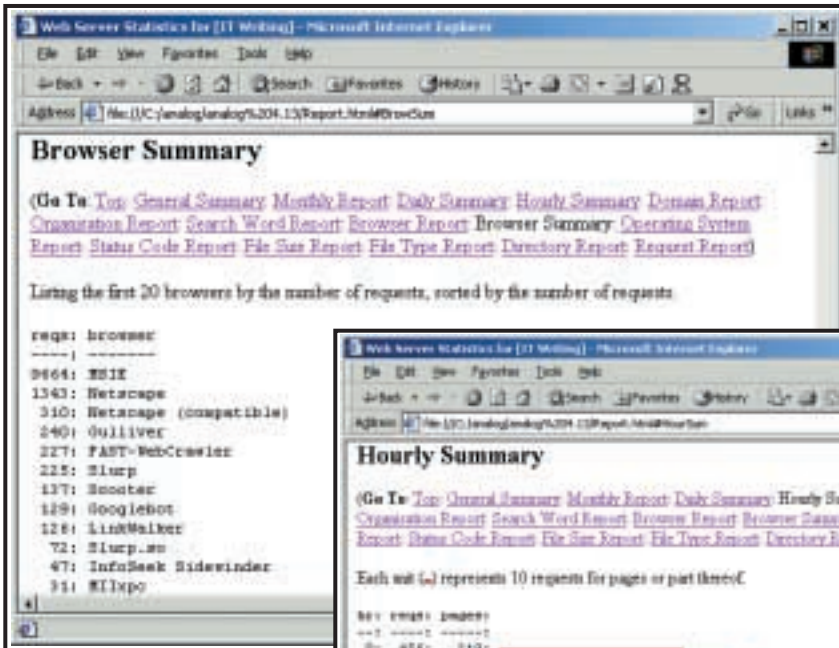
*Above: Browser summary tells you how users break down by browser. There is also a detailed report showing browser versions. Names like Slurp and Scooter indicate robot web crawlers*
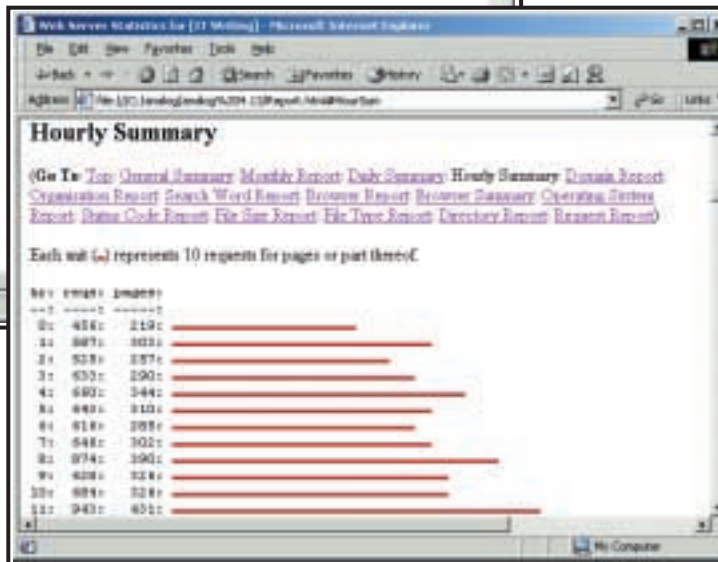


*The hour-by-hour report is an indicator of late nights or global usage, but check that Analog is interpreting the time correctly if your site is hosted in another time zone*

LOGFORMAT directive. This directive applies to the LOGFILE directives that follow it. LOGFORMAT takes either a word describing a standard format such as COMMON, or a format string, as described in Analog's help document. In this case, agent_log has only one field, for the browser, and Analog's format identifier for this is %B. (If you have more than one field in a LOGFORMAT, you must surround the format string with parentheses.) I therefore amended a few lines in Analog.cfg as follows:

```
LOGFILE access_log,↵
referer_log
LOGFORMAT %B
LOGFILE agent_log
```

Re-running Analog successfully created a report that included operating system information. However, I also wanted to see the browser usage analysed, and these sections are not included by default. I added the following lines to the end of Analog.cfg:

```
BROWSER ON
FULLBROWSER ON
```

These tell Analog to include sections for browser usage, in full and summary form. It was successful, and the next

Analog session produced exactly the desired result. This Analog report includes 15 sections, from a high-level summary showing total requests and the amount of data transferred, to the detail of how requests vary hour by hour, which words were used in searches that ended up on your site and which pages were most popular. You can increase this to 32 sections provided of course that your logs include the necessary data.

Installing Analog

It is not necessary to install Analog on a web server. You can simply download logs from time to time and run Analog as required. However, if you are able to run CGI scripts on your server you can set up an HTML form interface to Analog that provides a nice front end along with dynamic reports that are always up-to-date.

Note that you should not use Analog itself as a CGI program, for security reasons. Instead, use the supplied Perl script. Then you can edit the example

Analog form to work with your logfiles. In essence, the name – value pair in Analog.cfg is represented on the form by the name – value pair of a control. Once you have created a well-designed form, it is easier to work with than editing Analog.cfg.

Analog is well documented and there is a support mailing list available. The author's comments on why logs are unreliable are also worth reading. In essence, logs only record HTTP requests. They cannot tell you how many times or how many people looked at a page without making a new request, because it was cached in their browser, proxy server, or by their ISP. Nor can you tell how long people stay on your site, since the only information you have is the timing of the first and last request.

Despite their flaws, logs are extremely valuable for both developers and authors. You can soon tell if a page has hardly any visits, or if users are showing a strong preference for one aspect of your site. In addition, you have almost no chance of keeping a site well maintained and error-free unless you keep a watchful eye on what the server is telling you.

Cashing in on the web

Nigel Whitfield looks at the cheapest and most efficient ways to set up shop online

If you've got a business running already, rather than one that you've set up specifically to take advantage of the Internet, chances are that you don't want to have to change it too much just to go online. You may not even be particularly bothered about the technology – you just want to share in some of the riches that everyone says are available online.

The tools that we've looked at so far can certainly do the job – but if you're not the sort of person who wants to dabble with the intricacies of web design or even install yet another program on your computer, then something else might be called for. You could pay a consultant to set up a site for you, but that might be expensive – especially if you're not sure your business will really work on the web.

However, there is an alternative. There are shopping systems that you can set up by filling in the appropriate options on web pages, and uploading a few graphics. Add the details of your products, and you have a fully functioning online shop, much quicker and more easily than you could have managed if you had to design everything yourself.

Two of the systems worth looking at are iCat (www.icat.com), which is now part of Intel, and Click and Build (www.ClickandBuild.com), run by WorldPay, which specialises in processing online transactions. iCat's UK partner is BT, which can provide you with a basic shop using the system from around £40 a month – though online card processing costs a bit extra. WorldPay's basic brochure system is £30.

Though those prices may look cheap, remember you'll also be limited to using standard templates, so there's a risk of other people having stores that look fairly similar. You can, of course, customise a store with your own graphics – or enlist the help of a designer if you don't have one of your own. But this is when you'll find the cost of setting up a shop can rise, with Click and Build's designers being charged at £65 per hour.

So, are these solutions any good? Click and Build allows a free trial so you can see how the system works, though you're not actually allowed to sell anything during the trial; there are some similar offerings around, that don't cost as much, but aren't as flexible. In particular, if you're looking at using a solution like this, make sure you can prepare your product catalogue offline and upload a file with all the information; if you can't do that, then you'll have to fill in a web form for each product – fine for a small range, but tedious for anyone who has lots of different things to sell.

One other thing that is worth checking out is whether or not you can use these systems with a URL of your own – some of them will force you to have your site hosted in a 'mall' with a URL that gives the name of the mall, as well as your site within it. While that could help drive traffic to your site, it always runs the risk of guilt by association – especially if the mall itself isn't well designed and thought out. Some of the less sophisticated solutions might limit your upgrade options, too.

Both iCat and Click and Build will let you add credit card processing later and cope with different types of goods, so you can offer options for different colours or sizes for instance. You can even use systems like these to offer downloadable products, such as software. In short, for many people, solutions like these are certainly worth looking at if you don't want to have to build a site yourself.

Saving money

You can certainly find cheaper solutions, with some very rough-and-ready shopping-mall-type sites offering similar services, but looking nowhere near as professional. In short, you're probably getting more or less what you're paying for. This leads to a digression that several readers have asked about: where do you get a domain name for your site?

That might sound easy, and for a home user, the answer is very likely 'anywhere you like, and it won't cost you anything'. For a business online, however, I'd caution against that approach. While it's possible to register a domain in the UK for free, if you're planning on doing business, don't skimp on quality.

Click and Build can be a remarkably straightforward way to get a shopping site online without needing to know any HTML

As some readers will attest, there are some domain hosting companies that seem to provide a level of service and support entirely consistent with having charged nothing at all. While it may be an irritation for a home user when their own domain doesn't accept email for a few days, for a business it's lost money.

Most reputable ISPs will register a domain for you, or you can use one of the established companies that have been doing the job for a number of years. Yes, you might actually have to pay – but with fees for a .com of $35 (£23) a year via Network Solutions, for example, it's hardly going to break the bank. I'd also be interested to hear more from readers who have had serious problems with free domains. The short answer, though, is that if you want to make money from the net, it's hardly worth skimping on something that you'd only have to pay under £100 a year for anyway.

Step by step

So, back to building a shop online – how easy is it? We took a tour through the Click and Build system; the easiest way to get started is to click the QuickBuild button; you'll also need to change the password you were allocated. Click the User tab at the top of the screen, then the Edit button to choose the password – it's not quite as described in the welcome email you get when you sign up.

The first stage of building your store is choosing the look and feel, from a huge range of predefined styles. You can also choose to have default text and categories added to the store.

Next you need to supply the details of your store, including what category you want it in, and details for search engine submission. As with other sections of the site, you need to click Update to save the information on the form, then click again on the QuickBuild button to

Following Click and Build's QuickBuild function gives you an easy way to build your site
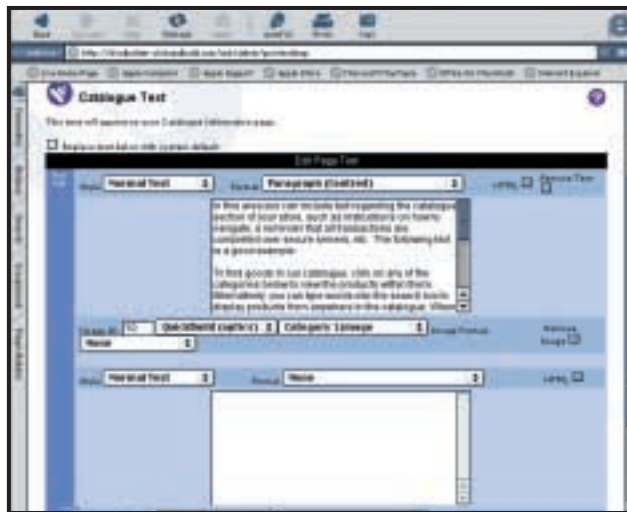
Editing the text for your pages is a relatively simple procedure in Click and Build, you can even add your own HTML

move to the next stage. There you can edit the text on the pages – you can even add your own HTML, if you like, but net novices will probably prefer to just type text, and let Click and Build format it for them.

The QuickBuild buttons lead you through each of the sections of site text in turn, after which it's time to add products; if you chose the defaults, there will already be categories, and some default products in the database. You can edit all these by clicking the Catalogue tab at the top of the screen. The best way to start is probably by deleting all the categories you don't need, if you chose to have the defaults added when you created the store.

Even better, though, is to click on the

Help button, and follow the links to Appendix A, which is where you'll find the details of the file format you need to create so that you can use the Inventory Upload function.

It's worth paying attention to this – most of the rest of the site is pretty straightforward to use, but uploading your inventory can be frustrating. The best idea is probably to print out the details of the file format, and write the spreadsheet column next to each entry, so you don't miss anything out – if you do, Click and Build will display an error.

There are some other gotchas if, like me, you use Excel to put the spreadsheet together. The first column needs to be blank for new products, but if it is, then Excel won't always output a comma; instead, you need to put a single space in the table cell. Likewise, the last few columns are optional – but you'll need to put something in at least the last, which is the number of days for which a particular product variant will appear, otherwise Excel won't add the appropriate number of commas, and the import of your data will fail – though you can manually edit the file after it's been uploaded. And finally, if you're using a Mac, you need to make sure the CSV file you create is Windows or DOS text format, since the upload doesn't understand Mac text files.

Once you've overcome those niggles, however, Click and Build can be a remarkably straightforward way to get a shopping site online without needing to know anything about HTML. You can see the results at http://trialbuilder.clickandbuild.com/cnb/shop/pcwtestshop.

Mobile support

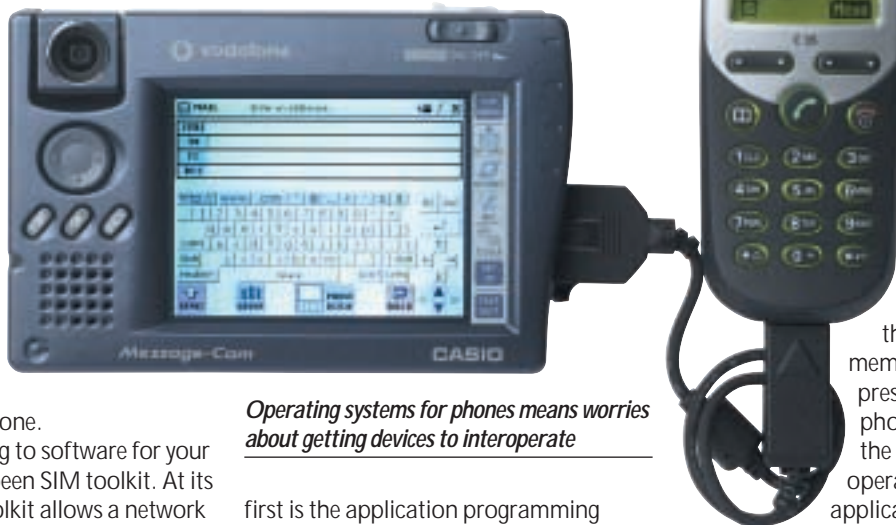**With the arrival of operating systems for mobile phones, Simon Rockman looks at the implications**

The mobile phone industry has never had to worry about getting different devices to interoperate. Instead the only optional extras that would work with your phone were the peripherals developed by the manufacturer.

This is all about to change – a change made necessary by the advent of operating systems for phones. Up until now phones, which are usually ARM based, have been treated as embedded devices. One of the most popular operating systems is Nucleus; but even the most geeky mobile phone owner wouldn't be able to answer the question 'What OS is in your phone?' And it hasn't mattered because there is no software you can buy to run in the phone.

The nearest thing to software for your mobile phone has been SIM toolkit. At its most basic, SIM toolkit allows a network operator to access the phone over the air, then download and run a program within it. Programs can put a menu on the screen of the phone, get user input or display text. They can also set up a voice or data call, send a text message or use

Operating systems for phones means worries about getting devices to interoperate

teleshopping from menus within the phone. Until now these had to be hardwired into the phone and could not be altered. You might have a million users out there, but it's impossible to reach them with a new service unless they buy a new handset. And if you want to terminate a service you can't remove it from the menu of customer phones – all you can do is take the call and say that the service is no longer available.

SIM Toolkit works in two halves: The first is the application programming interface (API) that runs on the phone and the second is the software that runs in the SIM card. The phone takes requests from the card and turns them into displays and prompts on the screen of the phone.

Things are going to get a lot more interesting with the new generation of mobile devices

one of a huge range of other messaging protocols. Since the SIM holds the encryption algorithm for the network, a program written under SIM toolkit can take advantage of that for security purposes.

It's not unusual for networks to want to add services to the phone; from launch in 1994 One2One has offered

The first generation of the SIM toolkit application uses code that is specific to the design of the card produced by the SIM card vendor. However, we'll soon start to see Java-enabled SIM cards using a cut-down version of Java called Java Card. Despite the overhead of using a bulky language like Java, this develop-ment will open up the compatibility and

competition between card vendors. Java Card has been modified to reduce the overhead compared with traditional Java as it doesn't need to support graphics or floating point and security is handled by the network.

However, until Java Card enters widespread usage, SIM toolkit programming will be the only method available to network operators wanting to customise phones.

The amount of memory in the phone needed by the SIM toolkit is not that large, around 100KB of the megabyte of memory that is usually present in a mobile phone. However, the worrying aspect for operators is that, as applications creep up in size, they may need to upgrade the smart cards used by customers. It might prove prudent to use cards with larger memories than strictly necessary to allow room for future growth.

A landmark project using SIM toolkit was undertaken by Gemplus, Alcatel, Cellnet and Barclays bank. This phone was built on an existing product that used a custom phone and an alpha version of the SIM toolkit specification. The aim of the technology is to provide a cashpoint screen on your phone.

To get a Barclaycard balance the customer selects the B icon in the phone – or rather the SIM toolkit – menu, then the menu option for balance/credit and enters a special PIN called a telecode. The phone calls the appropriate number as a normal voice call and then hangs up. The information that is passed to the

network in the usual course of making a voice call is enough for the computers at Barclaycard to know who you are. The number the phone calls – which you never know – determines which service you require. Just what information is extracted Barclaycard won't divulge, but at no time is account information transmitted from the phone.

The reply is sent as a special SMS in less than 10 minutes – typically a lot less – and held on the phone. Unlike standard SMS messages it isn't automatically displayed, so anyone looking at the phone won't see the state of your account. The SMS is encrypted using a 24bit DES algorithm. GSM phones are pretty secure anyway and with 37 million of them in use in the UK the chance of anyone getting hold of the call they want is wildly remote, but Barclays' attitude is 'we are a bank it has to be absolutely secure'.

However, despite impressive developments like this, the SIM toolkit has been underestimated as a source of mobile phone viruses. There has been publicity about SMS-based viruses but nothing on SIM toolkit. It's still a safer environment than a PC in terms of viruses, as mobile phones cannot propagate SIM toolkit applications. If I have an infected phone I can't pass it on to anyone else. It would, however, be possible to send an SMS out with details of any number a phone had made calls to or received calls from, or which cell the phone happened to be in, just the thing for government agencies and tracking unfaithful spouses.

New OS issues

Things are going to get a lot more interesting with the new generation of mobile devices which will have real operating systems. There are several runners in the field. Microsoft is making a great play with Pocket PC, but the dominant force is Symbian, with Palm OS also bringing the largest number of users to the party. There are a couple of other possibilities – Geoworks as found in the Nokia 9110 and Blackberry, which is being launched in the UK by BT Cellnet.

However, the real battle is between Symbian and Pocket PC. Several of the major companies – including Nokia and Motorola – have licensed Palm OS but

we're likely to see this most often being used as a user interface sitting on top of the Symbian OS. This battle is already beginning to produce products.

Compaq iPAQ: You really can walk down the street and surf at an acceptable speed

One device that points very strongly to the future is the Compaq iPAQ. While the iPAQ doesn't currently support cellular connectivity, you can add this functionality to the device if you take the long way round and are prepared to work out how to do the integration yourself. You'll need the iPAQ, its PC-Card adaptor and a Nokia Cardphone 2.0.

Now this should all work straight out of the box, but unfortunately it doesn't. While the Cardphone looks just like a Hayes-compatible PC Card, it doesn't operate like one. Pocket PC uses a 16bit bus, but the Cardphone expects a 32bit bus. Fixing this needs drivers. It's interesting that neither Microsoft, nor Nokia feels the market big enough to justify the development of drivers. However, TBS in Derby (www.tbs.co.uk) has come to the rescue. TBS acts as a

system integrator for lots of big corporate clients who want to use mobile data. The drivers are necessary for TBS to be able to sell complete solutions.

Unfortunately, there is no one place a private customer can simply turn up and buy all the necessary bits. The iPAQ can be difficult to find as it's still in short supply. Once you've got one of these you'll then need to find the £70 PC Card adaptor. The best place to buy the Cardphone is an Orange dealer. Orange is one of the few networks in the world to support 28.8Kbits/sec data. You'll probably want a separate account for data and Orange will charge you £5 a month over and above the normal tariff to use this higher speed.

You can contact TBS on 01773 828 766 in order to purchase the drivers. They're not cheap at £55, but you're not really paying for the drivers but rather paying for the support since Nokia, Compaq and Microsoft won't have a mechanism to support you. This is a shame because most of the problems seem to be down to Pocket PC.

In the three weeks I've had the Compaq, I hit hard and soft reset more times than I have in 10 years with a Psion. When it works it's wonderful. You really can walk down the street and surf at an acceptable speed. And the UK is one of the very few places in the world where you can do this, but a few things need to be sorted out before this becomes a mass-market proposition.

Someone is going to have to learn how to support these converging technologies. One of the mobile phone networks has recently employed a consultancy to decide who. I met with one of the consultants – Guy Swarbrick, an ex-editor of *PCW* – over a beer and sandwich. I gave my view that I don't think the mobile phone dealers are up to understanding the computer side of this integration. It's going to be the computer dealers who have to learn the mobile stuff and until that happens we won't really have mobile data, just a collection of toys. Good toys though.

Security conscious

Worried about your email security? Roger Gann sets out to unlock the secrets of encryption

I n previous columns we've covered the general subject of network security but have only skimmed over the matter of encryption and in particular using encryption to keep your email secure. You can't get too far on the Internet before you come across encryption, whether you're buying something over the web, setting up a virtual private network or sending a private email. Encryption has but one function – to keep information secret.

The basic tenet of encryption is simple – it allows a group of people to keep written messages private by employing some private knowledge or method. The original message (or 'plaintext' in crypto-speak) is transformed by some process (aka an algorithm) to render it meaningless gibberish (or 'ciphertext') if it should fall in to 'enemy' hands, that is anyone without the knowledge of how to decrypt it. But the recipient does know how to reverse the process and so can translate the meaningless ciphertext back into meaningful plaintext.

Email at risk

Email is deceptive – because it turns up in the recipient's mailbox quickly, you feel as though you've beamed your message directly to the recipient's computer and you can't get more secure than that, can you? Well, yes you can because there are so many opportunities to intercept email that it's tantamount to sending messages written on postcards when you think you're sending letters – just about anyone can intercept them and read them. But why should you care if people are reading your email? You probably don't transmit government secrets on a regular basis. In fact, most email messages are simply routine correspondence with colleagues, family, and friends, of interest only to you and them (and sometimes not even to them!).

Perhaps you don't need absolute anonymity, but you don't want anyone except your intended recipient to read your email. You may, after all, be exchanging confidential company

information with your business partner. For cases like this, you should look into encryption software. Encryption scrambles plaintext messages using a mathematical algorithm, so that only the intended recipient can read them.

There are two stages of security with email. The first level guarantees that the email has been sent by the sender and its contents haven't been tampered with – this involves digital signatures, backed by digital certificates, which confirm the

Strong email security

A

B
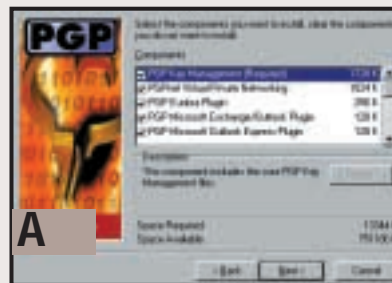
A After downloading PGP, install it. Enter the usual details, such as your name and address. Select the PGP plug-ins you want installed.

B The next task is to generate the cipher key so the Key Generation Wizard is launched. If you have an existing 'keyring' you can import it. You enter your name and email address. You can then choose between the older RSA key and the more modern Diffie-Hellman/DSS key – choose the latter. The next task is to select the Key Pair Size – 1,024 or 2,048bit is quite sufficient. You can also opt to give it a fixed life or set it to never expire.

C

D

C You then have to devise a 'pass-phrase' – this is used to encode your key so it's crucial to make it 'unguessable' – eg pick nine words at random from a decent dictionary and sprinkle some random punctuation in there. A gauge at the bottom indicates relative 'strength' of your pass-phrase. It's important to make sure you memorise your pass-phrase – if you forget it, your email will remain forever encrypted! The PGPKeys program then computes your key pair.
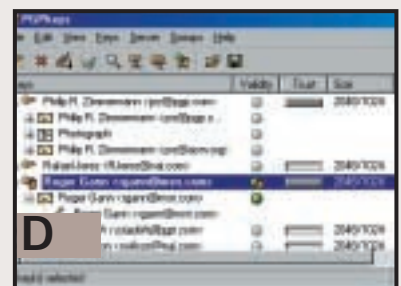
D Your public key is then sent to a 'root server' for all the world to see, though this is optional. Restart your PC and launch PGPKeys. It connects to the root server and you can check if your public key is available for the world to see and use – hey, my name is only two away from the guy that invented PGP, Phillip Zimmerman! Wow!

Continued overleaf

authenticity of that signature. You can 'buy' digital signatures from the likes of BT Trustwise or Versign for less than £10 a year. The second stage goes a step further and actually encrypts the message itself using something like PGP.

Strong security with PGP

For industrial-strength encryption, you need the freeware package, Pretty Good Privacy or PGP. Devised by Phillip Zimmerman, PGP is based on RSA technology, which uses separate keys to encrypt and decrypt data, the public key and the private key. Messrs Rivest, Shamir and Adelman are three very clever chaps who devised public/private key cryptography back in 1977. The RSA algorithm is based on the fact that there is no efficient way to factor very large numbers. For example, to the best of my knowledge there are but two factors of '6', 1 x 6 and 2 x 3. But factoring a number with hundreds of digits ain't quite so easy and deducing an RSA key requires an extraordinary amount of computer processing power and time. The RSA algorithm, incidentally, is now out of patent and so is freely usable.

The beauty of their solution is that this encryption process is asymmetric. Previously, the same key would encrypt and decrypt messages and so was said to be symmetric. This was potentially risky as you would encode with one key and then send the resulting ciphertext. Unfortunately, you also had to send the recipient the key as well (in order that they can decode it) and not only was this risky but secure key distribution was an admin nightmare as well. With asymmetric encryption, separate keys are used to encode and decode messages and these problems are neatly overcome.

So how does it work? The public key encrypts the data to be sent to you, so the whole world can have access to this key – it really doesn't matter because only one person can decrypt data encrypted with your public key – you. Only you have the key that decrypts, the private key.

PGP uses 128bit encryption as well as digital authentication, which tracks down the origin of a message, verifying the sender's identity. PGP also means you can be pretty confident that the information you send via email is secure and that only the intended recipient can read it – the files remain encrypted on the recipient's hard drive.

The good news is that PGP is free for personal, non-commercial use but if you're a business you need to buy it from Network Associates, at www.pgp.com. You can download the software from MIT'S PGP distribution page http://web.mit.edu/network/pgp.html – it's an 8MB download. Note that this site is restricted to US visitors only – foreigners like us have to go to the PGPI 'international' site, www.pgpi.com where you'll find slightly less up-to-date versions of PGP, PGPi, available: version 7.0 is available in the US but the international version is currently v6.5.8. Of course, new versions are released all the time.

Strong email security (contd)
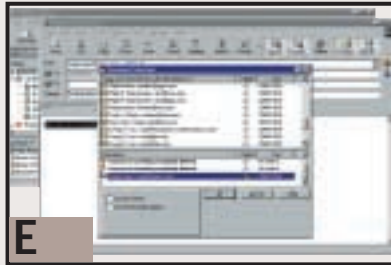
E **To send an email, open Outlook Express – you'll see some extra PGP buttons on the toolbar – Encrypt and Sign (PGP). Compose your email in the normal way. Click the Encrypt and/or Sign button as necessary. When you come to send, rather than your normal address book, the recipient list at the root server is displayed. You simply drag the intended recipient's name from the list, down to the Recipient box and click OK. This means we're about to encrypt our message with the recipient's public key. Alternatively, each correspondent can send their public key to you in a plaintext email message. To save public keys to your keyring, simply drag them into an open PGP Keys window.**

F **Now's the hard part – you have to enter your pass-phrase – correctly!**
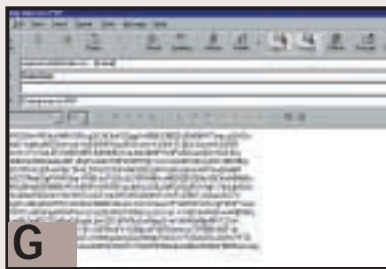
G **When you click OK, your message is instantly encrypted into military grade gibberish. You then hit the Send button a second time to send it on its way. To decrypt a message you've received, click the Decrypt/Verify button. PGP asks for your pass-phrase, then decrypts and replaces the ciphertext in the message window with the plaintext. If the sender signed the message digitally, Outlook Express adds a few lines at the top attesting to the signature's status and who the signer is, as well as timestamps for signing and verification.**
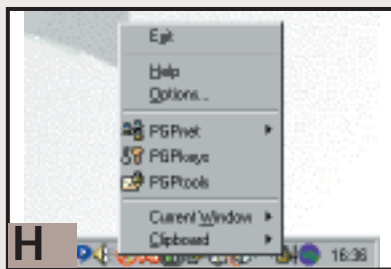
H **PGP's radius of action isn't confined to email programs – the PGP padlock icon in the system tray lets you encrypt on the fly text in the current window or on the Clipboard. Another utility, PGP Tools, lets you encrypt any file.**

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BE CLEAR ABOUT SUPPORT AND WARRANTIES

Make sure that you get a warranty that suits your needs and is fully detailed in the quotation. If you need swift repairs, consider paying extra for an eight-hour repair service. Also make sure you understand the level of service you can expect to receive, including who pays for couriers if your machine has to be returned for repair.

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SET DELIVERY DATE AND CHECK WHAT IS DELIVERED

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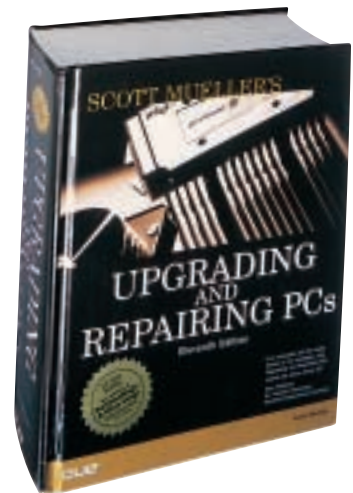
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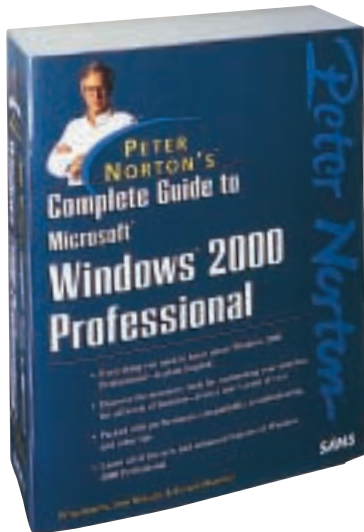
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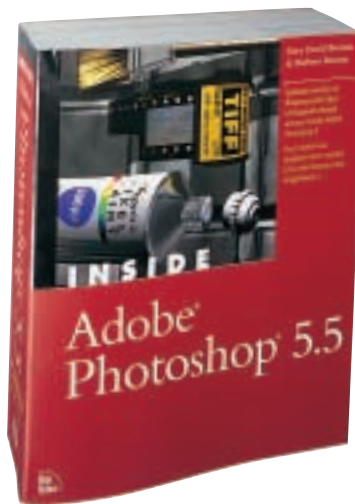
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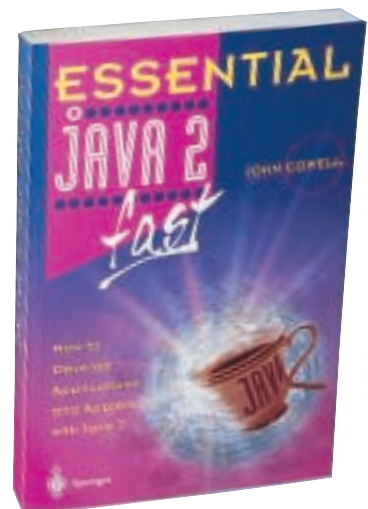
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LEISURE LINES

contents

C&C: Renegade

Fans of real-time strategy classic Command & Conquer are in for a treat later in the year when Westwood releases Command & Conquer: Renegade. Putting a new spin on the familiar C&C universe, Renegade dispenses with the macro, omnipotent point of view of conventional RTS games in favour of a third-person action adventure.

You play Global Defense Initiative commando Nick Parker, codename: Havoc, as he embarks on 12 missions against the evil brotherhood of Nod. Havoc wields a familiar arsenal of weapons, including the sniper rifle and C4 explosives, but there are a few new additions.

Like many new games, it has learnt a few lessons from its competitors and so you have the option of infiltrating the enemy base either by stealth, like Metal Gear Solid, or with all guns blazing, like so many other shoot 'em ups.

A selection of buildings from the original game make an appearance and frequently play similar roles. You'll also be able to drive a variety of familiar vehicles ranging from tanks to an Orca assault aircraft. Also, the now obligatory multiplayer function will allow you to play in online tournaments either co-operatively or in death matches.

This cross-pollination of two popular formats is sure to make it a hit when Renegade is released later in the year.
http://westwood.ea.com/games/ccuniverse/renegade/index.html

ANDY STEWART

Desperados

Desperados is a tactical combat game set in the Wild West and is due for release around March 2001. Developed by Spellbound and to be published by Infogrames, Desperados is set in the latter part of the 19th century in and around the vicinity of Louisiana and New Mexico in the US – a very dangerous place.

Your lead character is John Cooper, a bounty hunter hired by Twinning's Railroad to sort out some train robbers, led by El Diablo. Cooper eventually recruits other team members to help on this quest, each with unique skills. With 25 intricately drawn maps reproducing the desert town of the old West, it certainly looks very cool, with its saloons, barbers and a variety of other frontier town buildings.

The game is a lot like Commandos Behind Enemy Lines, due to an interface that is virtually the same, as well as some very similar looking visuals. The ideas of characters being able to sneak up and kill someone with a knife then drag the body off to hide it only serves to reinforce Commandos' influence on the game. Having said this, Commandos was good and being able to play a Spaghetti Western version certainly sounds quite appealing.

Spellbound's website for Desperados was still under construction at www.spellbound.net/deathvalley.htm as we went to press, but may be up and running when the issue hits the streets – otherwise search for 'Infogrames Desperados' to find info and pics.

SCOTT MONTGOMERY

Sacrifice

Shiny has re-invented the real-time strategy game, with what has all the hallmarks of a classic

The fevered imaginations at Shiny (Earthworm Jim, MDK and Messiah), have set themselves the task of re-inventing the real-time strategy game. Their answer to this particular challenge is Sacrifice, a heady mix of the tried-and-tested RTS format blended with elements of role-playing and action adventure games.

Basically, you choose to play one of a wide variety of wizards in the employment of five warring oddball gods. You choose which god to work for, which in turn determines the spells at your disposal, and switching allegiance adds new spells to your arsenal.

At the start of the game you're armed with a basic selection of spells and have an altar built over a Mana fountain. Mana is your source of power and can be drawn from any of the Mana fountains that dot the bizarrely surreal landscape. By building manaliths – a structure to tap a mana fountain – and summoning up special mana channelling creatures you ensure your powers are constantly replenished. Even death only slows you down, as you are only totally defeated when your altar has been desecrated – which is also the means of defeating opposing wizards.

The other main resource in Sacrifice is souls. On finding a blue soul floating above a body you can absorb it and use it to conjure up a new creature. If, however, you come across a red soul – which signifies a heathen soul – then you must convert it before using it.

Once you have enough souls you can start building your army choosing from a bizarre menagerie of creatures including winged shrikes, druids and rangers; each with their unique fighting strengths.

In fact, it's in the fighting that Sacrifice differs most from other RTS games. Shiny has purposefully simplified the resource management element of the game in favour of combat. Essentially, as long as you have a decent source of mana and have no trouble acquiring souls, you should be well equipped to take on any rival wizards in the area. However, a long set of tutorials and an initially perplexing range of elements means it will take you quite a while to become a proficient player.

Between each realm you enter the ethereal plane of existence where the gods beg for your help. It's here that you pick up new 'missions', which build into a campaign consisting of 10 levels. With 46 scenarios to choose from and the option to align with any god for each, it will take a while for Sacrifice to grow stale.

The 3D graphics of the game are undeniably excellent, with beautiful rendering of the undulating hills and lush trees of the realms. If there is any complaint with the game it is with the camera. It is constantly tied to the wizard meaning you can only see part of the battlefield at any one time. It also means you can't monitor any units that aren't close to the wizard, which considering the size of the levels is a bit of a handicap. A mini-map in the right-hand corner of the screen goes some way to remedying the problem, along with a teleportation spell that can transport you and your minions to any of your buildings on the map.

Sacrifice has an intuitive interface, some very impressive 3D graphics and, along with the inclusion of a level editor and an online multiplayer option, it has all the makings of a cult game.

ANDY STEWART

DETAILS

★★★★★

RECOMMENDED PERSONAL COMPUTER WORLD

PRICE £39.99 inc VAT
CONTACT Interplay 020 7551 0000
www.interplay.com
SYSTEM REQUIREMENTS Pentium II 266, 64MB of RAM; 2MB video card; four-speed CD-ROM; Direct Sound-compatible sound card; Windows 95, 98, Me, 2000

B-17 Flying Fortress 'The Mighty Eighth'

If you've ever wanted to know what it was like to fly a bomber in WWII, then this is the game for you

B-17 Flying Fortress is a game of stainless steel planes, roughly painted with scantily clad ladies, flying bombing missions over Europe in World War II – and it contains some of the most incredible visuals seen in a combat flight simulation.

You fly in a Flying Fortress, with the ability to control any of the crew members at any point. You select the crew member you want to be and you can look through his eyes and perform

his job. What this means is you can be the pilot on take-off, a gunner in a battle and/or the bombardier on the bomb run. And if this isn't enough for you, you can jump into the cockpit of attacking enemy fighters where you can try and shoot down your own bomber or take the controls of a US fighter to defend your bomber. The animation is excellent, with crew squeezing through the intricate innards of the aircraft to take up a new position.

The visuals are jaw-dropping because you can view your plane internally as well as from any angle externally, and the developers have also made sure it is as realistic as possible. The B-17 was known for its ability to remain in flight after taking a tremendous amount of punishment from flak and enemy fighters. To reflect this, damage modelling has been meticulously recreated: holes blasted through wing tips or the tail section reveal the inner struts of the aircraft. And this damage isn't only visible from outside. If the fuselage has been shot up you can see this in the internal compartment views as well. Visually, everything has been considered, from simple things like vapour trails from the planes as they climb above 20,000 feet to propeller blades bending back in the classic way during crash landings – excellent! So how does it play? Slowly.

B-17 is not a game of jumping into your aircraft and engaging your enemy within minutes of taking off, although there is a kind of quick combat option. Instead, it is an accurate recreation of what US bomber crews would have experienced on their bombing missions, namely about five and a half hours of boredom followed by about 10 minutes of hoping the flak doesn't get you, interspersed with intermittent four-minute sessions where you endeavour to fight off waves of enemy fighters.

When a call squawks over the radio that bandits are coming in from six o'clock high you can move into a gun position. You know the fighters will be

flying through the bomber formation, so you line your gun up pointing in the direction they will come from and then wait. If you're lucky you'll see one of the attacking planes flash through your field of view and get off some rounds. If you're really lucky you'll hit them. Unfortunately, more often than not nothing will pass in front of your gun's firing arch… frustrating. Externally, these battles look incredible, although from outside you are a pure spectator without even the possibility of affecting the course of the battle.

Overall, B-17 is as realistic a portrayal of a WWII bomber as you're likely to see. It looks spectacular and is incredibly versatile. If you've always wanted to be part of a bomber's air-crew without the risks involved in actually being there, this game will definitely appeal. For most people though, B-17 will leave them feeling like passengers on a long-haul flight with not much to do. The fourth star is for the graphics.

SCOTT MONTGOMERY

DETAILS
★★★★
PRICE £29.99 inc VAT
CONTACT Microprose 020 8569 1234
www.b17flyingfortress.com
SYSTEM REQUIREMENTS Pentium II 300MHz (400MHz recommended); 128MB of RAM (256MB recommended); CD-ROM; 700MB of free hard disk space; DirectX 7-compatible video card; Windows 95, 98, Me

Sudden Strike

It may not be as fast as some RTS games, but it will keep you on your toes

When it comes to real-time strategy, the tendency is to set the game in either the future, an alternate reality or in a science-fiction universe. So it is a refreshing slant on the genre to see Sudden Strike appear on the scene. You are in command of military units in World War II, specifically within the European theatre.

This is an intricate and exacting reflection of war in the middle of the last century, with vehicles from all sides meticulously recreated to give the game an extraordinary look and feel of authenticity. The only problem is, by comparison to other RTS games of recent times, the whole game seems remarkably sluggish. But then Sudden Strike is endeavouring to be not just an RTS title, but also, in part, a simulation.

There are options for playing either a single or a multiplayer game, with the option to control the Allied, Russian or German forces. The game map is an isometric rendition of a WWII landscape with an incredible level of detail represented in the buildings and fortifications. And everything you see on the map can be destroyed. One disappointing aspect is that each map terminates in a black edge rather than continuing beyond the area of any given mission. The landscape could easily have run on outside the mission area, which would have made the scenarios feel less like isolated free-floating landscapes. This small niggle aside though, both the map and the vehicles are brilliantly rendered – and as the units are sprites, the game will run well on lower specification machines while maintaining the quality of the visuals.

The interface to the game is very intuitive, keeping the complexities of controlling your troops to an absolute minimum. The mouse can be used to control the whole game, although issuing orders from some keyboard commands, along with assigning groups of units to specific hotkeys, keeps the game moving fluidly. The main interface comprises a mini-map, around which are areas for orders relevant to the currently selected unit(s) and areas for calling in air support. As you would expect, the game is basically a case of selecting a unit and giving it orders. One useful feature is that you can stack orders. So if you want a truck to move four gun batteries to various tactical spots, you just give the orders one after the other and the truck will merrily carry out the orders.

Sudden Strike does not lend itself to tank rushing or overwhelming your opponent with greater numbers. There is no harvesting of resources, or building of units, so what you have available at the start of a scenario is not merely expendable cannon fodder. As a result, utilising reconnaissance aircraft is a must, as is shelling a position before committing ground troops.

Overall, Sudden Strike will appeal to the hardened RTS fan. It doesn't have the pace of Red Alert 2, but is tactically quite interesting despite this.

SCOTT MONTGOMERY

DETAILS
★★★★

PRICE £28.99 inc VAT
CONTACT Gameplay.com 0113 234 0444
www.suddenstrike.de/english/index_news.htm
SYSTEM REQUIREMENTS Pentium 233MHz or higher; 32MB of RAM; 100 per cent Direct Sound-compatible sound card; four-speed or faster CD-ROM; 150MB of hard disk space; Windows 95, 98, 2000 or NT

Cultures

Help a Viking village to restructure its community in this absorbing management game

Cultures is a quite incredible game, not only because it looks brilliant, but also because it is as addictive as any management game you'll probably ever have played. The object of the game is simple: to guide a Viking community as it endeavours to find six pieces of an asteroid that are spread over North America. They must find these pieces of asteroid because they believe this will bring harmony to their village, which is in disarray, having had its crops decimated by floods.

The opening animation tells how the harvests have been destroyed by the rains, leaving the community in disarray. This is the first sight of the game's characters. Admittedly this is a cut scene, although thankfully the actual in-game characters are detailed enough to still achieve this look despite being only about a centimetre in size on screen. Each of the characters looks slightly different; with the colour of their hair or the way they wear their beard giving each a unique physical appearance.

Cultures is a total management experience. Every aspect of your Vikings requires your attention, from what they do, where they do it and when they eat,

to when they marry, when they have children and what sex the children are. The basic means of advancing characters is to assign a task to them, which after a certain time they become masters of. In this way your populous moves from being simple builders or scouts, to skilled workers such as bakers or brewers.

This advancement allows your community as a whole to construct the next level of buildings concerned with production of food, so you can then build a mill and send your master farmer to work there. This character then becomes a miller. In this way your characters become unique because they do not lose any of their skills, but rather add to them, making them more versatile in the community. For instance, a brewer will hold diplomas as a baker, a miller and a farmer – which also means he can work well in any of these trades.

Having said this, only men have trades and skills. In a rather misogynistic slant to the game, the women only stand around chatting, want to get married, provide food for their husbands and produce children. Equality does not figure in this representation of Viking life…

There are various play options, including four tutorials and some easy games to get you started. The first tutorial leaves you thinking that the game is quite slow. This is because there are only a few Vikings to control – and considering you're learning the interface,

it is a good idea that the initial pace is slow. When you progress to one of the simple games and have maybe 20 characters to control, you realise it's not such a slow paced game at all, as you try to make sure everyone is doing the right things and has a place to live, a job, etc. The control interface is alarming at first, although with about an hour's play you have pretty much got the basics under control.

The game is absorbing to the point that your eyes will sting. Your community grows as you build the various houses and roads you need. There is even a school you can build to educate your Vikings in skills the community as a whole has attained. This allows you to advance quicker and specifically train subjects in relevant skills. If you liked The Sims then you'll want to have a look at Cultures.

SCOTT MONTGOMERY

DETAILS
★★★★★

PRICE £29.99 inc VAT
CONTACT THQ **www.thq.co.uk/cultures**
SYSTEM REQUIREMENTS Pentium II 266MHz (400MHz recommended); 64MB of RAM; DirectX 7; Mouse; CD-ROM drive; sound card; Windows 9x/2000

Rune

Close quarters gore-fest that's guaranteed to have your mouse in tatters

Rune is a gore-fest where mêlée weapons are the only ones available. You play the part of Ragnar, a Viking warrior, who is brought back from the dead (by Odin himself) to avenge the death of his father and the other warriors from his village. The game involves your travels through 25 levels to destroy those who are responsible. These travels take you through various village and cave levels, as well as – quite literally – to hell and back.

What makes Rune unique is it's weaponry. The only long-distance attack comes from you throwing your sword, club or axe. This usually inflicts a bit of damage, but won't floor your opponent. Rune power provides special weapon functions, but this still involves close quarter combat.

The game looks stunning, Ragnar looking especially cool as his chest

heaves with his breathing. His weapons are located in his belt and on his back, so there is more realism than in games where the weapons miraculously appear as you cycle through them. The game environments are also extremely well rendered. Heat shimmer from lava looks especially good.

So is it a great game? Well, kind of. It is very linear, and being able to beat your opponent with his own dismembered arm isn't really enough to make up for this. Having said that, it is enjoyable enough and looks great. If you can sacrifice a mouse and are into third-person games, Rune may well be worth hacking through.

SCOTT MONTGOMERY

DETAILS
★★★★

PRICE £29.99 inc VAT
CONTACT Take 2 Interactive 01753 854 444
www.take2games.com
SYSTEM REQUIREMENTS 300MHz CPU (450MHz recommended); 64MB of RAM (128MB recommended); 8MB 3D accelerated graphics card; DirectX compatible sound card; 88MB of hard disk space (500MB recommended); four-speed CD-ROM (eight-speed recommended); Windows 95, 98, Me or NT (Service Pack 3 or higher)

Star Trek Deep Space Nine – The Fallen

The worst thing about a good game is finishing it. Yes, you can bump the difficulty level up to its hardest and play it again, but the magic has gone because you know what to expect. Replayability of games is a problem facing developers. Valve tackled the issue with a novel approach in Opposing Force, the sequel to the excellent hit Half-Life. But you had to buy the sequel for this new slant on the game. And this is exactly where developers The Collective have really given the gamer what they want.

The Fallen is three games in one, or more accurately you can play one of

three characters (Sisko, Worf or Kira from *DS9*) through an intermingled narrative. For example, if you're Sisko, you're soon on an away mission to save Bajoran crewmen from a heavily damaged ship, during which you'll get a radio message saying *The Defiant* is under attack. In the Worf missions, you are on *The Defiant* as this attack occurs, communicating the details to Sisko on his away mission. You don't play all three characters at once though. So you can play the game three times over 40 maps and it will be different each time.

The gameplay is fast and furious, with enemies that take a lot to beat or outwit. The gameplay is also satisfyingly difficult from the start, so be prepared to see Worf beaten to death by robots a few

times before you work out the required tactics. The Unreal Tournament engine driven graphics are spectacular, and with the replay options, this game will be a huge hit with *Star Trek* fans and action gamers alike.

SCOTT MONTGOMERY

DETAILS
★★★★★

PRICE £29.99 inc VAT
CONTACT Koch Distribution 01256 707 767
www.kochdistribution.co.uk
SYSTEM REQUIREMENTS Pentium II 233MHz; 64MB of RAM; 100MB of hard disk space; CD-ROM; video card; sound card; Windows 95, 98, NT

Starship Troopers

Making the transition from movie to game is not easy, but this is one of the better ones... and it's not for the faint-hearted

Starship Troopers is full of bugs. Not the ones that instigate 'blue screens of death', but those of the menacing kind from the movie of the same name, and in Robert Heinlein's original 1959 novel. The scenes of arachnid carnage are in keeping with the movie, and for once the transition from movie to game has been pulled off rather well by Australian developers Blue Tongue Software.

The story kicks off with a cut scene of the Mobile Infantry landing on the surface of the bugs' homeworld of Klendathu. From here you are under orders from the Federal Network to locate the creatures' tunnels and destroy them, and any rogue arachnids that you and your squad meet along the way.

Quite a task is ahead of you and if you're not into real-time strategy (RTS) games then it may not be for you. On the other hand, if you want to take the plunge and give it a go it's well worth taking time out to run through some of the training courses offered by the candidate training school.

Once you're up to scratch, you should find your team is better prepared to face the onslaught of the bugs. In the ensuing battle it's down to you to command and deploy your troops in the most effective way for a given mission. Moving your troopers is pretty simple and is a case of point and click – click on a region of the landscape and your team loyally advances to that point. You can also select commands from the interface but you have to be quick as the game runs at a fair speed.

As for weaponry, you can arm your squad with plasma guns, grenade launchers and morita light rifles. Each has its advantage so be sure to choose the right weapons before 'clicking' on an arachnid. Unlike other games based on the RTS format, there's no resource gathering so units aren't expendable.

The 3D landscape is impressive and by using the mouse, you can zoom down to the level of your troops or take a panoramic view of the horizon with its valleys, gorges and cliffs. The rest of the graphics in this game are equally impressive. This is due to the smooth animations that are immediately recognisable from the film, and transform and lighting (T&L) – for those with cards that support it. The latter is particularly evident during night missions, where explosions and weapon fire light up the surroundings. All these effects need a machine and graphics card that's up to the job.

In total there are 20 missions to complete, containing all the familiar bugs from the film. You must complete them in order, as there is a narrative structure with cut scenes between each mission, after which you arm and enter the mission.

If you've seen the film and you're into RTS games then Starship Troopers is definitely worth a look.

JALAL WERFALLI

DETAILS

★★★★★

PRICE £28.99 inc VAT
CONTACT Microprose 020 8569 1234
www.stta.com
SYSTEM REQUIREMENTS Pentium II 233; 64MB of RAM; 8MB; 300MB of hard disk space; DirectX v7.0a compatible graphics card; sound card; 4x CD-ROM; Windows 95, 98

Rainbow Six: Covert Ops Essentials

The supposed nine new upgrade missions fail to live up to the performance of the original

Rainbow Six: Covert Ops Essentials is, unfortunately, a disappointing package. This is because the originals were so good that this attempt at cashing in just feels like we've been short changed.

The first example of this comes from the bundled missions. The packaging claims that there are nine new missions, but six of them are tiny training missions, leaving just three proper missions to feed the combat hunger. Even then, these missions have disappointments in that they contain all of the same problems as the previous incarnation of the game:

Rogue Spear. The Jungle level highlights this best, as the enemy are cunningly camouflaged and blend into the background. Unfortunately, this degree of invisibility isn't reciprocated in your team. We may as well have been dressed in bright pink leotards, because the enemy had no trouble seeing us to machine-gun us down.

Ultimately, we had no choice but to switch on auto aiming, which sadly did not have the effect of making the level really easy to complete. Fortunately, the remaining two missions were a lot better, allowing you to glean some enjoyment as it starts to become fun, rather than irritating.

There is a second disc bundled called 'training', but this disc is only packed full of information and video clips of real-life terrorist and covert operations. Sitting over the top of this information is a set of quizzes designed to test the player's knowledge of counter-terrorism. This is

disguised as a proper examination that real operatives would take. Unfortunately, while the information is well written, the interface controlling it is appalling, which quickly made us want to give up.

With a level editor on the way it shouldn't be long before there are new missions aplenty on the Internet. Unless you just can't get enough of Rainbow Six, we'd suggest waiting until then and get all the upgrades you'll ever need for free.

DAVID LUDLOW

DETAILS
★★★

PRICE £24.99 inc VAT
CONTACT Ubi Soft 020 8944 9000
www.ubisoft.com
SYSTEM REQUIREMENTS Pentium II 266 (Pentium II 300 recommended); 32MB RAM (64MB recommended); 4MB OpenGL or Direct X compatible graphics card; Direct X 7 compatible sound card; Windows 95, 98, 2000

Swat 3 – Elite Edition

Multiplayer support makes an appearance in this upgrade

There were a lot of disappointed gamers out there when Swat 3 was originally released, and it all came down to one thing: no multiplayer support. This issue has now been addressed with the release of Swat 3 – Elite Edition.

The game itself is in no way any different from the original, except for that one little issue with the original launch. This is a great add-on but why would you pay the full price for the game if you already own the original? Well, you won't have to, because Sierra has made the multiplayer add-on patch available for download from its website.

It is a rather massive download at over

50MB and is not available in partial downloads. Nothing has been added to the single-player gameplay side except for a few bug fixes, but that is to be expected as the main change since the original is the multiplayer add-on.

Sierra has gone with the flow and added co-operative as well as death match multiplayer options. The only thing we have to say about the death match option is that there has to be a few players to make it enjoyable, since it takes a little while to find your opponent if there are only two players.

In co-operative mode you and your friends have to complete similar missions to those found in single-player mode, but hopefully with some more intelligent companions than the computer can provide. Swat 3 is starting to look a bit dated now and the game interface can be a bit quirky at times.

But if you liked the original game you'll probably enjoy the add-on, at least if you can get it for free.

In our opinion Sierra should have released a CD with the multiplayer add-on at a discounted price for owners of the full version of the game.

LARS-GORAN NILSSON

DETAILS
★★★

PRICE £29.99 inc VAT (free download for owners of Swat 3)
CONTACT Sierra Online 0118 920 9100
www.sierra-online.co.uk
SYSTEM REQUIREMENTS Pentium 233 or better, four-speed CD-ROM, Windows 95 or better, 32MB of RAM, 256 colours, supports a variety of 3D cards, DirectX-compatible sound card, mouse, keyboard

WIN!

GATEWAY SOLO 1150

Gateway and *PCW* are giving away a fantastic prize this month to celebrate the launch of Gateway's Solo 1150 notebook.

If you thought notebooks were just for businesses, think again. The Solo 1150 is the latest in Gateway's range of portable computers, and is designed to meet the needs of both home and business users. It's ideal for studying, gaming and working, and at just £1,099 it won't break the bank.

The Solo 1150 has an attractive, curvy case with rubber at key points to protect it from damage. Connecting peripherals to the USB ports is quick and easy, while an integrated modem, preconfigured with Gateway's Internet service Gateway.net, lets you get online and access email and the Internet when you need to.

Inside is an Intel Celeron 550MHz processor, 64MB of RAM, a 6GB hard drive, 24-speed CD-ROM and a floppy disk drive. The screen is a 12.1in TFT model.

The Solo 1150 is perfect if you're looking for a fun, stylish, practical portable, without compromising on features and performance.

If you would like more information on the Solo 1150 and other Gateway products, you can visit the Gateway website at www.gateway.com/uk, contact Gateway direct on 0800 55 2000 or visit one of the 18 Gateway Stores now open in the UK.

However you choose to buy, Gateway will help you to customise a high quality system that's as individual as you are.

■ *For a chance to win a Gateway Solo 1150, just answer this simple question and follow the 'How to enter' instructions opposite.*

What is the name of Gateway's Internet service?

How to enter
Fill in the coupon(s) and send to the following address by 30 January 2001:
February competition
Personal Computer World
VNU Business Publications,
32-34 Broadwick Street,
London W1A 2HG
Or email the answer, your name, address and daytime telephone number to us at
pcw_competition@vnu.co.uk
Please state in your email if you DO NOT wish to receive information about other products and services from VNU Business Publications Ltd, and if you DO want your details to be passed to other carefully selected companies for marketing purposes.
◆ *Competition open to UK residents only*

Rules of entry
This competition is open to UK readers of *Personal Computer World*, except for employees (and their families) of VNU Business Publications and Gateway. *PCW* is the sole judge of the competition, and our decision is final. No cash alternative is available in lieu of prizes.

Brother competition winners
The winners of December's competition are: Ralph Smith of Prestwich, John Kent of Fulham, A Evans of London, Mike West of Chandlers Ford, R Spinney of Chipping Norton, Christopher Bingham of Sittingbourne, E Owen of Hayes, Terry Cymbalisty of Woking, T Corbitt of Nunthorpe, and Gerard Lynch of Harpenden

PCW February 2001 Gateway competition entry form

Name:

Email address:

Daytime telephone number:

Address:

Answer: Gateway's Internet service is called:

• *Please tick here if you DO NOT want to receive information about other products and services from VNU Business Publications Ltd* ❑
• *Please tick here if you DO want your details to be passed on to other carefully selected companies for marketing purposes* ❑

Colour chaos

The day after Dreadnought Bathroom Supplies had held its annual dinner-dance, six enraged customers phoned to complain that the six supposedly matching elements of their new bathroom suites had in fact been delivered in six colours: avocado, dove, lemon, mango, peach and rose.

At 9.35am, Fenella, the DBS receptionist, contemplated the full complaints sheet and hoped that she would remain undisturbed until home time. The calls had started at 9.05am and had come at five-minute intervals. She noticed that in some consecutive boxes on her sheet the initial letters of the colours spelt out words.

The Soap family had PAR in their row of colours and the same word also appeared in a column. The Faucett family had LAD in their row and the Lathers had PAD. There was LAMP reading somewhere down the shower-tray column and LAP was to be seen in another column. The Waters family phoned some time after the Soaps, but 15 minutes before the Lather household. The Tubbs family had been sent a lemon bath and they phoned some time before the Faucetts and some time after the Flannell family. The peach bidet was noted 10 minutes after the rose cistern, but 10 minutes before the mango basin. The dove lavatory was noted 10 minutes after the peach basin, but 10 minutes before the avocado bath.

If you can complete Fenella's complaints sheet you could win a copy of Encarta Reference Suite 2001.

Send the answer, along with your name and an address where you would like the prize to be mailed, on a postcard to: *PCW* Prize Puzzle (February 2001), VNU House, 32-34 Broadwick Street, London W1A 2HG, or by email to: letters@pcw.co.uk.

Answers should arrive no later than 20 January 2001. Please note that we DO NOT open attachments.

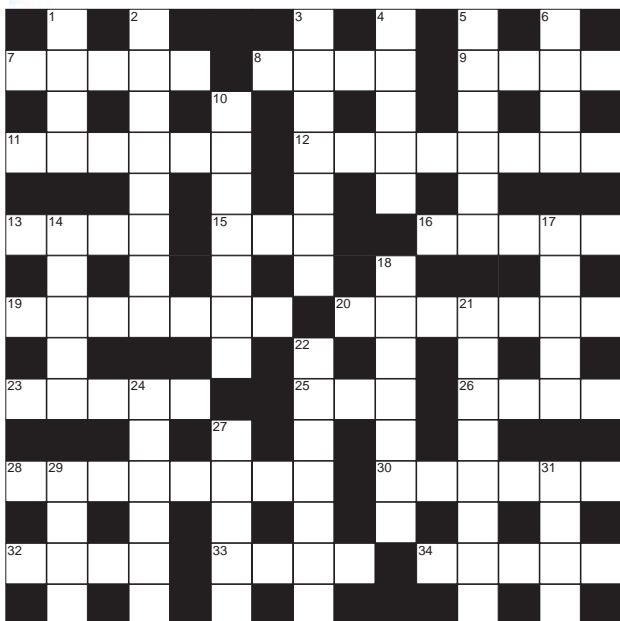| Time	Customer	Basin	Bath	Bidet	Cistern	Lavatory	Shower
9.05							
9.10							
9.15							
9.20							
9.25							
9.30							

November's Prize Puzzle answer

The solution to November's puzzle is:
Carly, south side, tumbler, 60.
Danny, west side, unicyclist, 140.
Darren, east side, juggler, 120.
Lisa, centre, mime artist, 30.
Wizzo, north side, magician, 80.
Congratulations to this month's winner, Mike Berry from Dudley.

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prize crossword

Each month, one lucky *PCW* Crossword entrant wins a copy of the *Chambers 21st Century Dictionary*. The December crossword stumped you with no-one getting the right solution, so no winner this month! You could be a winner. Send your completed crossword to: '*PCW* February – Prize Crossword', VNU House, 32-34 Broadwick Street, London W1A 2HG, to arrive no later than 20 January 2001.

• *Please state clearly on your entry if you do not wish to receive promotional material from other companies.*

ACROSS

7 Monospace font measure (5)
8 __ halt, unrecoverable machine stop (4)
9 Terminates a task (4)
11 Updates a database, eg (6)
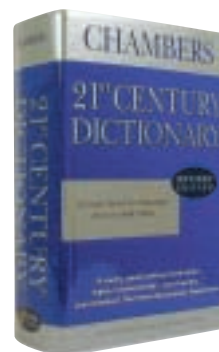12 Customized a system (8)
13 One trillionth (abbrev) (4)
15 Pascal-based language (3)
16 CD-ROM interface for PCs (5)
19 Logically grouped in a drawing (7)
20 Transistor's charge carrier source (7)
23 Electrical switch (5)
25 __ key, program switching keystroke (3)
26 Embed a table in a table (4)
28 Sets a program in place (8)
30 Throws out the video (6)
32 Dead keen about IT? No! (4)
33 __ Art, public domain graphics (4)
34 Parents' program blocking service (1-4)

DOWN

1 Unshakable (4)
2 The tibia (4-4)
3 Groom's aid (4,3)
4 Own up (5)
5 Tourist centre (6)
6 Lazy (4)
10 Breaks out of jail (7)
14 Furious (5)
17 Literary verses (5)
18 Neglected (7)
21 Trend (8)
22 Car frame (7)
24 Film director's cry (6)
27 Very dark (5)
29 One over the eight (4)
31 Pleasure tour (4)

Solutions to January's crossword

ACROSS
7 Algol 8 Grid 9 User 11 Status 12 Floating 13 Atto 15 AOL 16 Trace 19 Entered 20 Data Bit 23 Drift 25 INT 26 Amps 28 Amending 30 Return 32 Vine 33 Loop 34 Eniac

DOWN 1 Flat 2 Porthole 3 Profile 4 Idiot 5 Guitar 6 Keen 10 Estates 14 Tenor 17 Chimp 18 Lantern 21 Adapting 22 Kingdom 24 Finger 27 Villa 29 Main 31 Road

The death knell sounds for programming, and the first ergonomic mouse makes an appearance

20 YEARS AGO **February 1981**

Back in 1981, *PCW* ran with the world exclusive, 'At last – the end of programming?' This was a patriotic report about a 'program that wrote programs', aptly called The Last One. Developed by David James and Scotty Bambury from Somerset, it was set to revolutionise programming. Back then people called it a program editor, but it wasn't as limited as RPG, FILETAB or even PERL. It was easy to learn, and free from acronyms, abbreviations and codes. All input was in plain English and only the results came out coded. Once the design details had been keyed in to The Last One, program generation took only minutes. *PCW*'s David Tebbutt was quite excited about this – for not only was it original, it was British.

Up for bench testing was the Vector Graphic VIP. Conforming to the popular style at the time, it was a computer within a VDU. Our reviewer Stephen Withers liked the way the machine looked and its ease of use. Running CP/M over the six-slot S100 motherboard, he found that the VIP was a solid performer and can also be upgraded, but didn't offer value for money at £2,125.

And for the gamblers out there, Alan Green took a look at using the PET system to beat the bookies at their own game. The program in question allowed you to run a complete race meeting where you acted as race organiser, bookmaker and information service. Needless to say, if you invited your friends to place real money bets you would actually make a profit.

15 YEARS AGO **February 1986**

Dropping in on the front cover was Apple's new model, the Macintosh Plus. This latest Mac was Apple's answer to criticisms directed at the original Mac, primarily, that it had insufficient memory and disk space, and a slow disk drive. In light of the competition from the Amiga, ST and even the IBM PC, would it please *PCW*'s Nick Walker? Externally it was much the same as the original Mac, but internally Nick

found that the RAM and ROM had been upped to 1MB and 128KB, respectively, while the internal disk drive came with double-sided disks, giving 800KB of disk space and twice the performance. With extra software changes such as the control panel and the ability to format disks into the hierarchical filing system, the quicker Macintosh Plus gained Nick's favour.

Peter Jackson reported on Comdex/Fall 15 years ago. While Comdex is usually full of glitter and razzmatazz, the excitement at the 1986 event was distinctly muted, fuelled by the fear that the industry was entering a battle for survival. Nevertheless, there were some highlights. At IBM's enormous stand was a wall-hangable, plasma panel display for the PC, giving a 17in diagonal screen, and 960 x 768 resolution. Over at Tandy's set-up was perhaps the biggest launch at the show – an AT lookalike called the 3000, priced at an aggressive $2,599. It used an 8MHz 80286 processor, 512KB of RAM and had eight free expansion slots. Tandon, Mountain, Western Digital and Plus Development all demonstrated their versions of a hard disk drive mounted on a single PC add-on board.

10 YEARS AGO **February 1991**

Ten years ago, the Qubie 486/25 faced the AST Bravo 486-25 in what appeared to be a fencing match, competing with each other as 'Cheap 486 Rivals'. *PCW* writer Peter Jackson tested the machines against each other, in a challenge of the 'name-brand' PC vs the 'assembler'. Performance-wise, Peter concluded that the two machines were practically identical, despite the Qubie's slightly faster hard drive and the AST's superior memory read and write operations. However, he concluded that the Bravo, was more affordable than the Qubie, which consisted of more expensive parts, resulting in a more expensive buy in the long run when the machine needed replacements and/or upgrading.

1991 saw the debut of Logitech's MouseMan series of newly designed ergonomic mice. These were geared towards reducing the growing number of office and home computer users who were developing Repetitive Strain Injuries due to badly designed mice. Chris Cain

recommended the MouseMan highly in his article exploring the history of the mouse, first used as part of the Apple Lisa system.

Before there was spam, there was junk snail mail, that as we all know still exists in abundance. In his examination of the Data Protection Act, Geoff Wheelwright pointed out that the proliferation of PCs in the 1980s made it easier for companies both large and small to conduct direct mail campaigns. We wonder which he thinks are worse now – credit card applications received repeatedly in the post, or emails telling you how to make money fast.

5 YEARS AGO **February 1996**

If *PCW* told its readers today that the best modem it could recommend was rated at 28,800bits/sec, it would probably lose most of its subscribers quicker than you can say 'connect'. Five years ago, though, top-quality V.34 modems graced our cover with promises of faster connections and fax capabilities than ever before. In his review of 15 modems, Geoff Marshall gave the highest praise to the Motorola 3400 Online, citing it the best value for money, with a good set of security features and excellent fax performance.

Lately it seems that practically every audio CD is enhanced with some kind of eye-stimulating feature. *PCW*'s George Cole investigated this growing trend by spinning CDs by artists as diverse as Sarah McLachlan, The Cranberries and Mike Oldfield, on his CD-ROM drive. Features on these enhanced CDs included videos, along with performances, lyrics, short interviews and even a guide to Ms McLachlan's tour, in which she talked about each of the places she visited. Some music lovers may find these enhancements excessive, but to the ultimate fans, they can be gems.

Finally, in ChipChat, *PCW* took a look at brewer Carling's new website, which was supposedly 'dedicated to the best league in the world'. We wondered how many football fans actually owned a computer or a modem to access the site and receive all the pleasure and joy it had to offer?

JANET HEIL AND JALAL WERFALLI

Sinclair QL

Sir Clive's bid for the business sector took Sinclair computers leaps and bounds beyond the ZX

While Apple readied itself for the launch of the first Macintosh, another quantum leap in personal computing was taking place on our side of the Atlantic. Sir Clive Sinclair, flushed with the unprecedented success of the ZX80, ZX81 and ZX Spectrum, was about to see if he could work his magic in the business market.

Launched in 1984, the Sinclair QL (short for Quantum Leap), certainly was a significantly different platform to the ZX models that preceded it. Abandoning the Z80 CPU employed by each ZX, the QL instead opted for the far more serious processing muscle of the Motorola 68000 – in this case, a 68008, running at 7.5MHz, with the help of an Intel 8049 to control the keyboard among other housekeeping. 128KB of RAM was fitted as standard, expandable to an impressive 640KB. Not a bad package for £399 including VAT.

The graphics weren't bad either. 32KB of main system RAM was reserved to drive the display at 512 x 256 in four colours, or 256 x 256 in eight, while UHF and RGB outputs ensured you could either use a conventional TV set or a proper monitor.

Joining the two display outputs were a pair of proprietary network ports, two joystick and two RS232 serial ports. Most (in)famously of all, the QL featured a pair of Sinclair's own Microdrives, which first debuted on the ZX Spectrum/ Interface 1 combination. The proprietary Microdrives employed tiny removable cartridges, packed with a continuous 200in loop of tape. Each cartridge was capable of storing 100KB of information, and up to six more drives could be daisy-chained onto the system.

The QL case itself continued the Sinclair tradition of a dark plastic finish and somewhat peculiar keyboard. While a huge improvement over its squidgy predecessor, the QL keyboard still had a squishy feel to it, and the untilted, flat surface proved slightly uncomfortable for long typing sessions. On the upside, it was the first Sinclair machine to feature 'proper' Ctrl, Alt, Esc and no fewer than five function keys.

A machine lives or dies by its software support, and Sinclair ensured every QL user could get straight down to business with the contents of its 48KB of ROM. QDOS, was arguably the first pre-emptive multi-tasking operating system in its class, while the SuperBASIC programming language had a far greater capability than the, well, basic BASIC which came with the ZX models.

Much more exciting was the specially developed application suite from Psion, which consisted of a word processor (Quill), spreadsheet (Abacus), business graphics (Easel) and database (Archive). Each application could be quickly mastered for simple tasks, or quite easily

The Sinclair QL featured several accessories to soup up its performance

take on much more complex projects, particularly the database.

The QL's small but dedicated user base also ensured a life beyond Sinclair's standard configurations. Sir Clive may have chosen to fit Microdrives and neglect parallel ports, but that didn't stop third-party floppy and printer adaptors, not to mention all manner of souped-up accessories.

One of the most popular was Miracle Systems' Gold Card, a small circuit board consisting of a 16MHz 68000 processor, 2MB of RAM and a battery-backed clock. Pop one of these in your QL, and you could enjoy performance of up to four times that of the standard model. Quicker still was the Super Gold Card, boasting a faster 68020 processor,

4MB of RAM, a Centronics printer port and support for four disk drives.

Then again, why bother upgrading the original QL hardware at all? A popular option for PC-owning QL-junkies was the QXL card. This took a 68EC040 processor with 8MB of RAM and popped them on a standard ISA expansion card. Slotted into a standard PC, it could share the PC's keyboard, mouse ports and drives, and speed through QL software at a rate of knots.

Just when you thought it couldn't get any faster, how about the new Q40 card, featuring a 40MHz 68040 processor, with two 72pin SIMM memory slots, 1MB dual-ported video RAM, support for digital sound, 16bit XGA graphics and even an EIDE hard disk controller? Operating system support includes QDOS classic (seen in the Amiga QL emulator), SMSQ/E (supporting the superior graphics modes) and even a version of Linux. The Q40 card doesn't, however, sit inside an old QL case or even in an existing PC expansion slot. Instead, it's designed to fit inside a standard PC AT case, and is available now for £330 with 16MB and QDOS classic.

While most classic computers of the Eighties exist almost exclusively in software emulators, it's testament to the QL's certain *je ne sais quoi* that sees it enjoying life with dedicated hardware support that's still being developed today. Check out Q Branch (www.qbranch. demon.co.uk) for information and sales on a number of QL products.

GORDON LAING