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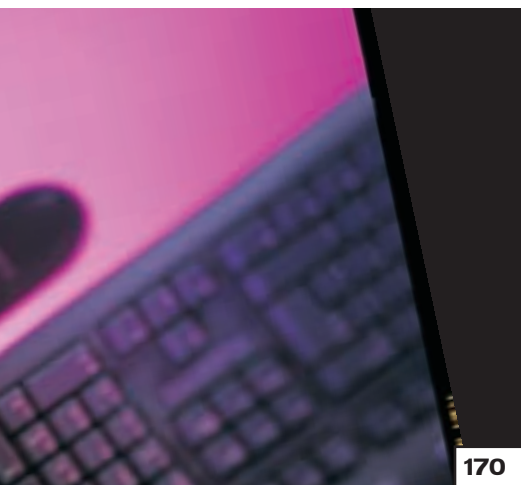


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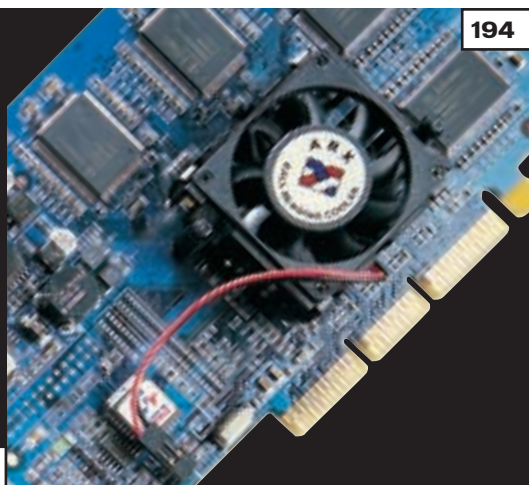


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As long as there's healthy competition, the future of the virtual 3D market should be groundbreaking

The third dimension



If you read the graphics card group test in this month's issue (p194), you'll find that the next generation of 3D accelerators are well and truly with us, producing the kind of images that you would have needed a Cray supercomputer for not too

many years ago. It seems as if the race for the ultimate graphics solution is getting as cut-throat as the race for the fastest CPU.

With nVidia selling its GeForce2 GTS chip to just about every potential graphics board manufacturer, it's hard to imagine that it won't become the most prevalent graphics chipset in the market. Obviously there's still competition from the likes of ATi, Matrox and 3dfx, but the market has shrunk substantially over the past couple of years. It wasn't too long ago that you would have seen graphics chips from S3, Cirrus Logic, Number 9, Tseng, Rendition, and Trident in a graphics card group test. Most of these used to work in the same way as nVidia, producing chipsets and selling them to board manufacturers, but now they're rarely heard of.

With graphics cards there's generally one winner and lots of losers. S3 was big back in the late 486 days when it released the Vision 968 chipset, which wiped the floor with every other graphics card on the market. Sadly for S3, however, it wasn't long before Matrox changed the face of the graphics card market forever with the release of the Millennium. This was an incredibly fast and well-featured card that was second to none at the time, but it wasn't until 3D graphics became an issue that things started to get really interesting.

The initial crop of 3D accelerators were nothing to write home about and it wasn't until 3dfx released its Voodoo board that 3D games started to come into their own. 3dfx followed the Voodoo with the Voodoo2 and every graphics card manufacturer worth its salt produced boards based on that. The problem with the Voodoo boards was that they were add-on cards that still needed a standard graphics card to run 2D applications.

Eventually all the major card manufacturers realised that the future of PC graphics was 3D, and the race to produce the *de facto* 3D graphics chip began. During this time we saw 3dfx buy STB and start to produce its own

cards rather than selling its bare chips. S3 applied a similar model buying Diamond. Unfortunately S3 was unable to produce a groundbreaking graphics chipset in its new guise and has faded into the background, although it's still producing decent mobile 3D chipsets.

Even though nVidia is probably the biggest name in 3D graphics at the moment it's also the newest. When nVidia released the TNT and TNT2 chipsets it shifted the balance in the market, but when it released the first GeForce 256 chip it redefined it. Ever since then the other manufacturers have been playing catch-up, and it's only ATi that has finally come up with an equally excellent product. The amazing thing about nVidia is that it had already superseded the GeForce 256 with the GeForce2 GTS before any competition started to rear its head. It's therefore hard to believe that nVidia doesn't already have its next trump card up its sleeve.

Of course, nVidia does have other things on its mind with the release of the Microsoft X-Box drawing ever closer. Rather than fearing the release of the new console as competition to its PC gaming cards, nVidia is

Major card manufacturers realised the FUTURE OF PC GRAPHICS WAS 3D and the race to produce the de facto graphics chip began

producing the graphics solution for Microsoft's new baby. This is another shrewd move that will no doubt net the company a tidy profit as well as much kudos.

Whether the Microsoft deal will help make nVidia the dominant player in 3D graphics remains to be seen, although it's worth remembering that ATi is still the number one supplier of graphics chips in the world and it's not likely to let go without a fight. That said, much of ATi's market share is in the business integrated graphics arena, whereas nVidia has concentrated on the high-end market that yields high-profile but lower market share.

Ultimately, nVidia has pushed the boundaries of 3D graphics further than ever before and shaken up what's left of the competition to do the same. As long as the market remains healthy with some semblance of competition, we should continue to enjoy groundbreaking developments in the virtual 3D world.

Riyad Emeran, Editor

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October COVER DISCS

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Welcome to the October *Personal Computer World* cover disc. This month's line-up includes one of the world's favourite 3D modelling and animation packages – trueSpace 3/SE. For small businesses, there's a full and unrestricted copy of the award-winning MYOB (Mind Your Own Business) Accounts version 6. You'll also find the brand new TaxCalc 2000 Lite from Which?, an invaluable helping hand for those who need to send in a Self

Assessment tax return. There's also one of the best-known web authoring packages, HoTMetaL Pro v4, which comes complete with a great set of web utilities for creating Java applets, animated gifs and much more. And if you want to give your PC a health check, CheckIt 5 will do just that. There are other great programs too, including Microsoft's brand new Internet Explorer v5.5, and much more.

For help on using the *PCW* cover disc please see page 16.

trueSpace 3/SE

FULL VERSION

3D tools for creative minds

One of the most intuitive 3D modelling and animation tools available for Windows, trueSpace 3/SE lets you create whatever your mind's eye can visualise.

New features in version 3 give you unprecedented power and control, all seamlessly integrated in the design environment. trueSpace 3/SE gives you the tools to create 3D characters and worlds your way, faster and easier.

Check out this month's workshop on page 136, where David Fearon takes you step by step through putting together scenes and building models with trueSpace 3/SE.



*Character building:
create your own
animated world*

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The Washington Post (July 1999) said that: 'trueSpace 4 costs far less than Hollywood-style 3D software but still has amazing powers. Once mastered, trueSpace 4 is an invaluable resource for the designer and the animator.'

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price, considering its top-end features and third-party plug-ins.'

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You can have all this power for only £245! (£295 inc VAT and delivery).

To order, contact Caligari on tel: 01752 895 100, fax: 01752 894 833 or <https://forms.caligari.com/store/uk/pcw>. Please quote Code 009CUWOR1.

Remember, this offer is available only to *Personal Computer World* readers!

What are you waiting for? Order by 31 October 2000.

**UPGRADE
OFFER**

TaxCalc 2000 Lite

FULL VERSION*

Which? Software, publisher of the best-selling TaxCalc 2000 personal tax program, has launched TaxCalc 2000 Lite. This enables taxpayers filling out basic Self Assessment forms to complete their tax returns quickly and accurately, without making any potentially costly mistakes. Since filling out a Self Assessment Return is even more complex this year (with a calculation sheet running to 29 pages, rather than an average of five pages in 1999), it makes sense to get some independent help to make sure that you're not paying too much tax.

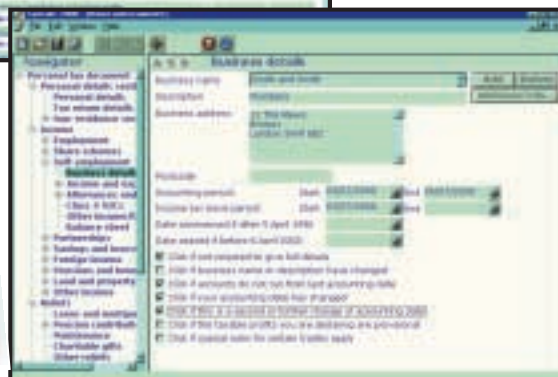
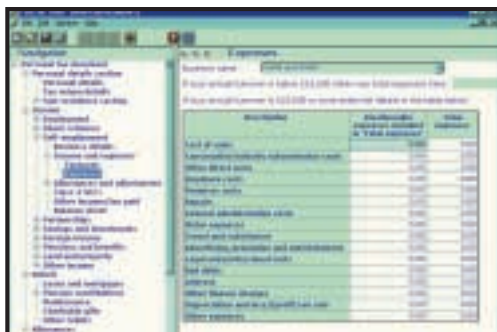
Covering the requirements of most tax payers required to submit an annual return, this great new software package is filled with features that will make completing this year's tax return easier than ever.

Once you've completed your return, TaxCalc Lite will also enable you to either print out a tax return document, or to use the online filing system to send back your return directly to the Inland Revenue over the Internet. The Revenue launched this service at the beginning of July, and if you use it to send back your return and pay your tax bill electronically, you can claim a £10 tax discount.

Even if you have already submitted your return or used an accountant to do it, the TaxCalc Lite program will allow 98 per cent of Self Assessment taxpayers to check the Inland Revenue's (or your accountant's) calculations. The Revenue's publicised accuracy level currently stands at 77 per cent, meaning that almost one in four could be wrong, so almost a quarter of taxpayers could potentially save money off their tax bills.

Also included on the CD is a comprehensive user manual in Adobe Acrobat format (the reader can be installed from the disc); plus 30 useful Inland Revenue booklets and leaflets to help you with your tax matters.

The Inland Revenue leaflets (Adobe Acrobat Reader required) include: SA/BK8 – Self Assessment. Your guide CGT1 – Capital Gains Tax. An introduction



With a reported 23 per cent of incorrect tax calculations by the Inland Revenue, you could use TaxCalc 2000 Lite to make sure you're paying the right amount of tax

- CWL1 – Starting your own business?
- CWL2 – NI Contributions for self-employed people
- IR87 – Letting and your home
- IR110 – A guide for people with savings
- IR120 – You and the Inland Revenue
- IR121 – Income tax and pensioners
- IR125 – Using your own car for work
- IR145 – Low interest loans provided by employers
- IR161 – Tax relief for employees' business travel
- IR172 – Income tax and company cars

Inland Revenue help sheets include:

- IR203 – Car benefits and car fuel benefits
- IR204 – Lump sums and compensation payments
- IR206 – Capital allowances for employees and office holders
- IR208 – Payslips and coding notices
- IR211 – Employment – residence and domicile issues
- IR222 – How to calculate your taxable profits
- IR227 – Losses
- IR229 – Information from your accounts
- IR281 – Husband and wife, divorce and separation
- IR283 – Private residence relief

Help for small-business expenses

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- IR285 – Share reorganisations, company takeovers and Capital Gains Tax
- IR289 – Retirement relief and Capital Gains Tax
- IR300 – Non-residents and investment income
- IR320 – Gains on UK life insurance policies

Inland Revenue notes include:

- SA103 – Notes on self-employment
- SA108 – Notes on capital gains
- SA109 – Notes on non-residence

TaxCalc versions

* TaxCalc 2000 Lite covers only the following schedules:

- The SA 100 (the eight-page core Return)
- Employment supplementary pages
- Self-employment supplementary pages
- Share schemes supplementary pages

You will need to upgrade to **TaxCalc Standard** if your income involves:

- Partnerships
- Land and property
- Foreign income
- Trusts
- Capital gains
- Non-residence

See cover disc for details on how to upgrade from TaxCalc 2000 Lite to the Standard version.

MYOB version 6

FULL VERSION

MYOB (Mind Your Own Business) is the world's leading accounting and financial management package for small businesses.

Thousands of growing businesses, from florists to advertising agencies, are now experiencing the many benefits of using MYOB and entrusting the mechanics of their cashflow, budget analysis and VAT to this superb software solution. MYOB is packed with features and it's easy to use.

In our August group test covering accountancy software MYOB received a Highly Commended award. The package is easy to set up and use. After you've loaded up, the Command Centre gives you access to the software's main functions. Entering transactions is straightforward, for example paying a supplier is just a case of writing an on-screen cheque – and while you are filling out the cheque you can create new suppliers.

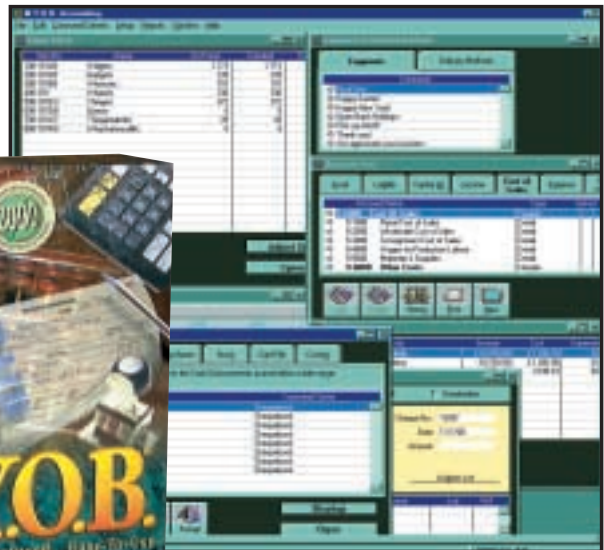
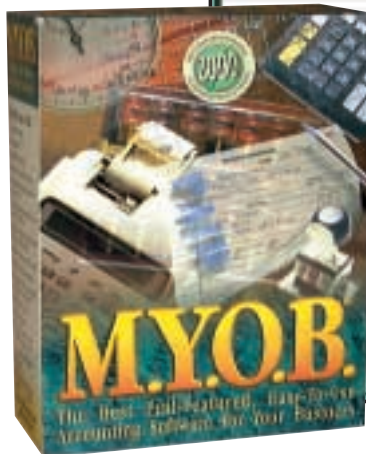
Creating invoices is similarly clear and straightforward and they can be batched ready for printing. The reporting function is excellent, with MYOB able to export reports as a web page and OfficeLink software allows you to pipe reports to Microsoft Excel. Word and WordPerfect can also be used for word-processing functions.

The customer and supplier databases enable you to keep records of invoices as well as attach notes about conversations.

MYOB's features include:

- Nominal ledger
- Chequebook
- Flexible invoicing
- Records and analyses sales
- Tracking debtors and identifying slow payers

It's easy to keep track of all your finances with MYOB 6



- Automatically creates and tracks purchase orders
- Records creditors and reminds of expiring discounts
- Handles quotes and estimates
- Flexible stock management
- Comprehensive financial and management reporting
- Report customiser
- Job management
- Electronic card file with contact management
- Custom forms designer
- 'To do' list

- Interactive cash flow for 'What If?' analysis
- OfficeLink/Script/Link
- VAT reports
- Clear bank account reconciliation

Special offer

Personal Computer World readers can upgrade to the latest version of M.Y.O.B. at a special discount price (a saving of £100). You can find details of the special upgrade offer on the CD.



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 will 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 normal 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.

If you have problems running the disc or any of its content, please follow these guidelines:

- Faulty disc (ie, the disc is physically damaged and will not load) – return the disc for a replacement to: PCW October cover disc, TIB plc, HelpLine Returns, Unit 5, Triangle Business Park, Pentrebach, Merthyr Tydfil, Mid Glamorgan CF48 4YB, quoting ref 'PCW Vol 23 No 10'
- You have problems installing/running the software. Check the support page on the CD, or the support website at www.pcw.vnuet.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.

HoTMetal Pro 4

FULL VERSION

SoftQuad's powerful software has been at the forefront of web authoring for many years. Version 4 introduces a new wysiwyg user interface that's designed to be as accessible to newer web developers as well as to professionals. HoTMetal produces code that conforms tightly to the standards, while offering support for a wide range of technologies, including ActiveX, Java, dynamic HTML and cascading style sheets.

You will need to visit SoftQuad's special PCW web page to register your copy of HoTMetal Pro 4. Registration is free and will only take a few minutes of your time.



How to register

Before you can start exploring the powerful features of HoTMetal Pro 4, you must register your software at www.hotmetalpro.com/register/special.htm. You will need to quote the following 12-digit product ID number: 233040335001. (If you're ready to, you can also upgrade to version 6 at this site – there's a link on the disc.)

Installing HoTMetal

To Install HoTMetal Pro 4, shut down all applications (including the disc's browser). Next, start the INSTALLATION WIZARD, by launching the file: [CD:]Software\HoTMetal\Setup.exe

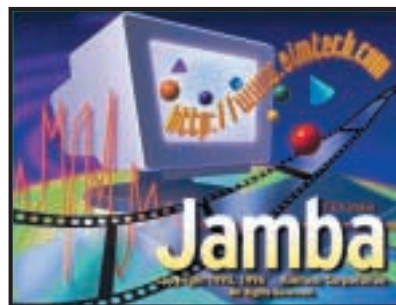
NOTE: the HoTMetal Power Tools installer can also be found in this folder.

Once the Installation Wizard has started, follow the on-screen instructions.

Note that HoTMetal Pro 4 comes with some useful extra programs, including:

- Ulead PhotoImpact Special Edition
- Ulead GIF Animator 1.5 Full Version
- Ulead WebExtensions
- Ulead SmartSaver 2.0 Full Version
- Aimtech Jamba PE
- Platinum VRCreator, and
- Acadia Infuse Scriptbuilder

NOTE: Skip installation of Internet Explorer. There's a copy of the latest version of Internet Explorer elsewhere on this disc. The same applies to Adobe Acrobat Reader.



Aimtech's Jamba PE is an added extra

Important

HoTMetal Pro 4 (DVD users only)

You may experience problems installing HoTMetal directly from the DVD (if you see an error message 'Cannot find C:\Windows\conagent.exe'). You can get round this by first copying the installation folder to your hard disk. Drag (copy) the \software\hotmetal\ folder from the DVD onto your Windows desktop. Open the folder and double-click the file setup.exe (DON'T run it from the Windows Start button). The installation folder is quite large (380MB), so you will need sufficient disk space. However, you can delete the folder immediately after installation.

Competition and upgrade offer



As well as the full and unrestricted version 4, we've included a fully functional trial version of the latest HoTMetal Pro 6 that you can use for 30 days. Here are just some of the new features in version 6:

- Improved source editing and authoring aids
- Enhanced FTP and remote file-editing features
- Improved asset manager
- Comprehensive extensibility and customisation
- Comes with more than 8,000 images in the Asset Library, WS_FTP Pro 6.02 full version, and HTML & JavaScript self-study training tools

Answer the following three questions and you could WIN one of three copies of HoTMetal Pro 6 for FREE:

1. Who publishes HoTMetal Pro?
2. Which image editor is included with HoTMetal Pro 6?
3. What does CSS stand for?

Send your entries to:
HoTMetal competition,
c/o Personal Computer World,
32-34 Broadwick Street, London W1A 2HG

PCW October 2000 HoTMetal Pro 6 competition entry form

Name:

Email address:

Daytime telephone number:

Address:

1. HoTMetal Pro is published by:
2. The image editor included with HoTMetal Pro 6 is:
3. CSS stands for:

- 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

CheckIt... IE5.5... Media Player... DisplayMate...

CheckIt 5

The full version of CheckIt 5 will test your hardware, discover any hidden conflicts and report detailed system information.

CheckIt is a powerful 32bit Windows diagnostic utility. It helps you pinpoint problems, test system components, locate system conflicts, and restore Windows' Registry and system files.



The first time it runs, CheckIt performs a multi-step collection process that gathers hardware configuration information and performance data. The Snapshot is a way of recording this information for use in future comparisons. In future, when the software checks out your system, if you get anything less than a smiley face, you've probably got

cause for concern. CheckIt will then help you to try and identify what's preventing your PC from working at 100 per cent efficiency. And if you just want to see how fast the various bits of your system can go, CheckIt includes benchmarking.

Internet Explorer 5.5

The newest version of Internet Explorer includes improved support for DHTML and CSS, giving web architects greater control over browser appearance and behaviour. You'll also enjoy the ability to preview web pages as they'll appear when printed. Web architects will appreciate the greater control over browser appearance and behaviour, including enhanced frames, element behaviours, vertical text layout and more.

NOTE: Microsoft will not provide support on this installation.

Windows Media Player 7

Microsoft's brand new Windows Media Player 7 (pictured top right) comprises seven features in a single application: CD player, audio and video player, media jukebox, media guide, Internet radio, portable device music file transfer, and an audio CD burner. These software programs are combined into one easy-to-use application.

NOTE: Media Player should NOT be



used on computers running Windows 95 or NT4. Microsoft will not provide support on this installation.

DisplayMate (demo edition)

Tune up software for your monitor. DisplayMate will help optimise your monitor to deliver the best possible image and picture quality. It guides you step by step through setting up and tuning all of the parameters, controls, and adjustments of the display and its adaptor. If you wish you can copy Displaymate to your hard disk (it's in the \Software\Essentials folder) or run it directly from the CD.

See also this month's *pcwexpert* on monitors (page 237). David Fearon explains how to set up your monitor with DisplayMate.

What's on the DVD

The programs referred to below can all be found on the DVD edition of *Personal Computer World*, available every month from main newsgroups or by subscription. You'll find details in the Subscription section of the CD.

The DVD includes everything on the CD-ROM, plus all these great full-version packages described below, six months worth of *PCW* group tests, and the new Essentials section packed with more than 50 utilities, add-ins and demos. Finally, there's a selection of nine of the best playable games demos.

Sun StarOffice version 5.2

Building on a history of 15 years of continuous innovation, StarOffice 5.2

incorporates more than 200 new or enhanced features. And, unlike some office suites, StarOffice 5.2 can be used on just



StarOffice is a complete office suite

about any OS. You get instant access to open, modify and even save as Microsoft Office files.

StarOffice 5.2 includes a rich set of productivity tools from spreadsheet to word processor, presentation graphics, drawing, image editing, HTML editor and database, plus email, newsreader, and scheduling and task management tools.

Best of all, StarOffice 5.2 is free.

Sun's powerful, cross-platform suite delivers seamless access to a variety of office productivity applications free of charge. A global, fully-featured suite, StarOffice 5.2 integrates the tools that today's businesses need to effectively create dynamic and professional documents, exchange files with Microsoft Office, and surf the Internet.

PCW COVER DISCS BROUGHT TO YOU IN ASSOCIATION WITH:



What's on the DVD

On the DVD you'll find the latest version of StarOffice for Windows (95/98/NT); Linux; and Solaris (Intel).

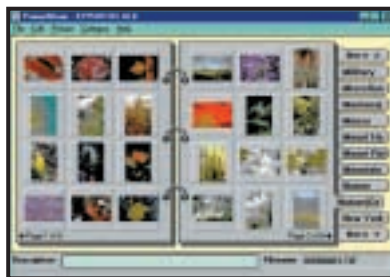
NOTE: During our tests we came across some script problems with Schedule Server installation supplied to us from Sun Microsystems that we were unable to resolve. We will include an update on next month's disc.

Full instructions for installing HoTMetal Pro 4 from the DVD are on p17.

SoftKey Key Photos

Key Photos is a collection of 2,100 royalty-free photos in 88 categories, covering everything from agriculture to wolves, and from office buildings to transport.

You can browse the photos with PowerAlbum, which allows you to add your own images and searchable descriptions. Click MORE to view the PowerAlbum manual (you'll need Acrobat Reader), or INSTALL to copy PowerAlbum to your hard disk.



SoftKey allows easy browsing of photos

Linux Special

Here's your chance to check out three complete Linux installations, from Mandrake, Phat and Armed.

Linux Mandrake 7.1

This latest version of Linux Mandrake is a complete, preconfigured graphical Linux operating system. It's easy to install, easy to use and stable. The graphical interfaces KDE, Gnome, AfterStep, Window Maker, IceWM and so on are fully integrated, fully compatible with Red Hat applications.

NOTE: We've provided Linux Mandrake as two ISO 9660 image files that you must burn onto two CD-Rs in order to install (so you'll need a CD-R burner). We've included instructions on how to do this on the disc.

Armed Linux Beta 1.1

A Linux workstation OS that installs under Microsoft Windows 95 or 98. Armed Linux is for first-time users and people who need Linux as a secondary operating system.

Phat Linux v3.2

This has a Windows-based install, so you



Linux Mandrake 7.1 is very easy to use

don't need to repartition your hard drive. It comes bundled with X-Windows, KDE, Gnome, Enlightenment, the Apache Web Server, a DOS emulator, sound programs, image editors and more.

NOTE: We cannot support this software in any way, and we strongly recommend that you research each one fully before installing, by visiting the respective websites where you will find updates and add-ins, as well as plenty of help and advice from the publishers and users.

While every effort has been made to provide useful and accurate information on these products and their installation, VNU cannot be held responsible for any inaccuracies in the text or damage that may result from running this software.

BeOS 5 Personal Edition

Thanks to the new Version 5, you can now install BeOS as a file within Windows. No repartitioning is necessary, and launching BeOS 5 is as simple as double-clicking an icon on your desktop.

PCW group tests

You've got access to more than six months of product testing from the pages of PCW. Desktop PCs, anti-virus software, CD writers, databases, digital cameras, DTP software, hard drives, image editors, monitors, motherboards, notebooks, PDAs, printers, visual programming software, and webcams are included.

The group tests are presented as Adobe Acrobat files to preserve the original layouts. You can browse or search each feature, copy text from the documents, or print them out for reading or reference.

Games demos

Vampire

Live as the undead: as Christof, a vampire of the Brujah Clan, you must fight and feed on the blood of mortals, while hiding your vampiric powers and controlling the urges of the beast within you. Masquerade's powerful 3D engine – dramatic lighting, fog

effects and gorgeous textures – bring life to the mediaeval settings, and Gothic realism to the cities of London and New York.

Homeworld (new demo)

This updated Homeworld demo includes the game's first two missions and a step-by-step tutorial.

In the first mission, command the massive mothership to begin construction of your fleet. In mission two, learn to engage enemy craft in the unique 3D battlefield of deep space. Each victory brings you closer to Hiigra, your homeworld.

Star Trek: New Worlds

This presents the Star Trek universe as never seen before. Set in the year 2292, the game chronicles the challenges and adventures of a small group of colonial officers on the surfaces of new alien worlds.

Motocross Madness 2

The trial version features both a stunt quarry for freestyle competition and a Nationals track for intense motocross racing, as well as two of the game's 16-plus bikes, and two racing skins. This version has single and multiplayer options, with multiplayer matchmaking for up to eight racers available on Zone.com (see also our review on page 455).



Practice some body-bending motocross

Dino Crisis

Ported from the PlayStation to the PC, Dino Crisis, from Capcom – creators of Resident Evil – pits you against some of the most ferocious predators that roamed the earth (see our review on page 456).

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.vnuet.com/cd for late-breaking news on the programs on the disc.

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Dial-up jams and free US calls signpost ADSL for the future

Computing lurched into the 21st Century last month as ADSL moved out of its trial phase and into homes and offices – while some of the new unmetered dial-up services buckled under huge demand (see page 27).

The snarl-ups were blamed on heavy users hogging lines, but the real culprit was the dial-up system itself. The lesson was clear: we have to move on, whether it is to ADSL or cable (see page 30).

BT OpenWorld, EasyNet and Demon are among several companies offering ADSL – see vnet.com for the

21st century storage

The month's other big event was Panasonic's release of a 4.7GB DVD-RAM drive that sets a benchmark for next-generation storage. Riyadh Emeran argues (p28) that one version will supersede the venerable video cassette and its PC-based sibling (review p98) already looks like a must-have at £319 ex VAT.

latest on deals. Business rates are around £90 a month for a basic 512/256K business link, plus installation charges. Prices vary according to service guarantees and line contention ratios (ie, the number of sharers).

Home connections will be available shortly for around £40 ex VAT a month. But many poorer users may get ADSL by sharing links.

Until usage patterns settle, even ISPs will not know what effect contention ratios, which vary between 20 and 70 to one, will have. Usage is

almost impossible to predict with content, demographics, technology and even modes of human interaction all changing at once.

There is sure to be a shift of voice calls to the net using Voice-over-IP services such as Go2Call and Net2Phone.

MSN is offering free PC-to-phone calls to the US. Nick Babaian, MSN business development manager, believes VoIP could take a big chunk of the market. 'There are always going to be paid-for routes because of regulated markets,' he said.

Dead heat at GHz-plus

We got to test Intel's latest 1.13GHz PIII just before we went to press. It lets Intel claim to have the fastest x86 processor, but our results show users would see little difference in comparison with AMD's 1.1GHz Athlon – even with the PIII using expensive RAMBUS memory.

And finding systems using the PIII will be tricky: it will be available in limited quantities, writes Jason Jenkins.

We tested it with 256MB of PC800 RAMBUS and a 64MB 3D Prophet II graphics card on an Intel VC820 board. For comparison we used an Athlon in a Mesh Matrix 1.1 GT PRO using 256MB PC133 SDRAM and the Prophet II.

The scores were (Athlon in brackets): 205 (204) in SYSmark 2000; 7,265 (7,261) in 3Dmark 2000; 118.7fps

(115.2fps) in Quake III; and 23 minutes 2 seconds (21 minutes 11 seconds) for our test scene in 3D Studio Max.

Meanwhile, a non-games application that may help create a mainstream market for 1GHz-plus chips has finally emerged, writes Clive Akass. A video-conferencing system developed jointly by Picturatel and Intel is said to provide jerk-free full-screen video at 256Kbits/sec.

Tim Duffy, Picturatel's vp of conferencing products, says it will be implemented in software when processing speeds get fast enough. See picture on page 30.

- IBM has confirmed that it will launch notebooks using Transmeta's battery-saving Crusoe chips. *Special reports on power saving – pp 46, 47, 48.*
- Athlon reviewed...page 73.

And for my NeXT trick...

The most stylish machine of the month has to be the new G4 cube, which was unveiled by Apple head honcho Steve Jobs. But... er... haven't we seen something like this before? Well, there was the NeXT cube (inset), launched in 1988 and still looking great after all these years. The head of NeXT at the time was a certain Steve Jobs.

- Apple gives PC vendors a thing or two to think about – page 40.



Porn sites are top for fraud

Pornography sites attract the highest levels of online fraud and UK credit-card firms have told them to clean up their act.

Under a scheme launched by credit companies in April the sites face fines of up to approx £3,000 a month if more than two per cent of their card transactions are fraudulent. However Visa now imposes fines of up to around £60,000 a month if fraud levels go above seven per cent.

Fraud accounts for an estimated 0.16 per cent of credit-card transactions worldwide – considerably less than the four per cent average on the Internet. In Britain this means a loss of £7m a year.

VNUNET.COM

Not so safe

Two out of three PC passwords can be easily cracked, according to new research by credit-card giant Visa. More than four out of 10 people use their birth date, sports team or the name of a pop star. One in five use their own name.

The easily cracked passwords are used to get online bank details or to eshop as well as to get into their PCs, the company says.

Ball-free mice

Fujitsu Takamisawa, like Apple, has just launched a new range of optical mice with a four-way switch scroll button that is said to be ideal in dusty areas and schools, where mouse trackballs tend to get lost. www.ftu.com For more on Apple see p40.



Security flaws dig deeper

Just clicking on an email can be worse than Love Bug, warns Microsoft

Microsoft has issued a flurry of warnings about security flaws, including two gaping holes that, if exploited, could make the Love Bug look positively cuddly. Both can be triggered simply by downloading email – most email viruses require you to open an attachment.

One involves an unchecked buffer that parses email headers. A long bogus date can crash the email client and send excess data, which may be malicious code, into memory where it might be executed.

In a security notice Microsoft said the code could do

anything you can do at the keyboard 'including reformatting the hard drive, communicating with an external website, or changing data'.

The Argentinian security firm Underground Security Systems Research, which discovered the vulnerability, said it constituted 'a new generation of virus'.

Outlook under Windows 2000 and Outlook Express, which is bundled with Internet Explorer, are both affected. Microsoft advises an upgrade to either IE 5.01 Service Pack 1 or IE 5.5. There is also a fix in Win2K Service Release 1 (see below).

The second flaw, found by Bulgarian coder Georgi Guninski, can be triggered by opening a rogue web page as well as a simple email. It tells the target computer to download Visual Basic code from a remote machine. A second email can then tell the machine to run the code within Microsoft Access and it can again do virtually anything an authorised user can do.

Microsoft says you can set an administrator password for Access that throws up a prompt before the rogue code is executed.

www.microsoft.com/technet/security/current.asp



This watch was produced by version 2.0 of the programmable Mental Ray rendering software 3DStudio MAX that is now being shipped by .Discreet, a division of Autodesk. It costs from £1,945 and requires 3DStudio Max R3.1. www.discreet.com

Microsoft reglazes Windows

Microsoft is releasing revamps of both its consumer Windows 9x and corporate Windows 2000 products.

Windows Millennium Edition (ME) will ship on 13 September, initially for £39.99 inc VAT as an upgrade for Windows 98 or 98SE – or £79.99 after 31 December.

Windows 95 or 3.1 users will have to buy the full package at £149.99. But as support for the latest hardware is a major reason for buying ME, they have less reason to upgrade. Also old machines might not run to the

minimum spec, which includes a 150MHz Pentium, 32MB of RAM, and 295MB free hard-disk space.

The relatively low upgrade price may reflect the fact that few people upgraded from Window 95 to 98 – at least, not officially.

Win2K product manager Neil Laver said reasons for the upgrade included greater reliability, system rollback after unsatisfactory changes, a better 'user experience', better multimedia support like the new Media Player, and Internet Explorer 5.5.

The 9x and 2K/NT lines will

converge next year in a product codenamed Whistler, part of Microsoft's emerging .NET architecture.

Meanwhile sales of Windows 2000 are expected to rise with the release of Service Pack 1, a packet of fixes for the Professional, Server and Advanced Server editions. It is available on CD or as an 83MB download from the Microsoft site.

DataCentre, the fourth component of Windows 2000, which is designed to compete with Unix in high-end data systems, should be also available by the time you read this.

Toll-free surfers beached

Service providers began to backpedal on unmetered deals last month as surfers, freed from time restraints, clogged lines and left business models in shreds.

Breathe.com infuriated many by barring 500 people who had allegedly been 'hogging the line'. Among them was reader Robin Downs, who told *PCW* that at no point was he made aware of 'any over-use of the service'.

Breathe.com said that it had 'removed a minority of users whose usage was

extreme' (for the full statement see *Letters*, page 66). Their £50 subscription was refunded.

LineOne, meanwhile, announced that it was stopping its unmetered service, using the telco Quip, in September because high demand made it too costly to run. Instead it will offer BT's more expensive Surftime deal.

One user, Brendan Crawford, of Stirling, said: 'I was disgusted. They sent me an email about it at 1.57am on a Sunday morning. Basically they have shut it

down because it was too successful.'

Users will get £20 worth of free calls with Quip to cover the cost of a box they had to buy when they signed on. 'Personally, I'd rather have the money,' said Crawford.

Virgin announced that it was delaying its unmetered plans until it was sure it could offer a good deal.

Most unmetered service providers reserve the right to bar users and impose time limits if lines become clogged. Many cut users off after two hours whether the line is active or not.

This does not stop the popularity of what, for most users, currently is the nearest they can get to an always-on service. Thomas Hill, who was one of many complaining of delays in the rollout of cable operator NTL's services, reported that he had finally got a connection and that it seemed to be faster than using a BT line.

He said the unmetered saga shows that providers had not done their homework properly. 'If you want to know how many people want to [use such a service] ... take a number and multiply it by 100 and you won't even be close.'

Short stories



TOMBOLA.COM

Addicts of the kind of Bingo competitions run by the tabloids will be attracted to www.tombola.com, which offers up to £10,000 in prizes a week with a maximum £5,000 jackpot ... and it is free to play.

The five-minute games can be played daily. Managing director Phil Cronin says he makes his money from advertising and promotion.

SQUASHED 3D

An algorithm for geometry compression with an efficiency 12 times that of MPEG4 has been developed by researchers at Bell Labs' Mathematical Sciences Research Center and Caltech's Computer Science Department in the US.

It will allow 3D virtual objects to be displayed and manipulated across the web, according to researchers. Digital geometric data represents objects as meshes of triangles and can be used for animations and video games.

Here comes the Sun

The network computer never died, it was renamed an information appliance. This is Sun's latest SunRay 150, a desktop terminal with 15in flat-panel display activated by a smart card. All information is held on the server so you can use your smart card to bring up your personal setup on any SunRay on the system. Details are at www.sun.co.uk.



'Poached' Red Herring threatens small fry

Two British sister IT companies have been ordered not to use their names by a large US magazine.

All three include the words Red Herring, a phrase stemming from the time when poachers dragged a specimen of the said fish to leave a false trail for tracker dogs.

Now David Jeffrey, who once worked with web pioneer Tim Berners-Lee at Cern, finds himself accused of poaching the name for his two companies Red Herring

Ltd and Red Herring Communications Ltd.

He set up his first Red Herring company in 1996, two years after the magazine was founded, but at a time when it was barely known in Britain. His companies hold the UK trademark for Red Herring for use in their web, consultancy and support work.

The magazine *Red Herring*, however, has warned him to 'cease and desist' from using the name or face court

action. In April, the tiny Old Pulteney distillery in Wick, Caithness, which has a strong herring fishing tradition, had to change the name of its newsletter after receiving a similar threat.

It seems *Red Herring* the magazine wants to promote sales in Britain and it is applying for an EU trademark. Jeffrey says he will oppose this.

No-one at the magazine *Red Herring* was responding to emails.



'What do you mean, I should have used cod?'

Short stories

WEB NAMES BOOST

Choices for website names should be much wider early next year following the approval of a plan to extend the number of permitted suffixes beyond the existing seven: .com, .org, .net, .edu, .int, .mil and .gov.

No decision on which suffixes will be adopted will be made by the Internet Corporation for Assigned Names and Numbers (Icann) until 20 November. Requests include .shop, .store, .travel, .news, .tel, .web, .union, .museum, .bank and .sex.

OPEN IPV6

Open-source operating system FreeBSD has been upgraded to include improved security and networking features – including support for the next-generation Internet protocol IPv6.

Users include Sony, Hotmail, MP3.com, UU.net, ClaraNet and France Telecom.

VNUNET.COM

CHILD AID

Ko-Rec-Type is paying ChildLine £1 for every laser-toner or inkjet cartridge (one with an attached printhead) it receives for recycling. The company provides collection bins and freepost envelopes. The recycling hotline is 0800 056 2416.

PARKING OFFER

BCP is offering discounted parking at airports through its site at www.bcponline.co.uk. Be warned... 'discounted' does not mean cheap.

RIP LIVES

The Regulation of Investigatory Powers Bill has passed into law but it will be some time before provisions for some of its measures, like email surveillance, are in place, the Home Office says.

BAN LIFTED

The US has relaxed its ban of exporting encryption technology to Europe, Australasia, and Japan. Industry has argued that it was holding back e-commerce.

DVD-RAM recorders could take over our living rooms, says Riyadh Emeran

VCR is dead, long live VDR

With the audio cassette finally starting to see extinction through mass adoption of MiniDisc and solid-state music devices, it looks like the VHS video cassette's number could also be up soon. The VCR has been with us for over 20 years and, although DVD players have started to take over as the preferred medium for watching movies, many VCR users won't take the DVD plunge due to its lack of a recording facility.

Panasonic is set to change the shape of consumer video recording with the release of its DMR-E10 DVD-RAM video recorder. Although Pioneer released a consumer DVD recorder several months ago, it was based on DVD-RW media that is currently only used by the Pioneer player itself. DVD-RAM, on the other hand, is already an established media with many PC users adopting it for high capacity backup and storage.

The beauty of the DMR-E10 is that it uses exactly the same discs as the PC devices, making it easy to record footage, transfer it to your PC for editing and



then return it to the player for viewing.

The DMR-E10 will accept both the older 2.6GB per side DVD-RAM discs and the new 4.7GB per side discs. Double-sided discs can be used, but as there is only one laser in the device the media will have to be ejected and flipped when

capabilities in its next-generation DVD-ROM and DVD-Video players. This vision becomes more believable when you consider that Hitachi was showing off a DVD-RAM camcorder at last year's Comdex exhibition in Las Vegas, with Panasonic also working on a similar device.

The only thing that could throw a spanner in the works is the impending launch of DVD+RW. Philips claims that DVD+RW is compatible with all existing DVD products, but as we have yet to see a single unit based on the technology, DVD-RAM definitely looks the stronger contender.

Of course, there is another issue to consider with digital recording and that's digital copyright. There's not much point having a digital video recorder if you're still having to record from an analog TV, but the chances of being allowed to record from digital TV are pretty slim since you'll be making a perfect digital copy of the original. Panasonic says that this issue is currently under discussion. That said, regardless of what the original source is, the DMR-E10 is likely to knock even the best VHS VCR into a cocked hat.

The price of the DMR-E10 is around £1,500 in Japan, but it is not expected to launch in the UK until next year. However, Panasonic has launched a 4.7GB DVD-RAM drive for PCs at just £299 ex VAT (see review page 98).



Snapped... Hitachi's DVD Camcorder

the end of a side is reached. The player incorporates an MPEG2 encoder and the bit rate can be altered to increase either the video quality or the length of recording.

Panasonic feels that DVD-RAM is the future of recordable media and is including DVD-RAM read



Open and shut case... single-side 4.7GB discs can now be removed from their cartridges. But double-sided 9.4GB discs will be sealed in as in previous models

ADSL

Dial-up web services are yesterday's news. Pull a fast one with ADSL, advises Clive Akass

Speeding into the future at 512K

Forget, if you can, unmetered dial-up services puttering along at 56K. They are yesterday trying to catch up with today. The farce of heavy users being thrown offline like criminals only serves to highlight the fact that it is the dial-up system itself that is hogging the line, not the user.

I've been using BT OpenWorld's 512/256Kbits/sec ADSL service for a month and three things are overwhelmingly clear: this is the way access (at least via the old phone system) has to go, it will change lives, and it is just a start.

ADSL, by piggybacking a high-frequency signal onto your line, is far more efficient than dial-up and leaves your phone free for calls. ADSL is truly always on. Unmetered dial-up and office users have an idea what this means, but to appreciate it fully you need it there in your home. It makes the Internet like TV, ever available with no sweat. And if you think you can't afford it, read on...

Installation turned out to be completely painless. A BT engineer replaced the old three-box setup I'd used for an early Virgin trial with a single Alcatel-made box combining the functions of four-port router, splitter, and



Video links also become more viable as bandwidths rise. Picturitel's new 900 Series videoconferencing system claims to give full-screen video at 30 frames a second at 256Kbits/sec with excellent quality sound. A smart camera zooms in on speakers and pulls back when a group is listening. I can't say how the system performs on an IP link, but on a 384Kbits/sec ISDN line it was the best I have seen. Prices start at around £7,500, complete with the controlling PC. But the system may migrate to cheaper desktops – see page 25. www.picturitel.com

ADSL modem. He plugged it into a network card on one of my PCs, tested the line, and left me to install the software from a CD.

The documentation offered little help on multiple PCs but the free support desk proved knowledgeable and helpful. To get online with a second machine, I plugged it into one of the router ports and simply copied the parameters over from the first machine.

My little net was now open

to a world that is effectively cut off to slow, expensive links. The response of particular servers was still sluggish, but suddenly it became feasible to listen to net radio or watch net video.

Also more viable were instant messaging services like those run by AOL, Yahoo, and MSN. These, I am sure, will be major drivers of Internet use when people get the hang of them – and especially as they begin to incorporate voice and video. Essentially they

turn you and your scattered friends into a virtual group, able to communicate (or not, as you choose) as if you are in the same room. They are a revolutionary means of interaction.

Most astonishing to me was the quality of Voice Over IP links. I could get my NAT-ted link (Network Address Translation, see below) to work only with MSN's free Net2Phone-based service (see page 28) but I had, absolutely free, a half-hour crystal-clear PC-to-phone conversation with someone in New York. If this quality can be maintained with heavy use, VoIP alone could recoup the cost of ADSL.

I also tried Napster, which (in case I need to explain) helps you locate and download music. I could see why the music industry is worried: I chose a few titles, went to a shop round the corner, and Napster had channelled me half an LP by the time I came back. (A system that does not reward creativity can't be good, but Napster will at least force the industry to agree a way of enabling online sales – and not at inflated CD prices).

The ADSL setup I used is a good starter for a small office network of four machines – more are possible, by plugging in a hub, but remember all have to share the 512/256K bandwidth.

Don't despair if you are counting your pennies. Factor in those VoIP calls. Think of neighbours who might share a connection. Look for cheaper lower-bandwidth ADSL links. And don't take your eyes off the ball by campaigning for better dial-up deals: push for 512K ADSL as entry-level for all, and it won't be so long before it seems like a crawl.

To be or NAT to be...

Your choice of ADSL service may be affected by the apparently obscure business of Network Address Translation (NAT), whereby a gateway router or server allocates IP addresses to machines on a local network. The web can talk to the gateway, but does not know how to reach an individual machine.

In an earlier report, stemming from a long discussion at a press conference, I said OpenWorld was not using NAT. It turns out that only the USB home deal, launching this autumn, will be NAT-free.

NAT is popular with businesses because it is a major obstacle to hackers; but it does have snags. You can't host a website locally, or use some Virtual Private Network (VPN) systems that extend an office network to remote workers. NAT also interferes with Microsoft's NetMeeting, and some messaging and VoIP systems.

You can compromise, however, by getting a NAT-free system and a firewall. ADSL providers like Demon (www.demon.net) are offering NAT and non-NAT options.

SOFTWARE

UK entrepreneur Daniel Doll-Steinberg is about to change the way we buy programs

Packaged software gets upstaged

Software dealers are facing the kind of shake-up normally associated with a major revamp of one of their products – and it should push down prices.

Most hyped of all the changes is the advent of application service providers (ASPs) who run software remotely on the behalf of clients. ASPs have their place but there is surely wishful thinking in the way they are being talked up by the likes of Microsoft, which is slaving at the prospect of long-term revenues from what are currently one-off sales.

There is something airtight about the way software is sold off-the-shelf in oversized packaging – a hangover from the days when hard disks were not big enough to hold documentation and code came with manuals the size of an encyclopaedia.

Marketeers have decided that we still expect large packaging. The result is bad for everyone but the carton makers: dealers carry less stock; users have less choice and feel vaguely cheated; and both pay pointlessly for wasteful cardboard.

Now UK entrepreneur Daniel Doll-Steinberg is challenging the idea that dealers need to carry physical stock at all. His system for burning and packaging CDs on the spot is about to be rolled out at WH Smith's 550 stores nationwide.

This is an even bigger deal than it may first seem. You would expect WH Smith to carry the odd game or educational title; but because the 'stock' is held as data, the number of titles a store can hold is limited only by disk space and licensing.

'About 80 publishers have licensed us products or are about to. We have 1,050 titles



Doll-Steinberg with some of the components of his system – and a few of his titles

live today and about 950 being prepared for release,' said Doll-Steinberg. So people in small towns boasting a WH Smith will have access to software, such as Borland/Inprise development kits, normally found only in specialist shops.

Doll-Steinberg, who studied electronics at Manchester University, worked in banking IT systems before founding his company Tribeka in 1997: 'I always wanted to found my own company by the time I was 30 and I did it. Just. I was 29 and a half.'

He got the idea for his system, called SoftWide, while working for Credit Lyonnaise in New York. 'A lot of my friends were software developers and they were always talking about how hard it was to get software into shops. They were at the mercy of retailers.'

A single SoftWide system

costs around £30,000, which Doll-Steinberg reckons can be recouped in two years with reasonable sales. It is a sum well within the scope of a small local trader as well as big chains.

Data is held on a two RAID arrays, each with five 50GB disks holding a total of half a terabyte – enough for 2,500 titles. Doll-Steinberg expects the number of titles to swell naturally as hard disk capacities increase.

Blank CDs are fed to an array of four writers, which can be used concurrently, and then on to a labeller where they are branded just like a CD – except that they can be customised. There are three other printers: a Tektronix Phaser 850 for the CD case labels; an HP 4500 DN colour laser for the manual, and an HP Professional for the software certificate.

Doll-Steinberg is proud of a system he developed himself

by which the cover page can be peeled off an A4 backing sheet after printing. The result is a professional-quality package about the size of a DVD case and carrying all the usual branding and graphics.

New software is delivered weekly on a 20GB hard disk that plugs directly into the USB port of the controlling PC (or in WH Smith's case, an iMac). A bonus is that software is always up to date. 'If a new virus like the Love Bug comes along, we can make sure that our anti-virus packages can cope with it. We can even amend the manual.'

Doll-Steinberg is experimenting with satellite delivery of small updates but, though installation would only cost about £1,000 per site, per MB charges are too great for bulk data dumps.

Sadly, prices of his products are the same as the standard issue. But Doll-Steinberg said: 'In the long run they are bound to come down.' He has no fear of software sales switching to Internet downloads as bandwidths increase. 'Even if that happens there will be the licensing issues that we have already solved. People will still come to us.'

The system, which can produce about 40 CDs an hour, has been piloted in 10 WH Smith stores and is set to be rolled out nationwide by the end of next year. Two HMV stores carry the system, and the French chain FNAC is to implement it.

Doll-Steinberg has considered producing a similar system for instant books, initially for printing titles in large type for the poor-sighted. 'Basically we would only need to add a binding machine,' he said. 'But for the moment I think I'll stick to software.'

CLIVE AKASS

New models

THE MACHINES

For detailed specs, options, and what colours are available for the new iMac models see www.apple.com/ukstore.



UNDER THE COVERS

The new iMacs... the basic 350MHz model costs £552 (£649 inc VAT), complete with CD drive, 7GB disk and modem. The top-of-the-range iMac DV special edition is £1,020 (£1,199 inc VAT) with 128MB of RAM, 30GB disk, twin FireWire, and DVD drive.

SMALL IS BEAUTIFUL

The 450MHz G-Cube costs £1,249 (£1,470 inc VAT) with 64MB of RAM, 20GB disk, modem and DVD. Similar 500MHz model costs £1,599 (£1,879 inc VAT). Monitor extra.



G4s GO GRAPHITE
New Power Macs range from the single-G4 400MHz with 64MB of RAM, DVD drive,

Gigabit Ethernet and 20GB disk for £1,149 (£1,350 inc VAT) to £2,499 (£2,936 inc VAT) for a 500MHz twin-G4 with 256MB of RAM. The monitor costs extra.

MONITORS

The 1,024 x 768 15in TFT Apple Studio costs £699 (£821 inc VAT). The 1,600 x 1,024 22in Apple Cinema TFT costs £2,799 (£3,299 inc VAT). The iMac-style 16in (viewable) Apple Studio CRT display is priced at £349 (£410 inc VAT).



APPLE

Cube shapes up Mac line

Apple has reinforced its revival with an impressive new range offering something to tempt everyone.

There are four new low-cost iMacs, a 400MHz Power Mac, and the much-vaunted G-Cube, powered by a single Motorola-made 450MHz or 500MHz G4 processor and quickly dubbed 'the toaster' because of the way DVD discs slot into the top.

Power users are likely to opt for the 450MHz and 500MHz Power Macs, which have twin G4s as standard for much the same price as their single-processor predecessors.

At the launch Apple chairman Steve Jobs showed a 500MHz Power Mac using only a single G4 thrashing a 1GHz Pentium PC running the same Photoshop tasks. The test should be taken with a pinch of salt, as Apple chose both the tasks and the PC. But the G4 is undeniably powerful and the machines belie critics who say the Apple revival is more of style rather than substance.

Still, the new Macs do have style. The see-through look of the first iMacs is retained, with a new set of colours – though not all are available on all machines.

The much-criticised iMac mouse is replaced by a new optical one in clear plastic with the entire upper surface



MacOS X, due for beta release this autumn, should help applications use the new twin G4s.

acting as a button. It plugs into one of the two USB ports on the curved keyboard, made of a similar clear plastic.

Jobs presented the G-Cube, an 8in cube, as a miracle of miniaturisation. This is hype: most notebooks are far smaller in volume and they include bulky batteries. The G-Cube's power unit is external.

The G3-powered iMacs are unremarkable technologically. The entry-level iMac, at just £649 inc VAT, will appeal to people looking for email, basic word processing and accounts.

The other iMacs are targeted at the digital video-processing market (see below) and come with version 2 of Apple's iMovie software.

The familiar Apple snag

remains: upgrade choices are limited and lock you into Apple products and pricing. Gamers, for instance, may turn their noses up at the iMac's two-year-old ATI Rage 128 Pro graphics, with 8MB of video RAM, but they will not be able to upgrade.

The Power Macs pack an analog VGA port but for digital graphics you are stuck with a non-standard link. This delivers video data, power and USB tidily via single thin cable, but bars you from a wider choice of displays.

However, USB is wedding Macs to PC peripherals and the whole range shows Apple at last matching design flair with competitive prices and performance.

How Apple could change the PC

Apple is good for PCs. The company is not the only one to rethink computer design, but it always gives PC vendors a lot to think about.

They are, for instance, likely to focus on the fact that most of the new Macs have FireWire (aka 1394), enabling the machines to make the best use of the new digital camcorders. Few PCs boast FireWire, largely because Intel

wants us to use its own next-generation USB 2.0.

Gigabyte has launched a FireWire-equipped PC motherboard that is likely to be well received by vendors who fear Apple may scoop the growing digital-video market.

Untypically, Apple is offering 11Mbits/sec 802.11b wireless network links at least 20 per cent cheaper than PC equivalents.

Even this is too pricey for what could be a boom market when fast web links hit the home.

The high-end Macs all support Gigabit Ethernet, still a minority sport among PCs.

And the fan-free G-Cube is said to be silent, as befits a machine that can be used for music. Noise is now an issue on PC desktop machines too.

CLIVE AKASS

RADAR

Clive Akass reflects on the wartime pioneers who fell beyond the radar of computing history

Boffins emerge from back room

If you think this wonderful contraption (pictured right) looks like a glorified ear-trumpet, you are not far wrong. It's a listening device from the First World War, designed to provide an early warning of the approach and direction of enemy aircraft. Apparently, in good weather, it was surprisingly effective.

And if you are wondering how it is connected with computing, the clue is in the picture below. This shows Freddie Williams and Tom Kilburn with part of 'The Baby', the world's first stored-program digital computer, which they built at Manchester University.

The link between the two is radar, the electronic descendant of that ear trumpet. The pictures are part of a new touring exhibition called *The Magic Ear**, set up by writer David Robertson, who believes that the contribution of wartime radar pioneers to computing has been unfairly overshadowed by the work of Alan Turing at the Bletchley Park codebreaking centre.

Radar scientists at the Telecommunications Research Establishment (TRE), which moved to Malvern in 1942, used logic



circuits that were equivalent to the basic building blocks of modern computers. In addition 'they knew all about the latest pulse circuit techniques and how to apply them,' said Robertson.

They brought the two technologies together to detect and analyse 'blips' from a distant target by passing reflected and reference pulse streams, remarkably similar to clocked computer data streams, through an AND gate.

'They even used the word "gate",' said Chris Burton, of the Computer Conservation Society, who helped build a replica of 'The Baby' for its

fiftieth anniversary in 1998 (see Tom Kilburn interview, *PCW*, May 1998).

Bletchley codebreakers used mechanical and (later) electronic proto-computers, but their influence in the crucial post-war decades was less than it might have been because of the secrecy surrounding their work. 'No-one knew anything about it,' Burton said.

No-one except Turing that is, but he was becoming bogged down in the ill-fated ACE computer project at the National Physical Laboratory.

It was the men who had worked at TRE (now the defence research establishment DERA) who built Britain's first general-purpose computers. They included Kilburn, Williams, and Maurice Wilkes, who went to Cambridge to build the first operational (as opposed to experimental) stored-program computer.

Williams used his knowledge of another radar-accelerated technology to provide the final building

block needed to produce the true precursor of the modern computer... random access memory.

You can see the result in the picture below: cathode-ray-tube memory. This used a 32 x 32 matrix of on-screen charges, a total of 1,024 bits that could be written like a radar trace by an electron beam and read by a capacitively-coupled wire mesh.

Memory was addressed in much the same way as modern RAM and, astonishingly, CRT memory was still being used in the early 1960s.

Robertson is writing the biography of another little-known pioneer, Alan Freed, who back in the 1930s invented the Pulse Code Modulation still used by today's modems.

All these men (these were pre-feminist days) were products of the classic age of the boffin, a creature assigned by wartime myth-makers to the status of anonymous 'back-room boy'. Turing, famously crushed by an uncaring world, killed himself in 1954.

Robertson believes we are in danger of crushing the memory of Turing's contemporaries, consigning them to the back rooms of history. 'They are old men now,' he said. 'We should get their stories before it is too late.'

For information on *The Baby* take a look at:

www.cs.man.ac.uk/Visitor_subweb/history.php3

Computer Conservation Society
www.cs.man.ac.uk/CCS/

**The Magic Ear, sponsored by DERA and the Imperial War Museum, is at Malvern Library until 7 October, after which it will tour libraries and museums across the country.*



Freddie Williams and Tom Kilburn and 'The Baby', which had a cathode ray tube memory

Short stories

AUCTION PROBE

The National Audit Office (NAO) may investigate this year's auction of third-generation (3G) mobile phone licences that brought the Government £22.5b. Huge bids by five operators have led to fears that users will be overcharged, delaying Britain's online development. The NAO, which presents 50 reports to Parliament each year, is holding a preliminary study before a possible full investigation this autumn.

VNUNET.COM

USB LINK

Lindy is selling a £35 USB link for transferring files between computers at up to 8Mbits/sec. It comes with Windows 9x/2K-compliant software. MACos software is also available. shop.lindy.co.uk

SPORTAL RECORD

The official EURO 2000 website, designed and operated by Sportal.com, is claiming a new world record of 1.41 billion hits. The France 98 World Cup site is listed in the current *Guinness Book of Records* as the most visited.

Cold water on Bluetooth

Bluetooth developers are warning people not to have too high expectations when products start to ship later this year.

The developers of the wireless technology are holding regular 'plug-fests' in a bid to avoid the kind of teething problems that hit early products using PC Card slots and infra-red links. Both technologies were nearly killed at birth because products from one vendor could not be guaranteed to work with those from another.

IR links, arguably, have never recovered their credibility even though they are now quite reliable.

TDK research and development director Nick Hunn points out that Bluetooth is no more than a short-range cable replacement and is not a wireless network – though Bluetooth is often referred to as a 'personal area network'.

Phil O'Donovan, MD of Cambridge Silicon Radio which produced the world's first single-chip Bluetooth implementation, says his product was one of only four to show interoperability at a recent plug-fest. He said: 'If people go through the test procedures there should not be a problem. But it will take some time to sort out.'

Bluetooth's range is only 10 metres – but that encompasses an area of around 300 square metres, with hundreds of people using Bluetooth devices. There has been talk of devices seizing up for a few minutes as they handshake everything within range.

O'Donovan says there are algorithms to deal with the problem, including talking only to the strongest signals, or you can dictate which devices can talk to each other. He says there can be interference with 802.11b wireless networking devices at ranges of less than three feet: 'But you can get more interference from a microwave oven.'



Memory hits new heights

Mitsubishi is shipping what it claims are the largest-ever flash memory modules – a 128MB Compact Flash (CF) card and a 640MB PC Card. But solid-state storage cannot yet compete on price per megabyte with IBM's Microdrive, which fits into a CFII slot. Mitsubishi's UK sales manager Nigel Furnston said new Flash would be 'very expensive'. Currently 440MB flash-memory PC Cards cost more than £1,000, compared with £310 for a 1GB Microdrive. Furnston pointed out that demand for flash memory is outstripping supply: 'We are, like everyone in the industry, investing heavily in manufacturing and R&D to boost production and bring prices down,' he said.

Indexing the spoken word

An indexing system designed for voice archives could be used by intelligence agencies to monitor phone calls.

The system is being developed by the Speech and Robotics group at Cambridge University's engineering department (see page 47) for the benefit of organisations like the BBC that need to keep track of huge sound archives.

The work, currently using voice sources on the net, is partly sponsored by Microsoft and uses a Microsoft speech recognition engine.

No software can yet take normal speaking voices at random and produce instant accurate transcriptions. But

Andy Tuerkle, who is working on the project, pointed out: 'We don't need an accurate transcription for our purposes. We find we can get useful indexing even when the error rate is high.'

Voice-recognition software requires some training on individual voices, though developers claim training times are being reduced from an hour or more to a few seconds.

The experimental system gets round this by doing two passes on recordings of new voices, using the first pass as a training session for the second. It can spot when voices change, and takes about 10 minutes to

process one minute of speech.

However, there is no reason in principle why it could not process recordings even faster than realtime speech. 'That's a hardware problem,' said Tuerkle.

Britain's RIP Bill has raised the profile of online surveillance and a US congressional committee is investigating an FBI device called Carnivore that snoops on emails. The Cambridge system could bring to voice calls the same degree of comprehensive monitoring that is possible with text.

'Obviously the military is interested in this kind of thing,' said Tuerkle. 'But we are concentrating on the indexing.'

Linux takes a security step

A group of Linux developers has begun an ambitious project to identify security problems before they trouble end users.

The Linux Kernel Auditing Project aims to educate Linux developers on how to write secure code to stay ahead of crackers in creating a secure operating environment.

Bryan Paxton, author of the project's mission statement, said: 'Certain proprietary OSs sit around and wait for a security bug to come to them and not go to bug themselves. Linux kernel developers or hackers are logical people, and realise that Linux is not perfect.'

JOHN LEYDEN, VUNET.COM

Games icon honoured

It's a law of life that yesterday's iconoclastic young thrusters become today's pillars of the establishment. It happened with rock musicians, and it is beginning to happen with the computer games industry.

The man looking as if he has stepped out of his own games is Tomb Raider creator Ian Livingstone, chairman and

founder of Eidos Interactive. He was granted an honorary doctorate of technology at Dundee's Abertay University, where students can gain an MSc and BSc in computer games. Former students include Lemmings creator Dave Jones.

The University of Essex also offers a computer games degree, starting this October.



PROCESSORS

Chip giant launches low-power unit as vendors fight to prolong battery life...

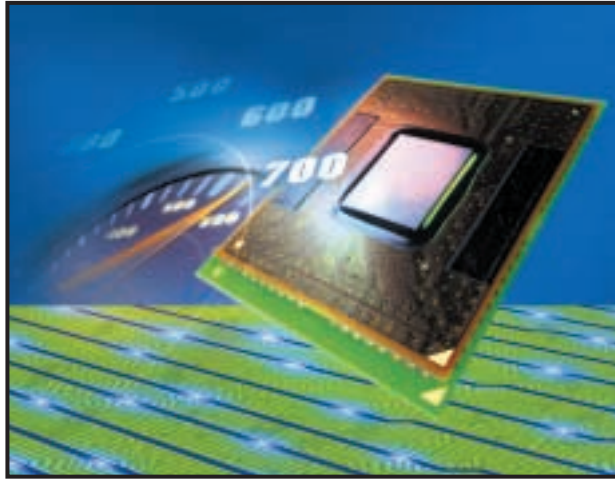
Intel focuses on low-power range

Intel has set up a low-power group in a move that signals battery drain is challenging speed as a selling point for processors. The company also began a charm offensive to stress the frugality of its latest mobile PIIIs, one of which is said to consume less than 1w in 'average' use.

The issue was highlighted early this year when start-up company Transmeta launched its Crusoe processors, with a claimed consumption of less than a watt. Several companies have since demonstrated Crusoe-based devices; how many will reach the market is unclear, but the surge of interest in Transmeta showed that it had touched a raw nerve.

AMD and National Semiconductor have also since announced new low-drain processors, and AMD is reported to be about to launch a new version of its PowerNow power-saving technology.

Don MacDonald, Intel's mobile-platform marketing director, told IT journalists in London that PIII's already incorporated three battery-saving technologies: SpeedStep, which switches down line voltage and clockrate during battery operation; QuickStart, which puts the processor into a sleep state during idle times;



Intel's new 700MHz mobile processor. Power drain ranges upwards from a claimed sub-1w for the 500MHz version to double that for the 750MHz processor

and 'mobile voltage positioning', which adjusts the voltage dynamically.

It was not, MacDonald said, Intel's policy to knock competitors, but he did feel moved to cite a claim that Transmeta's chips would not be 100 per cent Intel compatible.

MacDonald admitted that there is a trade-off between processing power and battery life: processor design can be optimised for one or the other. The fact that 'performance' notebooks, as opposed to sub-notebooks and low-cost slower models, accounted for 75 per cent of the market, showed that people wanted speed.

But he agreed that there

was expected to be a surge in demand for low-cost webpad devices of the type targeted by Transmeta and NatSemi.

The sales figures are also distorted by the fact that many powerful notebooks are bought to replace desktop machines, partly because they are quieter. And they are quieter because they use less power and thus generate less heat, doing away with the need for fans.

A trend towards designing fans out of desktop machines is likely to be accelerated by the latest Macs (see page 40). Apple is making a major selling point out of the fact that they need no fans.

Noise, as Intel itself points out, is not the only factor.

Cutting the power consumption of PCs can make a considerable difference to the electricity bills of large companies.

Underlying the new focus on wattage is the fact that hardware performance is currently running way ahead of most software needs (games excepted). This may change, but hardly in the near future; meanwhile mainstream PC buyers are going for mid-range machines rather than paying a premium for processing power they do not need.

People are already challenging Intel's claims for its latest mobile PIII's, the 500MHz version being said to consume less than a watt and the 750MHz version less than 2w. This from a company that used to boast of 'low-power' chips consuming up to 13w.

The different figures are partly due to definitions. One often-cited figure is for the power drain when a CPU is run continuously at its maximum number of operations per second, a figure of more interest to system designers than users.

It is hard to measure processor power consumption directly under real working conditions. Some CPUs need more power-consuming support chips than others.

The total system consumption is what counts and the processor may account for less than a third of this – developers are already taking a long hard look at the consumption of other components (see opposite). What does seem certain is that the power debate will provide new elements for obfuscation by vendors – and corresponding confusion among buyers.

CLIVE AKASS

IA64 processor delayed

Intel will not deliver its 64bit Itanium chip as planned this autumn, the company has admitted. A spokesman for Intel explained that: 'The testing of the operating system, applications and validation is taking more time than previously estimated.'

He said early systems will be delivered at the end of the year, but that 64bit servers

from many manufacturers will not ship until the first half of next year.

Xephon analyst Chris Martin said people who need the 764bit address space for big databases and other apps would wait for new servers rather than buy older technology.

'The main impact of this will be on Intel's own revenue stream,' Martin said.

JOHN LEYDEN, VNUNET.COM

MOBILE DISPLAYS

...and researchers look at how they can cut down on power drain from displays

Energy-saving tactics for screens

British researchers are developing ways of reducing the power needs of that other great mobile battery-drainer: the display. One approach could also lead to flat-panel wall screens that are larger, and 30 per cent cheaper, than plasma panels that are currently available in sizes up to 60in.

The frugal photo-luminescent liquid crystal (PLLCD) system could also be used in notebook screens, according to Bob King, CEO of developer Screen Technology.

Normal backlit LCD screens use white (that is, broad spectrum) light passing through a liquid-crystal matrix to RGB filters that produce a colour image with a narrow angle of view. The filters, by rejecting some of the light, are inherently inefficient.

The PLLCD screen uses a narrow-band ultra-violet source and replaces the filters with a screen coated with light-emitting RGB phosphor pixels with a wide angle of

view. The technology was shown off at an exhibition to mark the 125th anniversary of Cambridge University's engineering department, where it was first developed.

Screen Technology has developed an additional optical layer that spreads the image slightly so that an array of LCD panels presents a single seamless picture.

It is on these large displays that the company is concentrating. King believes notebook battery life is no longer a big issue – although having arrived in Cambridge hotfoot from an Intel briefing on mobile processors (see opposite), I was inclined to disagree.

But 'the acreage of displays that will be coming out in the next decade' will present a power problem of a different order, according to King. He says that PLLCD technology could cut the national power load by megawatts, with corresponding ecological benefits.

The defence research

Through thick and thin

Cambridge 3D Display, as its name suggests, is experimenting with various 3D techniques. At Cambridge University's exhibition (see left) it showed a design called the Wedge, which uses a tapered sheet of glass to produce the seemingly impossible: a flat projection screen. The image is beamed through the thick edge and refracted through a diffusing screen to form a display of up to 50in. www.cam3d.co.uk

establishment DERA (see page 42) showed a small Zenithal Bistable Display (ZBD) that requires absolutely no power to retain an image – normal screens need refreshing many times a second.

The ZBD uses a microscopically corrugated surface over a liquid-crystal layer with the geometry cunningly contrived to allow crystals to flip into either of two stable states.

It can work with backlighting, though power savings are greatest with reflective screens – as much as 1,000 per cent in the case of an ebook display, which may not need to change for

minutes at a time, according to DERA fellow Guy Bryan-Brown.

Savings are large even with rapidly moving images because only the changing pixels need to be addressed. Filters can be used to provide colour.

The ZBD reflective screen turned out to be unexpectedly bright, Bryan-Brown said. Certainly it looked impressively crisp compared with that of a Palm Pilot which, he said, was using expensive compensatory layers and extra power to achieve its contrast.

A final advantage is that the screens can be flexible. Not foldable like paper, but capable of being scrolled out of a tube like a spring-back projection screen. 'For the first time you could have a device with a screen larger than its footprint,' Bryan-Brown said.

DERA does not intend to make the same mistake with ZBD that it made with an earlier breakthrough – active matrix displays. The company failed to take out a patent before university collaborators at Dundee published a paper on the technology. 'If we had done the paperwork we would be £30m a year better off,' Bryan-Brown said.

See also *Tim Bjarin, page 48*
Screen Technology
01223 875550
www.dera.gov.uk

LEP in the dark hits a glass ceiling



Waiting for a breakthrough

Displays will be revolutionised the day you see plastic light bulbs, according to DERA fellow Guy Bryan-Brown. The reason is that no-one has come up with a plastic that can match glass for impermeability.

All plastics leak gas and even water. One screen technology that has been held back as a result was notably absent from the exhibition. Cambridge Display Technology (CDT) uses Light Emitting Polymers (LEP) which generate light-like LED status lights. There

has been a lot of hype about CDT's potential to produce flexible electronic paper but, following a recent shake-up, forecasts have been more conservative – especially about timescales.

But CDT has just demonstrated a full-colour 2in screen, developed with Seiko, which should go on sale 'within a couple of years'. This breakthrough involved getting polymers that emit red, green and blue within the required voltage constraints. However the polymers are water-sensitive, which is why CDT is still stuck with glass.

In another look at low-power futuristic displays, Tim Bjarin unveils some US developments

A new chapter for electronic paper

Two pieces of technology that I found while roaming around Silicon Valley recently have gone into my 'must watch' file. One could have a major impact on the way we view digital information and the other (see below) could finally make Linux mainstream.

Imagine a sheet of paper showing news stories that are updated wirelessly throughout the day, so that each time you pick it up, the news is always current. Or, how about a book that receives new content over the air: one device that replaces the hundreds of books on your shelves.

Welcome to the future of electronic paper and ink. One approach to the idea comes from a company called E-Ink, which has had an electronic paper sign in use for most of the last year in a shop near its Cambridge, Massachusetts, headquarters.

The company's electronic



Signs of the future: a never-ending update via electronic paper

'ink', which can be printed on nearly any surface, uses millions of tiny microcapsules containing white particles suspended in a dark dye. An electric field pushes the particles to one or other end of the capsule to produce a white or a black spot. The ink is printed onto a plastic sheet that is laminated to a transistorised layer that drives the pixel patterns.

Xerox, however, is taking a

different approach at its Palo Alto Research Center in Silicon Valley, where scientist Nick Sheriden has been working on an electronic-paper project since coming up with the concept 15 years ago.

His e-Paper uses what is officially called a Gyricon sheet, a layer of millions of bi-chromal balls sandwiched between two sheets. The balls change colour under an

applied electric field to create a paper-like digital display. Now Xerox is partnering with 3M to create some of the first applications.

Xerox will be using this first-generation e-Paper in shop displays but, like E-Ink, the company believes it has the digital display technology of the future.

Both technologies are strictly two-colour and have very slow refresh rates, but over time, executives of Xerox and E-Ink believe that they will be able to make their products multi-colour and deliver much faster refresh rates. At some time in the future this would allow them to display not only simple text, but perhaps even moving images on these new electronic paper displays.

The displays will be cheap and demand little power. But in truth, we are years away from seeing electronic paper or electronic ink reaching their full potential.

Linux gets a facelift for the desktop

The second technology of note will finally put a truly consumer-oriented interface on Linux. Up to now, Linux has been largely an operating system for servers and industrial-strength applications. For years I have been saying that Linux will never make it big on the desktop unless someone creates a great interface for it. Now it appears that Silicon Valley start-up, Eazel, has done just that.

Eazel was founded by Apple veterans Mike Boich and Andy Hertzfeld and aims to change the face of Linux. Andy Hertzfeld is the better known of the two as he designed and implemented a

large portion of the Macintosh system software, including the User Interface Toolbox. Boich was the first Mac software evangelist and is credited with getting the first third-party applications created for the Mac.

Eazel has come up what it calls the Eazel Nautilus 1.0, which blends a graphical user interface with a powerful embedded web browser based on Netscape's Mozilla. It definitely takes GUI standards up a notch. Nautilus 1.0 displays files by using representations of their contents (image, text, music, etc), which allows users to identify file type and content without having to

choose or open applications.

Virtual search folders enable users to immediately locate related files, based on user-defined relationships, regardless of their location in the Linux directory structure. This new UI even allows zooming onto any file to gain a better view of what's inside, a feature that sets it apart from all other GUIs on the market.

It is quite possible that the various innovations within Nautilus 1.0 will

take the market by storm and give Linux the type of interface needed to help it move beyond the back office and onto the desktop in the future.

A public beta of Nautilus is scheduled for late August and the final version is due to ship in early 2001.



A revamped interface could bring Linux onto the desktop

Technical and political problems could stall the progress of ASPs and ADSL, warns Gordon Laing

I want my ASP now



In the long term, all applications are likely to be provided as a service over the Internet. Not my words, but those of a Microsoft white paper detailing the concepts behind its .NET platform.

Wherever you are and whatever you're using, you'll be able to fire up a version of Office, edit your documents, check emails, change your schedule, then find this updated information on the next device you use. It's not rocket science, as your information was never on the device; since it's all hosted remotely, your data exists on someone else's computer.

A couple of decades ago, this was the theory behind all dumb terminals that networked into a large main server. Today the network is the Internet and the terminals are almost any suitable information appliance. Such outsourcing of data and programs is done by Application Service Providers (ASPs), and clearly that's the way Microsoft's heading.

Remote application hosting is a sound concept, where the user never has to worry about purchasing, deploying, maintaining or upgrading applications, as they only ever exist on the ASP's own server. You merely rent time on them as you need it.

The immediate problem that springs to mind is your connection to the hosting services. You need permanently connected, fast services like ADSL. Then there's being tied into the ASP. If it's got your data, then you've got to continue renting its services, and there's the justifiable paranoia that the network or your communications may fail at a critical moment.

The biggest problem, though, is finding relevant ASP services for you and me. Sure, there are plenty of ASPs serving worthy high-end applications like enterprise resource planning and salesforce automation, but how many small or home offices want that, or even understand what it's all about? I believe there's an enormous market for ASP services targeted at small businesses and individuals that cut through the typical enterprise terminology and deliver something useful.

Fired up, I recently went on the search for such services and came up almost entirely blank. There were loads of frightening enterprise ASP services I simply couldn't get my head around, but next to nothing targeted at me, my website and my business. Then I

came across NetStore (www.netstore.net), which, while offering a multitude of ASP services I couldn't quite understand, also provided Internet backup.

One account later and I had a small backup utility on my PC, looking not dissimilar to the one Microsoft supplies with Windows. The difference was that, once activated, my precious data was squirted out over the Internet to NetStore's secure servers. With my ADSL connection I transferred a 12MB folder of 572 documents in about three minutes, with subsequent updates occurring almost instantly. Even when my ADSL was playing up, my standard 56K dialup connection delivered the small updates in less than five seconds.

I try to back up regularly, but worryingly only get round to doing it every couple of weeks. With NetStore, I was automatically backing up several times a day whenever I was connected to the Internet delivering emails or browsing the web – convenient, easy and effective.

This is what we want from ASPs and this appears to be what .NET will offer over the next few years. My only fear is having your data or applications tied into or limited to a particular provider. BT Cellnet recently had its wrists slapped for operating a WAP gateway closed to anything other than BT's own content. I asked BT if I could try out its OpenWorld ASP services using my Demon Internet

I asked BT if I could try out its OpenWorld ASP services, but **THEY WERE ONLY AVAILABLE to OpenWorld ADSL subscribers**

ADSL connection, but it said they were only available to OpenWorld ADSL subscribers. And the more I learn about network address translation used by many ADSL subscriptions, the more I fear that the thing protecting you may prevent you from using services you're forking out at least £40 a month to experience.

While providers have to add value to services and protect their investments, what could damage ASPs and ADSL before they even get started are restrictions that prevent people from using the services they want. At the dawn of what could prove to be the most significant leap in personal information services, let's please sort out the politics and technical issues that could sink them before they've even got in the water. I want my ASP.

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Barry Fox questions the wisdom of the watermark that SDMI insists goes on all DVD-A recordings

The sound of silence



Readers were outraged at the news that a British company had developed a system to curb CD copying by blocking playback on a CD-ROM drive. I suspect few will welcome a plan to monkey with the super hi-fi sound available from the new

DVD-Audio and Super-Audio CD systems. But they can take heart from what happened to the CD copy-blocker.

UK company CDilla is best known for SafeDisc, which has been used to copy-protect over 30 million CD-ROMs. AudioLock added spurious ROM sub-codes to an audio CD that makes a PC CD-ROM drive refuse to play it.

Once the news was out, PC users warned that AudioLock would stop them legitimately listening to CDs while working, and ripping CDs onto the hard drive. Macrovision, which specialises in video copy protection, bought CDilla and went back to the drawing board.

AudioLock is now SafeAudio and Macrovision assures that processed discs will play on a ROM drive and compress into MP3. However, the MP3 copy must meet the requirements set by the Secure Digital Music Initiative (SDMI) and not copy through further digital generations.

Macrovision was due to run extensive, but unannounced, field trials in the US around May/June, so if you have come across a CD that behaves oddly, don't suffer in silence. Asking for a refund is always the best way to be sure the message gets through.

The SDMI is, of course, already behind the scheme to watermark music on the Internet. The analog waveform is altered slightly so that it conveys code that signifies 'copyright source' and triggers copy controls in future recorders.

Last summer the SDMI asked 4C Entity (an IBM, Intel, Matsushita/Panasonic and Toshiba consortium) to test several watermarking systems and recommend the best. The Verance system (developed by two US companies, Aris and Solana) won. An encoder analyses the music waveform and makes slight alterations that a lookup table decodes as digital bits. The mark must be sufficiently robust to survive MP3 coding and Internet transmission, but subtle enough to remain inaudible.

The 4C tests were done in US studios by the major record companies, with 50 'golden ear' listeners. The SDMI then went a whole lot further and agreed with the major record labels and DVD Forum that the Verance

system should also be used to watermark super hi-fi recordings on DVD-Audio. From October all DVD-A players must have Verance circuitry built in. This is good for Verance, which stands to earn huge royalties, but what does it do to the music?

We established that the golden ear tests had been conducted with recordings made and played at far lower quality than the 192KHz sampling and 24bit coding on which DVD-A will be sold. The SDMI, 4C and Verance would not identify the golden ear listeners and passed technical questions round like a parcel.

Grammy-award winning recording engineer Tony Faulkner decided enough was enough and used audio engineering news groups on the Internet to warn that DVD-Audio (and probably also the high-end Super-Audio CD system developed by Sony and Philips) were to be compromised by an inadequately tested analog watermarking system.

The result was a hastily arranged series of tests held at the Sony/CBS Studios in London in early July. It was hard to take them seriously. No-one from 4C bothered to turn up. Over 30 UK engineers did turn up, but were rewarded with old analog recordings played off a digital hard disk. Some engineers just said the music was too poorly recorded to give meaningful results; others

The GOLDEN EAR TESTS had been conducted with recordings made and played at far lower quality than that on which DVD-A will be sold

showed they could hear the mark, even though sound quality was far below the level of DVD-A and SA-CD. I sat in as an observer and could not miss the fact that the test rig relied on a laptop with a hard drive that whirred variably, generating a complex audio spectrum that was louder than the quieter music passages.

Although the DVD Forum still insists that all DVD-A players must have watermark detectors, it is up to the record companies to decide whether to tamper with their waveforms. And they save money on royalties if they don't.

While the tests were in progress a thief broke in overnight and stole a Sun server. Was this an attack on SDMI or an opportunist coincidence? Time will tell.

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Working in the country doesn't necessarily mean missing out. Brian Clegg envies Ezoka's location

The joys of rural business



The high-tech world of ebusiness has had an unexpected impact on the rural economy. Rather than snapping up me-too city offices, a number of hot ecompanies are opting for the country life.

A good example is business-to-business supplier Ezoka.com. Ezoka applies the 'let's buy it' approach to business essentials, but with a twist. Where customers of the consumer site have to wait until there's a critical mass of buyers, Ezoka customers get bulk-buying benefits up front. There are then further rebates if enough customers want the same products. And the earlier you commit to buying, the better the rebate you get.

Ezoka isn't a garage outfit. With £4.5m in backing it could have set up anywhere, but this technologically sophisticated etailer of anything from PCs to insurance operates from the back rooms of a pub. The True Heart looks like a typical village inn. Situated

There's something special about working over a VILLAGE PUB. In the afternoon, the ice-cream van calls and the office empties out into the street

in the pretty Wiltshire village of Bishopstone, it's a stone's throw from the pond, the church and the tiny village school. But in what were until recently a store room and a function room, the Ezoka development team works on the latest web technology.

This unique location can be quite a selling point. I spoke to Ezoka's chief technology officer, Simon Warrick. We met in the Ezoka office, but quickly moved to the True Heart's bar, which is connected directly to the offices by an internal door.

'Working here is very attractive,' explained Warrick. 'Business accommodation and housing is significantly cheaper. There's a lot less traffic than there is in a town - you can live 20 miles away and still be here in 30 minutes. And yet I can get to our marketing offices in central London in an hour and a half, maybe only half an hour more than from the suburbs,' he added.

Most of all, the employees enjoy the relaxed

environment. 'There's no need to dress up,' said Warrick who was dressed in shorts. 'Lots of people would like to work this way. There's something special about working over a village pub. We can even get breakfast and pizzas delivered straight to our desks. In the afternoon, the ice-cream van calls and the whole office empties out into the village street.'

When Ezoka's development team was set up in Bishopstone there were some concerns about the difficulties of getting connections in such a rural setting, but the reality has proved to be a pleasant surprise. Setting up leased lines and ISDN has been no problem (though ADSL may take longer). In fact, Ezoka is far from being the only high-tech establishment in this apparently sleepy hamlet. There are so many small operations with second lines and ISDN in the village that the local telecoms engineer refers to it as Silicon Pond.

Perhaps the only disadvantage of the rural location is the lack of public transport. Having your own vehicle (unless you live in the same village) is a necessity for the rural economy, though interestingly 50 per cent of the Ezoka team have motorcycles rather than cars, perhaps saying something about the sort of people who appreciate this type of lifestyle. Unlike a town centre location, though, the pub always has plenty of parking space.

We hear a lot in the news about rural decline. Ventures like Ezoka show that it is not just possible for IT to give the rural economy a boost, but it's actually desirable for everyone involved. There's a great atmosphere in a place like Ezoka that you don't get in a faceless city office. But like any business solution, there can be problems.

Ezoka has been lucky in getting the IT connections. Many small and medium-sized businesses in rural locations find it difficult or expensive to get anything more than a bog-standard phone line. And even Ezoka's paradise is under threat. The company has outgrown its accommodation and is looking to move on from the True Heart - but is making every effort to find another village-based home instead of the easy option of a business park or a city centre site.

Despite the limitations, though, it's time many more high-tech companies were considering the real benefits of getting out into the country. Ooh arr.

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As Nik Rawlinson takes the helm of this column, he proposes a safety tax to protect us from viruses

Don your Internet condom



I've finally done the responsible thing. It's months overdue, but at last I've installed some virus protection at home. I'm sick of people with a victim mentality who winge when they're hit by infected files and I'm determined not to be one of them.

The software scanned my drives and gave me a clean bill of health, so I'm counting myself lucky, but it could so easily have been very different. In the month or so since I last installed Windows I've received around 200 emails, downloaded countless files and visited so many websites I've got more cookies in my cache than my kitchen, but thankfully none of them contained any fragments of malicious code.

I'm lucky in other ways, too, though – I managed to get my hands on the software for free. It was completely legit, and no piracy or CD burners were involved, but had I had to pay for it, I have to ask myself if I'd have bothered. After all, virus software isn't much fun, is it?

Without virus protection it's not just my data I'm risking, it's that **OF ALL MY FRIENDS and do I really want to make that embarrassing call?**

You can't pass a rainy Sunday afternoon playing networked ViruStomper with your mates. You can't use it to produce birthday cards or a report for work, or to send emails to friends. Let's face it: virus protection is boring and unless it finds anything amiss all it seems to do is sit there slowing down your PC. In short, most of us need to have some sort of an incentive to install it, and all too often that incentive is when we've been bitten by the bug. Bug-busting software house McAfee puts the number of viruses floating around the Internet at 53,000, with more appearing every day. So it's not surprising that if you've been lucky and not been bitten yet, there's a good chance you know someone who has.

I spent an afternoon a couple of weekends ago reinstalling Windows on a friend's PC after its boot sector had been nibbled away by some malevolent code. And the first thing he did the very next day? He went out and bought some virus software. But why should he have to? Surely it should be free.

Virus protection is no longer a matter of choice; it's a point of social responsibility. If I get an electronic infection there's a good chance I'll pass it straight on to everyone in my address book. Without virus protection it's not just my data I'm risking, it's that of all my friends and do I really want to have to make that embarrassing call, explaining what has happened? Virus scanners are Internet condoms, and we should perhaps consider the risks associated with using neither to be more or less the same, offspring considerations aside, of course.

For this reason, I'm proposing a new tax, a safety tax to be levied on everyone who uses the net. A fiver a year ought to do it, and it would be collected through your ISP, paid directly to an independent international body to pay for two things. The first instalment would be used to set up a taskforce to write the next generation of virus protection software. Its remit would be simple – first, it should be small enough that until we all have unmetered access those who pay for their calls won't be put off downloading, and second, it should be freely distributed. The remainder of the fund will be used to run a name-and-shame campaign.

It is a small number of companies whose products are susceptible to the greatest number of virus attacks, and it's those companies that are best placed to fight back. They, after all, have access to the source code that sits behind their fancy buttons and toolbars. Each time a new virus crops up the body would approach the affected company and make it a standard financial offer, say £10,000, to cover the time spent writing a cure to update the free scanning software. If the company agrees, it gets the money. If not, a banner ad is created to highlight its social irresponsibility. This will run within the scanning software, ensuring the whole world sees it. I'm not denying that the blame for viruses lies squarely with those who write them, but if the people best placed to fight back don't chip in and help out, they're costing us money by forcing us to buy remedies.

I doubt this'll happen soon, if ever, so in the meantime, do the decent thing. Point your clicker at <http://antivirus.cai.com/> and hit the download button for some gratis social responsibility. If you're running a consumer version of Windows it might save you some heartache in the months to come and, best of all, the updates are free too.

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letters

Send your letters to:
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HEAVY BREATHERS CUT OFF

Along with about 750 other 'breathe freely' Internet users, I was informed that I was to be barred from using the service as of 1pm on Wednesday, 26 July 2000.

I received notification by email on Sunday, 23 July that the service would be removed due to 'excessive use', although this was, and continues to be, undefined. The company is using the following part of its Terms and Conditions for the breathe freely service as justification:

'The terms and conditions of the breathe freely service allow us to disconnect users if we feel that their level of use puts our ability to supply the service at risk.'

The subscription fee (£50, paid in advance) will only be refunded if users prove they are using the breathe 0845 Internet access service by submitting their itemised telephone bills to breathe.

At no point have I been made aware of any over-use of the service, which I can only use at home. I use a 'normal' subscription service from Global Internet when using my laptop to access the Internet elsewhere, or when a high reliability and performance connection is required.

Having emailed the breathe billing department on three occasions and not received a reply or return phone call, I called the national rate number. During a 35-minute conversation, I was told that 'the decision is final' and my only course of action was to write to the CEO who would read my comments. The company seems totally inflexible and committed to withdrawing the service from a large number of users, who are using it to a greater extent than breathe determines to be the norm.

The level of service and performance provided when the breathe freely service is operational is, I feel, acceptable for the charge incurred. I would be happy to continue using it, should I be allowed to, but feel I should make the wider Internet community aware of the above business practices and it is the end user who will lose out in the long run.

ROBIN DOWNS

BREATHE.COM replies >

The terminations by breathe of 500 of its 'breathe freely' user connections was not an easy decision for us to make. The difficult decision was made due to the action of a few affecting the service for the majority.

Although not all of the users terminated were clocking up over 16 hours a day, those who have been cut off were using the service enough to prevent other users being able to access the Internet via breathe.

In line with breathe's policy to deliver quality Internet access to all, these steps have been taken to ensure that this promise can be kept by removing the minority of users whose usage was extreme. Many of those accounts terminated were business users, but regrettably some were consumers with high-usage requirements.

All affected users will be refunded their £50 subscription fee, which can be claimed either as a direct deposit to their bank account from breathe or in free calls to the breathe 0845 service.

No 'breathe freely' user will be disconnected from the Internet or lose email access, but will be migrated by breathe from the free IDA access number to a call-charging 0845 number.

breathe is providing new solutions to heavier Internet users in August, which will incur a monthly fee. This service will be a separate

LETTER OF THE MONTH

ACCESS ALL AREAS

Alan Aitchison in his letter (PCW September 2000) exemplifies why personal computers (and IT generally) have only penetrated two homes in 10. It's because 'specialised' PCs, are complicated, difficult to use and over-powered for most people's uses. How many non-IT people can be bothered to mess around with config.sys or autoexec.bat just to get a game to play? No hassle with a PlayStation – put in the disc and close the lid.

IT will only become an enabling force when it becomes as simple as the TV – when the so-called couch potatoes can check their bank balance, search the British Library, or vote electronically anywhere, any place, any time. Just because something becomes simple and accessible to all doesn't make it a bad thing. Just because I'm using ON Digital's email service to write this doesn't mean my PII-350 is redundant – I'm just using different tools for different jobs.

Pervasive IT will be good for the community – IT that doesn't have to be fiddled with to get it to work will become part of everyday life. People will be ready for the e-age and perhaps that is what's worrying the Alan Aitchisons of this world. Could it be that he and many in our industry are more worried about losing their mystique than the future price of a PC? If IT becomes so accessible, what will he have to offer?

DAVID SANDERS

product to 'breathe freely' and will be made available to those users recently removed from breathe freely, as well as new users on breathe.

RISC-Y BUSINESS

I read with interest David Fearon's column *The nerd's revenge* in *PCW's* August 2000 issue. I notice that he referred to the Mac and Apple in his discussion of the problems of PCs. However, he did not mention the RISC OS computers pioneered by Acorn. These machines have always been far superior in operation and reliability to any PC and it is an astonishing feat of marketing on the part of Bill Gates and Microsoft that millions of people have been conned into buying inferior machines and systems.

The present generations of RISC OS machines are faster and more stable, as well as longer lasting, than the PC. The operation is much more efficient and they are superior in every way – yet only a small number of people seem to use them or even know of them.

Why don't you borrow one of these machines and try it for yourself?

KEITH BAMFORD

DAVID FEARON replies >

Don't need to borrow one, Keith. I've owned an Archimedes since 1990, and have spent most of my waking hours from the age of 10 in front of a BBC Micro. Unfortunately, there was never any chance of RISC OS becoming a de facto standard against the likes of IBM, so I defected to PCs in 1996. In any case I'd actually dispute the idea that RISC OS is superior these days – it hasn't progressed significantly since v3 was released in the early 1990s, and it's simply never been true that Arcs/RISC PCs are faster than a PC of the same price. You can buy a dual 800MHz PIII for the two grand or so that RISC PCs cost, and the latest generation of graphics cards completely blow anything that a RISC PC can support out of the water.

I was as disappointed as anyone when Acorn and its RISC PC II project foundered in 1998: I was reviews editor of PCW at the time and had a review of a RISC PC II machine all lined up. But, it's a tough old world out there, and in the end Acorn just didn't have what it took to survive.

LINEONE QUITS QUIP

As a LineOne subscriber I took advantage of its free phone call offer via Quip and was very happy – until now. LineOne sent me an email to tell me that the scheme will be withdrawn because it is too popular. Instead customers can opt for the more restrictive BT Surftime.

Surely this is a breach of faith? Any



Carrera's help desk wins applause

fool knows that if you offer a seven-day-a-week, 24-hour service for £5.99 a month then, yes, people will use it and, yes, it is very difficult to make money. The conclusion that many might draw then is that the people at LineOne are inept or more likely, have total contempt for their customers. If this is the case customers should vote with their feet.

TOM SWINNEY

NIK RAWLINSON replies >

Many readers have sent similar emails and all are putting the blame squarely at LineOne's door. Perhaps, though, we ought to look more closely at why the scheme failed. After some careful maths, LineOne worked out that the service was viable only if users stayed logged on for no more than two hours at a time. Sounds fair enough to me, but a lot of users didn't like this and so they rigged their PCs to automatically reconnect whenever the line dropped. This meant that just 10 per cent of users were accounting for over 40 per cent of online time. As a result, of course, the carefully constructed financing plan crumbled and BT rightly had to pull the plug, although it is refunding users' initial investment in the scheme by awarding them free voice calls.

I'd be the first to criticise a company that I felt had genuinely short-changed its users, but in this case, it looks more like the greed of the few has spoilt it for everyone else.

SURPRISE SERVICE

In January, I bought a new PC from Carrera. This has behaved well apart from a bad sector appearing in the middle of the Windows 98 software, which caused an hour or two of excitement.

However, the system crashed and refused to complete the boot sequence and I received a message from HIMEM.SYS suggesting that there was a memory error. A few changes to CONFIG.SYS (of unhappy memory) and the machine is going again. However, I was not happy with suspect RAM, so I called the vendor.

To my great surprise, the call was answered immediately, not by an engineer but by a pleasant lady who asked for a few details, and said that I had never called previously (so I knew they had a record of past problems and calls). She stated that the engineers were very busy and would not be able to call me back for several hours. I asked if it was normal for the company's engineers to call back, and she told me it was! Carrera phoned back two hours later, and is sending me some software to check my RAM.

I have been in this business for some years, and I know that this is not the proper way of doing things. You are supposed to make customers call a standard (or premium rate) phone line only available between 9am and 5pm, and then play music to them for 30-40 minutes with the occasional reassuring statement that my call is valuable to them and that there are only 27 people ahead of them in the queue. When you get through, someone takes half an hour to run a series of checks, which you have already done, and then says: 'Format the hard disk and reinstall Windows.'

CHARLES BREWER



Underclocking a high-performance PC negates the warranty, but it makes it far quieter

SCOTT MONTGOMERY replies >

It is refreshing to hear of service like this from Carrera, as unfortunately it is not the norm among manufacturers. Here at PCW we regularly hear of situations where computers have failed and customers have been put on hold for hours, or been bounced between departments, just to find that the problem is still unresolved after long periods of wasted time and anxiety.

Unfortunately computers are not perfect machines and do break down. This is a hazard that has arisen due to the pace of change in the industry and it has to be accepted (although it should obviously be minimised as much as possible). But this does not let the manufacturers off the hook. Provision must be made by manufacturers to deal with these after-sales problems. The bottom line is: if Carrera can do it, so can everyone else. It is not enough for the companies to say they will find time for these sorts of issues, they have to make time.

SILENCE IS GOLDEN

The computer press has recently focused on PC overclocking and its problems and benefits. Your August 2000 issue contained an article by Gordon Laing about overclocking – he managed to get his processor past 1GHz. There was also a letter from Alistair Mackenzie about turning a K6-III 400MHz into a 500MHz, and overclocking his graphics card.

All well and good, but am I the only person who has discovered the benefits of underclocking?

The PC is noisy, mainly because of the huge fans necessary to cool the latest chips. Look at the size of the beast in Gordon Laing's article; it's bigger than the one I use to cool down my Grandma. And Alistair Mackenzie pointed out that he too needed a fan for his graphics card after he overclocked it. Noise everywhere! My solution is to promote underclocking. Fair enough, it invalidates your warranty, but it's worth it for the silence.

The evidence? I recently bought myself a new PC, a lovely Pentium III 750MHz, costing about a £1,000. By tinkering with the processor switches I managed to underclock it down to the equivalent of a Pentium I 500MHz. It then ran cool enough to allow me to throw away the fan, and my PC is now almost silent (although it is a tad slower).

If enough research went into this area we could probably downgrade the latest processors into the equivalent of a 486 DX4/100 within a year and the result would hopefully run cool enough to chill beer. The possibilities are endless.

KARL DRINKWATER

IT DOESN'T ADD UP

I hope the youngsters pictured on pages 160-161 of your September issue are not looking at the incorrect mathematics you printed under the monitor.

Until recently, the scientific press frequently failed to check that numerical superscripts were printed correctly, presumably after converting text from one word processor to another during editing, which resulted in some awful howlers. Most seem to get it right now, and I trust *PCW's* lapse is just a one-off.

Thank you for an excellent magazine. Such minor blemishes are noticed just because they are so unusual.

HECTOR C PARR

CLIVE AKASS replies >

Sorry about that. The 132 and 122 should of course have read 13² and 12². As you rightly point out, these errors occur in translating from one system to another – in our case from PCs to Macs, which are used for production.

This is just one of many problems stemming from the fact that for a long time there was no global standard for representing text. Two-byte basic ASCII, with its 256 numbers, was simply not up to the job. Four-byte Unicode, which allows for 65,536 symbols and takes into account just about every language in the world, is supposed to be the answer, but it is by no means universally implemented. Which is why even the simplest email can get corrupted in transmission.

CLARIFICATION

The Belinea 10 30 50 that appeared in the 17in monitor group test (September 2000 page 188) was incorrectly priced at £260 ex VAT in both the review and the features table. We have now been advised the correct price of this monitor is £188 ex VAT. As our primary criticism was its cost, the 10 30 50 star ratings should now be revised to reflect four stars in all categories.

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Jason Jenkins
SENIOR STAFF WRITER

What's all this need for speed?

While Intel and AMD continue to try and outdo each other on the desktop processor front, the real battle has shifted from desktop to mobile processors. Two main forces are currently at work in this arena.

First, and most obvious, there's the rush to 1GHz. This month, we take a look at Dell's new Inspiron 5000e with a mobile Pentium III clocked at 750MHz, and Intel has plans to keep on increasing the clock speed in the future. At the moment, AMD is stuck at 550MHz with its mobile K6-2+, but later this year we will see mobile Athlons and Durons. There's little chance that the company

compromising performance. We've yet to see any products based on this chip, though, so for now it is all pie in the sky.

However, the company has clearly had an effect on the mobile-processor market, as both Intel and AMD have been talking more about their own power-saving functions. Intel has SpeedStep, a technology that runs the processor at a lower voltage (and speed), when the notebook is on battery power. It has also recently announced new low-power Pentium III 600MHz and Celeron 500MHz chips that, it claims, consume around 1w in 'normal usage'. Again, there are no products as yet.

AMD, not to be left behind, has its own PowerNow technology. This saves

A GigaHertz race in the mobile arena has the potential to be even more of a farce

will want to be seen to be falling behind Intel, and it's likely that, towards the end of this year and the start of the next, we will see yet another dash to 1GHz from both companies. Many people complained that the race in the desktop processor arena was bad for the industry and consumers, but a GigaHertz race in the mobile arena has the potential to be even more of a farce. There are few people that actually need 1GHz processors inside their systems at home, but it becomes even more ludicrous when placed inside a notebook. With the possible exception of digital video editing (and a desktop machine is more suitable for this task anyway), I have a hard time thinking of a mobile application that requires this much power.

The second trend is towards processors that consume less power, with the aim of improving battery life. One company that has grabbed the headlines many times over the past few months is Transmeta. It claims its low-power Crusoe processor runs cooler than others and allows battery life to be extended to a full day, without

power by changing the processor speed on the fly, depending on the operation being performed. Incidentally, we'll have a full review of this technology next month.

Intel and AMD say they can deliver extremely fast mobile processors that use very little power and, in the long term, they will doubtless turn out to be correct. But, in the short term, my guess is that faster processors are not compatible with very low power consumption. This is why I would prefer to see more low-power processors inside notebooks than headline-grabbing speed increases.

But this is precisely the problem. Think of two different adverts. One screams '1GHz mobile processor!' and the other 'This 500MHz processor uses only 1w in normal usage!' Which one is more instantly appealing, and which would you buy?

Mobile-processor power consumption will become a hot topic over the coming months. But, when push comes to shove, the top two vendors will fall back on increasing the headline-grabbing clock speed, chaining users to their wall sockets for a while to come.

ratings

- ★★★★★ EXCELLENT
- ★★★★☆ VERY GOOD
- ★★★☆☆ AVERAGE
- ★★☆☆☆ BELOW AVERAGE
- ★☆☆☆☆ POOR

Panrix Magnum MAX 1G

If you're after speed, good graphics and expandability, this is the machine – but it comes at a price

With processors clocked at 1.13GHz now a reality, you could be forgiven for thinking we'd seen everything a not-so-humble 1GHz chip could muster by now. You'd be wrong. Although we've put several 1,000MHz systems through their paces in the PCW labs, this PC from Panrix is the fastest 1GHz machine we've seen so far and it managed to clock up a very impressive score of 196 in our SYSmark 2000 benchtest.

This is partly due to AMD's new 1GHz Athlon. The chip, manufactured using 0.18micron process technology, comes complete with 256KB of on-die Level 2 cache. We first took a look at this processor in a Mesh system last month, but the extra time afforded to Panrix has enabled it to source a better motherboard, an Asus A7V-100, that features a Promise PCI-UltraDMA100 controller on board. This allows it to support the new generation of UltraDMA100 hard drives. It also frees up the motherboard's southbridge to deal with other matters, giving the system a further performance boost. We were pleased to see this mounted in a roomy, well-ventilated tower case, which will make it easy to add to the system in future months and years.

Inside the case is a hefty 256MB of PC133 SDRAM. This comes on a single DIMM that leaves a further two slots free to add extra memory modules. There's also a 60GB UltraDMA100 IBM Deskstar hard drive, mounted sideways in a 3.5in bay, which should be more than enough to store all the latest applications and games with plenty of room to spare. The drive has a spindle speed of 7,200rpm, so accessing your data should be extremely quick despite its cavernous capacity. There are two free 3.5in drive bays and a 5.25in bay should you want to add extra drives.

When it comes to 3D performance, this machine leaves others standing. There's a Hercules 3D Prophet II GTS

card on duty and this comes complete with 64MB of DDR memory. This helped the system turn in a staggering score of 7,235 in 3DMark 2000 when running in 16bit colour at a resolution of 1,024 x 768. Our Quake III time demo was completed with an average per second frame rate of 115.4, meaning that, if you're after the ultimate PC to play games on, you've found it. This PC could also be an option for graphic artists as, when we ran our test-rendering

keyboard and optical IntelliMouse complete the system, plus three year's warranty (one year on-site and two years return to base) and a copy of Microsoft Works 2000.

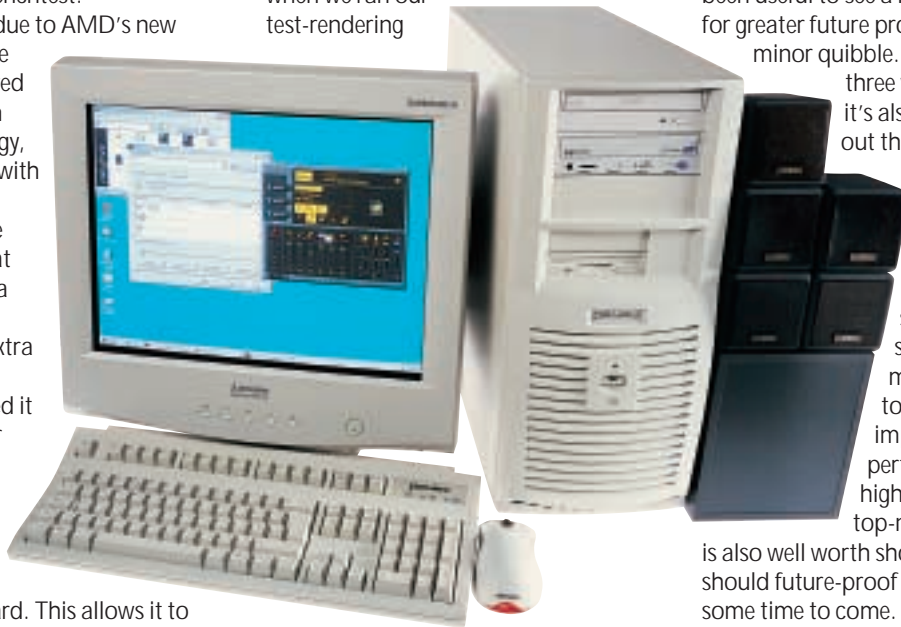
There's plenty of room for both internal and external expansion with this machine. For a start, there's a healthy complement of USB ports, five in total, as well as two serial and PS/2 ports and a parallel port. Although it would have been useful to see a FireWire connector for greater future proofing, again, it's a minor quibble. Elsewhere, there are

three vacant PCI slots and it's also worth pointing out that there's an AMR slot for one of the new generation of comms cards.

This Panrix PC is the fastest 1GHz system we've ever seen. The motherboard seems to have had a large impact on the chip's performance. It is also highly expandable. The top-notch graphics card

is also well worth shouting about and should future-proof your system for some time to come.

RICHARD MCPARTLAND



scene using 3D Studio Max, the unit took 22 minutes 54 seconds to render, marginally beating the Mesh Matrix GT Ultra we looked at in September, which took 23 minutes nine seconds.

As we'd expect from a system costing £2,149 ex VAT, Panrix's PC comes complete with both DVD and CD-RW drives. The DVD is a 12-speed model from Toshiba and the CD-RW is a 9110i model from HP capable of eight-speed write, four-speed rewrite and 32-speed read. We might have preferred to see a faster drive at this price, but the HP is still a good performer so it's no major criticism. A 56k PCI modem is also present.

The monitor is the excellent 19in Diamond Pro 91 from Mitsubishi. It uses a Diamondtron NF screen to provide a good image with a maximum resolution of 1,600 x 1,200 at 75Hz. A Creative Sound Blaster Live 1024 card takes care of sound and this is backed by an equally impressive speaker system from Cambridge SoundWorks. A Key Tronic

DETAILS

★★★★★



PRICE £2,525.08 (£2,149 ex VAT)

CONTACT Panrix 0113 244 4958

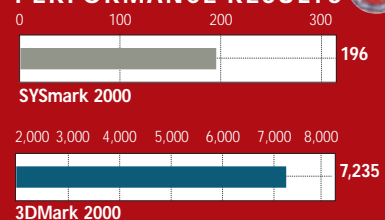
www.panrix.com

PROS Fastest 1GHz PC yet; excellent 3D performance; excellent monitor and lots of memory

CONS More expensive than the faster Mesh

OVERALL Unfortunately this level of processing power doesn't come cheap, but if your credit card can take the strain this Panrix system comes highly recommended

PERFORMANCE RESULTS



Mesh Matrix 1.1 GT Pro

The fastest system on the planet won't cost you the earth, although there's nothing cheap about it

The march to faster processors continues this month with AMD's launch of the 1.1GHz Athlon. Mesh has come up trumps again, giving us our first look at a PC based on this new chip.

The BIOS reported the chip as running at 1,066MHz but, using a couple of processor utilities we determined that it was actually running just over 1.1GHz. By the time you read this, Mesh and Asus will have come up with a stable BIOS update to ensure that the processor is reported correctly.

This system is virtually identical inside to Panrix's machine reviewed on the opposite page, but the faster processor inside it gives Mesh the award for the fastest machine we have ever seen, although judging by the 1.13GHz demonstration

system we've seen from Intel (see p25) it won't keep the award for long. There are two keys to its speed: first, the new Socket A Athlon inside has 256KB of on-die Level 2 cache, running at the same speed as the processor. This removes a speed bottleneck that was present on the old generation of Athlons. Second, the Asus A7V is a real gem of a board. Its secret is the onboard Promise UltraDMA100 controller. Its inclusion takes a load off the southbridge and helps increase the system's overall speed.

There's 256MB of PC133 SDRAM on one stick, leaving two further slots free. That means you could put in 1.5GB of RAM, providing you remove the existing DIMM and use 512MB sticks, of course. The 60GB hard drive is from IBM – a Deskstar 75GXP – with a spindle speed of 7,200rpm. It uses glass media, and we reviewed the 75GB version in our September issue. It is incredibly fast and provides the final touch to give this system a huge 204 in SYSmark 2000.

Producing the equally impressive 3DMark score is a 64MB Hercules 3D Prophet II. This Editor's Choice-winning

GeForce2 GTS graphics card is reviewed fully in our group test on page 203.

Needless to say, it is a very fast performer and has both DVI and S-Video out ports in addition to the standard D-SUB, so it will be able to connect to anything.

The extra processing power has only

only that, but there are a further four USB ports as part of the powered hub on the Taxan 975 TCO99 monitor, making a grand total of eight possible USB ports.

The 19in Taxan is a good shadow-mask model. To upgrade to the aperture-grille 985, Mesh will charge you around

£80. Four satellites and a subwoofer make up Labtec's LCS-2514 speakers.

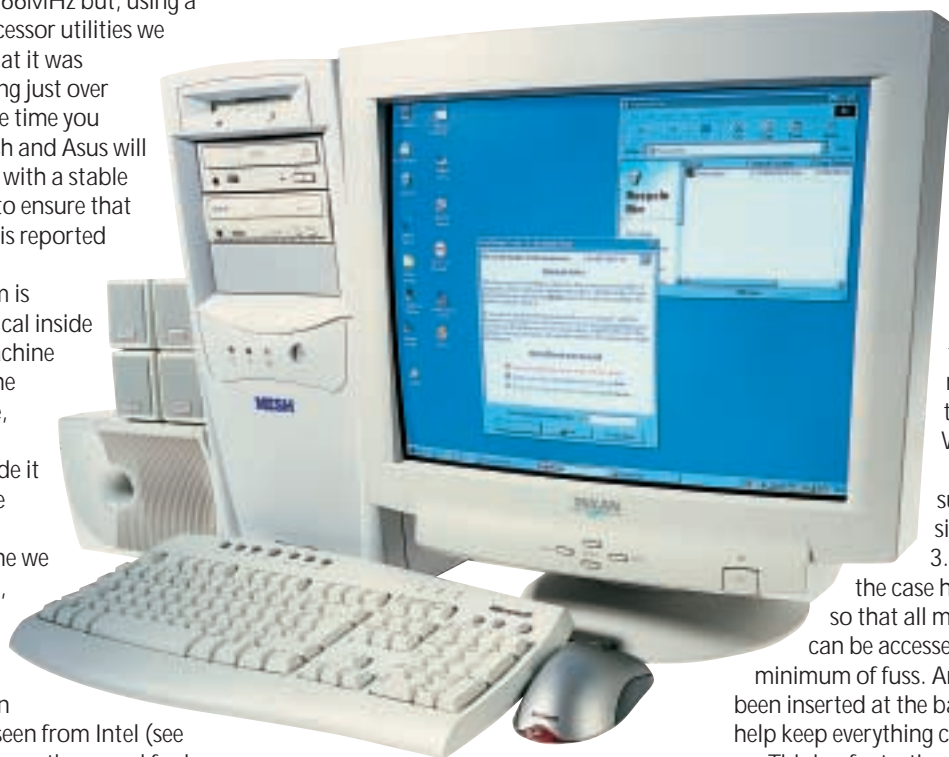
The system ships with Works Suite 2000 as standard. This includes Works 2000 and Word 2000, in contrast to the Panrix machine opposite that only ships with Works 2000.

Build quality is superb. There are single 5.25in and 3.5in bays free, and

the case has been designed so that all major components can be accessed with the minimum of fuss. An extra fan has been inserted at the base of the case to help keep everything cool.

This is a fantastic system that goes like the clappers and it's going for a song. If you are in the market for the fastest system on the planet, this is the one to buy

JASON JENKINS



given this machine a marginal 3D performance boost. It beats the Panrix slightly on 3DMark 2000, scoring 7,261. Quake III's time demo one was run with an average frame rate of 115.2fps, slightly below that of the Panrix, but within a certain margin of error. Our test render using 3D Studio was completed in 21 minutes 11 seconds: fast, but it still cannot beat a dual system – Panrix's dual Pentium IIIs running at 933MHz completed the same task in 14 minutes.

An OEM Creative SoundBlaster 1024 sits in a PCI slot, although it is without a CD SPDIF port. A V.90 PCI modem is also present, leaving three PCI and one AMR slots free. An Acer CD-RW is provided and this, like that on the Panrix, is an eight-speed write, four-speed rewrite and 32-speed read model. A Pioneer DVD-ROM (a DVD-115) sits below this, so you can play films and copy on the fly.

USB ports feature heavily on this product. In addition to the standard two at the rear of the case, there are another three mounted on a backing plate. Not

DETAILS

★★★★★



PRICE £2,348.83 (£1,999 ex VAT)

CONTACT Mesh 020 8208 4706

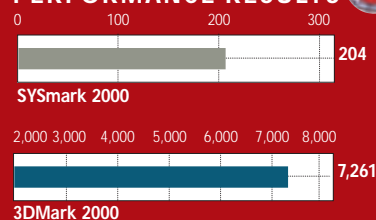
www.meshcomputers.co.uk

PROS Fastest system ever, well built, good expansion potential

CONS No CD SPDIF port on the sound card

OVERALL If you have this amount of money free to spend on a new PC, look towards Mesh

PERFORMANCE RESULTS



Systemax D700 RV Pro

A fast system that is more expandable than the first Duron systems

After providing us with our first look at a Duron processor in the August issue, Systemax has come up with another machine based on the same processor family, but this one is clocked at 700MHz.

One of the complaints we had the last time we reviewed a Duron was the lack of socket A motherboards available. The situation is now a lot better and Systemax has opted for a Biostar M7VKB. This is a full-size ATX board that affords plenty of room for expansion. As with all current socket A boards, it is based on VIA's KT133 chipset with support for AGP 4x and UltraDMA66. After all the cards are taken into account, there are two PCI slots free, plus one shared and one AMR. The latter is positioned in the more traditional position above the AGP connector, rather than at the base of the board. In terms of free bays, single 3.5in and 5.25in ones remain.

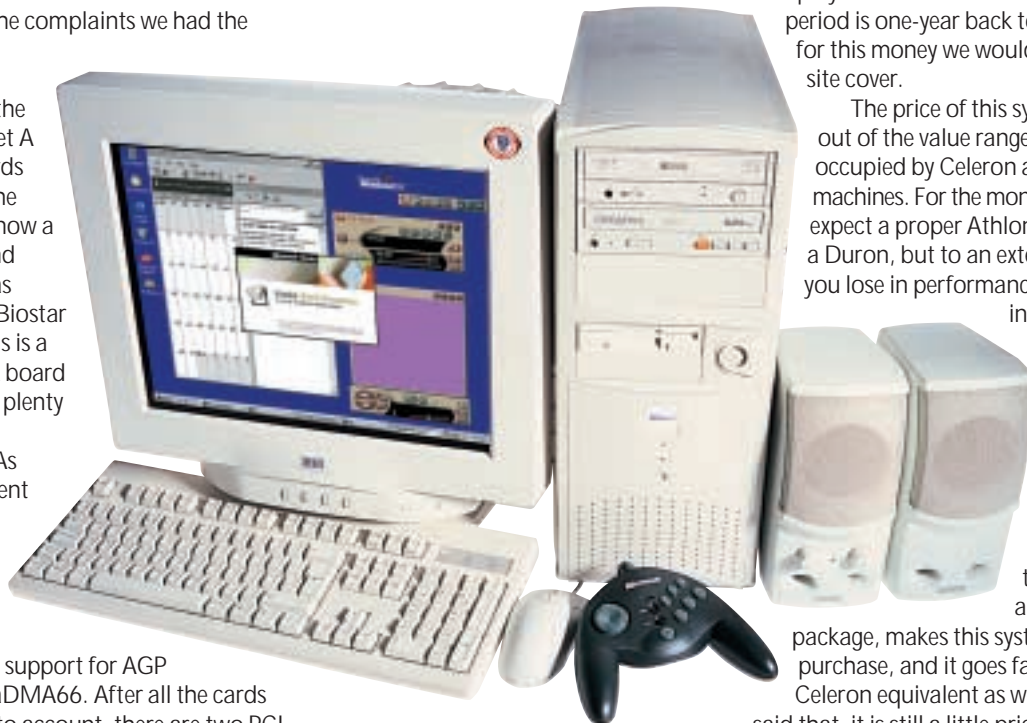
Backing up the 700MHz Duron is 128MB of PC133 SDRAM, all contained on one stick. This leaves two slots free for expansion. Attached to one of the two EIDE channels is a 30GB Maxtor hard drive. 30GB seems to have become a fairly standard size, and most people will have trouble filling this space.

Systemax puts in the same two optical drives into nearly all the review machines we see. It is an excellent combination: in one 5.25in bay there is the Ricoh MP9060, a 6 x 4 x 24 CD-RW and a four-speed DVD-ROM all in one unit. In the bay directly below there is a 52-speed Creative CD-ROM, giving you the opportunity to copy discs on the fly and still watch DVDs. The 52-speed was flimsier than usual, but this is still a fair drive.

You get a decent sound card for your money, an OEM version of Creative's SoundBlaster Live! 1024, although once

again this does not have a CD-SPDIF connector, so if you feel you need this, beware – it's not there. Sound comes out of a pair of Creative's SBS52 speakers.

One piece of new technology is the



graphics card. Systemax has opted for nVidia's new graphics chip, the GeForce2 MX. For the differences between this and the GeForce2 GTS cards featured in other review systems and this month's graphics card group test, turn to our review of the Hercules card on page 92. The MX card supplied in our system was a reference board directly from nVidia, and Systemax had yet to decide on a supplier as we went to press, so it will be worth checking this before ordering the system. A different graphics card will have some impact on 3D performance, but it will be very limited.

One thing that our performance tests did show up was that 3D acceleration is simply faster with a Duron inside. Not only did this machine beat Hi-Grade's Celeron in SYSmark 2000, but also in 3DMark 2000 and Quake III, scoring 68.6 frames per second in the latter test.

The monitor is the excellent CTX PR705F that we've written about so many times before it scarcely needs further commendation. Needless to say, its 17in Trinitron tube is very good and is great to look at.

In terms of software, you get a copy of Lotus SmartSuite Millennium, Nero Burning ROM 5 to keep the CD-RW happy, Power DVD, a games pack and a Microsoft Sidewinder game pad to play them with. The warranty period is one-year back to base, but for this money we would prefer on-site cover.

The price of this system takes it out of the value range normally occupied by Celeron and Duron machines. For the money, you might expect a proper Athlon rather than a Duron, but to an extent, what you lose in performance, you gain in extras. The provision of a decent sound card, graphics card and monitor, together with a fair software

package, makes this system a good purchase, and it goes faster than a Celeron equivalent as well. Having said that, it is still a little pricey, and the company's D650 RV Pro reviewed in August might be a better bet – for the sake of 50MHz and a sound card, you save £100.

JASON JENKINS

DETAILS

★★★★★

PRICE £1,173.83 (£999 ex VAT)

CONTACT Simply Computers 08707 297366

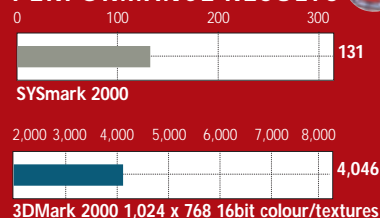
www.simply.co.uk

PROS Good sound card, monitor and graphics card: can copy CDs on the fly

CONS A little pricey, no on site warranty

OVERALL A good all-round system that is also fast. Worth a look, but you could consider downgrading the processor to save money

PERFORMANCE RESULTS



Hi-Grade Ultis PV3 700A

The first 700MHz Celeron system we've seen is well built, but the chip has had its day

This is the first time we've seen a 700MHz Celeron inside a system, and it puts this machine at the top end of Intel's budget range. It's still running on a 66MHz bus, though, which makes sense from Intel's point of view, since upping it to 100MHz or above means that this less expensive range of chips might start to make the PIIIs look less attractive by comparison.

The processor is built into an Asus 815E motherboard, the CUSL2, which supports any of the current crop of Celeron and PIII processors, so there's scope for upgrading this in the future, should you find it doesn't quite keep up with your software requirements. The spec is fairly generous so that shouldn't be for some time yet. Although set to 66MHz in this system the FSB can be clocked up to 133MHz and in the JumperFree mode all settings can be tweaked on screen through the BIOS. For the same reason it's likely to appeal to overclocking fans.

The Solano motherboard, of course, comes with onboard graphics, but Hi-Grade has turned a blind eye to this and slipped a Hercules 3D Prophet II MX (see p92) into the AGP slot. This is undoubtedly a good move, since it will enhance the performance, but it wasn't enough to push it ahead of Systemax's Duron (p74), which was 13 points in front with SYSmark 2000, almost 500 3DMarks ahead but only one more fps in the Quake III test. The Duron inside the Systemax machine, with its 200MHz FSB, clearly made a difference.

We were impressed by Hi-Grade's choice of monitor, the CTX PR705F, which is effectively the 711F, our *Best Buys* pick, but without the USB hub. The tube is a 17in FD Trinitron with a 16in viewable area and an excellent image.

Expansion-wise, there's plenty of space, with four PCI slots and two shared PCI/CNR (Communications and Network Riser) card slots, all of which are free except for one PCI slot that houses an internal Diamond modem. This will not hog a phone socket, because Hi-Grade has included a pass-through socket doubler that also

assured us this was so the system could achieve optimum performance and we have no reason to doubt this, but it's worth remembering that Microsoft's recommended course of action is to leave it up to Windows unless you have a specific reason for changing it.

Lefties will be happy with the symmetrical mouse that is comfortable to use and is biased towards neither hand. The software bundle is generous, too. Lotus SmartSuite Millennium will meet your business needs while the internal Teac CD-RW drive, which is partnered by a 12-speed EPO DVD drive, will be kept busy by Nero Burning ROM 5. There's also a copy of CyberLink PowerDVD for movie playback. Sound-wise, the Ultis uses the motherboard's onboard AC97 codec, pushing its output to a pair of desktop speakers.

This is a well put together machine with an excellent monitor, and so far the 815E chipset looks to be a solid platform, but we can't help feeling it is a little overpriced for a budget system. This isn't Hi-Grade's fault, however if you're going to spend this amount of money you can get a faster machine.

NIK RAWLINSON



acts as an RJ-45 to British socket converter. There are two free bays with external access, one of each size, and a single internal 3.5in space for a second hard drive should you run out of space on the primary device.

Around the back of the case you'll find two PS/2 sockets for the mouse and keyboard, a couple of USB ports and one port each for serial, parallel and VGA devices. In the box there's a second nine-pin serial port mounted onto a blanking plate, although with so many devices making the switch to USB it's unlikely you'll need to use it.

The inside is fastidiously tidy with all cables and power leads neatly clipped out of the way, giving you easy access to the processor and two free memory slots. There's 128MB of SDRAM installed in the form of a single module. For storage, Hi-Grade has opted for a Fujitsu hard drive with a capacity of 20GB. Upon closer inspection, virtual memory was set to 175MB rather than leaving it up to Windows to determine. Hi-Grade

DETAILS

★★★★

PRICE £1,115.08 (£949 ex VAT)

CONTACT Hi-Grade 0800 0740 402

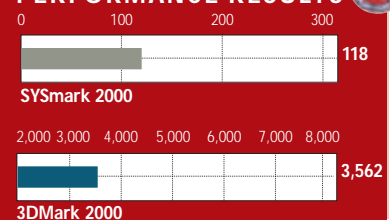
www.higrade.com

PROS Well built, stable platform, expansion potential

CONS A little too expensive

OVERALL A great system if you are committed to having 'Intel inside'

PERFORMANCE RESULTS



Sony Vaio PCG-Z600NE

While retaining the best features of the Z600RE, Sony's latest Vaio offering moves things up a gear

The first incarnation of the Sony Z600 notebook held pride of place in our *Best Buys* section – until now. The Z600RE was a great product that sported an impressive hardware specification along with a svelte and stylish chassis design. In fact, it was hard to imagine that Sony could have done anything to make the Z600RE a better machine. That said, Sony has never been a company to sit on its laurels and the newly released Z600NE has taken everything that was good about the original and made it that little bit better.

What makes the Z600NE a better machine than the SR1K (see review on page 82) is that it takes the winning formula of the original Z600 and builds on it, rather than completely changing the design. This approach has resulted in a beautifully designed unit that will make you the envy of all who see it.

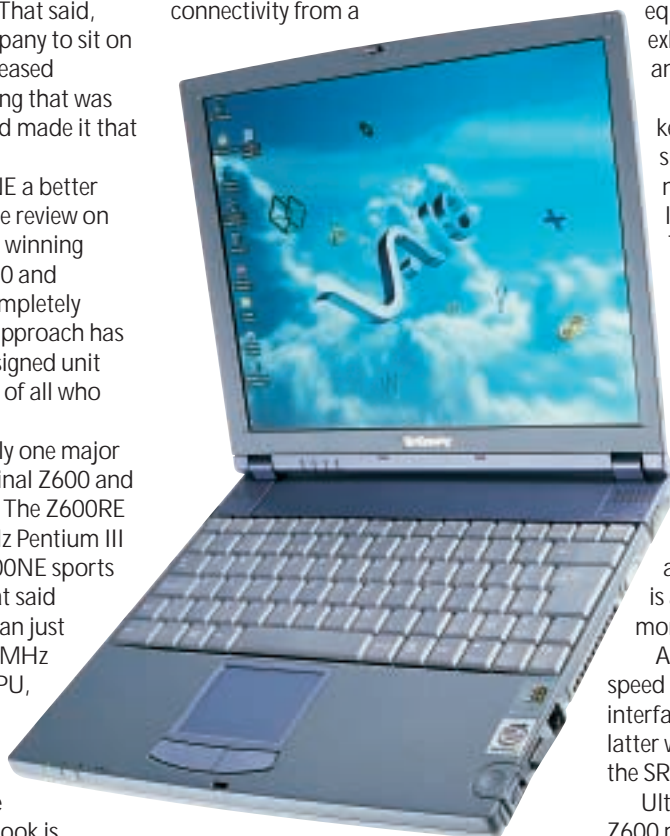
To be honest there's only one major enhancement over the original Z600 and that's the processor speed. The Z600RE was built around a 500MHz Pentium III processor, whereas the Z600NE sports a 650MHz Pentium III. That said there's more to consider than just an extra 150MHz. The 500MHz chip wasn't a SpeedStep CPU, but the newer 650MHz processor is. This means that the Z600NE will drop the speed and voltage of the CPU when the notebook is running on battery power. The result of this will be extended battery life with only a marginal drop in performance.

Unlike a fully featured notebook that's carted from one power socket to another, an ultra-portable notebook like this is likely to spend a great deal of its life being used on the move so the increased battery life will be a real bonus.

Supporting the new CPU is 128MB of RAM and a 12GB hard disk, which should be more than enough to run any application you're likely to use on a notebook.

What has set Sony notebooks apart from the competition in the past is their connectivity and the Z600NE is very well specified in this area. On the right of the chassis you'll find an integrated 56K modem and a 10/100 BaseT network interface, so you'll be able to connect to the Internet whether you're at home or in

the office. Also on the right is a full-size USB connector and an IrDA port. On the left-hand side is a PC Card slot, a mini USB port, audio sockets and a FireWire connector. There's also a port with which to connect the supplied port replicator which itself sports parallel, serial, VGA, USB and FireWire ports. All in all that's some pretty impressive connectivity from a



notebook that only weighs 1.7kg and measures in at 29.3 x 275 x 226 mm (h x w x d).

Located just above the PC Card slot is a Memory Stick slot that will accept Sony's proprietary Memory Stick solid-state media. Once a Memory Stick is inserted, the notebook treats it as a hard disk and files can be dragged and dropped to it and retrieved in the same manner. This is great for transferring pictures from a Sony digital camera, but, unfortunately, you can't drop songs straight onto a Memory Stick for use in an MS Walkman.

Like the SR1K the Z600NE sports a jog dial. This really is a great addition to a notebook and allows you to launch applications by scrolling through the jog dial list and then pressing the dial inwards. By linking your main applications to the jog dial it saves you

having to navigate the Start menu or fill your desktop up with shortcuts.

The screen is a 12.1in TFT affair with a clear and bright image, the lighting is even and the colours rich and vivid. With a resolution of 1,024 x 768 it will be more readable for some users than the 10.4in screen on the SR1K that sports the same resolution. The keyboard is equally impressive with each key exhibiting a decent amount of travel and solid feedback.

Even with the shallow chassis the keyboard is a joy to use and the small dimensions of the case have not stopped Sony from including large Return and Backspace keys. The touchpad is responsive and easy to manipulate, while the slightly recessed design negates the chance of any inadvertent cursor movements when hitting the space bar.

Unlike the SR1K, the Z600NE runs Windows 98SE, although the Z600NEK is supplied with Windows 2000. Performance is good with the Z600NE turning in a SYSmark 2000 score of 124. This is a couple of points higher than last month's Hi-Grade slimline notebook.

Also in the box you'll find a 16-speed CD-ROM drive with PC Card interface and a USB floppy drive. The latter was conspicuous by its absence in the SR1K box.

Ultimately, Sony has updated the Z600 range with faster and more advanced processing power, not much else has changed, but when the product was so good in the first place it doesn't have to.

RIYAD EMERAN

DETAILS

★★★★★



PRICE £2,399 (£2,042 ex VAT)

CONTACT Sony 08705 424 424

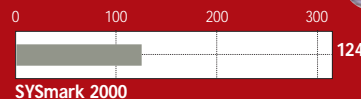
www.sony.co.uk

PROS Slim, attractive and very well featured

CONS A little on the pricey side

OVERALL Quite simply the best ultra-portable notebook on the market

PERFORMANCE RESULTS



SYSmark 2000

Sony Vaio PCG-SR1K

Despite improving on the spec of the 505s, the ultra-portable SR1K fails to score points on looks

The Sony Vaio 505G was the first truly ultra-portable notebook computer and it sparked off unbridled desire in all who saw it. The 505G went through many updates with newer, faster processors and larger hard disk and RAM complements, but as with all good things, the 505's days had to come to an end. In its place, Sony has come up with the Vaio PCG-SR1K.

The problem with the SR1K is that it's just not as pretty as the 505 was. We know that this shouldn't be a major consideration when purchasing IT equipment, but when you're buying an ultra-portable notebook computer, how it looks is usually paramount. Whereas the 505 series of notebooks looked stylish and sleek, the SR1K looks a little, dare we say it, cheap.

The new design is somewhat bizarre, with the keyboard and touchpad/wrist rest areas seemingly separated from each other. The battery pack is no longer integral with the hinge, the screen now folds back and under the unit, which works well but takes a bit of getting used to. Rounding off the bizarre design changes is a black plastic strip at the front of the case which seems to serve no purpose other than to spoil the usual sleek lines sported by Sony's mobile computers.

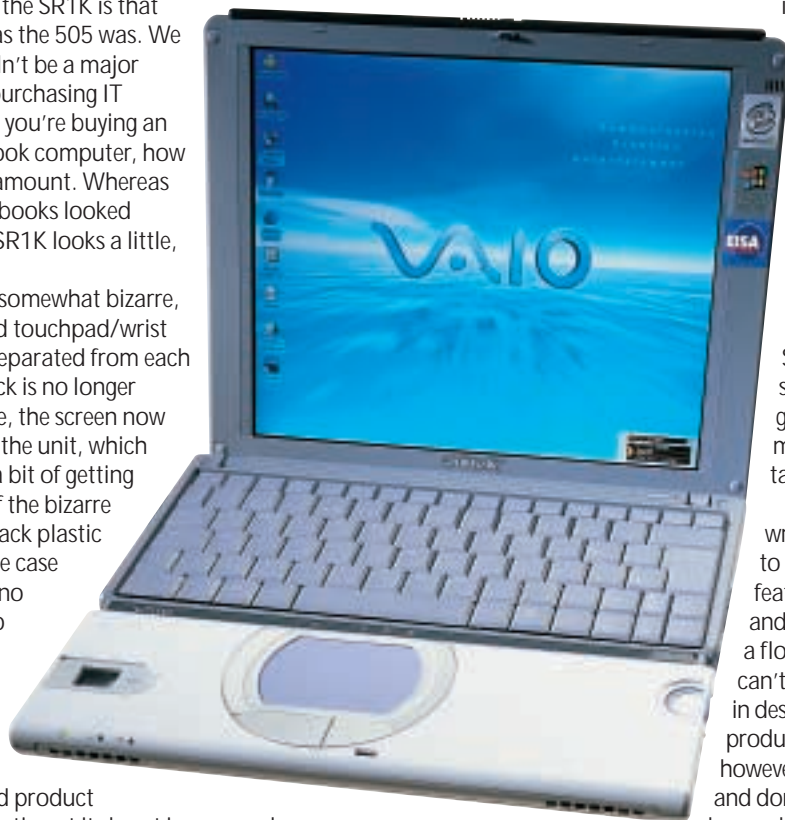
That said, this is a seriously improved product specification-wise. Beating at its heart is a 500MHz Pentium III CPU backed up by 64MB of RAM and a 9GB hard disk. That's a pretty impressive spec for a machine that only measures 32 x 259 x 209mm (h x w x d) and weighs in at 1.36kg, although the old 505 machine weighed only 1.2kg.

The keyboard is up to the usual high standard of Sony's machines and the touchpad is equally impressive. Not quite so impressive is the silver surround that frames the touchpad, although this, like the other design issues, is a matter of personal taste.

The screen is a 10.4in TFT display with a resolution of 1,024 x 768. This is a decent example of a notebook display with no dead pixels and even lighting across the whole screen area. There's a fair bit of space surrounding the display so it could have been a little larger,

although it's still every bit as good as the old 505 series screens.

Making a welcome appearance is the jog dial controller. This little beauty, located at the front right-hand side of case, allows the user to scroll through options and select them by pressing the dial inwards. A pre-loaded utility lets you add your own selections to the jog dial menu so that you can launch your



word processor or web browser from it.

On the opposite side of the chassis from the jog dial is the second new addition, a Memory Stick slot. For any loyal Sony customers this is a great feature since you're more than likely to already have devices that use this solid-state memory. A notebook like this would be an ideal companion for a Sony digital camera, where the pictures could be transferred by simply removing the Memory Stick from the camera and inserting it into the notebook.

However, as well as getting a couple of great new features, you're also losing some things. The most obvious omission from this package is a floppy drive. Whereas the old 505 series and the current Z600 series notebooks ship with an external floppy drive, there's no way of getting data off the SR1K other than

on Memory Stick. Also, there's no port replicator bundled, so you've got no serial or parallel ports. Sony is obviously expecting you to have USB or FireWire peripherals. There is a tiny VGA output on the left-hand side, next to the USB port and inside the box you'll find a converter to a standard D-SUB connector.

Another first for a Sony notebook is its choice of operating system. The SR1K runs Windows 2000 Professional rather than Windows 98. Obviously the improved power management and stability of an NT kernel has swayed Sony's decision and the system worked perfectly during our tests.

As for performance the SR1K turned in a SYSmark score of 75, which isn't ground breaking but is more than fast enough for its target use.

There's nothing practically wrong with the SR1K. It's a joy to use and sports some great features while remaining slim and light. Admittedly, the lack of a floppy drive is an issue, but we can't help feeling that the change in design makes it a less desirable product than the old 505. If, however, you like the new design and don't need a floppy drive, you'll be very happy with the SR1K.

RIYAD EMERAN

DETAILS

★★★★★

PRICE £1,699 (£1,446 ex VAT)

CONTACT Sony 08705 424 424

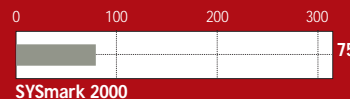
www.sony.co.uk

PROS Small, light, well specified for its size

CONS Questionable design by Sony's standards; no floppy drive or port replicator

OVERALL A product that's let down by its lack of a floppy and questionable aesthetics. If you like the new design, it's as good as the 505 ever was

PERFORMANCE RESULTS



SYSmark 2000

Samsung IZZI-Pro Swivel

A Windows CE device that falls short in bridging the gap between notebooks and pocket PCs

Not much larger than a fairly chunky hard-back novel, this is another full-sized Windows CE device that could easily pass for a small notebook, but it has one crucial difference. As the name suggests, the screen is able to swivel, so as well as using it as a regular keyboard and display affair you can twist it backwards and a couple of magnets will keep it in place for use as a pen tablet.

But surely Windows CE makes it a pocket PC, I hear you say. Well not yet, because, although Microsoft has only released a palm-held pen-based version of its latest mobile OS, it plans to port it to keyboarded devices in the future. Windows CE (2.11 in this case) works well on devices of this size, as it is more suited to the 8.2in VGA screen than it was to the smaller Psion-sized units. There is no touchpad or trackpoint, so we were pleased to see that when used as a regular notebook the hinge on the screen is strong enough to prevent it from swivelling each time we jabbed it with the stylus. However, the image it showed was less than impressive, suffering badly from reflection. Contrast can be changed on the keyboard but, unfortunately, this does little to help.

A tour of the external edges reveals an impressive collection of ports. To the right you have a single Type II PC Card slot, re-set point, power switch and a V.90 modem. Around the back you'll find a fast IrDA 2.0 port capable of communicating at 4Mbps/sec and a single USB port, although Windows CE is well known for having little use for this at the moment. Finally, on the left is where most of the important things happen and here you'll find the power socket and Type II Compact Flash slot. This is also where Samsung has located the jacks for headphones and mic to supplement the built-in mono microphone and 0.25w speaker.

Perhaps most important of all are the serial and video interfaces, the first being used to communicate with a host PC and the second to send the IZZI's image

to an external monitor. Each of these has a proprietary interface and to connect the device to a regular CRT you first have to attach the bundled adaptor lead so that it can interface with your video cable. Four Walkman-like buttons on the front of the device control audio recording and playback.

The keyboard feels satisfying and has good travel, but we



couldn't get used to the undersized keys. Sitting somewhere between a regular notebook and a Psion, they were neither one nor the other and we frequently found ourselves mis-keying. One touch we did like, however, was the inclusion of a euro symbol on the number 5 key.

Spec-wise, your £799 buys you a 192MHz MIPS processor and 32MB of RAM, which is enough to record up to 60 minutes of voice annotation in 8bit mono and is in addition to the 16MB of ROM. A smart IZZI-Pro applet in the Control Panel lets you set the modem country code, catering for a total of nine countries, of which the UK, France, Germany, Norway and the Netherlands make up the European contingent. The applet also controls the brightness and contrast settings as well as the backlight fade feature that slowly reduces the light's intensity if the device is not used

for a specified number of seconds. The other IZZI-specific application, InkWriter, lets you write on the screen using the stylus. While this is not translated to typewritten characters, it is intelligent enough to allow you to highlight individual hand-written words and apply simple formatting.

We were disappointed that the IZZI-Pro did not seem to switch off when we closed the lid. We're so used to other devices doing this that it would be easy to unwittingly run down the battery, which Samsung states has a life of eight hours and charges in three and a half. As a whole, the device is fairly heavy, tipping the scales at 1kg, which is surprising because it's not particularly large – just 25mm at its thickest point and 228 x 196mm in terms of width and depth.

When we first saw it we thought we were going to like the IZZI-Pro Swivel, but when in use it fares poorly in comparison to other Windows CE or EPOC-based devices of a similar size. It is let down badly by a reflective screen, and the lack of a touchpad or trackpoint is a big disappointment. Other devices, IBM's keyboarded WorkPad being a notable example, also manage full-sized VGA ports, which saves you having to carry an adaptor around with you.

NIK RAWLINSON

DETAILS

★★★★

PRICE £938.83 (£799 ex VAT)

CONTACT Samsung 0800 521 652

www.samsungelectronics.co.uk

PROS Good size; innovative tablet functionality

CONS Small keyboard; lots of reflection on the screen; heavy

OVERALL If you will use both tablet and notebook modes then this will do what you want, but if your primary input device will be the keyboard, then the extra functionality will not make up for disappointments in other areas

Dell Inspiron 5000e

The updated Inspiron has a fast SpeedStep processor and a large screen

Dell's Inspiron 5000 was one of the first SpeedStep notebooks to be put through its paces in the PCW labs. Its slimmed-down case and energy-conserving 650MHz processor found favour with us when we awarded it four stars back in April's issue. However, time and technological tide wait for no-one and six months on, you can get this 750MHz unit, the 5000e, for much the same price.

If you believe the marketing hype, SpeedStep chips will save power without overly compromising performance and our tests bear this out. As clock speeds continue their seemingly relentless march upwards, SpeedStep technology is a good investment for notebook buyers who demand ultimate processing power on their desktop and excellent battery life on the move, although AMD's PowerNow is hot on its heels.

The current top-of-the-range SpeedStep processor, a 750MHz Pentium III, can be found at the heart of this machine. This will happily step down to 600MHz to conserve energy and automatically runs at the lower speed whenever the unit is not connected to the mains. You can also choose to step the processor speed up or down manually. Power consumption is generally half that when running at full speed. We managed to squeeze out three hours' word processing from a single charge of the Inspiron's battery, not bad as the unit comes with a power-hungry 15in screen. The Inspiron's SYSmark score of 151 puts it on a par with similar specification desktops and we noticed no disruption to streaming video when switching between mains and battery power.

Graphics are taken care of by a Rage Mobility 128 chipset, backed with 16MB of dedicated video memory. Our 3DMark 2000 benchtest generally refuses to run on notebooks. No such problems here – the ATI chipset helped the unit turn in a score of 1,666. It even managed to run our Quake III test at

20.6fps in 16bit colour. We still wouldn't recommend playing the latest 3D games on the unit though.

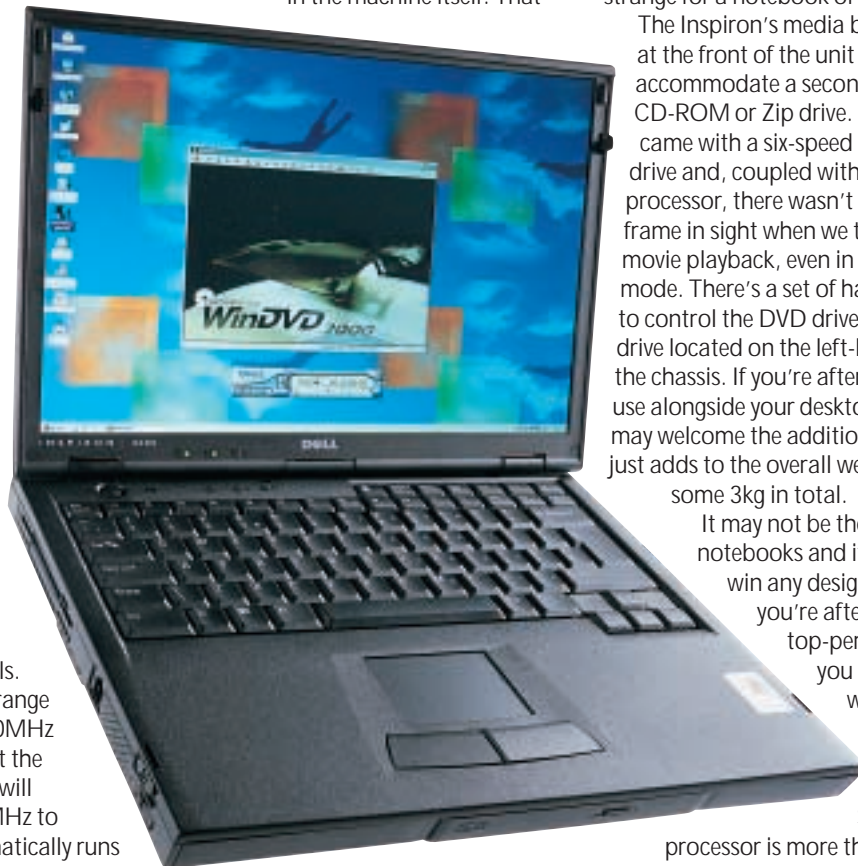
Elsewhere, there's 128MB of RAM and a roomy 27GB hard drive. A Sound Maestro chipset is on audio duty and there's a set of integrated stereo speakers in the machine itself. That

the hood though. At the rear, connections for a monitor, PS/2 keyboard and mouse are present and correct and there's also an S-Video output, PCI docking connector and IR port for good measure. There is no built-in Ethernet connection, which we found strange for a notebook of this size.

The Inspiron's media bay is located at the front of the unit and can accommodate a second battery, CD-ROM or Zip drive. Our model came with a six-speed DVD-ROM drive and, coupled with that powerful processor, there wasn't a dropped frame in sight when we tested DVD movie playback, even in full-screen mode. There's a set of handy buttons to control the DVD drive and a floppy drive located on the left-hand side of the chassis. If you're after a machine to use alongside your desktop PC you may welcome the addition but, if not, it just adds to the overall weight, some 3kg in total.

It may not be the sleekest of notebooks and it's not going to win any design awards but if you're after a rugged, top-performing unit, you can't go far wrong with the Inspiron 5000e. The 750MHz SpeedStep processor is more than able to handle today's applications and it helps eek out precious battery life.

RICHARD MCPARTLAND



15in screen we mentioned earlier is capable of displaying a crisp, stable image at 1,400 x 1,050 and the Synaptics touchpad and full-size keyboard are as good as they come.

In the looks department, little has changed from the unit we looked at back in April. Other manufacturers have worked hard to jazz up their systems but Dell has kept the faith and the result is a rugged, boxy unit in jet black, which is either conservatively reassuring or a missed opportunity, depending on your point of view. That said, it's nowhere near as bulky as the Inspirons of old.

The Inspiron is not the most expandable notebook we've ever seen but there are still a fair few connections to exploit. There are just two USB ports and one Type II and two Type III PC Card slots. It shouldn't be too much of a problem with a built-in modem under

DETAILS

★★★★

PRICE £2,406.40 (£2,048 ex VAT)

CONTACT Dell 0870 907 5664

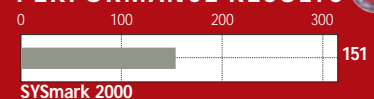
www.dell.co.uk

PROS Top processing power; excellent screen and easy on the battery

CONS Not the most expandable notebook or the best-looking; no Ethernet

OVERALL A top-performing, fairly-priced system. If it's ultimate processing power you're after you won't be disappointed

PERFORMANCE RESULTS



SYSmark 2000

IBM I series Thinkpad

A solid notebook for the budget-conscious that is well configured but has an average screen

IBM has made a name for itself in the notebook sector by consistently producing very high-quality products. These have traditionally been very pricey, however, and more suitable for the corporate space. The market has changed slightly, though, and recently we have seen some large names chasing the lower end of the market. IBM is no exception, and its I series Thinkpads are designed to be an affordable alternative to the A and T series models, but without compromising quality.

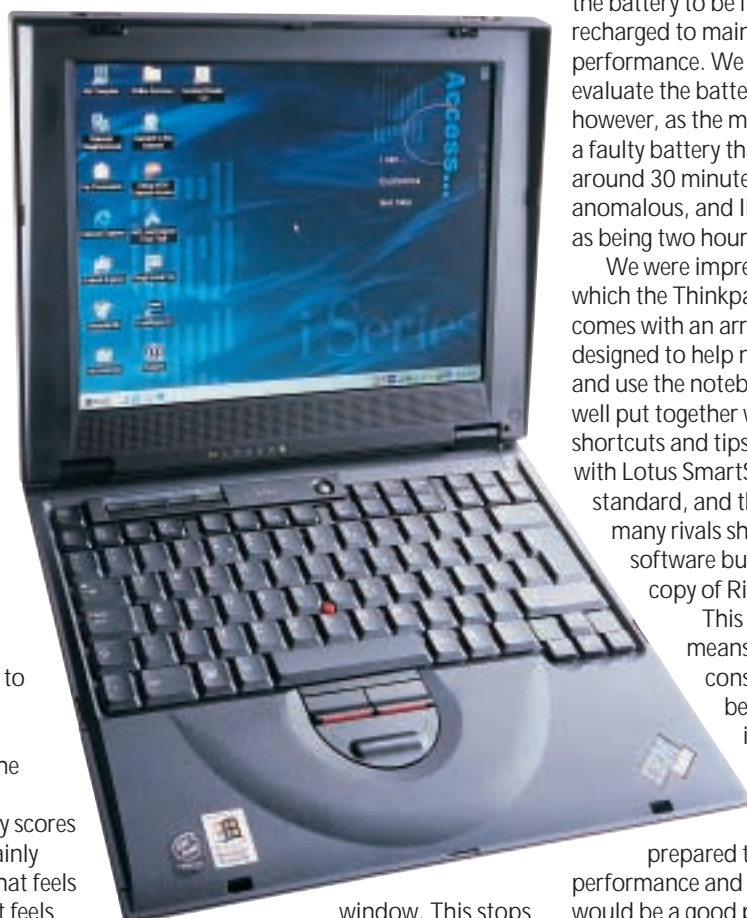
We've taken a look at one of the midrange I series 1200 notebooks, the 257. A quick glance at its spec sheet will leave you unmoved. There is a Mobile Celeron inside, clocked at 500MHz, together with 64MB of SDRAM, and 6GB hard drive. This is, admittedly, very underwhelming although this does manage to beat the Sony Viao PCG-SR1K in SYSmark 2000 (see page 82). Speedy performance has never been a Thinkpad virtue, however, and to an extent the score is fairly unimportant, as this still has enough power to perform all the functions it is intended for.

Where the Thinkpad usually scores is in build quality, and we certainly can't think of another model that feels so robust at this price. The unit feels more like a tank than a notebook, and should be able to withstand some knocking around in transport. It maintains the unique design of other Thinkpads that you'll either like or not.

The keyboard is very good. The layout is excellent, with all of the near full-size keys placed in similar positions to their desktop counterparts. IBM is one of the few manufacturers to ensure that a full-size return key is present, and the keys are very responsive with good travel. Unlike other low-cost notebooks, this keyboard has a rock solid base.

Control of the pointer is achieved through the trackpoint. Again, it is one of those things that you either love or hate. Our verdict is that it can take some getting used to, but once you do, it certainly offers a higher degree of precision control over the pointer than a

standard touchpad. There's a new scroll button underneath the standard two selector buttons (which are themselves both very easy to reach and press). Press this third button and move the trackpoint up or down, and you can scroll easily through your current



window. This stops you having to move the pointer to the side of the screen to scroll; a feature we found saved us a lot of wrist ache.

IBM has compromised on the display to help keep the cost down, and we found this a little disappointing. The 12.1in screen has a native resolution of 800 x 600, something that is looking a little old hat with the number of 1,024 x 768 screens around, even at this price. It displays a good image, though, and considering the high build quality of the rest of the system, it will be a fair compromise for budget-conscious users.

Dotted around the side of the case are two USB ports, a single Type III or two Type II PC Card slots, a D-SUB, parallel, 56K modem, PS/2, headphone out and microphone in sockets. There's also a 24-speed CD-ROM.

The battery is a nickel-metal hydride

(Ni-MH) version. We've got used to seeing lithium-ion (Li-Ion) batteries in notebooks, but this isn't necessarily a problem. What it does mean, however, is that the notebook's weight is increased. It also means that the battery will suffer from increased memory effect, requiring the battery to be fully discharged and recharged to maintain good performance. We were unable to evaluate the battery's performance, however, as the model was supplied with a faulty battery that only managed to last around 30 minutes. This is clearly anomalous, and IBM quotes battery life as being two hours 36 minutes.

We were impressed with the way in which the Thinkpad was configured. It comes with an array of useful utilities designed to help newcomers configure and use the notebook, and these are very well put together with some valuable shortcuts and tips. This model comes with Lotus SmartSuite Millennium as standard, and this is good to see as many rivals ship with little or no software bundled. You also get a copy of Ringcentral Fax.

This product is by no means perfect, but when you consider its low price it becomes a lot more impressive. The build quality and keyboard are particularly good and, if you are prepared to overlook its slow performance and average screen, this would be a good purchase for budget-conscious users.

JASON JENKINS

DETAILS

★★★★

PRICE £1,328.93 (£1,131 ex VAT)

CONTACT IBM 01475 555 055

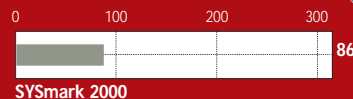
www.pc.ibm.com/uk

PROS Good build quality and keyboard; low cost; well configured

CONS No floppy drive; average screen

OVERALL A Thinkpad for the masses. IBM has cut a few corners, but this is still a good product

PERFORMANCE RESULTS



SYSmark 2000

Hercules 3D Prophet II MX

A card that has most of the advantages of the GeForce2 GTS products at a much lower price

Graphics cards based on nVidia's GeForce2 MX Graphics Processing Unit (GPU) should be on the shelves by the time you read this. The MX is a cut-down version of the GeForce2 GTS chip that features heavily in this month's graphics card group test (see page 194). It is intended to deliver powerful 3D acceleration, but without the weighty price tag associated with the GTS version.

Technology-wise, the GeForce2 MX is similar to the GeForce2 GTS. The MX and the GTS both have hardware Transform and Lighting (T&L) engines, making the MX the first budget card to support such a feature. The MX also utilises the 0.18micron technology of the GTS, albeit with a different clock speed and architecture.

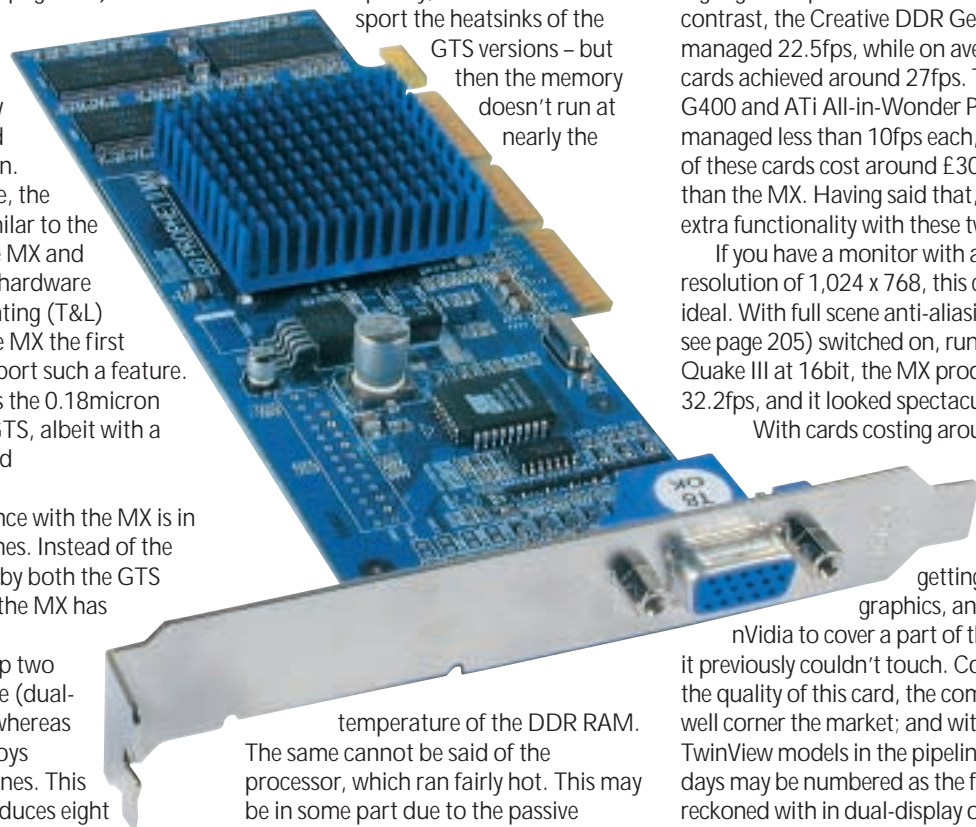
The first difference with the MX is in the texturing pipelines. Instead of the four pipelines used by both the GTS and the 256 chips, the MX has two pipelines. Both GeForce2 chips map two texels per clock cycle (dual-texture pipelines), whereas the older 256 employs single-texture pipelines. This means the GTS produces eight textures per cycle to the MX's and 256's four.

The second difference is that the core of the MX runs at 175MHz, compared to 200MHz in the GTS and 120MHz in the 256. This allows the MX to produce a pixel fill rate of 350megapixels/sec, and a texel fill rate of 700megatexels/sec. These are staggering numbers, although comparison with both the 256 and GTS is interesting. The 256 can produce 480megapixels/sec and 480megatexels/sec. The GTS by contrast produces a mammoth 800megapixels/sec and 1.6giga-texels/sec. With the ability to generate 20 million triangles per second the MX falls exactly between the GTS with 25 million and the 256 with 15 million triangles.

As for memory, it uses 32MB single data rate (SDR) SDRAM, whereas the 256 comes with either 32MB of SDR RAM or 32MB of Double Data Rate (DDR) RAM. All GTS-based cards, by

contrast, use DDR RAM, for which the GPU is optimised.

One of the first GeForce2 MX cards is the Hercules 3D Prophet II MX. As with the other Hercules cards it sports the blue board and electric blue heatsink. As the memory is running at the lower frequency, the SDRAM does not sport the heatsinks of the GTS versions – but then the memory doesn't run at nearly the



temperature of the DDR RAM. The same cannot be said of the processor, which ran fairly hot. This may be in some part due to the passive cooling (the GPU is covered by a heatsink without a fan). This card is about half the height of the GTS version.

We tested the card using the same machine and tests as for this month's group test (see page 206 for an explanation), and used nVidia's reference drivers (version 5.32). The results show this card to be an excellent performer for the price.

Running Quake III at 1,280 x 1,024 with 16bit colour and textures, the MX blasted out 45.3 frames per second (fps). At the same resolution in 3DMark 2000 it achieved a score of 3,223. These scores are around two-thirds of those of GTS-based cards, but then at around two-thirds the price of the cheapest GeForce2 GTS card, you're getting better value for money. By comparison, the Creative 3D Blaster Annihilator (SDR version) and the same card with DDR memory, straddled the MX card with 3DMark scores of 2,818 and 3,686

respectively. At the same resolution at 32bit colour and textures, the same spread of results was evident.

At 1,600 x 1,200 with 32bit colour and textures, the MX achieved 17.6fps in Quake III. Obviously this is a virtually unplayable frame rate, but it does highlight the power of this card. By contrast, the Creative DDR GeForce card managed 22.5fps, while on average, GTS cards achieved around 27fps. The Matrox G400 and ATi All-in-Wonder Pro managed less than 10fps each, yet both of these cards cost around £30 more than the MX. Having said that, you do get extra functionality with these two cards.

If you have a monitor with a maximum resolution of 1,024 x 768, this card will be ideal. With full scene anti-aliasing (FSAA – see page 205) switched on, running Quake III at 16bit, the MX produced 32.2fps, and it looked spectacular.

With cards costing around £129 inc VAT, this is a well priced way of getting excellent graphics, and it allows nVidia to cover a part of the market it previously couldn't touch. Considering the quality of this card, the company may well corner the market; and with TwinView models in the pipeline, Matrox's days may be numbered as the force to be reckoned with in dual-display options too.

SCOTT MONTGOMERY

DETAILS

★★★★★



PRICE £129 (£109.79 ex VAT)

CONTACT Hercules 020 8686 5600

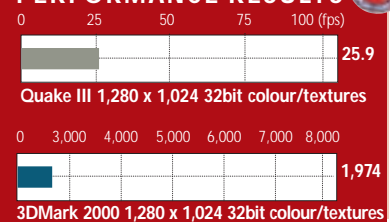
www.hercules.com

PROS A good performer for the price

CONS Not in the same league as the GeForce2 GTS versions, but excellent nonetheless

OVERALL The GeForce2 MX brings most of the benefits of the GeForce2 GTS cards, but at a fraction of the price

PERFORMANCE RESULTS



Cyber-shot DSC-F505V

Even without making full use of the CCD, Sony's camera has enough improvements to set it apart

Let's face it, only Sony would make a camera that looks like this. The lens appears oversized, but that's because it's the bit you're supposed to hold, resting it in your left hand and leaving the small body free to rotate 90 degrees upwards or 50 degrees downwards with a gentle push from your right thumb. This lets you compose with the screen from a variety of tricky angles, such as over people's heads – cunning stuff. The 2in hybrid TFT screen works well in direct sunlight, which is a good job, since there's no optical viewfinder.

Dedicated followers of gadgets will, however, have seen this camera before: originally called the F505 and featuring a 2.1 megapixel CCD, we reviewed it back in December's issue. Now the F505 is back, suffixed by a letter V and boasting a 3.3 megapixel CCD. Or does it?

The optical system of the original 505 was designed for a CCD measuring half an inch, but the new 3.3 megapixel chip in the V is slightly larger at one-and-one-eighth inches.

Redesigning the optical system was too complex, so Sony popped in the larger chip and accepted that not all the pixels would be used.

Consequently, instead of the 2,048 x 1,536 resolution of other 3.3 megapixel cameras, the V only musters 1,856 x 1,392 (2.6 megapixels). This is still higher than the 1,600 x 1,200 resolution of a 2.1 megapixel model though, and sufficient to make a 9 x 7in inkjet print – just an inch or so smaller than a true 3.3 model could deliver.

There's only one jpeg compression setting, creating files around 1.1MB – you'll get about six images on the meagre 8MB Memory Stick supplied. Sony also offers a 2,240 x 1,680 interpolated mode that delivers jpegs measuring 1.5MB and smoothes output on slightly larger prints. Unlike the original 505, the V offers an uncompressed tiff mode, which also works at all resolutions. Like the S70, the V also has a mono GIF mode for cleanly capturing text and diagrams on white or blackboards. Other resolutions include 1,280 x 960, 640 x 480 and a

special 320 x 240 email mode; curiously, the email, tiff and gif modes also create a standard jpeg file at the same time.

Users of the original 505 will understand why Sony was so keen to retain the optical section. Rather than your average 3x lens, the V boasts a great quality 5x optical Carl Zeiss lens with an extremely responsive motorised zoom – it'll even focus as close as 2cm. The focal length is equivalent to a 38-190mm lens on a 35mm camera; the actual specs are 7.1-35.5mm, f2.8-3.3.

Since the optics are already standing proud, the V is ready for action in a mere two seconds and can power

half-stop exposure compensation increments of the 505 have been refined to one-third stops and there's also a spot-metering option.

The flash brightness can be adjusted and there's a sync plug for an external flashgun. Movie mode captures up to 15 seconds of MPEG1 video at 320 x 240 (measuring 5.2MB in High Quality mode) or 60 seconds at 160 x 120, both at 15fps with mono audio; unlike the S70, you can use the zoom while recording. Once connected to your

PC using USB, the camera memory is simply mounted as a removable drive from which you can drag files; there's an AV output to your TV too. The InfoLithium battery is good for around 70 minutes, charges in 110 and handily feeds back how many minutes of life are remaining on screen.

Compared to the original 505, the new V model has many worthy improvements. Image quality is excellent, but if you look extremely closely, the S70 and other genuine 3.3 megapixel cameras definitely resolve a fraction more detail. The S70 is also £100 cheaper, boasts longer battery life and consequently remains our recommended digital camera. Photography enthusiasts will, however, be happy to pay for the V's improved handling, not to mention its superb lens – just try to forget about those redundant pixels.

GORDON LAING



down immediately, compared to the excruciating five seconds you can wait for other cameras to start up or retract their lenses. There's also a proper 52mm filter thread and manual focus ring. Recognising that manually focusing on a low-resolution LCD screen can be tricky, Sony has cleverly instructed the V to temporarily enlarge the central portion for a closer look. You can also zoom in up to five times and pan around images during playback.

The original 505 had shutter and aperture priority modes, but they were hidden deep within menus. The V makes them much easier to adjust and offers a choice of seven aperture settings and 19 shutter speeds: from eight seconds to one-thousandth of a second – a big improvement over the one-eighth of a second slowest speed of the 505. The

DETAILS

★★★★★

PRICE £849 (£722.55 ex VAT)

CONTACT Sony 0990 111999

www.sony.co.uk

PROS Superb handling, great features and the best lens in the digital camera market

CONS Infuriatingly doesn't use the whole 3.3 megapixel chip; memory card a meagre 8MB

OVERALL Not quite the ultimate camera, but hardcore photographers will prefer it to Sony's S70; everyone else should stick with the S70, though



Creative WebCam Go Plus

Taking a cue from its worthy predecessor, this webcam exudes quality at a competitive price

If you want the stats, it's got twice the memory of its predecessor – 8MB instead of 4MB – and now has a built-in mic. It's also silver rather than black and has a sharper lens, but apart from that this is largely a repeat of the WebCam Go. This is a good thing, since it was the first major innovation on the webcam scene for years, being the first you could unplug and use as a low-res handheld stills snapper or video camera.

Image quality is excellent, putting to shame many of its competitors. The software bundle, too, is first class and the WebCam Go Control, which you'll probably find yourself using most often, is intuitive and quick to learn. It lets you

tailor precisely how the camera is used and manually tweak the video settings.

From here you can control everything from brightness and contrast to zoom and saturation and even invoke special settings for fluorescent lighting – great in offices.

The WebCam Go Control has an integrated album and it's here that you'll save the images and movies you've captured while your camera has been unplugged. Photos can be saved in jpeg or bmp format and selecting the jpeg option lets you adjust the compression. Saving your videos gives the choice of seven compression engines and the ability to manually set the speed at which frames are displayed.

You can detach your Webcam Go

Plus and snap up to 150 pictures at 640 x 480 in 32bit colour, each accompanied by voice annotations, before the internal memory is full. It'll also record movies, albeit short ones, at 30fps (352 x 288 resolution) and 15fps (640 x 480).

Sadly, the documentation is scant and there is no bundled software for auto-uploading images to a website but this can be downloaded from shareware libraries on the Internet. However, this product is still fantastic value for money.

NIK RAWLINSON



DETAILS

★★★★★

PRICE £129 (£109.79 ex VAT)

CONTACT Creative 01189 344 744

www.europe.creative.com

PROS Inexpensive; can be used as a digicam; great software bundle; first-class image quality

CONS Poor documentation; no Internet-upload software

OVERALL The best webcam option by far



Samsung SyncMaster

Samsung's SyncMaster SM179MP LCD monitor will do much more than just give you TFT TV

Cards that let you watch TV on your PC are cheap and readily available, so you might question the point of paying a premium for an LCD panel with a built-in TV tuner. There's a lot of point, if you are talking about Samsung's SyncMaster SM179MP LCD monitor.

It looks good, with a steel-grey case and a well-designed base that swivels to double as a handle – useful if you need to tote the display around for presentations. Bolt-holes at the back provide for wall or arm mounting. The 17in screen, equivalent in viewing area to a 19in cathode-ray tube, offers a crisp display with a wide angle of view at resolutions up to 1,280 x 1,024.

You can use it as a TV while your PC is turned off, which you cannot do with a PC Card, and two extra

video inputs let you connect a video or DVD recorder, or surveillance cameras.

Each of these sources may be viewed full screen or in a resizable window that you can move around your desktop while you work. The display comes with S-Video, SCART and RCA cables and adaptors, and a TV-style remote control.

For those who routinely lose remote controls, you can also control the display using unobtrusive front-panel buttons. A pass-through port enables the PC and TV audio to use the same speakers or headphones.

Setup, via an on-screen menu, is painless, although the device we saw seemed reluctant to reduce its brightness – desktop LCDs going at

full blast can be wearing on the eyes.

The 179MP is likely to find a ready market among finance workers and executives who need a news feed at their desktops, as well as video editors and home workers who need to keep a camera eye on the kids or front door.

It does not come cheap, but there is a 15in version for the less well off. For those who can afford the 17in version, though, it is an ingenious piece of kit.

CLIVE AKASS



DETAILS

★★★★★

PRICE £2,137 (£1,819 ex VAT)

CONTACT Samsung 0800 521 652

www.samsungelectronics.co.uk

PROS Looks good; large crisp display; versatile

CONS Cumbersome VGA lead; no DVI

OVERALL A tax-deductible luxury that is great if you can afford one; the 15in version looks a good cheaper option

Panasonic DVD-RAM

The LF-D201 DVD-RAM drive ups speed and capacity and will quickly make itself indispensable

A couple of years ago Panasonic released the first DVD-RAM drive onto the market and redefined PC removable storage in the process. The most amazing aspect of the drive was the cost of the media, with a 5.2GB double-sided disc costing less than £25. This gave data-heavy users an affordable way to protect and transport their files, while the 30-year lifetime of the discs meant that the data was safe even after a significant storage time.

Now DVD-RAM has become an even more attractive medium with the release of the LF-D201 drive. This latest unit from Panasonic has increased the disc capacity from 2.6GB per side to 4.7GB per side. Anyone who knows anything about DVD will realise that this means a DVD-RAM disc can now hold the same amount of data per side as a single-layer DVD-Video or DVD-ROM disc. This brings DVD-RAM into a

completely new market, where the media can be used for pre-mastering DVD discs, thus cutting out the need for expensive

DVD-R or DLT (digital linear tape) solutions. Of course, this does depend on DVD-RAM being accepted by the mastering industry, otherwise you could find yourself having to transfer the data onto DLT anyway.

The drive itself is a standard 5.25in device that resembles a DVD-ROM drive. One disappointment is the loss of the loading mechanism employed by the 2.6GB drive where the media was inserted between two arms that extended from the chassis. Instead, pressing the eject button results in the appearance of a standard tray that accepts both caddied and empty media. The front of the unit is fairly bare with only an eject button, indicator light, headphone jack and volume wheel. Like the previous drive, the retail package comes with a SCSI interface, although there will be an OEM ATAPI drive available. At the rear you'll find a power socket, SCSI connector, SCSI id jumpers and an audio-out port.

The drive is completely compatible with existing 2.6GB per side media as

well as the new 4.7GB per side discs. Unfortunately, the 4.7GB discs cannot be read or written to by the older drives, but that's pretty much par for the course when a product line is upgraded.

The LF-D201 ships with a driver disc and a suite of application software. The driver includes a format utility and a set of tools. The discs can be formatted using FAT16, FAT32, UDF1.5 and UDF2.0. Using a FAT format is the quickest option, but it will reduce the capacity to 4.3GB on a 4.7GB disc. Also, using UDF (Universal Disc Format) will allow the disc to be read by Windows 9x, NT or Mac OS systems. On the application front you get an MPEG1 encoder and an MPEG-editing program to cut your own movies. Also thrown in is a backup utility and a program to

only two minutes eight seconds on the new one. Reading the 337MB file and the 94MB folder from the old 2.6GB drive took four minutes two seconds and one minute 43 seconds respectively, while on the LF-D201 the same operations took two minutes five seconds and 30 seconds flat. Obviously Panasonic has worked hard to improve the performance of the new drive, although the increased areal density of the new media also helps.

Panasonic sees DVD-RAM as the way forward for rewritable media and, having had a look at its DVD-RAM consumer video recorder, we have to admit that it's a compelling argument. Add to this the fact that within a few months most DVD-ROM drives will be able to read this new DVD-RAM media and the LF-D201 looks even more

attractive. It's also worth considering that the LF-D201 only costs £319 ex VAT and a 9.4GB disc will only set you back £34.99.

This is a great product for anyone who needs to store large amounts of data offline, or anyone who needs to transport very large files. For a professional photographer who's going digital, a device like this will be a godsend. If the rest of the industry follows Panasonic's lead, we may have a rewritable media that can be used in your PC, your living room and every other area of your life.

RIYAD EMERAN



facilitate the copying of DVD-RAM discs, even if you don't have enough room on your hard disk to copy all the data from the source media.

As with the previous discs, the double-sided 9.4GB variants are sealed in the caddy, but the single-sided 4.7GB versions can be removed. However, the LF-D201 has the ability to write to a bare disc as well as read from it and to capitalise on this feature you can also buy single-sided media in a standard jewel case without a caddy. In our tests there seemed to be no performance difference between writing to a bare disc or one in a caddy.

We tested the LF-D201 against its older 2.6GB sibling and the performance gains exhibited by the new unit are significant. Copying a 337MB file to a 2.6GB disc on the old drive took 13 minutes 11 seconds, compared to five minutes 14 seconds on the LF-D201 with 4.7GB media. We also copied a 94MB folder with a mixture of files, this took six minutes 38 seconds on the old drive and

DETAILS

★★★★★



PRICE £374.82 (£319 ex VAT); 9.4GB media £41 (34.99 ex VAT)

CONTACT Panasonic 0845 600 3535

www.panasonic.co.uk

PROS Huge capacity; good performance; great value for money

CONS None

OVERALL A superb update of an already great product. If you need high-capacity removable storage, this should be top of your list

Polaroid vs NEC projector

The Polaroid SVGA 238 and the NEC Multisync VT540G battle for projector supremacy

These two LCD projectors are aimed at users on the move who need to display PC-based demonstrations to audiences of up to 50 or so people. Key features are compactness, ease of setup and operation in often less-than-ideal environments and, at the end of a hard day's demonstrating, the option to hook it up to your DVD player for some well deserved home-cinema entertainment. Both projectors are NTSC and PAL-compatible and feature S-Video connectors

The Polaroid SVGA 238 (pictured right) is small and light, weighing in at 3.2kg. It is certainly a highly functional device, but it's not beautiful. All the input ports are on the side panel, which makes them much easier to get at than if they were at the rear. As well as RGB in and out ports there are inputs for S-Video, RCA phono video and audio. RS232 and USB connections are provided, so you can use the remote to control your PC's mouse pointer. There's an integrated laser pointer, activated by a button on the control. All the cables that you will need for these connections, both for PC and Mac, are supplied and for this Polaroid is to be congratulated.

Setup involved attaching the projector to the computer's video connector, and switching on. The Polaroid is an 800 x 600 native resolution version and can display what the documentation refers to as 1,024 x 768 compressed.

At the maximum resolution in 16.7 million colours the image was clear, sharp and stable. The 150w lamp produces 1,000 lumens, bright enough for comfortable viewing in a well lit room with a screen to projector distance of around 3m, giving a screen image of about 1.75m width at the wide-angle lens setting. The maximum distance is specified as just over 11m – giving a picture width of 6.7m.

Menu functions can be accessed from the top panel, or using the remote, and they include the all-important digital keystone correction. The remote is a long slim number that fits neatly into the

hand and has numerous logically located function buttons together with a central four-way rocker 'mouse' and a moulded index-finger trigger on the bottom which acts as a left mouse button. The menu is split into four sections – image, installation, feature and signal. You can tweak the input signal settings and all the changes can be memorised.

The NEC Multisync VT540G (below) looks a lot nicer than the Polaroid. It's grey, more rounded and has a number of practical design features, including an extendable carry handle, remote docking port for the tiny card remote, four IR receivers at the front, back and either side and recessed top panel controls. The front-mounted AC power connector is unorthodox and it's hard to see what the advantage of this positioning is. At 3.9kg it's a little bigger and heavier than the Polaroid.

The NEC 540 has a native resolution of 1,024 x 768 and a 160w lamp. The maximum picture size and distance is practically same as the Polaroid and, despite the NEC's higher resolution, there's actually little to choose between them in terms of picture quality. The NEC is supplied with just an SVGA cable with a Mac adaptor. Inputs are on the right-hand side for RGB in and out, S-Video, RCA video and audio in.

There is a serial port for PC control of various functions such as power on and off, input signal selection and sound muting, but you can't control your PC mouse pointer from the remote.

Like the Polaroid, the NEC projector was easy to set up: plug in the RGB cable, press the power button and the projector auto-senses the input source and displays the screen. Basic menu mode, which offers a subset of the advanced menu options – colour and brightness control, colour balance, digital keystone correction, orientation and so on – is all

you are ever likely to need, but navigating the nested menu arrangement with the nudge buttons on the remote card is tricky. It's not helped by the less-than-sparkling remote operation.

While the Polaroid, with two receivers mounted front and



rear, happily picked up signals bounced

off the screen or walls, the NEC would accept nothing other than direct line of fire. Unreliable remote operation is exactly the kind of thing that can turn a well-planned presentation into a farce.

Looks aren't everything. The Polaroid projector offers equal image quality to the NEC, superior functionality, easier operation and a smaller, lighter box. It is also a lot cheaper – no contest.

KEN MCMAHON



DETAILS

★★★★★

NEC MULTISYNC VT540G

PRICE £3,760 (£3,200 ex VAT)

CONTACT NEC 0645 40 40 20

www.nec.co.uk

PROS Good looks; good picture quality

CONS No remote mouse; fiddly OSM; poor IR reception

OVERALL Let down by lack of connectivity options and poor remote control

★★★★★

POLAROID SVGA 238

PRICE £2,818.83 (£2,399 ex VAT)

CONTACT IMC 01384 871 329

www.imcnet.com

PROS Good connectivity range; easy setup; powerful remote functions

CONS Clunky design

OVERALL If you can overlook the style shortcomings, this projector has it all



MSI Socket A motherboard

The K7T Pro board will let you take advantage of the Duron's low-cost speed and power

AMD has managed to steal the headlines once more with its new value processor, the Duron, and there is certainly no doubting that it is a good choice if you are thinking of buying a new PC. But what should you do if you are thinking of building a budget system yourself – should you go for Celeron or Duron?

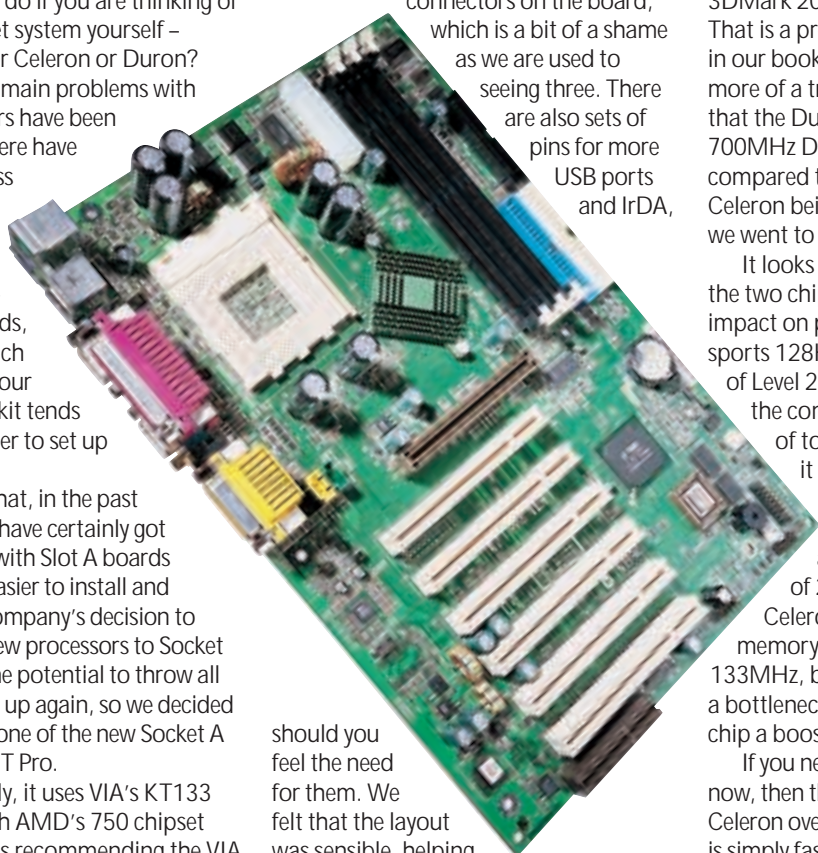
Typically, the main problems with AMD's processors have been twofold. First, there have generally been less decent AMD-compatible motherboards about than Intel-compatible boards, especially at launch time. Second, in our experience, Intel kit tends to be slightly easier to set up and configure.

Having said that, in the past few years, things have certainly got better for AMD, with Slot A boards becoming a lot easier to install and configure. The company's decision to switch all of its new processors to Socket A, though, has the potential to throw all the old problems up again, so we decided to take a look at one of the new Socket A boards, MSI's K7T Pro.

Unsurprisingly, it uses VIA's KT133 chipset. Although AMD's 750 chipset will work, AMD is recommending the VIA KT133 for its new Socket A Durons and new Athlons (codenamed Thunderbird). This offers support for most of the current PC standards: AGP 4x, PC133 and PC100 SDRAM, ACPI, and AC97 audio support are integrated into the chipset. The only major thing it does not support is UltraDMA100 – for this you'll need a board, such as Asus' A7V-100, with a separate controller card onboard. Nonetheless, this is still good feature set, although there are new chipsets from AMD and VIA waiting in the wings.

The board itself is fairly basic, but it will provide you with a good base. It sports five dedicated PCI slots, plus an extra one that it shares with a Communication Network Riser (CNR) slot. This slot is for a new generation of cheap modem, audio and network cards, but in the two months since we first saw a board with this connector on it, we have yet to see a single card. There are three memory slots available together with two

EIDE channels. Onboard sound is becoming standard for most motherboards, and this is no exception. Three audio-in connectors are located next to the external ports for CD, AUX and Modem. There are only two fan connectors on the board, which is a bit of a shame as we are used to seeing three. There are also sets of pins for more USB ports and IrDA,



should you feel the need for them. We felt that the layout was sensible, helping us to route cables tidily throughout the case.

Setting up the K7T Pro was a heck of a lot easier than setting up the old Slot A Athlons. We used a 700MHz Duron in this review. Admittedly, we needed to update the Award BIOS to cope with the new processor, and we needed the latest nVidia beta drivers to make our Gigabyte GeForce2 GTS work, but this is par for the course when building systems based on new technology. Once we'd done this and installed the VIA 4-in-1 drivers provided on the setup CD, we were left with a reassuringly stable system.

We then ran a few standard benchmarks on it and can report that the Duron wipes the floor with the Celeron in both price and performance. Our 700MHz Duron, Gigabyte GA-GF2000, 128MB of PC133 SDRAM and Quantum Fireball hard drive produced a SYSmark 2000 result of 128, a 3Dmark 2000 of 5,464 and a Quake III score of 89.8

frames per second (fps) at our standard resolution of 1,024 x 768 in 16bit colour. Compare this to a Celeron 700MHz, using the same parts and an Asus CUSL2 (an 815E motherboard). It scored a measly 117 in SYSmark 2000, 4,025 in 3DMark 2000 and 76.6fps in Quake III. That is a pretty comprehensive thrashing in our book, and what makes it even more of a triumph for AMD is the fact that the Duron is much cheaper. A 700MHz Duron costs £80 ex VAT, compared to the £150 ex VAT for the Celeron being advertised by dabs.com as we went to press.

It looks as though the difference in the two chips' architecture has a large impact on performance. The Duron sports 128KB of Level 1 cache and 64KB of Level 2 cache (that's why you'll see the company talking about 192KB of total on-chip cache). Crucially, it utilises the same system bus technology as its bigger Athlon brother, producing a front-side bus (FSB) speed of 200MHz, compared to the Celeron's 66MHz. Admittedly, the memory is still only running at 133MHz, but it looks like it has removed a bottleneck to speed that really gives the chip a boost.

If you need to build a budget system now, then there is no reason to go for the Celeron over the Duron: AMD's processor is simply faster and cheaper. This MSI board, although fairly basic, would also be a good choice. If you can hold on, though, it might be better to wait and see what the next generation of chipsets has in store – the more choice you have before taking the plunge, the better.

JASON JENKINS

DETAILS

★★★★★


PRICE MSI K7T Pro £99.88 (€85 ex VAT)
Duron 700MHz £94 (€80 ex VAT)

CONTACT Panrix 0113 244 4958
www.panrix.com

PROS Fairly easy to configure; fast; low cost

CONS Only two fan connectors; no UltraDMA100 support; may be better to hold off for new chipset releases

OVERALL The Duron is a fantastic choice if you are looking to build your own system and this low-cost board will get you there



Xerox DocuPrint M750

A budget printer that is fairly speedy, but does not deliver the best quality

Xerox may be a big name in the printing and copying business, but until recently it's been conspicuous by its low profile in the home inkjet market. The company hopes to change all that with an advertising campaign fronted by a big blue dog and some well-specified, reasonably priced printers.

Boasting a maximum resolution of 1,200 x 1,200dpi, the M750 is the baby of the bunch and comes in at £99. The unit bears a striking resemblance to a large shoebox with a curvy lid and with its 150-sheet paper feeder it eats up a fair bit of desk space.

The DocuPrint employs a two-cartridge print system (the black

cartridge fits to the first print head, while three separate coloured ink tanks fit to the second). The advantage of this is that, when one colour runs out, you don't have to replace all three. The

DocuPrint M750 boasts four print speeds (draft, normal, best and express).

Xerox claims the express mode delivers both speed and quality without the usual trade-offs, but we're not so sure.

Even in draft mode the claim of 10 mono pages per minute was closer to six, and in express mode we only managed 5.2. That said, the Xerox was still quicker than most similarly priced inkjets we've tested. Unfortunately, quality was just

average even in best mode and when we switched to inkjet and photo paper, text continued to bleed and images were grainy almost regardless of resolution.

When it came to photos, results on copier paper were also average and in places washed out, while when we switched to photo paper our test images were dark and blurry in places. The unit would probably suffice for printing office documents but, ultimately even for a budget printer, we expected a little more.

RICHARD MCPARTLAND



DETAILS

★★★★

PRICE £99 (£81.68 ex VAT)

CONTACT Xerox 0800 632 642

www.xerox.co.uk

PROS Keenly priced; 150-sheet paper feeder

CONS Average image quality; unacceptable text quality in normal and express modes

OVERALL A reasonable performer; it may be speedy but text performance suffers

NEC MultiSync FP1370

An excellent monitor that could pose a threat to Sony and Mitsubishi, except for a contrast issue

With the CRT monitor market pretty much dictated by the quality of the flat-screen tubes being churned out by Mitsubishi and Sony, it's refreshing to get hold of a display that bucks the trend. The FP1370 is fitted with NEC's own flat-screen tube, with a healthy nominal diagonal of 22in. As with Mitsubishi's tubes, however, the 22in figure is a little misleading, since the viewable diagonal is 20in: identical to most 21in units.

Our first impression after hefting it onto the desk – it weighs 32kg – was that, for a 22in flat-screen monitor, it's amazingly shallow. With a depth of just 465mm, it's actually 10mm or so shorter than Taxan's new 19in flat screen (reviewed in our September issue). Styling is great, too – the

standby/power on indicator is integrated into the NEC logo on the fascia, so it glows rather stylishly when the unit is switched on.

Round the back you'll find both D-SUB and BNC connectors, with a dedicated front-panel button to switch between them. There's also a dedicated front-panel exit button. The OSD itself is comprehensive, with six varieties of

convergence control as well as the GlobalSync adjustments, otherwise known as corner purity.

When it comes to image quality, the FP1370 delivers the goods on most fronts, displaying excellent geometry with good colour registration, power regulation and corner-

to-corner sharpness and focus. But there's one big Achilles' heel: contrast. The screen itself is far greyer than we've become used to and gives the feeling that you're looking at the display through a net curtain. It renders what would be an excellent monitor rather ordinary.

Unless NEC manages to sort out the contrast problems, you'd be much better off going with a 21/22in display fitted with a tube from one of the big two.

DAVID FEARON



DETAILS

★★★★

PRICE £888 (£756 ex VAT)

CONTACT NEC 0645 404 020

www.nec.com

PROS Amazingly short tube; good looks; a plethora of image adjustments

CONS Expensive; irritatingly poor contrast rules it out as a true contender

OVERALL A great monitor that's unfortunately marred by the contrast problem

Seagate Cheetah X15

If you need the speed, this 18GB drive is fast and efficient and will leave the competition standing

Hard drive manufacturers like nothing more than a game of 'pass the innovation'. For the latest round it's back to Seagate with its 18GB Cheetah X15 enterprise drive.

Following the standard product-naming strategy, the Cheetah X15 is a top-of-the-range SCSI drive that has been designed specifically for I/O intensive tasks. In order to get a faster drive, Seagate looked at the major limiting factor: spindle speed.

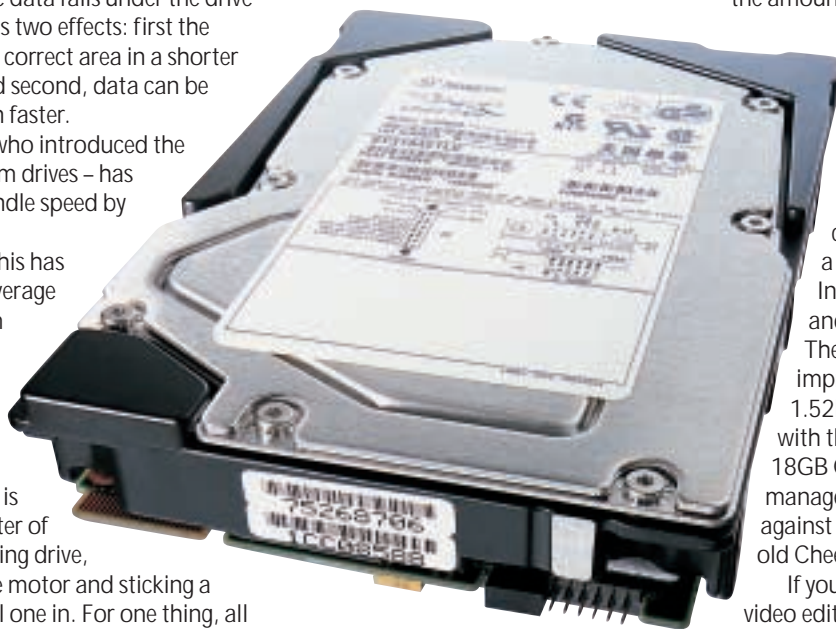
The faster the drive platters can spin, the quicker the data falls under the drive heads. This has two effects: first the heads find the correct area in a shorter time span; and second, data can be read or written faster.

Seagate – who introduced the first 10,000rpm drives – has upped the spindle speed by 50 per cent to 15,000rpm. This has reduced the average seek time from 5.2ms in the 10K drive to 3.9ms in the X15. This sounds easy enough, but it is not just a matter of taking an existing drive, pulling out the motor and sticking a more powerful one in. For one thing, all of the drive electronics need to be upgraded and certified to work at the increased speed. This is actually the easy part.

The hard part comes from making sure that the faster model doesn't use more power. Simple physics dictates that increased motor speed requires more power. More power leads to extra friction and generates more heat. With OEMs (original equipment manufacturers) already taking into account the power and heat requirements of the 10K drives, Seagate cannot afford to make an incompatible drive. When Seagate first launched the 10K drives, for example, they were found to run too hot and caused endless problems when installed in machines.

Determined not to fall into this trap again, the X15 was carefully designed to have exactly the same power, heat, and sound profile as the existing 10K drives. This required development of the RACE (Reliability with Advanced Control

and Efficiency) motor used to drive the spindle. The upgrades included a better magnetic seal and a high-efficiency stator. The stator is the stationary part of the motor that converts the supplied power into torque to rotate the motor at the rated rpm. A higher speed requires more power and has greater electromagnetic (EM) losses. Through the new stator, it is possible to allow the motor to spin 50 per cent faster without requiring any additional power or cooling



requirements. On top of this, a new magnetic seal protects both the disc surface and the GMR (Giant Magneto Resistive) heads from static caused by the spinning of the discs.

In a standard system, the centrifugal forces on the magnetic fluid inside the seal increase with rpm. Beyond a certain critical rpm, the centrifugal forces exceed the magnetic forces holding the fluid in the seal, rendering it useless. Seagate has designed a new seal that eliminates the centrifugal force component on the fluid, making it almost completely rpm-independent.

The remaining limiting factor was physical size of the disks themselves, which Seagate has also reduced. This affords better control of the spinning disks and reduces the forces applied to the platters. The reduced platter size, however, requires installation of more platters to get the 18GB capacity. The X15 has five disks and 10 GMR heads installed. Unfortunately, this takes up

all of the available space inside a 1in drive case, so we won't see higher capacities for this model until areal densities can be pushed up.

The final stage was to upgrade some of the basic points of the drive, with Seagate installing an Ultra160 interface – 200Mbytes/sec Fibre Channel is also available – and upgrading the cache. The 10K models only had 2MB onboard, but the X15 has a minimum of 4MB, and at the top end 16MB.

No real innovations were made to the amount of shock that the drive can take. In fact, the X15 has the same rating – 15Gs operating and 250Gs non-operating – as the 18GB Cheetah 10K.

We tested an Ultra160 SCSI drive with 16MB of cache. Our tests comprised a random read/write test using Intel's Iometer 1998.10.08, and timing a 1GB file copy. The results were extremely impressive. Iometer returned a 1.52Mbytes/sec result, compared with the 1.45Mbytes/sec of the 18GB Cheetah 10K. The file copy managed to complete in 41 seconds against the 48.5 seconds of the old Cheetah.

If you have an application, such as video editing, where performance is crucial, then this is the fastest drive that you can get your hands on. However, at £468.75 inc VAT, it's not cheap and you're limited to buying 18GB drives. If it's capacity that you're after, you'll have to buy one of the older generation of drives instead.

DAVID LUDLOW

DETAILS

★★★★

PRICE £468.75 (£398.93 ex VAT)

CONTACT Seagate 0800 783 5177

www.seagate.com

PROS The fastest drive on the market; same power/heat profile as previous model

CONS Expensive; recommended only for highly I/O intensive tasks; limited to 18GB capacity

OVERALL It's certainly fast and capable, but the price does mean that you'll have to carefully consider if the extra performance is worth the premium

Kyocera laser printer

The fully featured FS-1000 proves you don't have to sacrifice performance to be eco-friendly

Less contoured than earlier Porsche-designed printers from eco-friendly Kyocera, the FS-1000 is nonetheless small and attractive and should have no difficulty fitting onto a small desk or shelf. You'd be recommended to give it a bit of breathing space, though, so you can make good use of the impressive array of doors and openings. Around the front you can pull out the paper tray, capable of holding up to 250 sheets of standard 80gsm photocopy paper, above which is the MP (multi-purpose) feeder that will handle anything up to 163gsm. At the back, meanwhile, there's a fold-out holder for face-up output that will stack in reverse order to those pages you let the FS-1000 deposit in the standard tray on top of the unit's main body and offer a straight paper path for OHP transparencies and label sheets.

Under the hood there's an impressive set of electronics. The brain is a 75MHz PowerPC processor, and it benefits from a standard install of 4MB of RAM, which can be expanded to a maximum of 132MB. Beware, though, for this is pricey, with a 64MB DIMM upgrade setting you back as much as the printer itself. Combined, though, the processor and standard allocation of memory helped it pump out a steady 10 text pages a minute with a standard five per cent coverage in our tests, and the results were good – at the standard 600dpi setting characters were crisp and dark. Speed demons can drop this to 300dpi, or you can instead opt for the KIR2 (Kyocera Image Refinement 2) setting and up the ante to 1,200dpi. Splashing out on the 8MB FS-1000 doesn't up the quoted print speed, though,



The multi-purpose feeder is truly all-purpose

so it's the engine itself rather than the buffer that is setting the 10ppm limit.

Print quality is difficult to fault. Images were well rendered and our set of standard PowerPoint test slides, printed on generic paper, had even toner distribution, and text-based characters as small as 2pt were easy to read. Our 50-page Acrobat test document was cleanly produced and spot colours in the clip-art it includes were translated into well-differentiated greyscale equivalents. Throughout our tests the FS-1000 was quiet in use, making less noise than the fan in our test PC.

It has five in-built printer emulations, including Epson LQ-850 and PCL6, and optional support for PostScript Level 2 through an emulation ROM. Interfaces for serial connection and, at £229, a device to hook the printer to a 10/100BaseTX Ethernet network without an external print server box, are also available. The really clever thing, though, especially if you take the network option, is Kyocera's Remote Operation Panel (ROP). This effectively makes up for the lack of a screen on the unit itself, letting you monitor every aspect of its operation. Open up one of the external doors and the spinning image on your screen will open its door to match. Run low on toner and it'll warn you so you don't end up walking across the room to collect your print job only to find a pile of empty pages.

A directory tree interface lets you navigate the various settings and options, specifying print resolutions and ecology settings. Our only complaint was the speed at which it worked. It's all fine and well having a pretty image spinning on the interface but it made the whole thing less responsive. We soon found ourselves becoming irritated, too, at

the way in which it would slowly fade settings and stats onto the panel as it probed them rather than just displaying them right away. That said, though, these are minor points and you are in no way obliged to use the ROP which is, at the end of the day, just an added bonus.

The FS-1000 is not expensive to run. The £54 toner cartridge has a



quoted life of 6,000 pages if you follow the five per cent coverage rule, which those with calculators will no doubt already have worked out averages at 0.9 pence per page, which Kyocera claims makes it a penny a page cheaper to run than HP's LaserJet 1100. The all-in-one process unit, which comprises the drum and developer, carries a 100,000-page, three-year warranty so if guaranteed uptime is important to you this may be an attractive choice.

It's also a good one for the greens – Kyocera's Ecosys regime cuts down on wastage with a fully re-usable drum that just needs topping up with toner and a bit of regular maintenance when it's returned to the factory.

NIK RAWLINSON

DETAILS

★★★★★



PRICE £329 (£280 ex VAT)

CONTACT Kyocera 0118 931 1500

www.kyocera.co.uk

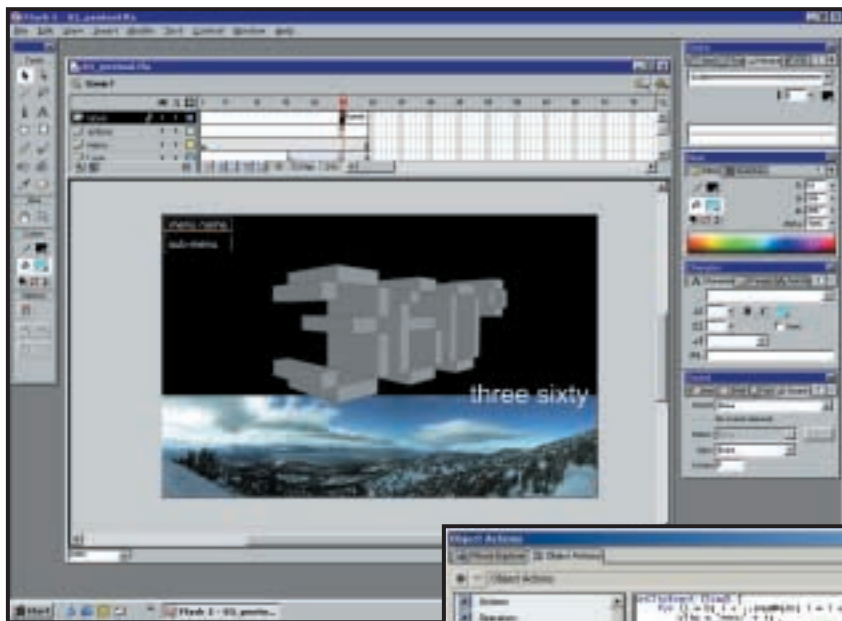
PROS Compact; quiet; fast; great output; will appeal to the green friendly

CONS Remote operation panel is somewhat ponderous

OVERALL Cheap to run, attractive – what more could you want?

Macromedia Flash 5

Flash is now ubiquitous: nearly all new browsers can read it, so you can't afford to be without it

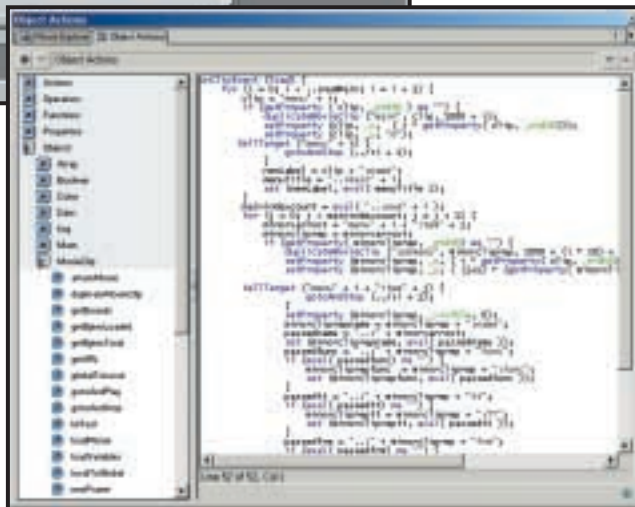


Over 92 per cent of the Internet population – that's 248 million people – can now view Flash content without having to install any more plug-ins. Bundled with all the new browsers and with Windows, the format is now almost as widely accepted as jpegs or gifs.

Flash has always supported importing Illustrator files, but in this release its handling of Freehand output has been improved, which isn't surprising, as they share a common owner. The pages of a Freehand document can be set to import as scenes or keyframes, and layers can be flattened out or, like the pages, distributed across the timeline as keyframes.

The import dialog also gives the option for importing only a select number of pages of the original Freehand document, but we would have liked to have had the opportunity to open, or at least preview, the source file at this point so that we would not be making such decisions 'blind'. That said, everything else is handled well. Layers in the Freehand original will import with the same layer-colour indicators. Names and even locking status are maintained, while scenes are distributed onto separate timeline entries and any related objects saved to the library for future use.

Reorganising layers is a simple matter of mouse-grabbing them and dragging them up or down the stacked pile, depending on whether you want their contents to appear in front of or behind



Layer-based work can be a bit tough for the novice, but ActionScript will let you get right into the code without having to write any

other objects in the animation. Flash has not adopted an object-based approach like that found in LiveMotion from Adobe, which may make it less attractive to the first-time user, for while Flash is undoubtedly more powerful and endowed with a far more impressive set of functions, the layer-based approach may be confusing to the novice.

This is a shame, because it means that Macromedia is unable to employ the fully expandable-collapsible timeline enjoyed by LiveMotion where element attributes can be fully tweaked in situ. Instead, Macromedia has had to stick with a palette-based approach and you'll sometimes find yourself hunting around the screen for a particular input box.

Macromedia is using this release to trumpet the arrival of its standardised user interface, so you can see why it may

be reluctant to introduce a shape-shifting timeline, but a best-of-both-worlds approach would have been nice, leaving the palettes there for those who already have a firm grasp of the package and a dropdown timeline for everyone else. Palettes can be re-grouped into whatever order you feel is most logical.

We were also disappointed that there is no history palette in Flash 5. This has been one of the must-have features in version three of both Dreamweaver and Fireworks – the ability to roll back past project saves or even to write all past actions to disk is a real time saver.

Fortunately, Flash has an extensive Undo cache, so there's a good chance you'll be able to repair any damage you might cause, but with Macromedia rolling out a unified product UI over the next six months – and we're wondering if this hints at forthcoming new releases of other Macromedia packages – it would have been nice to have seen it here, too.

The thinking behind the common UI is a sensible one, with

the company claiming that most of its customers use at least two of its products. If you're not one of them, though, you'll probably welcome the option to customise the keyboard shortcuts to match your other web-publishing installations.

There's a new Bezier pen tool that does just what you'd expect of such a device, but far more important is what Macromedia is calling the 'Movie Explorer'. Targeted at those developing in a corporate multi-user environment, where the working model often sees more than one person assigned to a particular animation, this makes it easy to trawl through the whole movie and search out specific elements.

Searching is a simple matter of entering a keyword that could be anything from the name of an object to a

string of text. In the case of the latter, the text can then be changed in the results window without venturing into the movie itself and the animation content will dynamically update. This means that the found result no longer exists, so the Explorer palette changes to reflect this.

Keeping your audio files small is all well and good, but if they suffer as a result, your whole movie will come across as less professional. So Flash gives you the option of individually setting the compression level of any sounds you use. This setting will then override any global setting applied to the movie as a whole.

Putting a sound into your movie is impressively easy – simply drag it onto the stage and it will be dropped onto the current layer. We would have liked it if Flash had been automatically set to initiate a new layer for the waveform as it's unlikely you'd want to lay it down on the same level as an on-screen animation, but the ability to simply drag and drop sounds onto the stage is a real time saver and more than makes up for it.

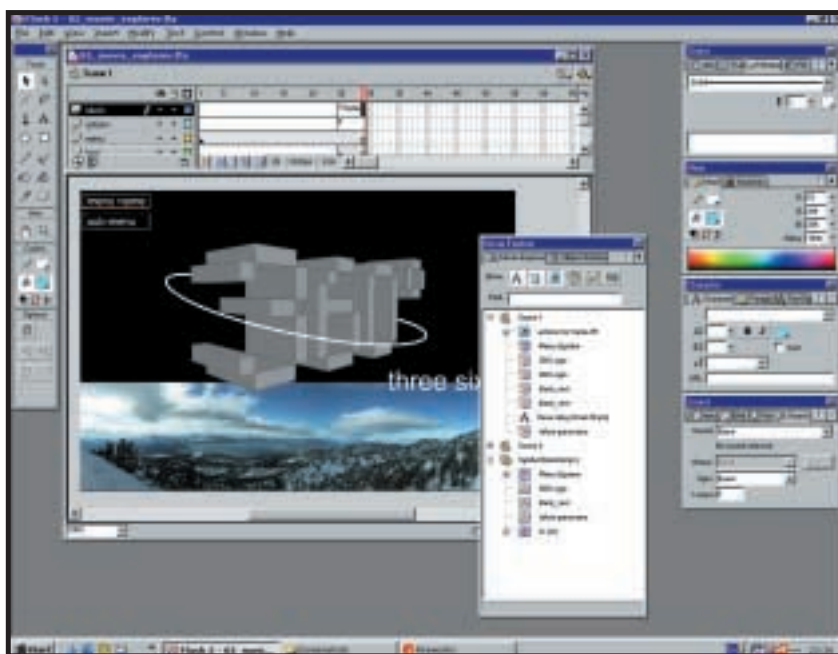
Flash includes a simple set of non-destructive audio-editing tools that let you loop the waveform without having to load more than one instance. If you spend a couple of minutes fiddling, you can get your sounds to pan from one side to the other and effectively follow the on-screen action, giving your movie greater depth and a professional finish.

This isn't as tricky as it sounds, as it's just a matter of reducing the volume level on one channel while increasing that of the other. Doing this involves simply dragging a linear representation of the volume up and down the screen and adjusting each end higher or lower to indicate amplification or tapering off.

If there's one area in which Flash developers have been restricted in the past, it's the programming side of things. The interface makes it easy to drag and drop elements and animate them by tweening across the timeline, but getting under the program's skin, so to speak, and accessing its inner workings has traditionally been something of a task.

All of that has changed with the introduction of ActionScript. It's designed to be easy to learn, sharing a common structure and syntax with JavaScript, but if programming doesn't float your boat you can resort to what we all know best – drag and drop.

The ActionScript interface can be set to consist of two windows, one with all the available commands and the other, your script. Dragging commands from the left window to the right adds them to your program and opens up an attribute dialog at the bottom of the palette.



The Movie Explorer makes it easy to select individual elements of an animation

Completing the code line is then a matter of filling in the blanks, so programming becomes more a case of answering questions than typing code.

We were a little disappointed that when specifying URLs or files that should be included in lines of code, there was no facility to browse for them. Instead you had to rely on your memory, or find them in Windows Explorer or IE. Like the lack of a preview button in the Freehand import dialog, this seems to be a small oversight on Macromedia's part that could easily have been incorporated and enhanced the user experience greatly.

A neat new feature is web native printing. Designers can now produce banners that, when embedded into a page and clicked on by the user, will print a hard copy of whatever they choose. Imagine, for example, a banner advert for PCW that prints out a sample page when clicked. If widely adopted, this could be a powerful advertising tool.

The new Flash plug-in, which is a necessary download for anyone who wants to view Flash 5 files, also caters for XML Socket Connection, whereby a link to the server will be maintained so that XML data can be passed back and forth between the server and the player for constantly updated content.

An effective implementation of this technology could see Flash being used to gather orders and credit card numbers, validate them while the user stays online and produce a receipt without needing to refresh the browser window content, giving the developer greater control over the event from beginning to end, and greater security for the user who won't be

peppering their cache with sensitive data.

While LiveMotion may be an easier first step for the novice, there is no denying that the genuine article is a more powerful option. Its use of true vector-based imaging produces compact output that downloads quickly and new features – such as shared asset libraries, the movie explorer and drag-and-drop ActionScript programming – make this latest version quick and easy to use.

There are things missing that we would have liked to have seen – primarily a fully-featured history palette and browse and preview buttons, but these omissions are soon forgotten when the package is viewed as a whole.

NIK RAWLINSON

DETAILS

★★★★★



PRICE Full version £259 (£220.43 ex VAT); upgrade from earlier version £99 (£84.26 ex VAT); Flash 5/Freehand 9 Studio full version £399 (£339.57 ex VAT); upgrade to studio £179 (£152.34 ex VAT)

CONTACT Computers Unlimited
020 8358 5857

www.macromedia.com/uk

SYSTEM REQUIREMENTS 133MHz Pentium; Windows 9x/NT4/2000; 32MB of RAM; 40MB of hard disk space; 256-colour monitor capable of 800 x 600; CD-ROM drive

PROS Well established; extensive features, cuts development time over previous versions

CONS A couple of omissions as mentioned above, but nothing drastic

OVERALL If you want to do web animation properly, this is how

Microsoft Visio 2000

A general-purpose diagramming tool that demonstrates great versatility and value for money

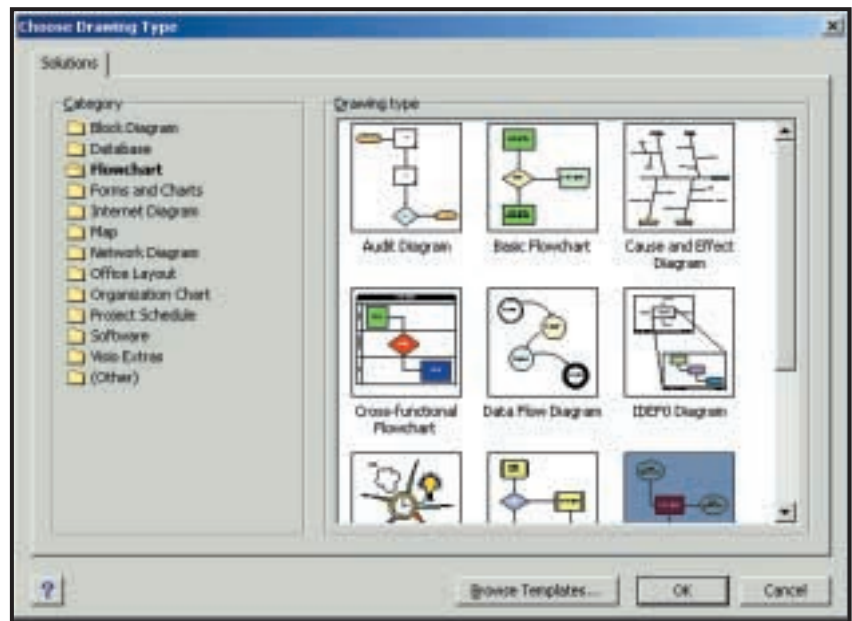
Visio is in essence a diagramming tool based on shapes and connections. The product has evolved to include areas such as design, documentation and software modelling. Even though it was only recently acquired by Microsoft, Visio has for a long time been deeply integrated into Windows. Visual Basic for Applications is built in, and Visio exposes a complete object model so that other applications can control its features programmatically.

Developers can use Visio as a front-end for custom applications. For example, an office designer might use it to plan where staff will sit, calculate the cost and initiate an order for furniture. Microsoft is using a Visio application as a core part of its forthcoming BizTalk server, for managing business processes, exploiting its ability to provide drag-and-drop design together with code generation and programmatic control of other application components.

A Visio shape is a sophisticated drawing object, with a huge range of formatting options and the ability to be merged and grouped. Shapes also support data and events. In Visio's office layout shapes, for instance, each item has custom properties to supply an inventory number and an owner. Events fire when shapes are added to a diagram, clicked or modified. Shapes can also be categorised into layers, so you can show or hide selected objects. Visio connectors are equally sophisticated. You can specify connection points and routing behaviour, so that connectors reposition themselves intelligently as a diagram grows.

For general-purpose diagramming, such as creating flow charts, organisation charts, or building your own charts from scratch, the standard edition is a good choice. The product has been extended, with numerous specialist macros and stencils, Visio's term for custom shapes. The Technical edition has stencils for such things as electrical, civil and mechanical engineering and architecture.

The Professional edition targets the IT industry, with basic network design and diagramming and documentation for database, software and Internet development. The Enterprise edition is also IT-oriented, but with more complete stencils and tools. It is the most expensive, but does not include all the features in Technical, so if you model databases and design electrical circuits, you'll need both.



Choose your drawing: Visio morphs accordingly as you pick different types

Visio Enterprise can automatically discover a network and diagram it. There is also full support for unified modelling language (UML). It is a complete modelling environment, with its own navigator and the ability to check a model's integrity.

You can generate code for C++, Java or Visual Basic and reverse engineer existing code in Visual Studio projects. In the same way, the database modeller lets you generate DDL (Database Definition Language) scripts, so you can first model and then create a database. You can also reverse engineer existing databases. With such strong development tools, it would make sense for Microsoft to incorporate some form of Visio into Visual Studio, rather than the current Visual Modeller, which is based on a Rational product.

A couple of years ago Visio absorbed a product called InfoModeler, with its intuitive object-modelling technique ORM (Object Role Modelling), which uses natural language facts to capture business rules. ORM lives on in Visio 2000, with its own shapes and tools.

Seasoned Visio users will not find this a radical upgrade. The most noticeable change is in the interface, which has new docked windows, a diagram explorer, and page tabs for navigating complex documents. You can now save diagrams as HTML and embed hyperlinks into shapes. There is also improved network discovery with auto-layout and support for importing structures from Active

Directory, NDS (Novell Directory Services) and LDAP services. Many other features have enhancements of detail, listed on Microsoft's Visio website.

Any evaluation of Visio depends largely on what you want it for. Visio scores highly on versatility, but may take second place to more specialist tools in any particular niche. For general-purpose business diagramming, it is superb. It is also great value for software developers, with tools for everything from designing an interface to advanced modelling.

TIM ANDERSON

DETAILS

★★★★★



PRICE Standard £179

(£153 ex VAT); Professional or Technical £355 (€303 ex VAT); Enterprise £889 (€760 ex VAT)

CONTACT Microsoft 0345 002 000

www.microsoft.com

SYSTEM REQUIREMENTS Windows 95/98/NT/2000, 80MB of RAM, 130MB of disk space, CD-ROM drive

PROS Highly versatile and customisable; strong VBA and COM automation support; complete UML diagramming

CONS Sluggish screen refresh on complex diagrams; too few example diagrams; Enterprise edition excludes Technical features

OVERALL Sleek implementation, versatile features and a huge range of stencils and tools make Visio hard to resist

Autoroute GB 2001

A great route-planning package that only falls foul of the competition in that you have to pay for it

Autoroute has changed a lot over the past decade. Once it was an independent DOS-based route-calculation package, but it has been in the Microsoft fold for many years now and offers not only route calculation, but also extensive information about the areas through which any route passes.

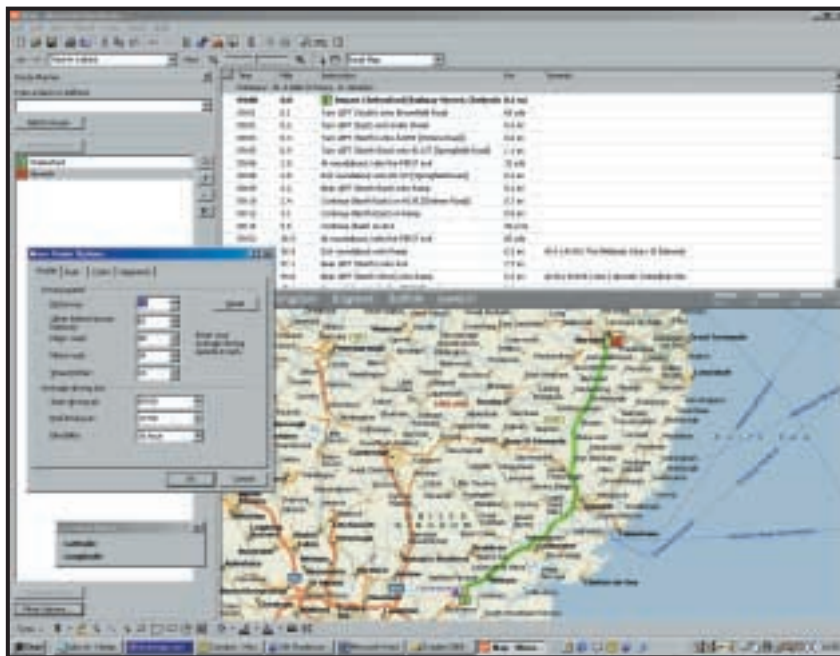
This version may be called Autoroute GB, but it also includes maps for the whole of Europe and even door-to-door planning from anywhere in the UK to major parts of Germany and France. With so many foreign place names involved, the new Smart Spelling feature will hunt down words you enter phonetically. In practice this worked fairly well. Basyldun, Rumfud and Covuntree found Basildon, Romford and Coventry in the UK, and looking overseas we correctly hit upon Aix-en-Provence and Malmo after searching for Aches on Provence and Marlmow respectively.

The maps are comprehensive and up to date, even including the brand new tunnel/bridge route opened up between Malmo and Copenhagen just a week before the review copy arrived in PCW's office. There's also an online phrase book, which may be of less use to desk-bound users than to those who will be able to take the package with them.

It includes a wide range of interest points, including over 49,000 restaurants and 37,000 petrol stations and, as you might expect, allows you to enter your average driving speeds so that it can accurately calculate how long it will take you to get from point A to point D, taking in points B and C along the way. It does not, however, take into account differing speed limits on multi-nation routes. In the UK, for example, you might top out at 70mph, while in Germany there's a chance you might want to go faster.

Maps can be downloaded into PDAs running Windows CE 2.0 or above using Pocket Streets for viewing on the move and if you want to print them out, the package includes a range of simple drawing tools for highlighting pertinent features and adding notes. If you're wired you might want to put a map on your website and, provided you stick to some copyright guidelines, Microsoft has no problems with you doing so.

Autoroute is a great package, but it has one big problem, which is no fault of its own: competition. The RAC and AA



Comprehensive maps can be downloaded into PDAs for on-the-move viewing

both offer extensive UK-based route-mapping services on their websites for free and you can pay for a lot of phone calls to your ISP for the price of a copy of Autoroute. To compare the three we set each an identical task. The RAC and AA services assume their own average speeds, so we left those in Autoroute set to Microsoft's defaults. We told each that we wanted to take the fastest route from Chelmsford to Swansea.

Each took pretty much the same route, with the shortest being the RAC at 234 miles and the longest the AA completing the trip in 238.5 miles. Autoroute came home at 235.5. These figures are so close, though, that they can easily be explained away as being within an acceptable margin of error.

The supplementary information returned was of more interest, though. The AA warned us about the toll payable on using the second Severn crossing, but Autoroute only gave us an overall cost based on the price of petrol. Likewise, the RAC impressed us by incorporating up-to-the-minute travel news into its route. Another nice touch from the RAC was the ability to tell it when you'll be travelling and it'll email you the route just before you set off, incorporating traffic news relevant at the time.

The AA and RAC routes should always be up to date, being live systems, but Autoroute has a map feedback

utility, guiding you through a series of screens that will gather your comments and feedback for the next edition.

Autoroute GB 2001 is a well put together package that will be ideal for anyone with a car but in an age of cheap Internet connections, you can get pretty much the same information online for free. Autoroute will produce a better map but most users will find printed directions of greater benefit and this is an area where both the AA and RAC currently have the upper hand if your travelling is primarily within the UK.

NIK RAWLINSON

DETAILS

★★★★★

PRICE £59.99 (£51.06 ex VAT)

CONTACT Microsoft 0345 002 000

www.microsoft.com

SYSTEM REQUIREMENTS Pentium processor; Windows 95/98/NT4 or later, 16MB of RAM (32MB for Windows NT), 145 - 200MB of available hard drive space, double-speed or faster CD-ROM drive, 256-colour SVGA monitor; mouse

PROS Fast route mapping, easy to use, up to date

CONS You can do the same thing for free online

OVERALL A great product that has some stiff competition from its rivals

Cubase VST 5.0

The sequencer of choice for budding desktop musicians has made the path to success smoother

Since its early days on the Atari ST, Cubase has been the sequencer of choice for huge numbers of professional musicians, particularly in Europe. It's not surprising really, as Steinberg has worked hard over the years to make sure that musicians enjoy rather than endure using the software.

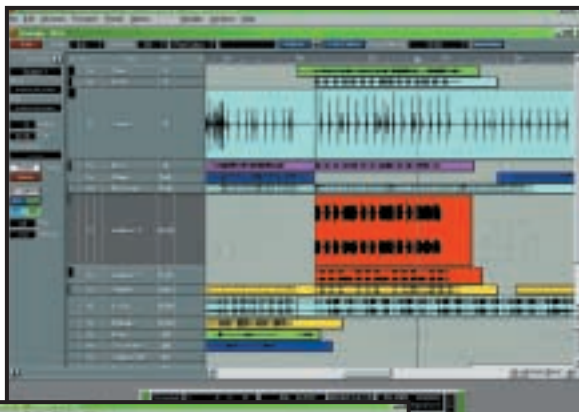
Cubase has led the way on the technology front, having a number of firsts to its name, including the introduction of the graphical-arrange page, native hard-disk recording (using the old Atari Falcon's built-in audio capabilities) and realtime effects with the arrival of Virtual Studio Technology (VST).

However, the fast pace of development hasn't been without its troubles. Updates, while usually fixing large numbers of small bugs, have sometimes introduced new nasty ones, forcing Steinberg to make quick revisions. So now we're at version 5.0 and Steinberg has not only put the software through a visual design overhaul, but also rejigged its audio engine.

The first thing you'll notice is the updated interface. Steinberg has taken a long hard look at the menu system and decided that it was getting a bit out of hand. The result is that the Audio menu has now been dumped and a new Panels menu has been added. This Panels menu is now the place to look for all the VST functions, such as the effects and mixer windows, and also where you'll find the MIDI mixer and interactive phase synthesiser. The Structure and Functions menus have also been expanded to include entries for the new features present in this update. This fresh approach will take a bit of getting used to for existing users, but after a while you start to see the logic behind the change.

There are plenty of other tweaks to the user interface. Cubase is at last fully drag-and-drop enabled. You can drag parts (MIDI) and audio (waveforms) from one Arrange window into another or between the desktop and folders.

Both MIDI and audio tracks can now be individually zoomed in on the arrange page, instead of you having to zoom in



Top: Markers enable the user to quickly jump between specific parts of the arrangement

Bottom: Cubase allows a number of elements to be moved using simple drag and drop commands

on the entire arrangement. This is a neat feature that Emagic's Logic sequencer has already had for some time, so it's nice to see Steinberg paying attention to the competition.

Perhaps the simplest but best addition to the user interface is the new markers for the Arrange page. It has always been frustrating jumping forward and backward between sections of a long arrangement. Now you can set and name markers for different parts of the arrangement and quickly select areas to jump between by clicking on the Marker button at the top of the Arrange window.

If you're into filter and MIDI gating effects, you'll love the new dedicated controller editor. This allows you to edit controller data for VST plug-in controllers and MIDI mixer events as well as MIDI events. It's been a long time coming, but it's great to finally see this as a full standalone editor.

There are plenty of new features on the audio side too. All versions of Cubase can now record in 24bit resolution –

although this is only useful if you have a 20- or 24bit-capable audio card. Dither is also included for reducing files from 24 to 16bit and if you purchase the high-end Cubase/32 you'll also get the TrueTape facilities that act like Steinberg's Magneto plug-in, simulating the warmth of analog tape.

However, there is one problem with this new upgrade and that's the Dongle. We've never been keen on Dongles as a means of copy protection as they only inconvenience legitimate users of the software. This time it's even worse: if you're upgrading, you'll have to send in your old Dongle and wait for Steinberg to send you a new one. This means that you'll be without the main hub of your studio for at least a few days.

Unlike previous upgrades version 5.0 doesn't have any major headline-grabbing features, apart from maybe the addition of 24bit recording to all flavours of the software. Steinberg has settled down on the feature-adding frenzy and turned its attention to making the platform more stable and user friendly with a wealth of editing options and cleaning up the user interface. Overall, Steinberg has taken a fantastic product and made it even better.

NIALL MAGENNIS

DETAILS

★★★★★



PRICE Cubase VST 5.0 £329
(£280 ex VAT), 5.0 upgrade £99 (£84 ex VAT)

CONTACT Arbiter Music Technology
020 8970 1909

www.steinberg.net

SYSTEM REQUIREMENTS Windows
98/2000, 200MHz Pentium (450MHz
Pentium III or Athlon recommended), 64MB
of RAM (128MB recommended), fast EIDE
or SCSI hard drive, MME or ASIO-compliant
sound card

PROS 24bit recording, MIDI mixer, dedicated
controller editor and a whole host of other
additions

CONS Annoying Dongle copy protection

OVERALL Cubase VST continues to lead the
pack in both features and usability

Web Traffic Maximizer

This software makes light work of submitting your site but it won't give you an unfair advantage

Billing itself as the most powerful traffic-building tool available, Web Traffic Maximizer submits the address of your site to the top 50 search engines around the world. You'll have heard of most of them – Yahoo and Lycos are two – but some, such as Lifestyle UK, are less common and make you question how they define 'top'.

In a nutshell, the package takes the legwork out of getting yourself listed. Anyone who's tried to get their site to the top of an engine's results pile knows that there's a lot of hard work involved. Clearly, the most important thing to do is to define meta tags containing keywords within the head of each and every page on the site. If you've finished your site without doing this, it's unlikely you'll want to go back and add them throughout so the keyword fields in this software will come in handy, allowing you to specify as many keywords as you feel are relevant, which it will then use in submitting your site for indexing.

Once your keywords have been entered you can select which of the 50 engines you want to hit or opt to submit to them all at once. This is a surprisingly quick process and within 10 minutes our test site was lodged with all but two that had refused connection attempts. A progress screen shows which engines have been successfully hit and any problems encountered are listed so that you can right-click and work on a fix.

Submitting your site is only half the story, though, because Web Traffic Maximizer allows you to monitor your ranking. It is obvious that the earlier a search returns a hit on your site the better. You don't, after all, want visitors having to search through 10 pages of results before they get to your URL. Maximizer will therefore use search terms you specify to hunt through every one of the 50 engines in its database in blocks

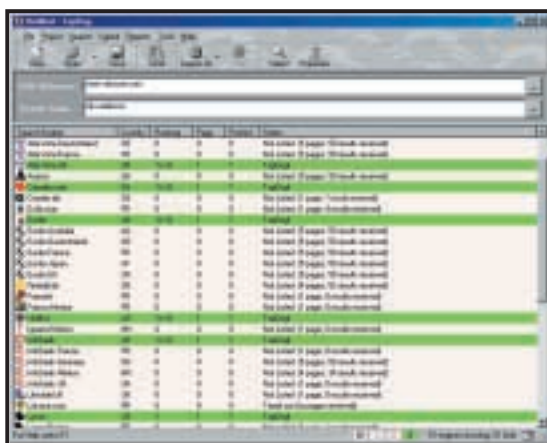
of five and report back how high up each comes up with your site. Reports can be saved so you can track progress across several months.

The Internet is a transient medium, so you welcome the update screens that crop up every few uses or so and it's comforting to know that you're marketing your site using the most up-to-date product available.

If you're expecting a quick-fix solution you'll be disappointed. Getting listed in search engines is a lengthy process and all Maximizer really does is lodges your URL in the long queues of other worthy sites waiting to be indexed. What it does do, though, is dramatically reduce the amount of work you'll have to do. In the two weeks we spent testing the product it did nothing to improve our ranking on any of its 50 search engines, but then manual entry of the same sites to the same engines would have had much the same effect.

Those with eagle eyes will spot in the screenshot above that the title bar says TopDog. This is because Web Traffic Maximizer is a cut-down version of this much larger package, featuring only the 50 most popular search engines, rather than TopDog's full database of 232. The name TopDog relates to your site's status once you become the first hit on a page of results – somewhere we all want to be.

To try it out you can download an evaluation version from TopDog's website at www.topdog2000.com. This only lets you submit to five of the engines it supports, but if you decide to register, it'll open up the rest of its database of engines to you. Be wary, though – its



Web Traffic Maximizer gives you an update of how your site is progressing up the list on each search engine

3.2MB download will take around quarter of an hour on a 56K modem. Registering TopDog is more expensive than investing in a UK-sourced copy of Web Traffic Maximizer (see contact details below), so you need to be sure that the 180 or so extra search engines you'll get to use are really worth paying twice the price for.

NIK RAWLINSON

DETAILS

★★★★

PRICE £39.99 (£34.03 ex VAT)

CONTACT MediaGold 020 7221 3755

www.topdog2000.com

SYSTEM REQUIREMENTS 486 processor or better, Windows 9x or NT4, 32MB of RAM, 5MB available hard drive space, SVGA monitor, dual-speed CD-ROM drive

PROS Takes the legwork out of URL submission

CONS There is no quick-fix way to getting yourself a top slot in the search engines

OVERALL If you're prepared to sit it out, this is an easy way of getting yourself listed online

Ricoh Aficio AP2100

A good workhorse printer that will handle anything you throw at it, although it doesn't excel

We don't often see printers from Ricoh, but its latest product is the Aficio AP2100 – a 21ppm, laser printer designed for the office.

Network connectivity can be added by installing a separately available network board. Our first job, therefore, was to plug in the card and get the network set up. One problem was that Ricoh provided a vertical network card, making it difficult to line up the connector properly.

After plugging the machine into the network, we fired up the management software, which scours the network looking for printers that have not been configured. We had to manually supply an IP address, as the printer does not use the Dynamic Host Configuration Protocol (DHCP) that allows IP

addresses to be assigned automatically. This would have made life a lot easier.

The management software also allows the Aficio's status to be viewed from across the network. In addition, you can change settings such as the default paper size and print quality.

With management out of the way, we loaded the TCP/IP printing software provided onto the client machine. This creates a network port on which the client can communicate to the printer using the standard drivers. The software has all the reporting aspects of the administrator account without being able to change anything.

We used a 50-page Word document and a 50-page pdf file to test the printer's speed and quality, while a greyscale image allowed us to test the output.

The results were a mixed

bag. The pdf file only managed to come out at 13.5ppm, while the Word document managed a much better 20ppm. In both cases, the text appeared well formed except for large fonts where there was some ghosting. The same quality appeared on the greyscale image, which, while viewable, showed evidence of density variation.

Overall, Ricoh has done a good job here, but there's nothing to get excited about.

DAVID LUDLOW



DETAILS

★★★

PRICE £ 1,333.63 (£1,135 ex VAT)

CONTACT Ricoh 020 8261 4000

www.ricoh-europe.com

PROS Good management software

CONS It could be more straightforward to get onto the network

OVERALL The print quality is fine, but the device is nothing to write home about

Dell PowerApp.web 100

A pared-down web server, optimised for performance, which will suit inexperienced users

A standard web server contains a lot of extra clutter that is not needed and consumes system resources. A typical install of an operating system, such as Windows 2000, occurs with web-server software sitting on top. As the OS will be loaded to the gills with software that doesn't need to be there for web serving, this is a little redundant.

A better approach is to take dedicated hardware and software and put it all in one box. These kinds of appliances have worked well for companies such as Cobalt and its Qube. Dell has decided that it's such a good idea it'll do the same with the PowerApp.web 100. It provides the basic operating system – Windows 2000, or Red Hat Linux – with all the unnecessary fluff removed, leaving a streamlined OS for the web server to sit on.

There are also two different web servers to choose from. If you opt for the Windows 2000 model, you get IIS (Internet Information Server), while Red Hat Linux comes with Apache. For this review, we were sent the Windows 2000 model, which is generally easier to set up, although it is more expensive.

From the outside, there's nothing particularly unusual about the 1U high server. Removing the front panel gives access to the floppy drive, a slimline CD-ROM and the power button. Strangely, you cannot access the hard drives from the front – you'll need a screwdriver to delve into the internals of the case.

Once the top panel has been removed, the two 9.1GB Quantum Atlas V hard drives are clearly visible, although getting them out of the case is another matter. Taut cabling makes it difficult to slide them out.

This is the only problem internally though, with everything else, including the memory and 650MHz Pentium III processor, all easily accessible. The same goes for the expansion slots, which house the graphics card and an Adaptec 29160 SCSI card.

When we started the machine up for the first time, the work that Dell has put

in began to show. The first thing you are presented with is a Kick-Start wizard. This allows you to configure the web server for use, including setting an IP address, DNS Server address, and primary gateway. Beyond this, Kick-Start is capable of creating default configuration files. These files can then be used to quickly apply configuration information to additional PowerApp.web machines. Once Kick-Start has completed its job, the server is ready to start processing web requests.

The default settings are not going to suit every company, so Dell has created the PowerApp Admin tool to help



change server configuration settings. Running as a web page, this application allows remote management of both the web server settings and the physical machine. Appearing with a tool bar running down the left side of the screen, it gives one-touch access to all the tools that you'll need. On the physical server front, backup, disk defragmentation and cleanup tools are accessible. Another page allows software such as task manager and performance monitor to be run.

Apart from this, the main task that the tool provides is configuring IIS. All the major functions of the web server are stripped out to allow quick configuration. One benefit is that it is easy to add another IP address to the server, allowing multiple websites to be run from a single machine.

Other features include creating web users, assigning disk quotas, and creating an SSL certificate for secure transmissions. How useful this application is depends on your level of knowledge. If you just want a simple appliance that you can get up and running without needing to understand how it all works, this is a godsend. Dell has done a sterling job of allowing access

only to the important features of the web software, without assuming vast technical knowledge. However, if you already understand a lot about IIS, then this application is more likely to get in the way of your standard administration. Fortunately, you can always switch back to the standard method instead.

Installed under the Administration Tools section of the start menu, is the standard IIS console. IIS also installs with an administration website allowing configuration functions to be performed from across the web.

The software is certainly up to the task, but how does it perform? To

answer the question we loaded Intel's Iometer version 1998.10.08 onto the server and ran the web server workload.

This emulates the strain that the server would be subjected to under typical web serving conditions.

The important result to look out for is the number of I/Os per second the server can perform, as web serving involves many small file transfers. The PowerApp.web achieved 94.76, which wasn't a long way behind the 124 I/Os scored by a dual-processor machine with a RAID system.

There's no denying the quality of the PowerApp.web. The software allows easy configuration for the novice, while leaving the more in-depth features for the web guru.

DAVID LUDLOW

DETAILS

★★★★

PRICE £3,215.98 (£2,737 ex VAT)

CONTACT Dell 0870 907 5664

www.dell.com

PROS Easy to set up; good-quality hardware

CONS Interface may be too simplistic for some managers

OVERALL A good product based on fast hardware that provides both enterprise scalability, and a good starting point for websites

PERSONAL COMPUTER WORLD

BEST BUYS

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ENTRY-LEVEL PC

Atlas
Meridian A750T



Based on AMD's Socket A 750MHz processor, an MSI K7T Pro motherboard and 128MB of PC133 memory, this machine makes use of the latest technology. You get a 20.5GB IBM hard drive and a 32MB Hercules 3D Prophet DDR-DVI. Bonuses are the 17in CTX Trinitron monitor, eight-speed DVD and Mitsumi CD-RW. A killer price for a killer system.

Review August 2000, p78 Price £1,173.83 (£999 ex VAT)
Contact Atlas 07000 285 275 www.atlaspc.com

MID-RANGE PC

Mesh
Matrix 850T



At the heart of the system beats AMD's Athlon 850MHz with on-die cache. You also get 128MB of PC100 memory and a large 30.7GB Maxtor DiamondMax hard drive. The excellent Hercules 3D Prophet II graphics card drives a 19in Mitsubishi Diamond Plus 91. Mesh has produced a fantastic package for any user after the latest technology at a bargain price.

Review August 2000, p76 Price £1,749.75 (£1,489 ex VAT)
Contact Mesh 020 8208 4706 www.meshcomputers.com

HIGH-END PC

Mesh
Matrix 1.1 GT Pro



Making good use of AMD's 1.1GHz Athlon, which has 256KB of on-die Level 2 cache, this PC means business. It's based on an Asus A7V-100 motherboard with a Promise PCI-ATA100 controller that really helps it to fly. There's also a 64MB GeForce2 GTS graphics card, 256MB of RAM, DVD and CD-RW drives, a Creative Sound-Blaster Live! 1024 and a 19in Taxan monitor.

Review October 2000, p73 Price £2,348.83 (£1,999 ex VAT)
Contact Mesh 020 8208 4706 www.meshcomputers.com

FULLY-FEATURED NOTEBOOK

Gateway
Solo 9300 LS



Making use of Intel's 650MHz SpeedStep processor this notebook has blistering performance. The screen and keyboard are both excellent, and the notebook enables you to do some basic video editing using the composite in and out ports at the back through the ATI mobility video card, or for digital video there's a FireWire port.

Review April 2000, p158 Price £2,136 (£1,818 ex VAT)
Contact Gateway 0800 55 2000 www.gateway.com/uk

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

Ericsson
MC218



Based on the Psion Series 5mx, the MC218 has 16MB of memory and a processor speed of 37MHz. The email software is built into the ROM and supports UUEncoded attachments and MIME. Frames and Java 1.1.4 are supported by the web browser. Ericsson has even bundled an IrDA modem for connecting the device to its range of mobile phones.

Review May 2000, p204 Price £379 (£322 ex VAT)
Contact Ericsson 0990 237 237 www.ericsson.com

DIGITAL CAMERA
Sony
Cyber-shot DSC-S70

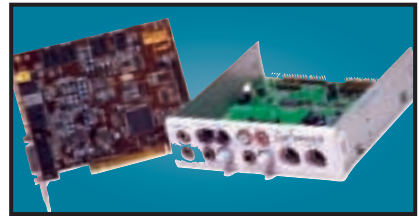

Sony's S70 uses the latest battery technology to provide around 120-150 minutes of usage and is Sony's first genuine 3.3megapixel camera. Image quality is superb. All in all, the S70 is the best all-round 3.3megapixel camera out there.

Review August 2000, p97 **Price** £750 (£638.30 ex VAT)
Contact Sony 0990 111 999 www.sony.co.uk

WEBCAM
Creative
WebCam Go Plus
**new**

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** £129 (£109.79 ex VAT)
Contact Creative www.europe.creative.com

SOUND CARD
Creative Labs
SB Live! Platinum


This is exactly what gamers and budding PC musicians have been asking for – great sound quality and excellent bundled software make it a winner. We think it's the best sound product ever.

Review February 2000, p83 **Price** £179 (£152 ex VAT)
Contact Creative Labs 0800 973 069 www.soundblaster.com

COLOUR INKJET
Hewlett-Packard
DeskJet 930C


This uses the same engine as the higher spec P1100 and is a breeze to setup. Connection is via the parallel or USB interface and drivers allow you to adjust the printed page drying time.

Review July 2000, p201 **Price** £175 (£149 ex VAT)
Contact HP 0990 47 47 47 www.europe.hp.com

BUDGET LASER PRINTER
Kyocera
FS-1000
**new**

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** £329 (£280 ex VAT)
Contact Kyocera 0118 931 1500 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** £207.98 (£177 ex VAT)
Contact Simply 020 8523 4020 www.simply.co.uk

BUSINESS LASER PRINTER
Hewlett-Packard
LaserJet 4050TN

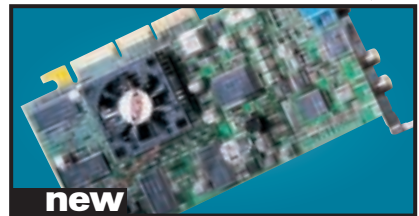

The 4050TN's 1,200dpi resolution is outstanding, and with a 133MHz NEC processor and 16MB of RAM it can turn out 16ppm. It also comes network-ready as standard.

Review September 1999, p96 **Price** £1,580.38 (£1,345 ex VAT)
Contact HP 0990 474747 www.europe.hp.com

MULTI-FUNCTION DEVICE
Hewlett-Packard
Office Jet G85


A scanner, photocopier and colour printer in one, that produces vibrant colours and realistic skin tones. Well suited to home or office work – and it's keenly priced.

Review September 2000, p112 **Price** £599.25 (£510 ex VAT)
Contact HP 0990 474747 www.europe.hp.com

GRAPHICS CARD
ATI
Radeon
**new**

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** £299 (£254.46 ex VAT)
Contact ATI 01628 533 115 www.ati.com

EXTERNAL STORAGE
LaCie
PocketDrive


This tiny external 6GB hard drive has two FireWire ports and a single USB connector. The FireWire ports mean the drive can be daisy chained to other FireWire peripherals.

Review July 2000, p108 **Price** £351.33 (£299 ex VAT)
Contact LaCie 020 7872 8000 www.elacie.com

EIDE HARD DRIVE
IBM
Deskstar 75GXP
**new**

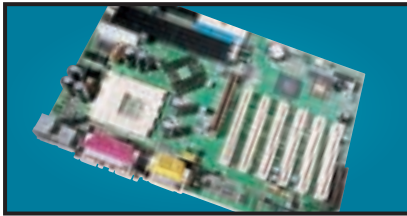
A 75GB drive with an areal density of 11GB/sq in. It has a spindle speed of 7,200rpm, a 2MB data buffer and an average seek time of 8.5ms. A lot of storage for the money.

Review September 2000, p109 **Price** £430.05 (£366 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** £399.50 (£340 ex VAT)
Contact Quantum 01344 353 500 www.quantum.com

SOCKET A MOTHERBOARD**MSI
K7T Pro**

An AMD Athlon/Duron motherboard that uses VIA's KT133 chipset and has AGP 4x, ACPI, integrated AC97 audio support, five PCI slots, plus one shared with a CNR. It's simple to set up and with a 200MHz FSB is fast too.

Review October 2000, p92 Price £99.88 (£85 ex VAT)
Contact Panrix 0113 244 4958 www.panrix.com

17IN MONITOR**CTX
PR711F**

Using a Sony FD Trinitron tube, this monitor's slim casing somehow makes the display seem larger. Image quality is superb and a USB hub is built in to the base as standard.

Review January 2000, p79 Price £239.70 (£204 ex VAT)
Contact Simply 0800 035 2100 www.ctxeurope.com

LCD MONITOR**Sony
Sony SDM-N50**

This TFT display is a svelte 1.3cm thick and the screen is easy to position with its multi-pivoted stand. The display quality is first rate and it even has built-in speakers and a headphone socket.

Review April 2000, p96 Price £1,291.32 (£1,099 ex VAT)
Contact Sony 0990 424 424 www.sony.co.uk

ISDN TA**Eicon
DIVA USB**

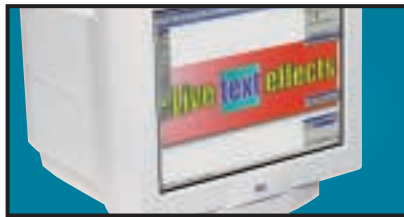
Weighing in at 70g and no larger than a mouse, this USB ISDN TA opens up 128Kbits/sec bandwidth and supports G3 and G4 faxing as well as a variety of voicemail and file transfer facilities.

Review March 2000, p87 Price £104.57 (£89 ex VAT)
Contact Eicon Technology 020 8967 8000 www.eicon.com

REMOVABLE STORAGE**Panasonic
LF-D201 DVD-RAM****new**

With a disc capacity of 4.7GB per side, compatibility with existing 2.6GB as well as new 4.7GB per side discs, and a versatile software bundle, this is a great product for anyone who needs to store large amounts of data.

Review October 2000, p98 Price £374.82 (£319 ex VAT)
Contact Panasonic 0845 600 3535 www.panasonic.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 £358.37 (£305 ex VAT)
Contact dabs.com 0800 138 5240 www.dabs.com

SOUND SYSTEM**VideoLogic
DigiTheatre**

This set includes five speakers, a subwoofer and an integrated six-channel amplifier plus a decoder. Excellent sound quality at a fair price make the DigiTheatre a must-have.

Review January 2000, p81 Price £249 (£211.91 ex VAT)
Contact Videologic 01923 277 488 www.videologic.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 £363.07 (£309 ex VAT)
Contact Simply 020 8523 4020 www.onstream.com

PROJECTOR**InFocus
LP335**

A fantastic unit that uses the latest DLP chip. It even allows you to view slides with the lights on. It is expensive, but if you need something this small and light then the LP335 gives an extremely sharp, crisp image.

Review August 2000, p118 Price £4,876.23 (£4,150 ex VAT)
Contact InFocus 0800 028 6470 www.infocus.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

CD-RW**Creative CD-RW Blaster
CD-Studio**

This 8 x 4 x 32 EIDE CDRW package has everything you need to get started. Not only is there an EIDE cable and screws to mount the drive, but also a CD-RW disc and 10 CD-R discs.

Review June 2000, p192 Price £141 (£120 ex VAT)
Contact dabs.com 0800 138 5114 www.europe.creative.com

DVD DRIVE**AOpen
DVD 1640 Pro****new**

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 £141.58 (£120.49 ex VAT)
Contact Jungle.com 0800 0355 355 www.aopen.nl



Getting into shapes



IF YOU'VE EVER WANTED TO CREATE YOUR OWN WORLD NOW'S YOUR CHANCE. ON THIS MONTH'S COVER DISC IS A COPY OF TRUESPACE 3/SE AND DAVID FEARON OFFERS STEP-BY-STEP GUIDES TO PUTTING TOGETHER SCENES AND BUILDING MODELS

These days, the power of the PC sitting in your spare bedroom – you know, the one you only use for surfing the web and checking your email – greatly exceeds the million-pound research monsters of a decade or two ago. This means that a whole fascinating world is open to you: the world of 3D modelling and rendering. You can get yourself going for free and produce some seriously worthwhile results using trueSpace 3/SE, which is on the cover disc this month. As well as the three workshops on the following pages, there are extensive help files and demos on the disc, and the application isn't time or save-limited.

The world of CGI (computer-generated imagery) is split into three main areas: modelling, rendering and animation. If you're talking about the kind of work done for film and television, or even extensive amateur projects, there's also a fourth step of compositing and post-production.

But when you're starting out, getting to grips with modelling and rendering are the first steps.

Modelling

Modelling is all about turning objects in the real world or the imagination of the modeller into a set of numbers that a computer can use to produce an image or animation. The fundamental and most used type of 3D model is the polygon mesh. Here, an object is represented by a set of flat surfaces (polygons) in three-dimensional space. Each polygon is defined by a set of points (vertices). Usually the vertices are described by Cartesian co-ordinates, in other words three numbers describing their position in each of the three dimensions – width, height and depth, usually referred to as X, Y and Z.

The reason polygon meshes are a popular way of representing objects is that they're memory-efficient and make for fairly easy editing of objects: memory efficient because you only need to store the vertices and some information about

ILLUSTRATION DANIEL MACKIE

The art of animation



The major commercial use of CGI these days is, of course, animated sequences for film and television. Really good animation facilities are one of the aspects that separates the very expensive packages from the lower-end apps. It's also one of the major differences between trueSpace 3 and 4. That's not to say that trueSpace 3/SE doesn't have any animation facilities, and you can get some good results pretty quickly, but be prepared to get frustrated at the lack of control over movement.

Whatever the package, though, all computer animation works on the same basic principle, called keyframing. Traditional cartoon and stop-motion animation à la *Chicken Run* requires each and every frame to be set up by hand. With CGI, you can be the director and the computer can take the strain. To set up an animation, you only need to

define a series of keyframes – the major moments in the animation where certain events happen. Place all the objects in the scene where they need to be and record a keyframe.

By default, trueSpace generates keyframes automatically, an irritating feature that you can switch off by right-clicking on the Record button. Once you've generated your first keyframe, work out how many seconds need to elapse until the next one. If you want your animation to run at 25 frames per second (fps), multiply the number of seconds by 25 and set the current frame to that number. Arrange your scene the way you want it to be and record a new keyframe. Now, when you hit the Play button, the computer will automatically generate the frames in between the two keyframes by interpolating the start and finish positions (known as 'tweening').

Keyframing itself can be a tricky business though – initially you'll probably find that the objects in your scene don't move in the way you expect, or some aspect, such as the rotation of an object, hasn't been animated properly. With trueSpace, you need to bear in mind that the behaviour of keyframe recording changes according to the currently selected tool, and it's also modified when the keyframe monitor window, which is produced if you right-click on any of the animation controls other than Play or Record, is open. The keyframe monitor is a rather confusing system, but the help files are fairly thorough, so you need to make sure you read them very carefully. trueSpace 3/SE also has physical simulation and inverse kinematics controls, which can make it easy to produce fun animations with the minimum of effort.

how they're connected; easy to edit because you can move points around, delete faces and edges and join objects together without too much complex and computationally expensive maths. Also, when professional modellers and animators are designing models, they'll often make a real, physical model and use a 3D scanner to digitise it. The result is a polygon mesh.

The downside is that most objects in the real world aren't split into flat facets – they're curvy, continuous and smooth. So, if you want realistic-looking models, you need to model your object with lots of polygons. The more polygons you have, the smaller each facet of the object and the closer the representation in the computer comes to the near-infinitely smooth objects in the real world. But more polygon data means more memory is needed, and it takes longer for the computer to manipulate the data.

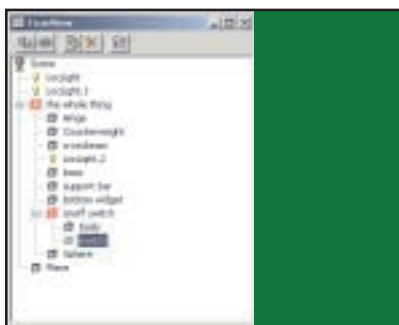
When you start modelling it's easy to fall into the trap of using far too much detail and creating objects at too high a resolution: pretty soon your PC starts thrashing the disk as it pages information to the swap file, and your 3D modelling package becomes unusably slow. One of the arts of modelling is learning to use a high level of detail only where it's required, designing models with

compromises to lessen the number of polygons, and using shading schemes such as Phong shading that hide limited-resolution models.

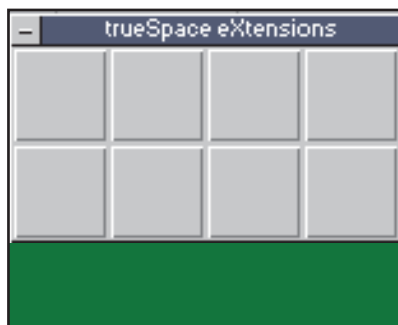
There is an alternative to using polygon meshes to represent objects, but it's generally only used by the more expensive, higher-end packages. The technique is called NURBS. This bizarre acronym stands for non-uniform rational B-splines. NURBS are a 3D version of the Bezier curves you may have come across in 2D vector art packages like Corel Draw, where you can create a curve and then manipulate it via control points. NURBS objects are defined by a set of mathematical curves rather than definite, discrete points in space, so they effectively have infinite resolution. Although the description of the curves themselves requires a tiny amount of memory, when it comes to rendering NURBS objects they can appear perfectly smooth.

The difference between a polygon mesh-based object and a NURBS object is essentially the same as that between a 2D bitmap image and a 2D vector-based image. Modelling packages such as Rhino use NURBS exclusively, and several other packages, for instance 3D Studio and LightWave, can mix NURBS and polygon meshes in the same scene. TrueSpace 4 also has support for NURBS-

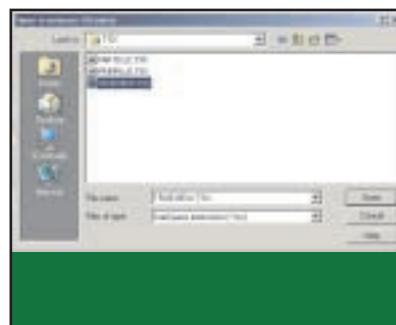
Installing trueSpace extensions



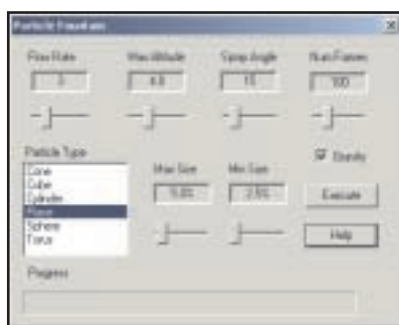
1 Any 3D package worth its salt has an extension API (application programming interface) that allows third parties to produce new tools and widgets to add to the abilities of the app or cover any holes. trueSpace 3/SE is no exception, and you even get a selection of very useful TSX (trueSpace eXtension) plug-ins free with the app. One of the most useful is the TrueView hierarchy editor, shown here.



2 Click in the trueSpace eXtensions (TSX) button near the right-hand end of the main toolbar when you first install the app, and you'll get a boring box with eight blank squares. That's because the plug-ins aren't installed yet. They're actually in two separate places, so you need to dig them out and install them.



3 Click on the first empty square in the TSX panel, and an Open trueSpace eXtension dialog will pop up. The first three plug-ins are ready to go in trueSpace's own installation folder, in the TSX subfolder. *truvievw.tsx* is the hierarchy editor, *particlz.tsx* allows you to create animated particle fountains, and *primplus.tsx* is an automatic fractal terrain generator. Select one of these and hit OK.



4 The new plug-in is instantly installed in the TSX window; just click it to activate it. Now install the other two in the same way and have a play. TrueView is pretty self-explanatory, and the other two have Help files. Particlez provides a particularly entertaining way to waste an hour or two.



5 The second lot of plug-ins aren't installed by default, but are left on the CD in the COOLPWRS directory. Double-click the Setup file in the usual way. Go for Typical installation – that just installs all three plug-ins. Once they're on your hard drive, you still need to install each one in trueSpace by clicking on a blank square of the TSX window and navigating to the installation directory.



6 You should now have a nice, fully-populated TSX window, which adds considerably more functionality to your software. The CoolPowers plug-ins are LandMass, similar to Primitives Plus, Multiplex, for animated object replication and strange growth effects, and Wiggledy, to introduce random variations to the position of vertices on an object for making things look more natural.

type objects. The downside is that NURBS modelling is more complex, can be unpredictable and takes a lot of getting used to.

When creating 3D models, there's a fairly standard set of techniques and tools that all packages support, including trueSpace 3/SE, to enable you to transform the image in your head into an object in your PC. The basic structure of most models is based on primitives. The term primitives refers to basic geometric shapes such as spheres, cubes, cylinders and so on. Most everyday

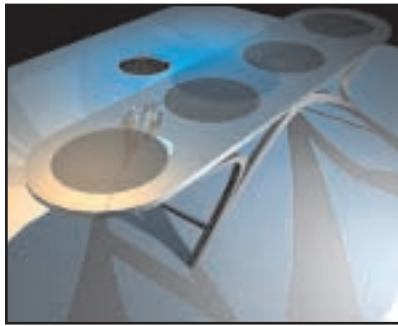
objects are basically a box or a cylinder of some kind, with a few kinks, twists and extra bits here and there. The extra bits are also often based on a primitive shape. So, just by combining primitives you can produce a simple model of just about anything (see the deskclamp creation workshop).

Most packages also have tools to kink, twist, bend and squash these primitives into the required shape. The second staple modelling tool is the use of Boolean operations. These let you merge two objects into one or subtract one shape

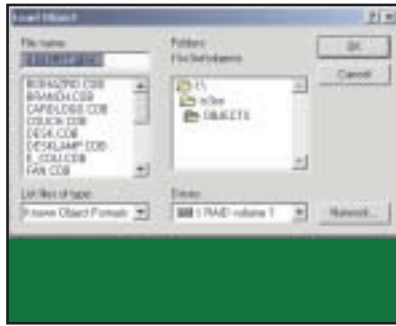
QUICK TIP

Save often. TrueSpace's Undo function is rather unpredictable, and the sheer complexity of any 3D package means crashes are a constant possibility. Also, remember to save with a new filename at each major stage of construction.

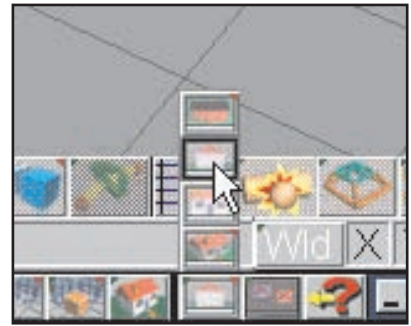
Basic operations and putting a scene together



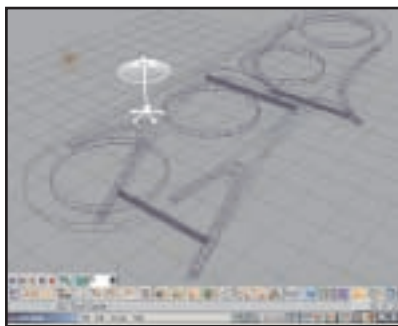
1 TrueSpace has hundreds of functions, but it's easy to get going and put a simple scene together from the small library of pre-built objects that comes with the app. In this workshop we'll just load a few up, place them and see the effects of changing lighting and rendering options, in particular the difference between normal rendering and raytracing.



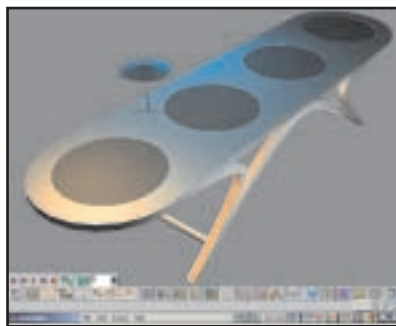
2 From the File menu in the main trueSpace window, select Load Object. Navigate to the installation folder, and select the OBJECTS folder. You'll see various filenames ending with .cob (Caligari Objects). trueSpace will also import popular file formats such as dxf. For now, load up the desk.cob object, and then the desklamp.cob object. Wireframe representations of the objects will appear in the main workspace, in the centre, one on top of the other.



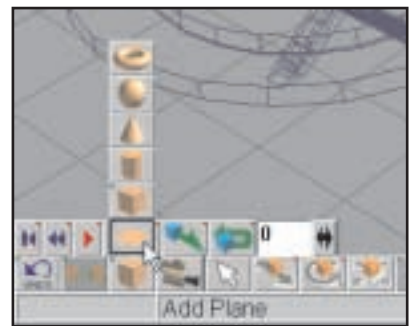
3 As well as the main view, you can open separate left, right, front, top or perspective views in a small window. trueSpace 3/SE only allows one extra view to be open at a time, but that's not too much of a limitation. Open a new left view of the scene by clicking and holding the icon at the bottom right of the screen – a pop-up list appears. Move the pointer to New Left View and release the mouse button.



7 Close the small Top View window and turn your attention to framing the scene in the main perspective view. Experiment with the Eye Move and Eye Rotate tools at the bottom right of the main window to get the feel of moving round and placing the viewpoint. Try dragging with both the left and right buttons – it affects different axes. Also use the Zoom tool to get the table and lamp to fill most of the frame.



8 Now try rendering the scene to turn it from a wireframe representation into something solid. There are a few render options in the render tools group, located at the bottom right of the screen. By default, Render Current Object is selected, so left-click and hold the icon, then select Render Scene instead. It'll take a few seconds to render, but won't look too good: grey background, jagged edges, no shadows. We need to jazz it up a bit.



9 First, add a floor to the scene. To do this, left-click and hold the primitives creation tool at the left of the main toolbar, and select Add Plane. A small square will appear under the table. To increase it in size, select the Object Scale tool, hold down both the mouse buttons and drag the mouse. Keep dragging until the floor is a sensible size.

QUICK TIP

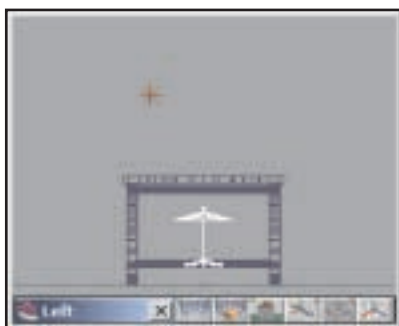
Don't fall into the trap of making each of your models with 100,000 polygons. Think about the resolution of the final image, and whether a model is likely to be placed in the scene, and trim those faces.

from another. With Boolean subtraction, you can use one shape as a cutting implement to sculpt another: for instance you can position a long cylinder inside a cube, do a Boolean subtraction using the cylinder as a cutting tool and you have a solid cube with a hole through it.

Not far behind Boolean operations on the usefulness front are extrusion and sweeping tools. These let you take a 2D shape, often some form of curve, and use it as the profile for a 3D solid by sweeping the shape along a straight line,

another curve or in a circle. trueSpace 3/SE's Lathe tool lets you sweep a shape through a circle or arc – see the desklamp creation workshop.

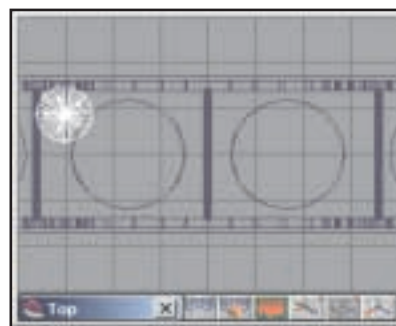
Aside from these basic tools, there are hundreds of variations and extra widgets that different packages support: generally the more expensive the package the greater the variety of tools, and the more committed you must be to learn the package. This is a good reason not to buy the most expensive package if you're just starting out: the complexity will put you off for



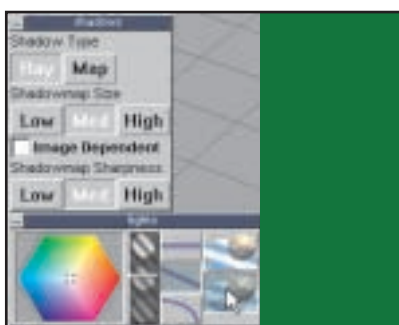
4 The new view window has a few buttons of its own, mainly to orientate the view. We want to have the scene centred in the window to start with, so click the window's Eye Move button, left-click in the window, and drag the mouse. Centre the desk and lamp objects in the window.



5 Obviously, the lamp needs to be on top of the table, not stuck beneath it. Click on the Object Move icon at the bottom left of the main window. To constrain the movement to the vertical direction, click on the large X and Z figures at the bottom right of the main view window to deselect them. Left-click and drag the lamp up. To position it precisely, use the Eye Move and Zoom tools in the Left View.



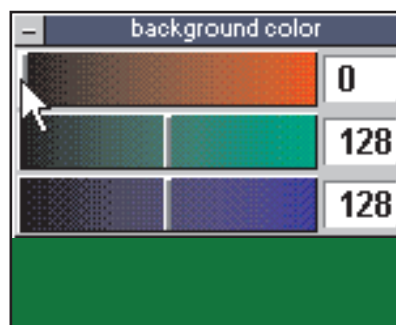
6 Now change the Left View window to a top view by clicking and holding the View icon and selecting Top View. One of the ways to make 3D scenes look a bit more natural is to try and ensure that objects aren't precisely placed centrally or in straight lines with respect to each other, so use the Object Move tool to shift the lamp to a natural place on the desk.



10 Now open a new top view, and zoom out until you can see all the scene lights – they're the three sunburst-type wireframes in the scene, placed there by default. Click on one of the lights and the Lights adjustment dialog will appear. Left-click on the bottom right button to select shadow casting, then right-click on it to bring up the advanced shadow options. Under Shadow Type, click Ray. Do this for the other two lights.



11 Now right-click on the Render Scene button. The Render Options dialog will appear. Check the Raytrace and AntiAlias boxes.



12 Still in the Render Options dialog, click the grey square next to the left of the Background check box. The Background Colour dialog appears. Drag the red, green and blue sliders down to zero. Now close all the extraneous dialogs that are open, and hit the Render Scene button. It'll take a lot longer to render this time, but you should be left with a scene not unlike the picture at the beginning of this workshop.

life. One of the best examples of this is 3D Studio MAX, whose functions, and variations on functions, number well into the thousands.

Rendering

Simply put, the rendering process follows modelling and scene creation, where your finished scene or animation is drawn by the computer, taking into account lighting, simulation of surface materials and visual effects like fog, to produce a properly shaded, solid

image. The first images in the second and third workshops are examples of rendered scenes.

The phrase 'rendering' can mean two things, depending on context. In general it means the final calculation and drawing of a scene, but it's often also used to distinguish between scenes produced with or without the use of raytracing.

When a scene is rendered without raytracing, the computer looks at the geometry information of all the objects, polygon by polygon. For each polygon, it calculates the angle between that

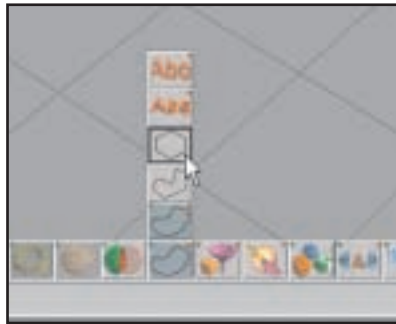
QUICK TIP

Reduce rendering times for quick previews by turning off raytracing and anti-aliasing, and reducing the output resolution. An image at 1,280 x 1,024 takes four times as long to render as an image at 640 x 480.

Building a model from scratch



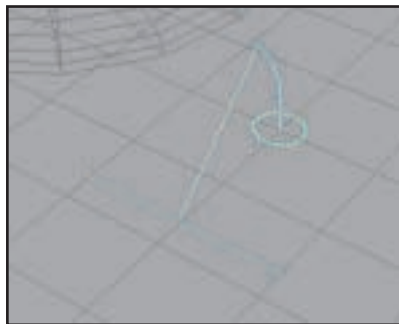
1 It's fun to bung scenes together from ready-made objects and muck about rendering them, but modelling your own 3D objects and environments from scratch is far more rewarding. Most objects are built by assembling primitives – basic shapes like cylinders and cubes. The complexity of the objects you can create like this, with a few other manipulations along the way, is surprising. Here, we're creating our own simple Anglepoise-type desk lamp.



2 As you can see, most of the lamp is made from cylinders, the exceptions being the base and the lampshade. The base is made by creating a 2D profile shape and using a lathe operation to turn it into a solid. Start by switching the main view from Perspective to Top. Then select the Regular Polygon tool, which will allow us to make a 2D circle.



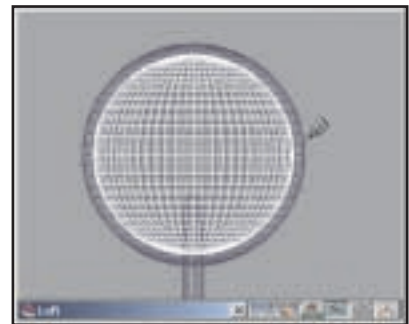
3 When you select the Regular Polygon tool, you'll get a Poly Modes dialog. Increase the resolution up to 50 points by clicking the arrow button and dragging the mouse. Then click on the work area and drag out a circle. The exact size doesn't matter, since you can scale it later.



7 To make the curved rod that attaches to the base, create a small circle the way you did in Step 3, then use the lathe control, but adjust the control so that it only sweeps through 30 degrees or so of its arc.



8 Assemble all the bits you've got so far into their final places. Make use of left, front and top views to make sure you've got everything correctly aligned in all three directions – it's often difficult to tell exactly where parts are in 3D space if you're only using the main Perspective view.



9 To make the lampshade, use the Add Sphere tool, then hit the Smooth Quad Divide button a couple of times to increase its resolution. Use the Copy tool at the far left of the toolbar, and scale the copy down slightly. Then use the Object Subtraction tool to subtract the small sphere from the larger, leaving a hollow ball. Use a cube and object subtraction to cut off the bottom quarter of the ball, and you've got your lampshade.

QUICK TIP

It's usually easier and cleaner to build each model in a separate session of your 3D package, then save the objects out and import them all into a new session for final scene arrangement and rendering.

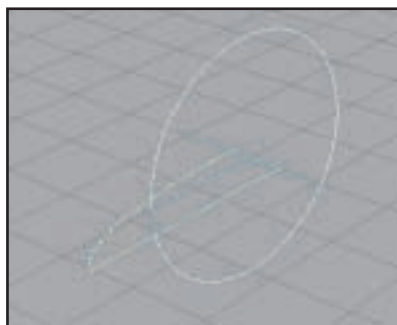
polygon and the lights in the scene. The amount of light that a particular scene light contributes to each pixel of the polygon depends solely on angle between the light and the polygon, in a direct line. This is a relatively fast way of doing things, as you'll see if you try rendering a scene in trueSpace with raytracing switched off and then on. But because of the direct mathematical calculation of the lighting of each facet, standard rendering techniques can't produce reflections on the surface of an object,

which can be an important part of making a scene look realistic.

To produce reflections and accurate shadows, raytracing is used. It works by tracing an imaginary line forward from the viewer into the scene for each pixel of the image. Where the line hits an object in the scene, the colour of that pixel is altered accordingly, and if the object is reflective the imaginary ray bounces off that object and continues its journey. If it meets another reflective object, that has to be taken into account, and so



4 Select the Object Scale tool and use it to squash the circle to make an ellipse. Use the Add Plane tool to make a plane, position the plane so it covers the bottom half of the ellipse then select the circle so it's highlighted in white. Select the Object Subtraction tool to perform a Boolean subtraction on the circle. Click the plane to subtract it from the ellipse, leaving the left half only. Do the same on the lower half.



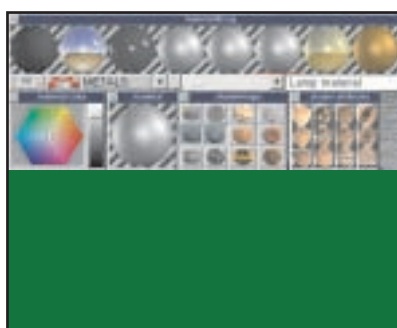
5 Click on our new shape to select it. Now select the Lathe tool from the centre left of the main toolbar. A green and blue T-shaped control is overlaid on the shape. Drag the top of the T so it snaps to the straight side of our profile shape. Drag the vertical part around a full 360 degrees, and drag any of the points to increase the resolution. Hit the Lathe icon again to perform the operation.



6 You should now have a 3D base, albeit on its side. Hit the Toggle Grid button on the centre right of the main toolbar and use the Object Rotate tools to turn it round so it's lying flat. Now create the other two main parts of the lamp, the crossbeam and the counterweight, by using the Add Cylinder tool and the Object Scale tools, and rotate them with the grid switched on so they're correctly aligned.



10 For final detailing, try switching to OpenGL solid preview mode. Use the Bevel tool (in the same group as the Lathe tool) to take the sharp edge off the counterweight and make it look a touch more realistic. Also create another cylinder for the hinge at the join between the crossbeam and the curved upright, and make yourself an on/off switch with a couple more cylinders and a bit of judicious bevelling.



11 We want a trendy chrome lamp, so we need to assign an appropriate material to its parts. Hit the Material Library button, load up metals.mdb, then right-click on one of the icons in the Object Painting group to get material adjustment parameters. The two default chrome materials aren't actually very good, so choose the Aluminium material and increase its shininess slider. Select the appropriate object and use the Paint Object tool to assign the materials.



12 Finally, move one of the default scene lights so it's inside the lampshade of our lamp. Set that light to be white or yellow. Make sure all lights are set to cast shadows, and the Shadow Type is set to Ray. Create a floor and assign a wood material to it, then set the Render Options for raytracing and anti-aliasing, with the background set black. Hit the Render Scene button and Bob's your uncle.

on. The result is a scene with shadows and reflections, which can incorporate things like glass and transparent objects properly, but which can take far, far longer than standard rendering.

So, when you're putting together your scene and you need to see roughly what it's going to look like, keep the raytracing switched off and only use it for the final render. The same goes for anti-aliasing, which can remove the jagged appearance of angled edges but needs a lot of calculation to do so.

The perseverance factor

Packages like trueSpace are relatively easy to get to grips with initially, but 3D modelling and rendering can be very time-consuming if you want to get really good results. All 3D packages have their quirks, and you need to get used to these. Just remember you're not the only person to get furious at the apparent inconsistencies in a package, and if a function appears not to work it's probably because you've failed to put the package into the correct modelling mode.

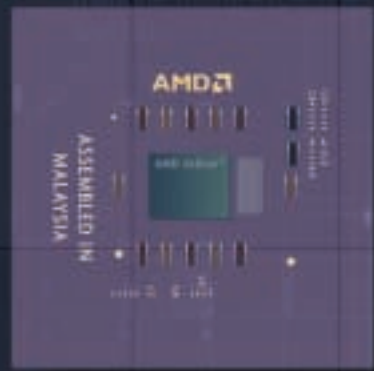
QUICK TIP

Pay attention to the lighting in your scene. Just like a real photo or film, it can make the difference between an average image and a great one. Remember, though, that more lights means increased rendering times.

IP 700, 667, 633, 600, 566, 533, 533A and 500 MHz includes Intel MMX™ media enhancement technology, Intel Streaming SIMD (SSE) and Intel Celeron™

held and performance that stands out among other processors in its class. It reflects AMD's 30 years of design and manufacturing expertise.

and other leading-edge systems. Over



AMD Athlon



Intel Celeron

X86

INSTRUCTION SET ARCHITECTURE (ISA) x86 MICROPROCESSOR



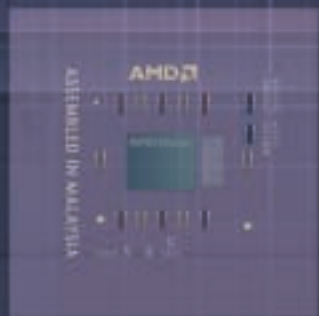
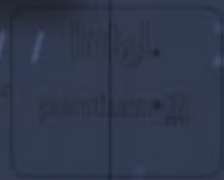
Transmeta

Transmeta's software translates blocks of x86 instructions once, saving the resulting translation in a translation cache. The next time the (now translated) code is executed, the system skips the translation step and directly executes the visiting optimized translation at full speed. This unique approach to software execution allows Transmeta to dynamically optimize their code for the current



Intel Pentium III

The Pentium III processor offers a robust, new instruction set and architecture enhancements which include: frequencies to 500MHz and 450MHz, integrated PBSPAM L2 cache (50K) 300MHz, and 20 new instructions, including



AMD Duron

The AMD Duron processor offers value-conscious buyers access to technology and performance that stands out among other processors in its class. It reflects AMD's 30 years of design and manufacturing expertise and sales of more than \$25



The mighty processor

X86 CHIPS >>

A CHIP IS A CHIP – ISN'T IT? GORDON LAING INVESTIGATES THE DIFFERENCES BETWEEN THE MAJOR PROCESSORS ON THE MARKET AND EXPLAINS SOME OF THE TERMS AND TECHNOLOGY INVOLVED IN WHAT LIES AT THE HEART OF A PC

PENTIUM, CELERON, ATHLON, DURON – we all know they're the brains behind your PC, but what precisely are the differences between these and other chips for desktop and mobile systems?

There are perhaps more x86-compatible chips available now than at any time in the past, all featuring different designs and features, which can make it confusing when it comes to comparing different CPUs. So we've decided to take an in-depth look at every aspect of PC-compatible CPUs. On the desktop side we've put Intel's Pentium III and Celeron chips under the microscope, along with examining AMD's latest Athlon and Duron contenders. We've also taken a peak at the new Cyrix III processor from VIA to check out where it fits into the overall picture.

However, what makes a great chip for desktops isn't necessarily a good thing for mobile environments – after all the last thing you want in a notebook is a physically large chip, consuming loads of precious battery power. The CPU manufacturers are all too aware

of these issues, and have produced a number of cunning solutions: so we've compared Intel's mobile Pentium III and Celeron processors, AMD's mobile K6-2+ and K6-III+, along with upstart Transmeta's pioneering Crusoe CPU.

But first things first. What exactly is a CPU? Typically about size of a postage stamp, a CPU is an integrated circuit built onto a small piece of silicon. It consists of millions of tiny transistors connected by incredibly fine traces of aluminium (copper interconnects will be increasingly used in the future). Intel's first CPU, the 4004, was introduced in 1971 and contained 2,300 transistors, compared to the latest Pentium III's 27.1 million transistors.

A basic CPU is typically split into seven sections: Control Unit, Arithmetic Logic Unit (ALU), Registers, Decode Unit, Prefetch Unit, Bus Interface, and the Cache memory, which is normally split evenly between storing instructions and data.

Cache is a very small amount of high-speed memory, located in or extremely near the CPU

ILLUSTRATION CARLTON HUTCHINSON



Most CPUs are currently made using the 0.18micron process

itself. It stores the most recently accessed portions of main system RAM for quick and easy reference. When the CPU is told to fetch data or an instruction, it always checks the cache first to see if it's in there. If not, the data must be fetched from the main memory instead, which is a much slower process.

While all the chips here differ in a number of ways, there is one significant trait that they all share – compatibility with Intel's x86 instruction set. Intel developed this to allow developers to program its original 8086 CPU back in 1978. In 1982, Intel introduced its 80286 16bit CPU, which was the first that could run all the software written for its predecessor. Later came the faster 32bit 80386, 80486 and Pentium product lines, which in theory could run any software written for the x86 instruction set. This level of backward compatibility is the main reason the IBM PC platform dominates the desktop computing world.

AMD's CPUs are x86-compatible, as are VIA's Cyrix III and Transmeta's Crusoe processors, which means they'll all, in theory, happily run Windows and its multitude of applications. Different internal support for additional instructions, not to mention the means by which x86 instructions are decoded, however, means they'll all execute software with varying performance.

Smaller is better

Most current desktop CPUs are made using a 0.18micron process. This number refers to the distance between adjacent components on the silicon wafer, with 0.18micron being about 500 times thinner than a human hair.

A finer manufacturing process allows more transistors to be placed in the same area, enabling more complex chip designs, or physically smaller CPU die sizes. Smaller die sizes means more CPUs produced on any one

silicon wafer, which means a greater yield and potentially lower costs or greater profits for the manufacturer. With shorter distances between the transistors, the CPU requires less power too, which is great news, particularly in mobile environments. The shorter distances also allow the CPU to be clocked at higher speeds.

Desktop CPUs

Now the theory's out of the way it's time to consider the products vying to be the heart of your desktop PC. The contenders we'll cover are Intel's Pentium III and Celeron, AMD's Athlon and Duron, and VIA's Cyrix III. These are their official names, but like all products, they've all gone through long development cycles with only codenames to identify them.

The core of the first Pentium IIIs was codenamed Katmai, while the core used to make all new Pentium IIIs and Celerons is nicknamed Coppermine. AMD's latest Athlon with on-die Level 2 cache (explained below) was referred to as Thunderbird, while the new Duron was previously known as Spitfire.

Finally, VIA's Cyrix III was at first thought to be the chip codenamed Joshua, but this design was dumped in favour of the Samuel, developed by VIA's Centaur Team in Austin Texas. Before wrapping up the codenames, it's worth mentioning Intel's forthcoming Willamette CPU, which was recently officially branded as the Pentium 4.

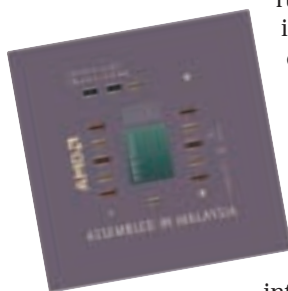
Intel Pentium III

Launched at 450MHz in mid-1999, the Pentium III is the latest in Intel's P6 family that started with the original Pentium Pro in 1995. Models between 450 and 600MHz were manufactured using a 0.25micron process and used a brand new Katmai core design, while current models running faster than 600MHz employ a finer 0.18micron process, along with the enhanced Coppermine core design. Note that where two Pentium IIIs are available at the same speed, the newer 0.18micron Coppermine models are labelled with an E, for enhanced process.

Pentium III's are currently available from 667 to 1,000MHz, although models up to 1,133MHz should be available by the time you read this and the Pentium 4 won't be too far behind, speeding at 1,300 and 1,400MHz. Intel has already begun building a chip fab in Ireland designed for a 0.13micron process, although it's currently unknown whether this will be used only for new CPUs or also to extend the life of the Pentium III against stiff competition from AMD's Athlon.

Intel Celeron

Intel first introduced the Celeron in early 1998 at 266 and 300MHz. It may have employed the Pentium II's Deschutes core, but in order to keep costs down, Intel removed its Level 2 cache



chips. This impacted performance so significantly that a new core, Mendocino, was developed a few months later, incorporating 128KB of Level 2 cache – see later.

Mendocino Celerons using a 0.25micron process are still available up to 533MHz, while faster models running at 533MHz and above employ the same 0.18micron Coppermine core as current Pentium IIIs, however, there are differences in cache and front-side bus (FSB), which we'll discuss later. Note the 533MHz Celeron employing the newer core is labelled with an A. Coppermine Celerons are currently available up to 700MHz, with speeds up to 800MHz expected by the new year.

AMD Athlon

Codenamed K7 and launched last August with initial chips clocked at 600MHz, the Athlon proved AMD could compete with Intel at the high end. Early models were made with a 0.25micron process, with later ones switching to 0.18micron.

At the beginning of June this year, AMD launched Athlons based on its new Thunderbird core, which at last allowed it to catch up with the latest architecture innovations Intel had been enjoying with its own enhanced Coppermine core.

Thunderbird Athlons using a 0.18micron process are currently available from 700 to 1,000MHz in 50MHz increments, although note that those based on the old K7 core are also available at the same speeds – see the section on packaging and cache for more details. AMD is

likely to continue matching the Pentium III's clock speeds with its Athlon, although next year should also see the introduction of AMD's Sledgehammer CPU which extends the x86 instruction set to 64bit.

AMD Duron

AMD also launched its Duron CPU in June this year. Produced using a 0.18micron process, the Duron is currently available at 600, 650, 700 and 750MHz flavours. Pitched somewhere performance-wise between Intel's Celeron and Pentium III CPUs, but priced at an affordable level for the entry/mid-level market, the Duron promises to be an exciting player. So far it has led the Celeron in clock speeds, and you can be sure AMD will try to continue this trend.

VIA Cyrix III

At the annual Computex show in Taiwan this June, VIA announced its Cyrix III CPU. VIA purchased Cyrix from National Semiconductor in June last year, then acquired IDT's Centaur processor design subsidiary shortly afterwards. While using the stronger Cyrix brand name for this new CPU, the design is from the same team that made the IDT WinChip.

Produced using a 0.18micron process, initial versions of the Cyrix III CPU are available at 500, 533 and 600MHz. Speeds of 733MHz and above are believed to be supplied by the forthcoming enhanced Samuel 2 core, using a 0.15micron process. Speeds up to 800MHz are expected by



Chipsets – the heart of the matter

While many people believe the CPU is the brains behind their PC, it would be nothing without its accompanying chipset, which really forms the heart of the operation. It's the chipset that co-ordinates activity between the CPU, RAM and the front-side bus, which in turn connects to other system buses including PCI. It's also the chipset that normally provides features like an IDE controller for your drives, along with support for the AGP graphics bus and specific types of memory.

Most CPU manufacturers develop chipsets to match a series of their processors, but you don't always have to use them. The best known third-party chipset supplier is VIA,

which makes a number of solutions for both Intel and AMD platforms. The chipset is an integral part of the motherboard and, unlike a CPU or card, cannot be swapped for a new one. If you fancy the enhanced features of a new chipset, it's time to change the entire motherboard.

Most chipsets come in two sections, with the first dealing directly with the CPU and system memory over the FSB and optionally supplying a faster AGP graphics bus. The second tags on to the first section across the PCI bus, supplying support for USB and IDE drives, along with optional further support for the old ISA bus and a variety of legacy ports. In VIA and older Intel chipsets, these two halves were

known as the Northbridge and Southbridge components.

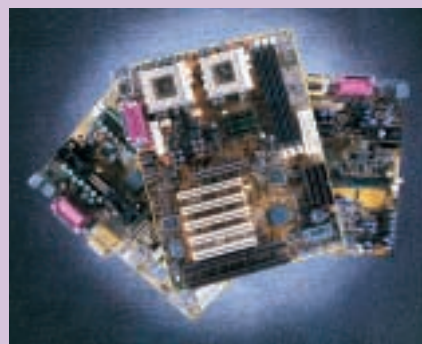
Intel's 800 series chipsets use an alternative hub architecture. The main memory

controller hub takes care of the CPU, AGP and memory, leaving the I/O controller hub to handle PCI, IDE and USB.

Intel's latest 815 chipset supports PC133 SDRAM, AGP4X, while the E version additionally offers UltraDMA100, another pair of USB ports, and internal support for optional Ethernet and audio ports. Compare this with the aging BX chipset that, despite support for only

PC100 memory, AGP2X and UltraDMA33, still boasts excellent overall performance.

VIA has forthcoming chipsets for both Intel and AMD platforms, supporting UltraDMA100, AGP4X and uniquely 266MHz DDR SDRAM. Contrary to its previous decision, Intel has now said its mid- to high-end chipsets for Pentium 4 processors will support PC133 as well as RDRAM memory.



the end of the year, with 1GHz parts claimed to be following shortly after.

Die sizes, slots and sockets

The 0.18micron Coppermine core used on the latest Pentium IIIs and Celerons is the same, consisting of 27.1 million transistors, and a die size measuring 106mm square. The 0.18micron Thunderbird Athlon has a 120mm square die, consisting of around 37 million transistors. The Duron has a 100mm square die, while the VIA Cyrix III die is only 76mm square. The smaller the die size, the more chips you can fit on a single silicon wafer during manufacture. Every component on the die runs at the core processor speed, which is why it's preferable to incorporate all the cache memory on-die. About one-third of the die area on the latest Pentium IIIs is occupied by its cache memory.

While the die itself may be smaller than a postage stamp, it must be delivered in a larger package for desktop systems, allowing easy access to its hundreds of electrical contacts.

Today's processors are typically delivered in two different physical packages: those that fit into square sockets and those which slide into slots. While almost all CPUs started life in socketed form factors, Intel developed its slotted cartridge for the Pentium II processor.

This allowed Intel to employ a faster interface between the CPU and its external Level 2 cache chips, then pop the whole lot into a chunky cartridge. This Slot 1 packaging and interface was used on all Pentium II,

the original Celerons and is still available for all speeds of the Pentium III. AMD also used a similar cartridge design for its Athlon CPU, and while the connector is the same size as Intel's Slot 1, it is electrically incompatible; AMD calls this Slot A.

With the later Mendocino Celeron core, Intel squeezed 128KB of Level 2 cache onto the actual die itself, and dumped the slotted cartridge for a Plastic Pin Grid Array (PPGA) design, which fitted into a 370-pin motherboard socket, appropriately called Socket370.

With the 0.18micron Coppermine process, Intel could also integrate the Pentium III's larger Level 2 caches onto the actual die, again making the large cartridges redundant. Intel stuck with a 370-pin socket for its Pentium IIIs, but employed a Flip-Chip Pin Grid Array (FC-

PGA) design rather than the older PPGA. The Flip Chips place the processor die facing upwards to make direct contact with the heatsink, compared to PPGA packages that face down. While PPGA processors work with new FC-PGA motherboards, you can't use an FC-PGA CPU in an old PPGA system.

Intel's first FC-PGA Pentium III ran at 500MHz, and since then Intel has released all Pentium III speeds in both FC-PGA and Slot 1 packages – apart from the 1GHz Pentium III, which for now is Slot 1 only. Celerons from the 533A upwards also use the FC-PGA design.

AMD has also now dumped its Slot A form factor, and supplies all Durons and Thunderbird Athlons in its new 462-pin PGA Socket A design; while some Slot A Thunderbirds were made, these were for early tests and not for sale. Also, remember that Socket A is not compatible with Socket 370.

The VIA Cyrix III uses a Socket 370 design, which is said to work in most Socket 370 motherboards, although a BIOS update will normally be required.

Dual-CPU support

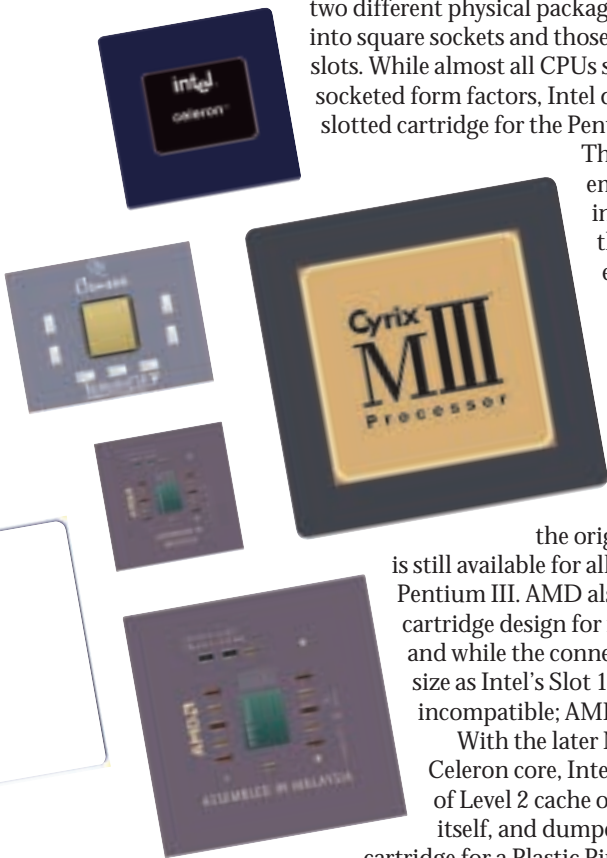
In theory all Pentium IIIs support dual-CPU configurations, but in practice, only those officially certified by Intel will work – this excludes some earlier FC-PGA models. The Celeron does not officially support dual-CPU configurations, although many enthusiasts have built working systems. AMD's Athlon supports dual systems, although we have never tested one. The Duron is not listed as supporting dual configurations, but like the Celeron it may be persuaded to in the future. The Cyrix III specification has no mention of dual-CPU support.

Front-side bus

The system bus carries all the traffic between the CPU and its chipset, and in many cases also the memory – see box later. Also known as the front-side bus (FSB), it can have a huge impact on overall system performance. After all, it determines the speed at which data and instructions get in and out of the CPU.

In order of desktop FSB performance, the slowest is the Celeron that runs at 66MHz. Next up are the Pentium III and Cyrix III, which both have models running at 100 or 133MHz externally. Intel's forthcoming Pentium 4 uses a 400MHz FSB using quad-pumped technology similar to AGP 4X.

AMD cunningly licensed the EV6 bus protocol of the high-end Alpha platform, originally developed by Digital, which is now owned by Compaq. While actually running at 100MHz, this bus transfers data on both the rising and falling edges of each clock pulse, effectively delivering 200MHz 'double data rate' (DDR) performance between the CPU and its



chipset. This 200MHz FSB is employed by the Athlon, and impressively also the Duron despite its cheaper price.

Cache

Most CPUs feature both Level 1 and Level 2 cache along with main system memory, with each storage type traditionally getting bigger but slower respectively. When the CPU needs to get hold of data, it looks first in the Level 1 cache, then browses the Level 2 cache, after which it searches main memory. Clearly the sooner the CPU can get the information, the faster it can act on it, but space in the caches is so restricted that only the most frequently accessed data is stored there. Note that Level 1 cache is normally always split equally between data and instructions.

Level 1 cache has always been built into the CPU die itself, and as a consequence runs at the same speed as the CPU. Level 2 cache is normally bigger, but in the old days was accessed over the relatively slow system bus. With the Pentium II, Intel developed a new faster interface to its Level 2 cache, running at half the speed of the actual processor. The first Pentium III processors shared this design, with 32KB of Level 1 cache running at full-speed, and 512KB of Level 2 cache running at half-speed over a 64bit interface.

The Mendocino Celerons also featured 32KB of Level 1 cache, but integrated their 128KB Level 2 cache on the die, thereby running both at the same speed as the CPU. With the Coppermine process, Intel also integrated the Pentium III's Level 2 cache on-die, but halved its size from 512KB to 256KB. As mentioned below, though, Coppermine's on-die 256KB Level 2 cache boasts a wider 256bit interface that, along with matching the CPU's core speed, makes it faster than the 512KB half-speed of older Katmai Pentium IIIs. Intel calls this Advanced Transfer Cache.

AMD's Athlon impressively has 128KB of Level 1 cache – four times the Celeron and Pentium III. Earlier cartridge-based K7 Athlons had 512KB of off-die Level 2 cache, but in some cases running as slow as one-third the speed of the main CPU. The recent Thunderbird core addressed this, with 256KB of Level 2 cache running full-speed on-die, matching the Coppermine Pentium III.

The Duron, too, impressively boasts 128KB of Level 1 cache, but has only 64KB of Level 2 cache, albeit also on-die. The Cyrix III also has 128KB of Level 1 cache, but unforgivably has no Level 2 cache. In a move that mirrors Intel's initial Celeron performance disaster, VIA has already stated that the forthcoming Samuel 2 processor will feature on-die Level 2 cache.

With both Level 1 and Level 2 caches now running full-speed on the dies of most CPUs, why not stick them together into a unified



cache? The answer is that by keeping them separate, they can independently organise and address their data in what the chip designer believes is the most effective manner.

While AMD and VIA boast 128KB of Level 1 compared to Intel's 32KB, Intel argues that a cache that's four times larger takes four times longer to search, and hence while storing more instructions, is slower to respond. AMD, however, believes that 32KB doesn't make sense with today's finer manufacturing processes.

Then there's the Level 2 cache interface, which with Intel Coppermine CPUs is 256bit compared to 64bit on AMD's new Athlons and Durons. Intel champions its four-times faster interface, while AMD counters that with a four-times larger Level 1 cache in the first place, the slower interface to its Level 2 isn't that big an issue.

At the end of the day the benchmarks we run in group tests and reviews reveal the differences to end users, but bear all of the above in mind when the marketing people take an oversimplified approach, add up all their cache and present a single number for comparison.

Extra instructions

The CPUs covered in this feature may be described as x86-compatible, but Intel's original instruction set has seen many enhancements over the years. Notable was Intel's addition of 57 new multimedia instructions called MMX, debuting on the 166MHz MMX Pentium, and now incorporated in every Intel CPU. AMD was quick to respond adding its own set of 21 instructions called 3DNow! The idea is that software developers make use of these extra instructions to speed up processing if a suitable MMX or 3DNow! CPU is present. Today almost every OS and application, not to mention most graphics card drivers, make calls to these extended instruction sets for improved multimedia performance.

With the Pentium III, Intel added Katmai New Instructions (KNI). Officially now branded as SSE, or Internet Streaming SIMD Extensions, these 70 new instructions can speed up speech

Systemax's D650 RV Pro uses a Duron processor, which boasts a 200MHz FSB and 128KB of Level 1 cache

recognition, multimedia streaming, and 3D applications. SIMD stands for Single Instruction Multiple Data.

All Pentium IIIs and Celerons from the 533A onwards feature SSE along with the original MMX instructions; the forthcoming Pentium 4 boasts no fewer than 144 new instructions in addition to SSE and MMX.

Athlon and Duron CPUs now feature Enhanced 3DNow! which adds a further 24 instructions onto the original set, as well as supporting MMX. The Cyrix III supports both MMX and 3DNow! but it's unknown whether or not it's the enhanced version.

Where an application supports, say, only SSE, there is a big performance difference between Intel and AMD CPUs otherwise running at the same clock speed.

Mobile CPUs

Desktop CPUs are great consumers of power. Intel's Coppermine Pentium IIIs consume up to 29w. The original Celerons consumed up to 28w, while new models with Coppermine cores currently max at around 18w. AMD's Athlons and Durons are particularly hungry, said to consume as much as twice their Intel counterparts under maximum conditions. VIA's Cyrix III claims to consume only 10w in 'full operation mode', which if directly comparable to the figures above, means it could enjoy a greater success in mobile rather than desktop environments.

While you could fit any of the above into a notebook, and indeed several manufacturers do, there are more ideal solutions.

Power saving

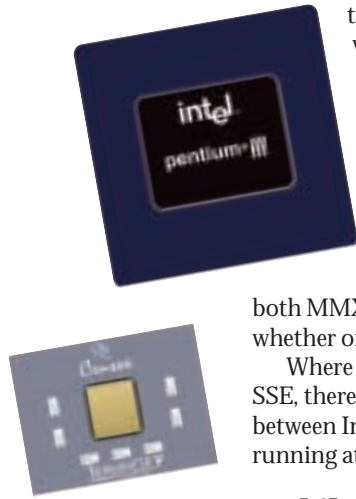
It's possible to save half the power by halving the speed of your CPU, although this of course also halves your performance. Since power is also proportional to the square of voltage though, a small voltage drop can make a big saving in power consumption.

Intel's SpeedStep technology does this, and can reduce power consumption by as much as 40 per cent while maintaining 80 per cent of the chip performance. Better still, it can make this voltage switch almost instantly while running applications with no need for a system restart.

SpeedStep is available on Mobile Pentium IIIs running at 750, 700, 650 and 600MHz, and allows them to drop from 1.6v to 1.35v. In this battery-saving mode, the 750 reduces to 600MHz, the 700 to 550MHz, while both the 650 and 600 drop to 500MHz. Mobile Pentium IIIs also feature SSE, 256KB on-die Level 2 cache, 100MHz FSB and are made with a 0.18micron process.

Intel does not currently incorporate SpeedStep into its Mobile Celerons, but otherwise these cheaper chips bear many resemblances to the Mobile Pentium IIIs. Mobile Celerons running between 450 and 650MHz are made using a 0.18micron process, run at 1.6v, feature 128KB on-die Level 2 cache, support SSE and, interestingly, a 100MHz FSB, compared to the 66MHz of desktop Celerons. Additional 400 and 500MHz low-voltage 1.35v models are also available. All of Intel's current mobile CPUs are supplied in compact BGA-2 (Ball Grid Array) and Micro-PGA2 packages that are about the size of a postage stamp, including motherboard connections.

AMD has recently announced its own power-



Memories are made of this

The dominant PC memory technology today uses SDRAM. Previously, Dynamic Random Access Memory was rated by an access time of nanoseconds, but as front-side bus speeds approached 66MHz, a new memory technology was required to address latency issues. By employing Synchronous Control, DRAM could exchange data with the CPU in time with the system bus. SDRAM was therefore measured in MHz, with the first flavours matching the dominant FSB speed at the time of 66MHz.

As FSB speeds increased,

SDRAM followed, with 100 and now 133MHz parts – these are also commonly known as PC100 and PC133. The SDRAM story doesn't stop at 133MHz though. Double Data Rate (DDR) technology allows data to be delivered on both the rising and falling edges of a clock pulse. Already doubling the memory performance of many graphics cards, not to mention the Alpha EV6 FSB used on Athlon and Duron systems, DDR is about to take SDRAM to 266MHz – VIA will have supporting chipsets later this year.

Intel, however, favours a relatively new type of memory

called RDRAM, rated at 600, 700 and 800MHz. RDRAM actually employs DDR technology, so the clocks only go at half these speeds, apart from the 700MHz parts which are actually driven by a 356MHz clock. RDRAM is claimed to have superior performance in environments where multiple tasks are taking place, which Intel says matches our average desktop experience. However in our admittedly single-tasking benchmarks, there's little difference between RDRAM and SDRAM.

Since its release late last year, RDRAM has consistently

cost two to three times that of SDRAM per megabyte. For a short time, Intel produced a Memory Translator Hub chip which allowed its RDRAM-preferring 820 chipset to talk to PC100 SDRAM, but recently withdrew it due to technical problems. Intel is well known for its strong support for RDRAM, but nevertheless has reluctantly announced that there will be a P4 chipset supporting PC133. However, even if these are only manufactured in small quantities, support from the Taiwanese and VIA in particular will see SDRAM enjoying a longer life.



Transmeta's TM3120 is ideal for low-power devices like webpads

saving technology, called PowerNow!, which is available on its latest 0.18micron Mobile K6-2+ and K6-III+ processors. Using the same theory behind SpeedStep, PowerNow! features not two states, but adjusts the voltage between 1.4 and 2v depending on the demands of the processor.

Both chips support 3DNow! and a 100MHz FSB. The K6-2+ is available up to 550MHz, has 64KB of Level 1 and 128KB of Level 2 cache. The K6-III+ is available up to 500MHz, but on top of its 64KB of Level 1 cache, has a larger 256KB on-die Level 2 cache, and support for off-chip Level 3 cache up to 1MB. Reduced voltage mobile versions of the Athlon and Duron are expected by the end of this year.

Transmeta Crusoe

While SpeedStep and PowerNow! are undeniably cunning solutions, they are essentially just the same old desktop CPUs modified to be slightly more mobile-friendly. Transmeta has a completely different mobile strategy with its innovative new Crusoe line of processors, designed from the ground up for low-power environments.

Rather than implementing an entire x86 processor in hardware, the Crusoe employs a simple VLIW (Very Long Instruction Word) engine with an instruction set that bears no resemblance to the x86 instruction set. A surrounding Code Morphing software layer actually takes x86 instructions and translates them into the native instruction set of the VLIW hardware.

This approach eliminates the need for millions of transistors, producing a smaller, faster and less power-hungry core. Since the hardware doesn't have to natively support the ageing x86 instruction set, Transmeta's chip engineers can make use of the latest architecture designs. In addition, the Code Morphing layer

can be independently evolved to support new x86 extensions, or even entirely different instruction sets altogether.

Transmeta's first Crusoe CPUs are the TM3120 and TM5400. Using a 0.22micron process, the TM3120 features 96KB of Level 1 cache and a die size of only 77mm squared. The TM5400 uses a 0.18micron process, incorporates 128KB of Level 1 and 256KB of Level 2 on-die caches, in a 73mm squared die size; the Mobile Pentium III is a 106mm squared die.

Transmeta has famously shown heat results of its TM5400 and Intel's Mobile Pentium III decoding a DVD. The TM5400 max temp was 48 degrees C, while the Pentium III, perhaps unfairly

naked without its compulsory heatsink, peaked at 105 degrees C.

The TM3120 is designed for Internet appliances and ultra-portables, while the TM5400, which can also adjust its clock frequency to further save power, is aimed at fully-functional notebooks. At the recent PC Expo show in New York, several prototype Crusoe notebooks were shown and Transmeta already has another three chips coming soon.

It's currently unknown how the Crusoe notebooks will compare in terms of speed and battery life with mobile solutions from Intel and AMD, not to mention in price and software compatibility. It is, however, an exciting technology and a welcome additional player in the mobile market.

Faster and faster

There are huge differences between the various architectures and designs of the competing processors, but that doesn't necessarily mean that there are enormous differences in performance. While Intel used to have the lead on its competitors in terms of raw processing power, with the advent of the Athlon, this is clearly no longer the case.

Also, raw performance is not the be all end all of microprocessors. Clearly price is a big decider for many people and the positioning of the Duron against the Celeron can only be good news for people who want performance without the price.

The mobile arena is a key market for all and the chip suppliers and it will be interesting to see how the new low-power designs of Transmeta's Crusoe and, to a lesser degree, VIA's Cyrix MII, will fare in the future.

Only one thing is certain when it comes to microprocessors, and that is that they'll keep getting faster.





Great expectations

DESPITE THE PROMISE OF A MULTITUDE OF WAP INTERNET SERVICES, JANE DUDMAN FINDS THAT MCOMMERCE IS STRUGGLING TO LIVE UP TO THE HYPE

SO FAR WAP HAS PROMISED A LOT, yet delivered relatively little. If the advertising is to be believed, WAP (wireless application protocol) phone users can surf the web and connect to a multitude of different services. The reality is often somewhat different. But now a new selling point has emerged for WAP, that of mobile ecommerce services, or mcommerce for short.

For instance, the WAP Forum, which represents all the major suppliers of WAP phones and services, paints this picture of what will be possible: 'Imagine stepping out of an office building to go to the airport, using your WAP-enabled wireless device to check the traffic congestion, followed by the train timetable and

then purchasing a train ticket online instead of driving. On the way to the airport, you select your aisle seat and check in for the flight, reserving a special meal, and unpack your raincoat after looking up the weather at your destination.'

Sounds great. But here is what is actually available from this scenario at present via BT Cellnet's Genie WAP portal that was launched in January: 'Currently, it is not possible to check traffic congestion,' said the spokesperson for Genie. 'You can check train times, but no, you can't buy train tickets, although I don't think that's far away. You can buy an airline ticket via one of our partners, such as Lastminute.com or Thomas Cook, but you can't check in, reserve a seat or order a meal.' And the weather? 'There is

ILLUSTRATION: ADRIAN JOHNSON

weather news. But it's UK only,' he said.

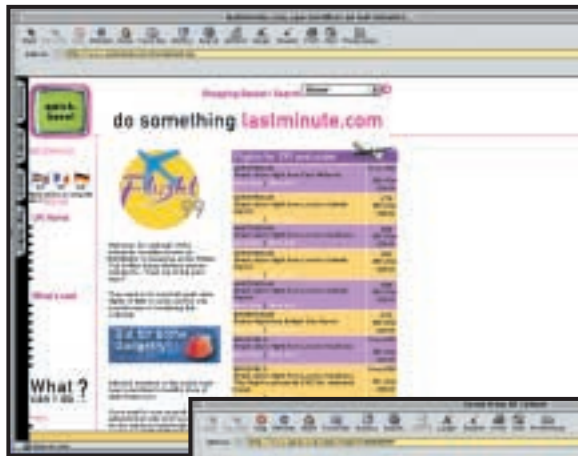
Things are slightly better in some areas with Mviva, the joint AOL Carphone Warehouse mobile portal launched on 20 July. This has a link into CNN's weather service, so it provides worldwide weather information, and airline tickets are available via ebookers or Lastminute.com.

Some traffic congestion information is provided, but it is 'limited', admitted an Mviva spokesperson, in that it covers only major motorways. 'It is being developed,' the spokesperson added. However, you can't book a train ticket or even look up train times via Mviva, although train timetables will be available by the end of August, and you cannot check in for a flight or reserve a meal.

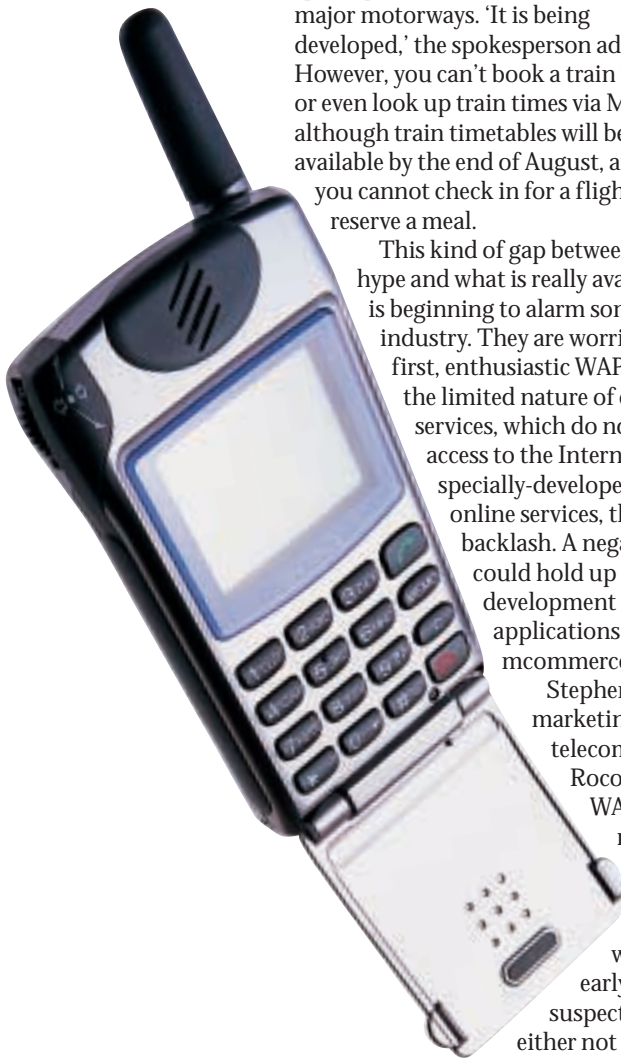
This kind of gap between the hype and what is really available is beginning to alarm some in the industry. They are worried that once the first, enthusiastic WAP buyers realise the limited nature of existing services, which do not provide full access to the Internet, but only to specially-developed, text-only online services, there could be a backlash. A negative response could hold up any further development of new WAP applications such as mcommerce services.

Stephen Wright, marketing manager at telecoms distributor Rocom, said sales of WAP handsets are relatively slow, in the wake of an initial burst when they were bought by early adopters. 'I suspect people are either not convinced by the services that are available

or are confused by the WAP concept,' he said. Others remain confident that while the present level of WAP services is pretty weedy, this will not seriously harm future market growth. 'If you don't have a WAP phone today, you're probably not missing much,' admitted



Left: WAP users can book air tickets online with Lastminute.com
Below: Genie is Cellnet's own portal for mobile web surfers and one of the first of its kind



Mike Herman, chairman of the Global Mobile Commerce Forum, 'but I firmly believe there is an absolutely huge market here. It may not be this year, it may not even be next year, but trading over portable devices, with the same functionality as over fixed devices, will develop.'

The market forecasters agree with Herman. Analysts Frost & Sullivan reckon worldwide revenue from mcommerce was close to \$2.98b last year, but will be worth \$64b by 2005. Forrester Research puts the figure even higher: it thinks worldwide mcommerce will be worth \$200b by 2005. Merrill Lynch estimates the European mobile portal market will be worth £14b by 2005 and £63b by 2010.

These kinds of figures are seriously tempting for Internet content providers and mobile network operators, both of which are putting a lot of investment into WAP services. In particular, the UK's four existing mobile phone network operators are racing to hook users into their own services before the market opens up. Cellnet was the first to market, with Genie, but Orange and Vodafone both now have mobile portals and deals with a number of content providers. As yet, no commercial WAP service is available from One2One, but the company is advertising for developers to work on its mobile Internet services and says it is investing £2m a day to ensure a 'winning position' in the world of





mcommerce. Other recently launched independent mobile portals include iTouch, which is run by Independent News & Media, and the previously mentioned Mviva portal from Carphone Warehouse and AOL.

The main services available from these WAP portals at the moment are fairly standard fare: email, entertainment listings, sports, travel, news, weather, share prices, some shopping and money services. As yet, there are far fewer true mcommerce applications, such as the ability to buy and sell online.

One issue that will certainly need to be addressed before mcommerce can take off is security, something in which Herman is involved in a commercial capacity as vice-president of security firm Thyron, which has developed a concept called the YES.wallet, to help speed up transactions over WAP devices (see box below).

But there are also technical limitations at both the front and back ends of mobile online services. There are obvious problems trying to carry out complex transactions via the small screen of a mobile phone or even a Personal Digital Assistant.

Richard Schwartz, senior vice-president of technology at software company Vignette, which is working with many content providers on adapting their ecommerce applications for



iTouch currently offers such things as news and travel information, but little in the way of mcommerce

the mobile market, said mobile users are, by definition, usually doing something else and concentrate on their phone for no more than about 10 seconds. This is a huge difference from the average desktop browsing time of anything up to an hour and a half.

'The challenge is to develop applications that present themselves, require an absolute minimal level of keystrokes and scrolling, and return the awaited result or complete the transaction,' said Schwartz, who adds that what customers need is a smarter generation of device-savvy ebusiness applications.

Peace of mind on the move

How secure will mobile Internet transactions be? The WAP Forum insists that the WAP approach provides security, based on the WTLS (Wireless Transport Layer Security) specification, which implements options for authentication and encryption.

Encryption appears to be the answer to the problem of protecting credit card details as they pass over insecure mobile networks. But there are still a lot of unanswered questions about security, such as what happens to stored credit card details if they are held on a mobile phone or PDA that is stolen?

More pressing in the first instance, however, is the problem of convincing people that mobile online services can be both secure and easy to



Convincing users that mcommerce services are secure is essential to making it a viable method of performing transactions

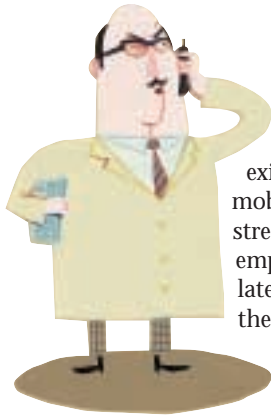
use. Mike Herman, vice-president of security firm Thyron, says there is a lot of content just waiting to be made available on mobile devices that can't be distributed at the moment

because there is no effective way to pay for it. Gambling is one big area, he points out, that is being held up because it would simply be too difficult and time-consuming for mobile users to have to fill in

their details every time they logged on to a website.

Thyron has come up with a concept it calls YES.wallet to try and get round this problem. The software stores users' personal information, including billing and delivery addresses and credit card details on a secure server. When the user wants to buy something via a WAP service, they authorise payment by entering a PIN and their details are sent on to the merchant. The software is being licensed by ISPs and will be free to users.

According to Herman, YES.wallet uses the security features already available in mobile phones. 'To get this market to move, people don't need to know what's behind the scenes, they just need to trust that it is secure,' he said.



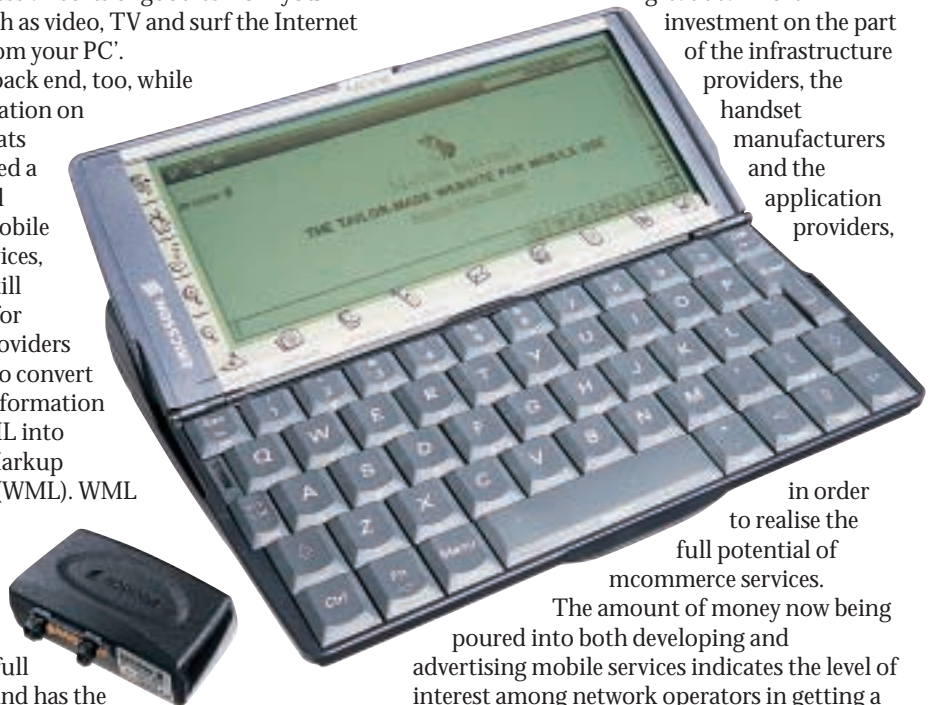
Slow data transfer rates over existing networks are also slowing up mobile Internet use, and even the high-street dealers, keen to shift WAP handsets, emphasise that while the launch of GPRS later this year will improve the speed of the current networks, the really big breakthrough will come with the launch of the third-generation (3G) mobile network in two or three years' time when, according to dealer DX 'you will be able to access all sorts of goodies from your phone, such as video, TV and surf the Internet just like from your PC'.

At the back end, too, while standardisation on WAP formats has provided a substantial boost in mobile online services, there are still problems for content providers in having to convert Internet information from HTML into Wireless Markup Language (WML). WML has been developed to provide easy navigation without a full keyboard and has the ability to adapt screen displays for a range of mobile devices, from the smallest of two-line text displays to full graphic screens on larger PDAs.

Schwartz says online content on mobile devices will only really take off when it is better adapted to these kinds of limitations. He

believes one way this will happen is via far more personalised services. Auction services, for instance, could benefit from this approach. A user could bid for an item while surfing from their desktop PC, but might then receive notification, via their mobile device, if a higher bid is made and would automatically be rejoined to the auction to make a higher bid themselves.

But these kinds of personalised services are some way off for mobile devices. It will require a great deal more investment on the part of the infrastructure providers, the handset manufacturers and the application providers,



in order to realise the full potential of mcommerce services.

The amount of money now being poured into both developing and advertising mobile services indicates the level of interest among network operators in getting a toehold in the mobile Internet market. Just don't buy a WAP phone tomorrow and expect to be able to access your local takeaway on the way home. For that, as for many other services right now, the mobile phone is still best at its original, old-fashioned job: enabling consumers to ring up and place an order.

European mcommerce takes the lead

At the moment, there is a distinct split in online development on each side of the Atlantic. The US is the undisputed champion of e-commerce. Recently, for instance, European Union IT minister Erkki Liikanen announced a plan to develop more diverse website content, after research revealed that 94 of the world's 100 most visited websites are located in the US and that most web pages are in English.

But Europe has the highest number of mobile phone users per head in the world and this has put the continent in pole position in the developing mcommerce market. Many industry analysts predict that by 2003 there will be more users accessing online services via mobile devices than via desktop browsers.

However, some in the market believe that while Europe has a lead at the moment, both the US and the

Far East are hard on its heels, for different reasons.

Mobile phone use in the Far East is not far behind Europe and there is a lot of interest in innovative new applications, such as online gambling.

In the US, according to Les Line, business development manager at financial software specialist Fiserve, which is developing online banking services accessible via desktop, mobile and interactive TV

devices, the situation is different. 'US colleagues don't have such a love affair with their mobile phones as we do in Europe,' he said. 'They regard mobiles as largely for social use. But they are terrific users of PDAs, so when PDAs and mobile phones come together into a single device – and we are now seeing smaller form prototypes of that – I believe the mobile online market over there will really take off.'

THE SENX MACHINE IS SET TO BRING THE THREE MISSING SENSES TO YOUR PC.

See me, feel me...

ALTHOUGH NOISY AND COLOURFUL, the Internet is still sterile and senseless. Now a US company claims to have found a way to send tastes, smells, textures and even weather conditions over the Internet. The company has even been granted a US patent (#6053738) for its technology.

The 'Senx machine' is fitted with replaceable or refillable cartridges containing liquids or powders used to create the smells and tastes. These cartridges are arranged around a cylinder (like corn pellets on a cob) that can be rotated in both directions. Doors on the cartridges can be controlled to allow a single drop to exit. A rod slides underneath the cylinder along its length, collecting drops of the chemicals that are released from the cartridges at the bottom of the cylinder. These drops are mixed in different proportions to create different smells.

To release these smells, the rod extends beyond the reach of the cartridges into a tube, where an updraught of air blows the chemicals

to an outside outlet for smelling or tasting. To taste, wafers can be fitted to the outlet for flavouring with the chemicals that are dispersed, or the machine can have a straw-like outlet for putting in the mouth. Different cylinders of cartridges are to be used for taste and smell.

Infra-red sensors inside the cartridges detect when they're running out and automatically place an order for a refill over the Internet.

The patent includes the suggestion that companies (such as perfume producers) could offer promotional Trisenx machines that only include their own scent.

The texture simulator works by stimulating hairs on a membrane, which is then touched by putting a finger through an opening. A less sophisticated (but more accurate) texture device included in the patent works by rotating a drum of sample textures and using tinted lighting to colour them. Customers in remote locations could choose fabrics without leaving home.

The weather simulator combines a heating lamp and a cooling agent to quickly control temperature and a liquid capsule to create humidity. A fan simulates wind velocity and water droplets fall as rain. This might be useful for education or adventure games.

The inventors suggest that the machine could have its own controller keyboard as well as memory to store information about which cartridges contain which scents. This would allow it to be used independently, or possibly in connection with other Internet-enabled devices. Or, to keep costs down, the unit can be controlled from a conventional PC.

A demonstration on the Trisenx website (www.trisenx.com) features a game where a spaceship shoots fast-approaching fruits that, using a Senx machine, could be smelled as they explode. Whether the cost of the unit would be justified by this type of entertainment is uncertain. If the machine can be made accurate enough to satisfy manufacturers, though, the device could transform Internet shopping.

So far books, software and CDs have sold well online. Being able to sample a curry before ordering could stimulate meal delivery services and being able to feel the cloth before buying an expensive suit would undoubtedly have a positive effect on the sales of clothes. The company has already formed an alliance to market cosmetics, fragrance and health and beauty products and claims the first machine will be available in the spring.

The shopping experience could become a different ball game if the Senx machine catches on



PHOTOGRAPH TONY STONE

SEAN MCMANUS

THE ROAD TO TELEPORTATION SEEMS TO BE A CASE OF MINDING YOUR PS AND Qs

Beam me up Scotty

TELEPORTATION IS A science fiction staple. People and objects are disintegrated, beamed across the universe in the blink of an eye, and are reconstructed on a remote planet, often in a landscape strewn with styrofoam boulders. The trouble is, fundamental physics has always said teleportation cannot possibly ever work. Until recently, that is.

The idea of teleportation is simple. You first record all possible information about the object you want to teleport, then transmit the information to the new location. Then, you read back the information, decode it, and reconstruct the object. But the laws of quantum mechanics scupper you before you can even get started.

Let's consider teleporting a single atom. Quantum mechanics says that the very act of measuring an atom's state changes that state. And the more accurate you try to make your measurement, the more you disrupt the atom. So this rules out the possibility of ever extracting enough information about an atom to make a perfect replica. But researchers have recently found a way around the problem, using a quantum property called 'entanglement'.

Quantum particles have states that can be used to represent binary digits. If a particle spins one way, for example, it can represent a 0; if it spins the other way, it's a 1. Particles like this are called 'qubits', and form the basis for building quantum computers. But you can only ever tell what state a particle is in by performing a measurement on it. When you're not looking, it exists in a weird mixture of 0/1 states called a 'superposition'.

It's possible to prepare two particles - P and Q, say - in such a way that they're intimately related, like quantum twins. Let's separate P and Q, and send them as far apart as we like. They're still both in the indeterminate 0-ish/1-ish state. Now let's measure P, and say we discover it's in state 0. Instantaneously, this means that particle Q, which may be light-years away on the other side of the universe, instantly assumes the opposite state - it's now definitely spinning as a 1. Entanglement has been known theoretically for decades, but it's only recently been proven by experiment. 'Entanglement means if you tickle one the other one laughs,' said Caltech physicist Jeff Kimble, one of the researchers to first demonstrate entanglement in the lab.

Although the entanglement effect isn't itself teleportation, it provides the key. Let's imagine

Alice wants to teleport a particle (say, A) to Bob. First, she creates two entangled particles, P and Q, keeping P, and sending Q to Bob through some ordinary data channel like the Internet. Now, Alice allows particles P and A to interact, measures the resulting state, and sends that data to Bob. Bob then applies that data to Q, which - and this is the magic bit - then turns into an exact copy of particle A! The original particle A is still with Alice, but its state has been scrambled.

So you can teleport an atom, and people are made of atoms so... well, the answer to the obvious question is at best 'who knows?' - but



what is emerging as a possibility is the use of teleportation to send qubits between quantum computers, linked into a quantum Internet. Quantum computers already exist (see *Futures*, May 1999), and the current largest machine computes with words seven qubits long (<http://qso.lanl.gov/qc/>). It's also possible to prepare the entangled particles such that the entanglement itself actually encodes an algorithm.

You can already try quantum computation for yourself, by running a simulator on your PC, see www.senko-corp.co.jp/qcs/. As for teleporting yourself across the universe, you might have to wait a little longer.

TOBY HOWARD

Science fiction may yet become fact, but hold your horses before you get ready to teleport yourself



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by Lars Goran-Nilsson



Stylish systems

If you've coveted the iMac for its looks, read on, because this month we challenged 12 manufacturers to come up with a slimline system you'd be proud to have in your living room

The age of grey dull boxes may soon be over – well at least the box part. This month we decided to see what the PC manufacturers have come up with to compete with the more stylish looks that machines like the iMac manage to achieve; and rather surprisingly, there are a number of very small, unobtrusive solutions that are – dare we say it – stylish enough to have in your living room.

The reason for this is that today there are high-quality small form factor motherboards with both sound and video onboard, allowing manufacturers to cram quite a lot of computer into a small space, while still leaving enough in the budget for appealing items such as TFT flat panels. It is certainly a long overdue move, and there are a few really snappy systems out there that, despite being more expensive than their bigger brothers, are far more likely to not be hidden in your spare room.

We set the manufacturers simple guidelines for this group test, and with no price point, all the machines had to do was allow easy access to the Internet and be able to handle home/office duties. The system had to be a small, unobtrusive easy-to-use PC, with at least 64MB of RAM, 10GB of hard drive space, a DVD or CD-ROM, a minimum of a 15in display, a modem, and an office suite. The entrants varied from the very inexpensive smallish PC to the ultra-stylish, ultra-expensive unit where money needs to be no object. If you're looking for something a little bit different, then the following pages show that the old PC needn't be only a grey box, but can be as stylish as the best of them.

PHOTOGRAPH DAVID WHYTE

Acer Veriton FP



LIKE AJP'S PC, THE Acer Veriton FP is an integrated unit, with speakers built into lower corners of the fascia, below the 15in TFT screen. The Panasonic CD-ROM and 3.5in floppy drive sit between the speakers, along with an infra-red port. The Veriton doesn't have the simple elegance of AJP's system, but the screen image is sharp – although the colours are not as vibrant as some other TFT screens. The screen can be tilted to the required viewing angle.

Processing power comes in the form of a 500MHz Pentium III, mounted on the BX-based motherboard. Installed in one of the DIMM slots is 128MB of PC100 SDRAM, leaving one slot free for upgrading the memory. A modem is supplied as standard. Both sound and video are integrated onto the motherboard in the form of an ESS Solo audio chip and an ATi Rage LT Pro graphics chip, supported by 8MB of SDRAM. As with all the integrated units, upgradability is not the priority.

For storage, a 13GB Quantum hard disk is installed, which is not large by today's standards, but will be adequate. Unfortunately, only a CD-ROM is supplied for optical reading, where DVD would be preferable and would make more sense with a unit of this price. Inclusion of the floppy drive, however, is beneficial for small file transfer. In general, the spec on this system is not as strong as similarly priced units, although

the inclusion of network software and the lack of an office suite point to this machine's roots and price being firmly in the business world. For home use, though, Acer will supply the unit with whatever software is required and add the cost to the basic price.

Overall, the Veriton FP is not as stylish as some of the other all-in-one units in this group test, but then again, it has been primarily designed for the business environment. It is expensive for the specification supplied, although it will take up very little space, and won't spoil your décor too much.

DETAILS

PRICE £2,113.82 (£1,799 ex VAT)

CONTACT Acer 0870 900 2237

www.acer.co.uk

PROS All-inclusive unit with a TFT screen; infra-red port.

CONS Very pricey for the specification; software not included in the price

OVERALL An all-in-one unit that is pretty small and unobtrusive, but too expensive for the spec. There are better value systems in this group test

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★

★★★

★★

★★★

AJP Neo-PC



AJP'S NEO-PC, IS ONE of the most expensive systems in this month's test. A concept PC for the ultra-stylish, it both looks good and has the specs to match.

Apart from the ergonomic keyboard and the mouse, the PC is integrated into a single unit that has a small footprint for a relatively unobtrusive presence in your living room or office, although the power cable pushes it forward from the wall. There is even a handle on the top for easy transportation, although the

unit is heavier than it looks. The 15.1in TFT screen is attached to the front of the main body and pivots up and down for comfortable viewing. The on-screen image is even with well-represented colour.

The AJP is powered by a 750MHz Flip Chip Pentium III, mounted on a Slot 1 converter, for use with the Mitac BX-based motherboard. Occupying one of the DIMM slots is a 128MB module of PC100 SDRAM, leaving one slot free for

upgrading, although this involves placing the unit on its screen and removing the back. An onboard Crystal Sound Fusion chip provides sound, which is piped to the integrated speakers, while an ATi Rage LT Pro with 8MB of SDRAM deals with video.

The hard drive is a very respectably sized 20.5GB Quantum Fireball, and a vertically mounted 3.5in floppy drive is installed to one side. Unfortunately loading floppies correctly into the

laptop-style drive is quite difficult, requiring nimble fingers to push the disks home. A Hitachi DVD is mounted beside the floppy drive.

The Apollo Fax/Modem fits neatly into a PC Card slot on the left of the unit, leaving a second slot free for other peripherals. The system also has an onboard network adaptor, as well as an infra-red port.

The Neo-PC doesn't only look pretty, the bundled Microsoft Works Suite 2000 is a strong software package. If you're looking for a PC with simple, elegant looks and don't mind paying the premium, this may just fit the bill.

DETAILS

PRICE £1,976.35 (£1,682 ex VAT)

(delivery £15 unless ordered on the Internet)

CONTACT AJP 020 8208 9755

www.ajp.co.uk

PROS Simple elegant machine, with a built-in TFT screen

CONS Very pricey

OVERALL A good specification on a simple unobtrusive machine. It's expensive, but perhaps worth a look

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★★★

★★★★

★★★★

★★★★

Carrera Octan DM 650



THE SMALLEST OF Carrera's Octan range, the DM, looks like a conventional PC, just slightly smaller. The micro ATX case is a similar height to a conventional PC, but not as deep. A quick look inside shows that the depth has been cut to enable the micro ATX motherboard to fit snugly with no room to spare.

The Biostar M7VKA motherboard employs the VIA KT133 chipset, with the new 650MHz Duron processor and 128MB of PC133 SDRAM strapped into

it. There are two spare DIMM slots and the motherboard can support a massive maximum 1.5GB of RAM.

Installed in one of the two 5.25in bays is a Ricoh Combo drive. This allows four-speed DVD reading, 24-speed CD reading and writes and rewrites discs at six-speed and four-speed respectively. Carrera has also included both a CD-R and CD-RW disc with the bundle to get you started.

A 15GB Western Digital hard disk in one of the 3.5in bays leaves one bay free. Although not the largest hard disk in the test, 15GB will still take a while to fill. A modem is seated in the AMR slot.

The motherboard has both sound and graphics onboard. The sound is integrated into the VIA chipset, and outputs to the supplied Altec Lansing speakers. The graphics, although onboard, are provided by an nVidia TNT2 chip, with 32MB of SDRAM.

As with the Time entrant, this

onboard graphics solution allows the Octan DM to produce a respectable gaming performance. With a Quake III score of 24.8fps (frames per second), it's not quite as fast as the Time PC, but then neither of them are trying to be games machines.

The monitor is an LG 775N 17in unit. As the PC's case is not as small as the systems from Simply or Elonex, the monitor does not look too large, but for space-saving considerations, a 15in unit would have sufficed.

Lotus SmartSuite Millennium is included, making this a pretty good machine overall. It is certainly not the most stylish in the test though.

DETAILS

PRICE £938.93 (£749 ex VAT)

CONTACT Carrera 020 8307 2800

www.carrera.co.uk

PROS Good performance

CONS It just looks like a small PC and might not look too good in the living room

OVERALL This is a good performer and, if you don't mind the conventional design, it is a good machine

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★★★

★★★★

★★★★

★★★★

Elonex Book PC



THE BOOK PC IS satisfyingly small and includes a stand that allows the case to sit vertically. As with Simply's entrant, the unit includes a 17in monitor, where a 15in would be more in keeping with the smaller chassis.

The front of the case has a full-sized floppy drive, as well as a laptop-sized Mitsumi CD-ROM drive. There is also an infra-red port on the front. A small flap allows access to the two USB ports, plus headphone and microphone sockets.

Inside the case is an MSI motherboard. The NLX form factor uses a riser board, which means the PCI slots are perpendicular to the main board, so installed cards lie parallel. This allows more boards to be fitted into a smaller space.

Tucked neatly under the CD-ROM is a 27.3GB Fujitsu hard drive, giving plenty of storage. With its 810E Intel chipset, this machine is for gamers, but the 733MHz Pentium III Flip Chip will pound through anything else you

can throw at it. The motherboard has a single 128MB PC133 memory module installed, leaving one DIMM socket free, although, unfortunately, on the PC we saw, the memory was incorrectly clocked at 100MHz in the BIOS.

As for upgrading, apart from USB peripherals, there is a problem if PCI cards need to be installed. The modem sits in one of the two available PCI slots, and, although the other is free, a serial port obscures the backing plate position

in the case. This means the serial port will have to go if another PCI card is installed. However, a serial port is built into the motherboard, so the sacrifice isn't too great. At the back there is a socket for the onboard network adaptor, along with a DVI output. The onboard Yamaha sound output is also at the back and is piped to the Creative SBS20 speakers.

The inclusion of Microsoft Office 2000 Small Business Edition means the software on this PC is excellent. Its small case is a good size, although the monitor is slightly too large. If this doesn't bother you, this system is good value; but for a bit more cash, you could afford the more stylish Hi-Grade UltiNet 733.

DETAILS

PRICE £1,065 (£899 ex VAT)

CONTACT Elonex 020 8452 4444

www.elonex.com

PROS Small case with infra-red at the front

CONS 17in monitor dwarfs the case

OVERALL A good little system with reasonable performance. Unfortunately the monitor doesn't complement the small chassis

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★★★

★★★★

★★★★

★★★★



evesham.com Evolution



WITH A MICROTOWER two-thirds the size of a normal PC case, and a 15in evesham.com-branded monitor, the Evolution looks like a PC in miniature.

Opening the unit was a nerve-jangling experience, although as there is no room for internal upgrading, there is no need to get inside the box. The Intel 810E Desktop motherboard has both sound and video onboard. A Creative SoundBlaster PCI 128 feeds Creative SBS52 speakers, while the 810E chipset,

along with 4MB of SDRAM, deals with graphics. A single DIMM slot is filled with a 128MB PC133 memory module, although as the system bus is 100MHz, running the Pentium III processor at 700MHz, this faster memory is redundant, although it affords some future proofing. There is also an onboard network adaptor, with the output at the rear. The single PCI slot holds a Diamond SupraExpress modem.

To compensate for the lack of internal upgrade options, there are four USB ports, two at the rear and two at the front under the small blue rounded flap. This looks fine when it is closed, but is not aesthetically pleasing when open, although the location of USB ports on the front perhaps makes this compromise acceptable. Both the mouse and keyboard are USB, although the keyboard has a PS/2 mouse socket into which you could plug a PS/2 mouse, freeing a USB port.

A 20GB Maxtor hard drive is included, as well as a Samsung Combo drive to cater for removable storage. This allows CD-ROMs and DVDs to be read, while also allowing CD-R and CD-RW media to be written. On the whole, a very versatile solution to the issues of optical reading and removable storage.

Coming complete with Microsoft Works Suite 2000, this machine has it all – in miniature. Only one real criticism can be levelled: the image on the monitor submitted for review was very poor. Ultimately, the Evolution will do its job, but it's not much cheaper than the superior Hi-Grade machine.

DETAILS

PRICE £1,291.32 (£1,099 ex VAT)

CONTACT 0800 038 0800

www.evesham.com

PROS Small, compact system, with a good combo drive

CONS Monitor image quality was poor on our test unit; USB flap is unattractive

OVERALL A small, relatively unobtrusive unit. If CD writing is required, this unit is worth a look

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★★

★★★★

★★★

★★★

Gateway Profile 2



GATEWAY'S PROFILE 2 is a stylish system that would certainly be a conversation point if it were nestled in your living room. With its curvy body supporting a high-quality 15in TFT screen, Gateway has moved away from the boxy conventional lines of PCs.

As a 'legacy-free' machine, there are no output sockets except four USB ones. The keyboard plugs into one port, leaving the others free for peripherals (the USB mouse conveniently plugs into

the keyboard to keep the other ports free). The only other sockets are the Motorola modem output and the Ethernet network output, both situated at the back.

There was no popping the bonnet on this machine to ogle its interior, since the Profile 2 is a 'sealed box'. It has not been built for the upgrade addict, and its performance is geared towards Internet surfing and office applications. Its Celeron 500MHz processor is adequate for

these tasks, as is the Intel 810-based motherboard and the 64MB of PC100 memory. Graphics and sound are both dealt with onboard by the 810 chipset (the video having 4MB of SDRAM to help it along), with the sound piped to speakers that are integrated into the base.

The IBM Deskstar 20.5GB hard disk will provide plenty of space; and a floppy drive is installed at the front. Above this is a Toshiba DVD-ROM for optical

reading, while below it there is a built-in microphone as well as a headphone socket for convenient access.

Bundled with Microsoft Works Suite 2000, this is a fine unit. The stand holds the screen at a good level for viewing and gives the machine a more organic profile – Gateway has even put a curve on the top of the fascia to get away from any artificial man-made straight lines. It won't be breaking any performance records, but when it comes to style, this may well be the machine to put in your living room, and it's certainly a worthy winner of this month's Highly Commended award.

DETAILS

PRICE £1,643.82

(£1,399 ex VAT)

CONTACT Gateway 0800 552 000

www.gateway.com/uk

PROS Wonderfully vibrant TFT screen; interesting shape

CONS A little pricey

OVERALL Different enough to normal PCs and with an excellent TFT screen, the Gateway would be a stylish addition to any living room

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING



★★★★

★★★

★★★★

★★★★

Hi-Grade UltiNet 733



THE ULTINET 733 is a very snappy looking machine, with its small case and TFT screen. The case is only 29 x 9 x 28cm (w x h x d), yet it still has room for both a full-sized floppy drive in the front and an Asus E608 DVD. If nothing else, this PC will look good in your living room, but thankfully there is much more.

Powered by a 733MHz Pentium III processor on the L-shaped Chaintech motherboard, this little machine has versatility we would usually expect only

from a much larger unit. Opening a front flap reveals two USB ports, microphone and headphone sockets, as well as a FireWire socket. Round the back, there are a further two USB ports, a serial port, a parallel port, two PS/2 sockets, a further FireWire socket, a DVI, as well as S-Video and composite video outputs. We think you'll agree this is an incredible array of connectivity. There is even an IrDA port at the front for infra-red communication.

Especially noteworthy are the FireWire sockets, which allow digital video devices to be attached – ideal for those who dabble in video-editing capabilities. The 20.4GB hard disk will fill up reasonably quickly with this sort of task, but it will be adequate with a bit of organisation.

With 128MB of PC133 SDRAM installed, one DIMM is free for upgrade, but apart from this there is no room for expansion. There is an AMR socket,

although this holds the AMR modem. Both sound and video are onboard and are controlled by the SiS chipset.

The 15in TFT flat panel has integrated speakers in the base, and the screen can be tilted up and down to adjust for comfortable viewing. The combination of both the TFT screen and the small case makes this a PC that will look good wherever you decide to put it. The system case can even be stood on its side to save space.

Bundled with Lotus SmartSuite Millennium, and costing only £1,373.58 inc VAT, you'll be hard pressed to find a machine as unobtrusive, yet still offering the versatility. Overall, a worthy winner of this month's Editor's Choice.

DETAILS

PRICE £1,373.58
(£1,169 ex VAT)

CONTACT Hi-Grade 020 8532 6111
www.higrade.com

PROS Compact, stylish and versatile PC

CONS None

OVERALL If it's a small PC you desire, then this is the one to go for

FEATURES

PERFORMANCE ★★★★★
VALUE FOR MONEY ★★★★★
OVERALL RATING ★★★★★



Packard Bell Spirit RF 730



THIS LATEST INCARNATION of the Spirit series certainly has some ethereal qualities in that both its keyboard and mouse are cordless, so you literally 'beam' your information to the PC via radio waves. Decked out in stylish dark grey and silver, the Spirit RF 730 is one of the most attractive in the test. Its Slimview TFT screen has a fairly sharp and vibrant image, although it is not of the same quality as the digital flat panels bundled with previous Spirits.

The case is constructed to mount vertically, which makes loading CD media into the drive a little awkward, but that's a price you have to pay for stylish looks. This niggle aside, the Pioneer DVD114 is a quality, full-sized drive. Below the DVD sits a laptop floppy drive. Also adorning the front of the Spirit RF 730 is one of the two USB ports, along with a microphone socket (for use with the supplied microphone) and a headphone socket,

complete with a useful volume control.

The processor is a powerful 733MHz Pentium III, which sits on the MSI 810E-based motherboard. The memory installed is a single module of 128MB memory clocked to 133MHz, complementing the 133MHz FSB. Another DIMM slot is free for upgrading.

Inside, the modem sits in the AMR slot, leaving the two available PCI slots free for adding any required cards. A

fairly large 20.4GB Maxtor hard disk takes care of fixed storage. Video is onboard and is dealt with by the 810E chipset, as is the sound, which is piped to rather stylish flat NXT speakers.

A good software bundle – Packard Bell's Spirit CD collection (including Caesar III and Photo Express) and Microsoft Works 2000 – complements its stylish looks. With its radio-controlled keyboard and mouse, TFT screen and stylish colours, this is an eye-catching PC, with a bit of power as well. That said, it's more expensive than some of the similarly specced PCs in this test.

DETAILS

PRICE £1,899 (£1,616 ex VAT)

CONTACT Packard Bell 01628 508 200
www.packardbell.co.uk

PROS Very stylish looking unit

CONS A little bit pricey; flat panel not as good as previous models

OVERALL With its cool grey colour and its flat speakers, this unit looks great; and it has a solid spec and good software. It's just a little on the expensive side

FEATURES

PERFORMANCE ★★★★★
VALUE FOR MONEY ★★★★★
OVERALL RATING ★★★★★



Panrix V-Box Home Theatre PC



A TV-style remote control is included, which has a joystick-driven mouse, so you can operate the V-Box from the comfort of your armchair. The V-Box is certainly a big move away from conventional thinking.

An infra-red keyboard allows input to the system from anywhere within a fairly large room, as long as the keyboard is pointed at the receiver. To aid reception, the receiver extends on a short cable for optimal positioning.

The motherboard is Intel 810-based, with video dealt with by the chipset, and supported by 2MB of onboard video memory. Sound is onboard in the form of a C-Media chip (which is also employed for use with the modem), and a quality set of Creative Soundworks Digital speakers is included to blast the sound out. The motherboard has a 128MB memory module slotted into one of the two available DIMM slots.

This Panrix has neither vacant bays,

LOOKING SOMEWHAT LIKE a video recorder without a time display, Panrix's entry wins the prize for the system that looks least like a PC. Built primarily as a low-cost alternative to conventional PCs, Panrix expects to supply the V-Box without a monitor, leaving the user to connect it to a television. However, our review unit came with a ViewSonic 17in monitor, or you could have a dark grey monitor (to match the case) if you want a matching ensemble.

nor any slots for upgrade, although for the target user, this is unlikely to be a concern. A Panasonic SR-8584A DVD and a floppy drive fill the only available drive bays, while a 15.3GB Maxtor 91531U3 hard drive deals with storage. In terms of software Microsoft Works 2000 is bundled in.

This low-cost move away from PC convention is interesting. Only one thing concerns us, and that is the quality of the image on a television. With lower resolution, web pages and especially text tend to look fuzzy; and doing any kind of high-intensity work on a TV will perhaps be a bit of a headache.

DETAILS

PRICE £821.33 (£699 ex VAT)
CONTACT Panrix 0113 244 4958
www.panrix.com

PROS Inexpensive and unique solution to PC construction
CONS If you opt for the V-Box without a monitor, viewing on a television will perhaps be a bit of a strain
OVERALL Interesting, low-cost alternative to a standard PC

FEATURES	★★
PERFORMANCE	★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Simply Systemax P750 RV Perf



included, all the software you'll need is available for working at home.

The case itself is satisfyingly small, yet the front still has room for a floppy drive, as well as two USB ports and headphone and microphone sockets. A Compaq DVD is also mounted on the front, although unlike Hi-Grade's entry, it is a laptop model. There is also the option of mounting the case vertically with the included stand.

Opening the chassis reveals a Tardis-like quality, with the components and the Intel 810-based Q-lity FlexATX motherboard neatly fitted in. The motherboard has room for only a couple of upgrades: one DIMM slot is free, the other being filled by a 128MB PC100 SDRAM module; and there is one PCI slot, which is free because the Motorola modem occupies the AMR slot.

Sound is onboard, in the form of a Creative SoundBlaster PCI 128, and this

SIMPLY'S ENTRY IS a small, tidy looking box, let down by only one thing: the CTX PR705 monitor is too large. It is not a bad monitor – far from it, the image is crisp and the colours vibrant. It's just that a 15in monitor, or a TFT display, would have been more in keeping with a small unobtrusive PC.

Pumping along with its Pentium III 750MHz, this machine will be more than adequate for surfing the net, and with Microsoft Office Small Business Edition

pipes out to Creative SBS52 speakers. With the inclusion of a microphone and a Creative WebCam3, with its maximum resolution of 640 x 480, the opportunity is there for a bit of home video dabbling – and it works remarkably well. The 20GB Maxtor hard disk is of a reasonable size for this task, but saving too many videos will soon fill it up.

This PC looks good, and the webcam helps to make it fun and versatile. Office 2000 Small Business Edition makes this a good system for work as well. Only the large monitor lets it down. In our opinion, it is a bit too big. Apart from this, though, this is an excellent machine.

DETAILS

PRICE £1,173.83 (£999 ex VAT)
CONTACT Simply 08707 297 366
www.simply.co.uk



PROS Small, compact case; webcam
CONS Monitor, although a high-quality unit, is a little too large to be unobtrusive
OVERALL An excellent system and a worthy winner of an award despite the size of the monitor. If you don't mind that, this is a very good value system

FEATURES	★★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★



Time Time Machine 750-7f VQ Pro



WITH THE FRONT of its case shaped like the heads of the battle droids in *Star Wars Episode I*, the Time Machine's design is certainly intriguing. There's even a silver handle on the top, in case you need to move it around. You'll either love the way it looks, or loathe it.

The processor is a 750MHz Athlon, and with the AMD 750 chipset-based micro ATX MSI motherboard and 128MB of PC100 SDRAM occupying one of two available DIMM slots, this

machine is no slouch, despite its size. Its SYSmark rating of 134 and Quake III score of 29.2fps make this one of the preferred units for those looking for a small PC with a bit of scope for game-playing. With its onboard nVidia TNT2 64 chip with 32MB of SDRAM powering the graphics, this performance isn't that surprising though.

Storage comes in the form of a Fujitsu 20GB hard drive, and there is also a floppy drive. A

Pioneer DVD means you can read CDs at a respectable 40-speed and DVDs at 10-speed.

Inside the case a Winmodem is slotted into one of three PCI slots, leaving some room for upgrades. The internals are neatly set out; with cables carefully tied back, and there is even an extra fan to make sure it all stays cool.

Audio is onboard, in the form of a Creative Audio PCI 128. The output from this is pumped to two Time-

branded speakers designed to match the case. The 15in Time-branded Samtron monitor, on the other hand, doesn't follow suit to complete the look. The monitor is a good size for a relatively unobtrusive PC, although the image isn't the sharpest in the world.

The standard Time extras and software are included: a joystick and gamepad and a standard software pack, including Lotus Word Pro Millennium for word processing and 1-2-3 for spreadsheets, among other packages. This is a well-specced PC but it doesn't really fall into the same slimline category as much of the competition

DETAILS

PRICE £821.32 (£699 ex VAT)

CONTACT Time 01282 777 555

www.timecomputers.com

PROS Inexpensive, good performance, decent graphics

CONS The case will appeal to some, but will put others off; larger than other systems

OVERALL As an inexpensive machine in a relatively small case, this system is good value, if aesthetically a little different

FEATURES	★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Viglen Incepta



THE VIGLEN INCEPTA is a compact unit indeed, and in a daring move away from the drab beige colour of most cases, the Incepta comes in navy blue, with the Viglen logo emblazoned vertically down the front of the case. Totally legacy-free, there are USB ports (two front and two rear) and no other sockets at all – except to connect the modem to a telephone socket. The keyboard and mouse use two of the USBs, leaving two free for the addition of peripherals.

Strapped onto the Intel 810 motherboard is a respectably powerful 700MHz Pentium III, plus a single 128MB PC100 memory module, leaving one DIMM slot free.

Sound requirements are onboard in Intel's Sound-max Digital Audio, with output piped to Altec Lansing LCS33 speakers.

The Fujitsu 10GB hard disk is fairly small by today's standards, but it will be adequate for most home users. Also worthy of note, in light of the smaller hard disk, is that

the Incepta has no floppy drive, so nothing can be saved external to the machine (although an external USB Zip drive, or something similar, would address this issue). For accessing the Internet, a mini PCI modem is fitted into the only available (mini) PCI slot, which means upgrades all have to be external, and USB driven. For optical reading, a vertically mounted, black Teac DVD drive is installed at the front of the case.

Driven by onboard graphics is a

Viglen 15RX-TA 15in TFT flat panel. The quality of this was fairly mediocre, as the colour representation and lighting from top-to-bottom was not particularly regular. However, colours were vibrant and focus was good. The TFT panel in combination with the small case will certainly make this PC a talking point.

With Microsoft Works Suite 2000, this unit has a strong software package, since Word 2000 is the preferred word processing option; and for £1,350.08 inc VAT, it isn't too expensive either. Overall, the Incepta is small, different looking, yet has most of what you require for a small fully functional home PC.

DETAILS

PRICE £1,350.08 (£1,149 ex VAT)

CONTACT Viglen 020 8758 7000

www.viglen.co.uk

PROS Small machine with strong software

CONS TFT screen wasn't the best quality; no removable storage

OVERALL As a small, stylish looking unit, this one is up there with the best, although it's not very feature rich

FEATURES	★★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★

Any colour as long as it's beige?

A computer is ultimately nothing more than a versatile tool, or is it? Admittedly its roots are firmly in the realms of functionality, but can the modern computer's status really be reduced to a mere tool? With email and the Internet being used more and more for non-work purposes, computers are as much a part of personal life as of our professional lives. It is therefore strange that the PC's looks have remained so functional when a more stylish look would be more in keeping with its home use.

As this group test has shown some steps are being taken to make the PC look a bit trendier, but there is still a long way to go as the standard colour schemes of most of the test systems highlight. Of course it doesn't have to be this way, as Apple has shown with the iMac.

It is likely that if you asked someone to imagine the most stylish computer they could, their mind would drift to the curvaceous all-in-one form of Apple's iMac. What Apple has observed is that in the same way that people like objects such as their telephone to look a bit cool, they want their computer to look good too. As a result, the iMac is physically different in almost every way from a PC, and looks far more like part of your home décor than a business device. All its components are built into the monitor casing, which is

decked out in clear plastic allowing the world to see the slick innards, and the keyboard and mouse are also similarly translucent.

Specification-wise, the iMac is not dissimilar to a PC. It has a processor, a G3 clocked at between 350MHz and 500MHz, although due to the architecture of both the G3 and the new G4 processor, there is no real comparison of clock speeds with Pentium IIIs and Athlons. A comparable amount of memory to PCs is installed, either 64MB or 128MB; and there are all the other usual components too: up to a 30GB hard disk, a CD-ROM/DVD drive, and a built-in 56K modem. The graphics solution is provided by an ATI Rage 128 Pro with 8MB of SDRAM; and the audio system is integrated into the main unit. This could all be straight from a PC specification sheet, yet the packaging makes the iMac appeal to a totally different audience.

And the nightmare doesn't end there for the PC manufacturers, because Apple hasn't been sitting on its laurels since it released the iMac and has let loose the Power Mac G4 Cube. Even the name sounds like something you'd want in your living room, somewhere between your lava lamp and your stylish mini hi-fi. The cube, although not truly cube shaped, is a mere 24.8cm tall with its width and depth both 19.5cm, making it extremely small and unobtrusive, but as powerful a computer as any home user will need.

Another threat to the home PC market is the Sega Dreamcast, an alternative to both the PC and the iMac for email and Internet browsing.

Although primarily a console, with a keyboard (which only costs £20)



Apple's new Cube is small, stylish, powerful – and not beige

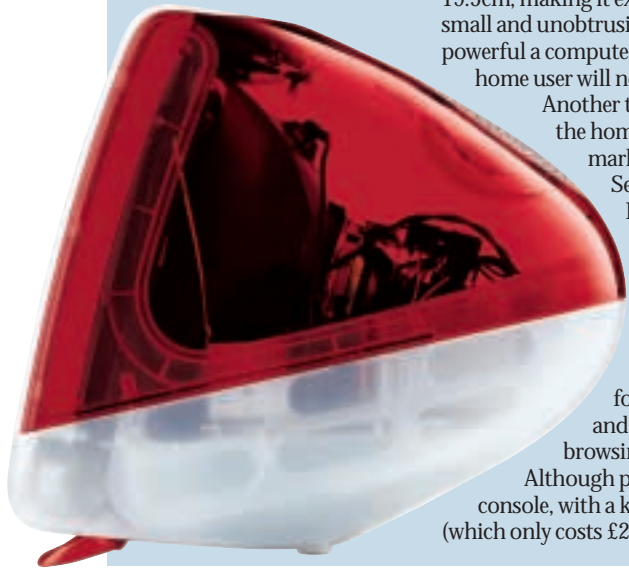
emailing and the Internet become a possibility. There is an obvious television screen resolution issue with this solution, and it does not have the versatility of either the iMac or a PC. But then when the primary use is online gaming, the option of email and web browsing is an attractive extra; and no doubt web pages will be optimised for television viewing in the near future, which will increase the appeal of the games console over a computer as an email and surfing solution, especially taking the cost differential into account.

Another option for a move away from PC convention is a laptop docking station from manufacturers such as Hewlett-Packard. This allows a laptop to be shared between work and home environments. The laptop gives the versatility of a mobile computer, but there is the option of docking it at a static location where, along with the station itself, it attains all the functions of a full PC.

The docking station can have a greater number of input and output sockets than a laptop, such as SCSI and PC Card slots, as well as allowing further hard drives and CD/DVD-ROM drives to be fitted. A screen, keyboard and mouse have to remain with the station (which doesn't work without the laptop) but at least the overall look is different to the conventional PC – and they don't all come in beige either.

Ultimately, most people would like their computers to look good, as well as perform well. Considering the way current motherboards and graphics cards look, PCs would doubtless look as good as the iMac if the interior was visible. Apple has shown that style can be achieved in a computer. We say it's time for the PC to undergo a similar metamorphosis so it can also display a level of stylishness more in keeping with the modern household item that the computer has become.

SCOTT MONTGOMERY





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.

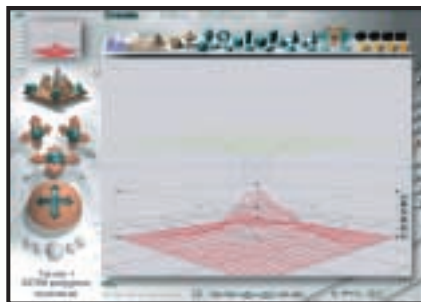
Office productivity

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



Bryce 4 script manipulates a wire frame scene and renders it

charts, applying graphics and sound effects, and adding movie files.

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)

Dragon NaturallySpeaking Preferred 4.0

The script plays a pre-recorded wav file into NaturallySpeaking, 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 1,024 x 768 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

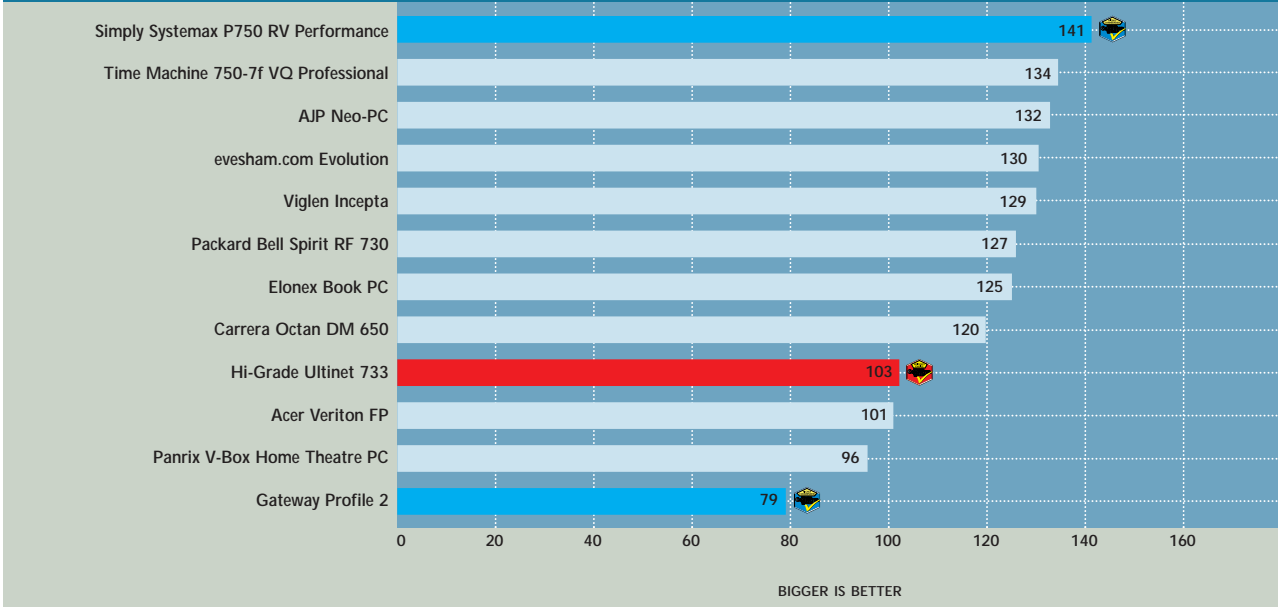
We tested each system's OpenGL performance with Quake III: Arena (1.11).

The settings were: video mode - 1,024 x 768, colour depth - 16bit, full screen, highest texture detail, texture quality - 16bit, texture filter - bilinear, lighting and lightmap.

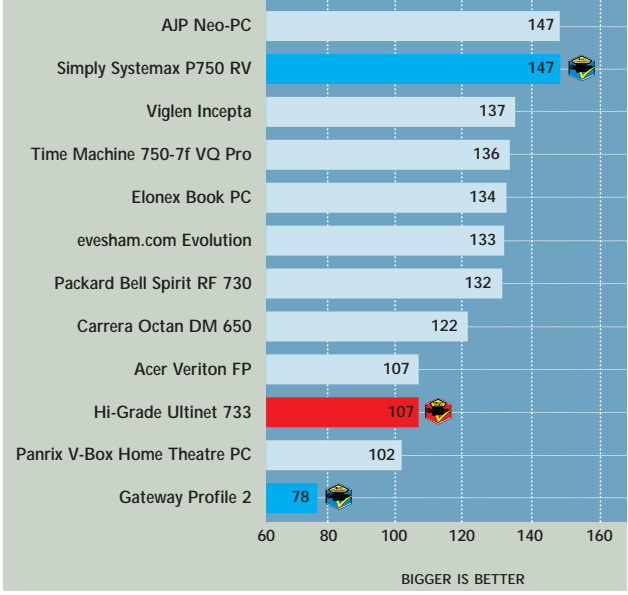
At command prompt we typed:
`timedemo 1`
`demo demo001`

This runs demo 1 and records the frames per second.

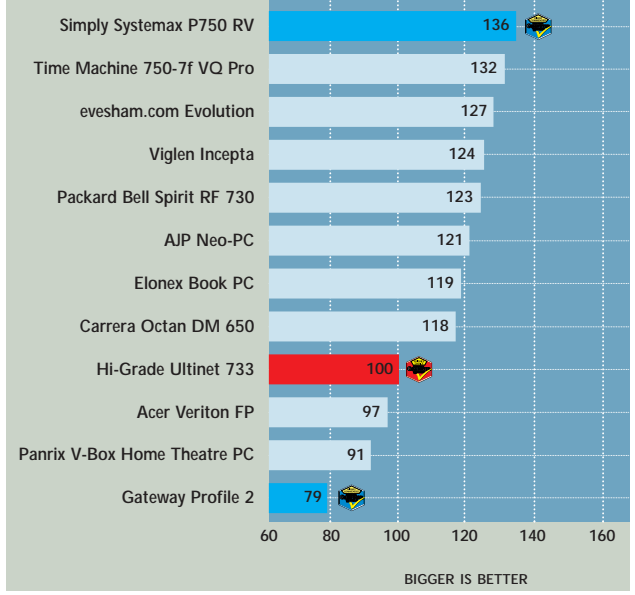
SYSmark 2000 overall



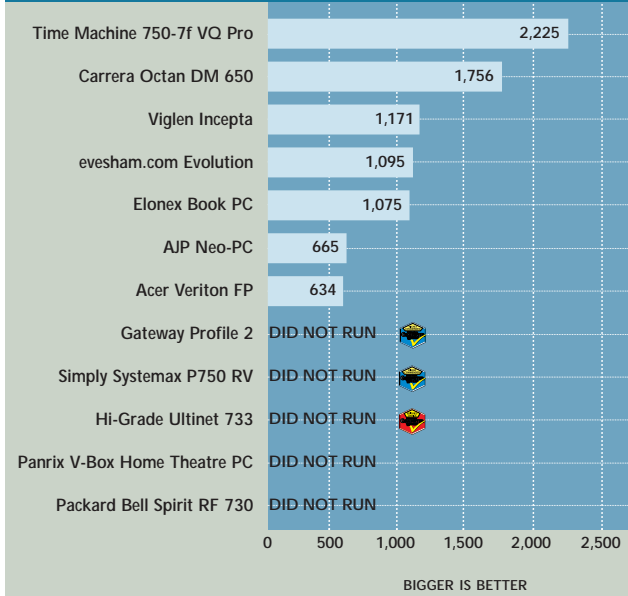
SYSmark 2000 Internet content creation



SYSmark 2000 office productivity



3DMark 2000



Quake III (fps)

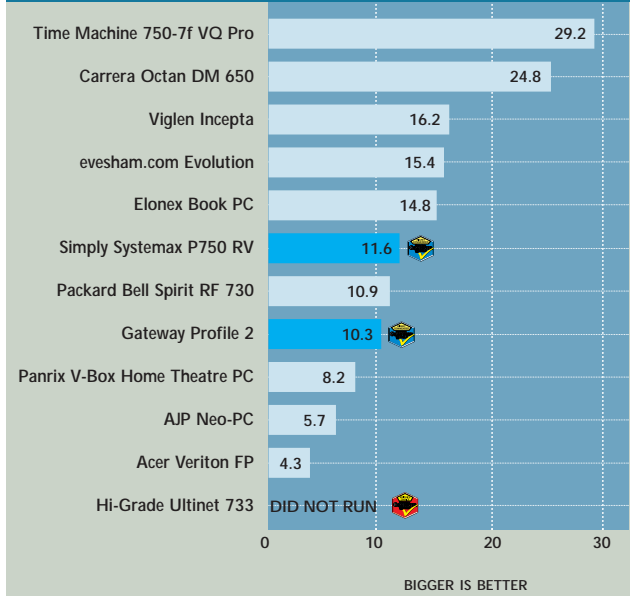










Table of features						
						
MANUFACTURER	ACER	AJP	CARRERA	ELONEX	EVESHAM.COM	
MODEL NAME	VERITON FP	NEO-PC	OCTAN DM 650	BOOK PC	EVOLUTION	
Price inc VAT (ex VAT)	£2,113.82 (£1,799)	£1,976.35 (£1,682)	£938.93 (£749)	£1,065 (£899)	£1,291.32 (£1,099)	
Telephone	0870 900 2237	020 8208 9755	020 8307 2800	020 8452 4444	0800 038 0800	
HARDWARE SPECS						
Processor	Pentium III 500MHz	Pentium III 750MHz	AMD Duron 650MHz	Pentium III 733MHz	Pentium III 700MHz	
RAM/type	128MB/PC100	128MB/PC100	128MB/PC100	128MB/PC133	128MB/PC133	
Occupied RAM slots/spare RAM slots	1/1	1/1	1/2	1/1	1/0	
Max memory in this configuration	384MB	256MB	1.1GB	384MB	128MB	
Maximum memory supported by motherboard	512MB	256MB	1.5GB	512MB	256MB	
Hard disk (manufacturer and model)	Quantum Fireball Plus KA	Quantum Fireball QML20400LB	Western Digital WD15 3BA	Fujitsu MPE3273AH	Maxtor 52049U4	
HD size/interface	13GB/EIDE	20.4GB/EIDE	15GB/EIDE	27.3GB/EIDE	20GB/EIDE	
Storage drive model and manufacturer	N/A	N/A	Ricoh Combo MP9060	N/A	Samsung Combo SM-304B	
Size of storage drive media/storage drive interface	N/A	N/A	650MB/EIDE	N/A	650MB/EIDE	
3.5in floppy drive	✓	✓	✓	✓	✗	
MOTHERBOARD COMPONENTS						
Motherboard manufacturer	Acer	Mitac	Biostar	MSI	Intel	
Model/chipset	V66LT/Intel BX	67X/Intel 440BX	M7VKA/VIA KT133	MS6174/Intel 810E	MO810E Desktop/Intel 810E	
EXPANSION AND I/O						
No of 3.5/5.25in bays	1/0	1/0	3/2	2/1	1/1	
No of free 3.5/5.25in bays	0/0	0/0	1/1	0/0	0/0	
No of PCI/ISA/shared/AMR slots	1/0/0/0	1/0/0/0	2/0/0/1	2/0/0/0	1/0/0/0	
No of free PCI/ISA/shared/AMR slots	1/0/0/0	1/0/0/0	2/0/0/0	1/0/0/0	0/0/0/0	
No of USB/serial/parallel/PS/2	2/1/1/2	2/1/1/2	2/2/1/2	2/2/1/2	4/0/0/0	
MULTIMEDIA						
DVD manufacturer/model	CD-ROM: Panasonic CR175	Hitachi GD-S100	Ricoh Combo MP9060	CD-ROM: Mitsumi SR242S	Samsung Combo SM-304B	
DVD speed/interface	N/A	6x/EIDE	4x/EIDE	N/A	4x/EIDE	
Sound card manufacturer	ESS	Crystal (onboard)	Onboard	Onboard	Creative (onboard)	
Sound card model	Solo	Sound Fusion Audio	VIA KT133	Yamaha AL-XG Audio Device	SB Audio PCI 128	
Speakers (manufacturer and model)	Integrated	Integrated	Altec Lansing ACS22	Creative SBS20	Creative SBS52	
Graphics card manufacturer and model	ATI Rage LT Pro (onboard)	Onboard	OEM TNT2 M64	Onboard	Onboard	
Chipset	Rage LT Pro	ATI 3D Rage LT Pro	TNT2 M64	Intel 810E	Intel 810E	
RAM/max RAM and type	8MB/SDRAM	8MB/SDRAM	32MB/SDRAM	4MB/SDRAM	4MB/SDRAM	
Graphics card interface	Onboard	Onboard	Onboard	Onboard	Onboard	
Monitor manufacturer/model	Integrated flat panel	Panasonic integrated MEDTCF02QEF	LG 775N	ELX MN017HS	Vibrant VM52RDA-E02	
Monitor size/max viewable diagonal	15in/15in	15.1in/15.1in	17in/16in	17in/16in	15in/13.8in	
Maximum resolution and refresh (Hz)	1,024 x 768/60	1,024 x 768/60	1,280 x 720/75	1,280 x 1,024/75	1,024 x 768/60	
OTHER INFORMATION						
Modem manufacturer and model	Standard 56K PCI modem	Apollo Fax/Modem FM560	HAMR 5600 Voice Modem	Conexant HCF V.90 56K PCI	Diamond Supra SST 56i Pro DF	
Misc hardware	Intel 82558-based integrated Ethernet, IrDA port, ASM Pro Suite V.1	AMD Family 10/100 Ethernet adaptor, IrDA port	None	Intel 82559 Fast Ethernet (onboard), DFPI connector, IrDA port	Intel Ethernet LAN onboard	
Bundled software	None	MS Works Suite 2000	Lotus SmartSuite Millennium	MS Office 2000 Small Business Edition	MS Works Suite 2000	

	 GATEWAY	 HI-GRADE	PACKARD BELL	PANRIX	 SIMPLY	TIME	VIGLEN
	PROFILE 2	ULTINET 733	SPIRIT RF 730	V-Box HOME THEATRE PC	SYSTEMAX P750 RV PERFORMANCE	TIME MACHINE 750-7F VQ PRO	INCEPTA
	£1,643.82 (€1,399)	£1,373.58 (€1,169)	£1,899 (€1,616)	£821.33 (€699)	£1,173.83 (€999)	£821.32 (€699)	£1,350.08 (€1,149)
	0800 552 000	020 8532 6111	01628 508 200	0113 244 4958	08707 297 366	01282 777 555	020 8758 7000
	Intel Celeron 500MHz	Pentium III 733MHz	Pentium III 733MHz	Celeron 600MHz	Pentium III 750MHz	AMD 750MHz	Pentium III 700MHz
	64MB/PC100	128MB/PC133	128MB/PC100	128MB/PC100	128MB/PC100	128MB/PC100	128MB/PC100
	N/A	1/1	1/1	1/1	1/1	1/1	1/1
	N/A	384MB	384MB	384MB	384MB	384MB	384MB
	N/A	512MB	512MB	512MB	512MB	512MB	512MB
	IBM Deskstar DPTA-372050	Fujitsu MPE3204AH	Maxtor 32049U3	Maxtor 91521U3	Maxtor 52049U4	Fujitsu MPE3204AT	Fujitsu MPF3102AT
	20.5GB/EIDE	20.4GB/EIDE	20.4GB/EIDE	15.3GB/EIDE	20GB/EIDE	20GB/EIDE	10GB/EIDE
	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	✓	✓	✓	✓	✓	✓	✗
	Gateway	Chaintech	MSI	PC-Chips	Q-lity	MSI	Intel
	Intel 810	6SLV/SIS 630	MS-6303/Intel 810E	Panrix OEM/Intel 810	CP810-F1/Intel 810	MS6316/AMD 750	GS810/Intel 810
	N/A	2/1	1/1	2/1	1/0	3/2	1/0
	0/0	0/0	0/0	0/0	0/0	1/1	0/0
	N/A	0/0/0/1	2/0/0/1	0/0/0/0	1/0/0/1	3/0/0/0	1 mini PCI/0/0/0
	N/A	0/0/0/0	2/0/0/0	0/0/0/0	1/0/0/0	2/0/0/0	0/0/0/0
	4/0/0/0	2/1/1/2	2/1/1/2	2/0/1/2	4/1/1/2	2/1/1/2	4/0/0/0
	Toshiba DVD SD-C2302	Asus E608	Pioneer DVD114	Panasonic SR-8584A	Compaq DRD-U624	Pioneer DVD-104S	Teac DV-25E
	12x/EIDE	8x/EIDE	10x/EIDE	6x/EIDE	6x/EIDE	10x/EIDE	5x/EIDE
	Soundmax	SIS (onboard)	Onboard	C-Media	Creative (onboard)	Creative (onboard)	Onboard
	AudioCodec 97	SIS 7018	Intel 810E	CM18738/C3DX PCI	SB Audio PCI 128	SB Audio PCI 128	Intel 810 Soundmax Digital Audio
	Integrated	Integrated	NXT FPS-1EP(B)	Creative Soundworks Digital	Creative SBS52	Time speakers	Altec Lansing LCS33
	Onboard	Onboard	Onboard	Intel 810	Onboard	Onboard	Onboard
	Intel 810	SIS 630	Intel 810E	Onboard	Intel 810	nVidia TNT2 M64	Intel 810
	4MB/SDRAM	8MB of system memory	4MB SDRAM	2MB system memory	4MB SDRAM	32MB/SDRAM	4MB/SDRAM
	Onboard	Onboard	Onboard	Onboard	Onboard	Onboard	Onboard
	Gateway PFL2-15A (integrated)	X-TAL 6220 TFT	Packard Bell Slimview S525	Viewsonic E70	CTX PR705	Samtron 55E (M) (plus)	Viglen 15RX-TA flat panel
	15.1in/15.1in	15in	15in/15in	17in/16in	17in/16in	15in/14in	15in/15in
	1,024 x 768/60	1,024 x 768/60	1,024 x 768/60	1,024 x 768/75	1,280 x 1,024/75	1,024 x 768/75	1,024 x 768/75
	Motorola SM56 AC-L	Standard AMR modem	AMR modem MR 2800-W	C-Media 56K	Motorola SM56 AC-L	WinModem 56K	3Com Mini PCI Datafax Modem 56K
	Intel 21145-based phone/Ethernet controllers	2x FireWire sockets, DVI, S-Video, composite out IrDA port, SIS 900 PCI Fast Ethernet	Microphone	SIS 900 Network (onboard)	Creative WebCam3 Microphone	Joystick, gamepad headset & microphone	Network Card 10/100 Intel-based (onboard)
	MS Works Suite 2000	Lotus SmartSuite Millennium	MS Works & Word 2000, Packard Bell Spirit CDs	MS Works 2000	MS Office 2000 Small Business Edition	Time standard software pack, MS Works	MS Works Suite 2000



Editor's Choice

The judging this month was exceptionally hard, because so many of the systems were good in different ways. The manufacturers followed three directions. First, Time and Carrera opted for basically a standard PC, but in the smallest conventional case available. These units are not only the most upgradable, but are also fast enough to indulge in a little gaming. Both have an onboard TNT2 chip and 32MB of video SDRAM, so the graphics processing, although not state-of-the-art, is good enough to run games. So, if it is just a small PC you need, with some upgradability and a bit of pace, then either of these will be in the running.

Other entrants are built around a fully integrated unit, with speakers and a TFT screen attached to the main body of the PC and only the keyboard and mouse plugging in. This is a lot more expensive and most of the models have been designed more for business environments than as cheap and stylish home PCs. As a result, they have virtually no options for upgrade, as the design is for the user who wants something to look good as well as perform. But then let's face it, an amateur 'hotrod' PC builder will want a giant case, with lots of fans and good two-hand access, not a curvy all-in-one case with built-in TFT. The bottom line is that this type of unit fits a niche, and if money is no object it's worth a look.

AJP's entrant has a screen that almost looks like it's hovering in front of the rest of the case, while the Gateway Profile 2 has a TFT screen image was second to none.

The third approach was to use ultra-small cases not much bigger than a stack of five PCW issues. In combination with a TFT flat panel, these are as small and unobtrusive as a PC can be while still being functional. Unfortunately, some of these units came with 17in monitors. This is a pity as it doesn't matter how small the PC case is if you need to find space for a large monitor. The PCs from Viglen and Hi-Grade, by contrast, have small cases and TFT screens, which in our eyes, was the most stylish combination. Unfortunately, in Viglen's case this wasn't backed up by lots of features and the TFT screen was not the best.

The winners

This month's **Editor's Choice** is the Hi-Grade UltiNet 733. This unit has everything a small PC should have to be versatile, while being so stylish that you'd actively encourage people to look at it when they visit your home. The case is small and compact, yet Hi-Grade has managed to fit in a full-size Asus DVD and a floppy drive. Not only do these feel more robust to use than laptop equivalents (used in many of the other units), but also in the event of failure of either of these drives, there will be a great financial saving when replacing them.

The UltiNet 733 has such a vast array of versatile inputs, that the competition is left standing. Where some of the systems in this group test had USB and little else, Hi-Grade's PC not only offers USB, but also DVI, composite video, S-Video, as well as being one of the first systems we've seen with integrated FireWire

sockets. This will appeal to the video-editing enthusiast, and the 733MHz processor and 128MB of SDRAM is adequate to battle through the processing of this and any other task. There's a spare DIMM socket to boost the memory to 384MB. As for storage, a good-sized 20.4GB Fujitsu hard disk gives plenty of room, although video editing will soon use up the space. Completing the stylish ensemble is a TFT screen. The UltiNet is small, good looking, versatile and well priced. Need we say more?

As for this month's **Highly Commended** awards, the first goes to the Gateway Profile 2. Cheapest of the integrated units, this machine looks almost organic with barely a straight edge on it. The TFT screen was second to none in the tests, with a bright, sharp, focused and regular image, which is presented at a good viewing height. Driven by a Celeron 500MHz backed up by 64MB of SDRAM, it isn't the highest specification, but as a stylish PC, it wins the first award hands down.

The second award goes to the **Simply Systemax P750 RV Performance**. Despite its large screen, there is just too much about this PC to not recommend it. The monitor is of excellent quality, our only criticism being over its physical size. The small case houses the Pentium III 750MHz; Microsoft Office SBE ensures that all office applications will be handled easily; and Creative's WebCam makes it a fun and versatile system as well. As an overall bundle it may not be the most unobtrusive, but it certainly deserves a Highly Commended award.



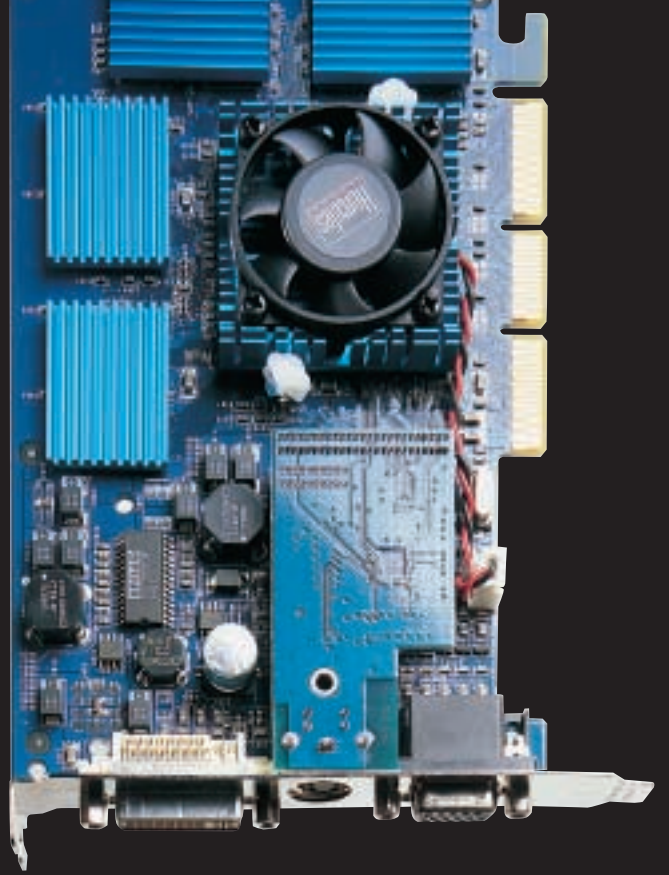
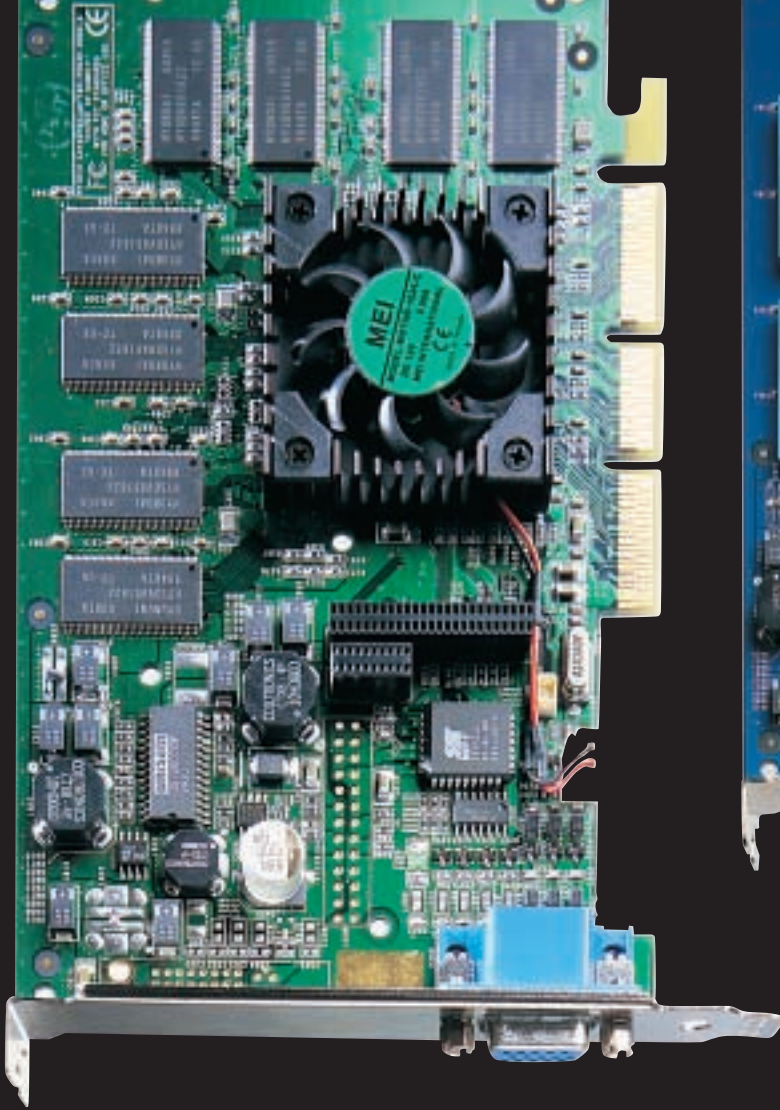
Hi-Grade's UltiNet is a versatile and stylish system you'd be proud to show off



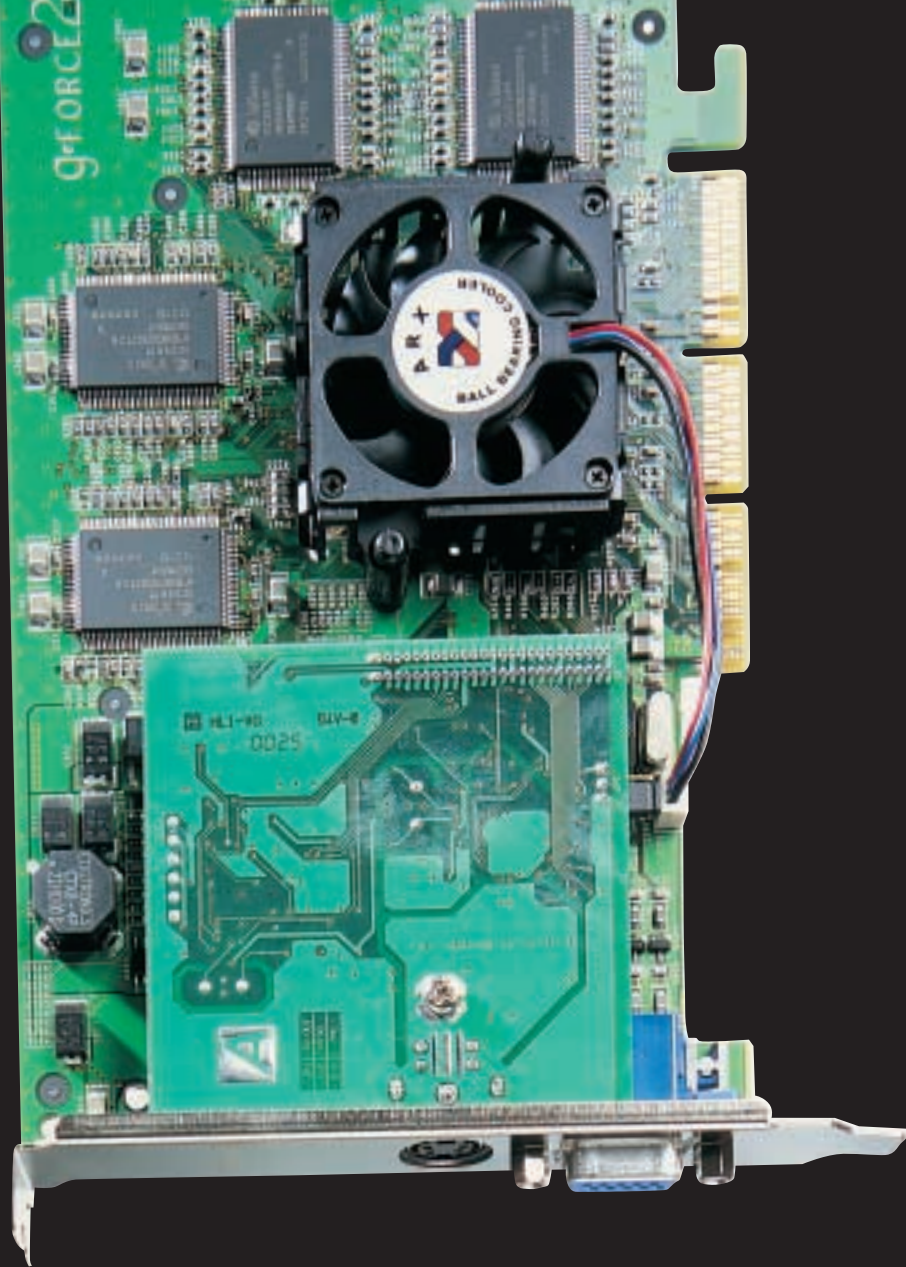
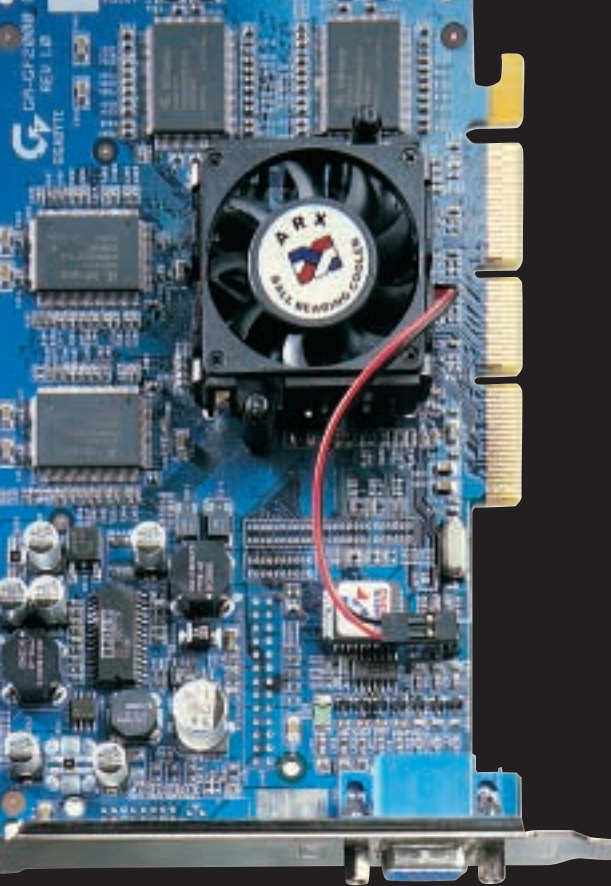
The curvy Gateway stood out with its high spec, great screen and low cost



Simply's large screen was not enough to put us off and the WebCam adds a bit of fun



Pixel perfect



Gamers are always looking for the best and fastest graphics cards, so we took a look at 14 of the best around to see how well they performed under rigorous tests in our labs

Over the past few years and since our last group test back in December, graphics cards have undergone many changes. With the rendering process moving from the PC's CPU to the graphics card's GPU (graphics processing unit) together with increases in memory size, these cards have now become very desirable upgrades – especially for the gaming enthusiast. This demand for top-quality graphics and 3D acceleration continues to be fuelled by the gaming community and has given rise to a very competitive market akin to the one being thrashed out between PC processor manufacturers.

One of the main players in this field is nVidia and its release of the GeForce 256 GPU last year heralded a new era in graphics card technology. The card had its own T&L (Transform & Lighting) engine that ultimately took load away from the CPU. Barely six months later, and in true Intel/AMD style nVidia released the GeForce2 GTS chipset to supplant the older card. This runs faster and cooler, and has been incorporated into many of today's graphics boards. However, nVidia is not alone, with the likes of ATI and 3dfx producing cards based solely on their own chip designs.

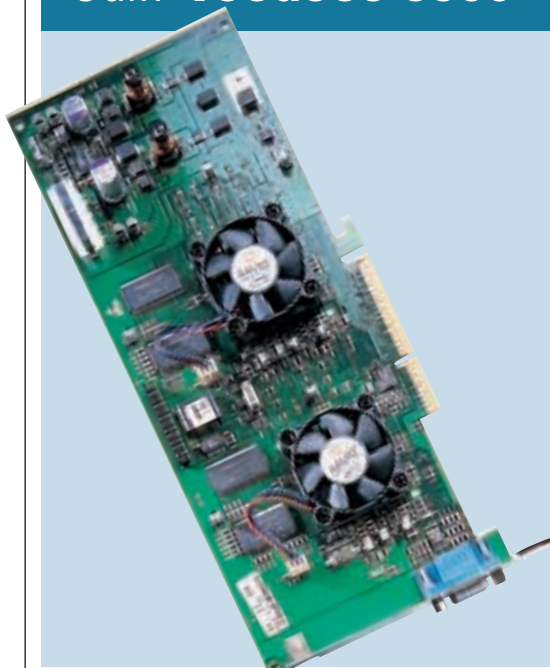
So, to find out who has made the best use of nVidia's technology, and to see how the independent contenders fair, PCW has rounded up 14 of the best and latest cards and challenged each to run our gauntlets.

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• Graphics cards tested and reviewed by Riyad Emeran, Scott Montgomery and Jalal Werfalli

3dfx Voodoo5 5500



Performance results show it languishing near the bottom of almost every graph. When we first heard about the Voodoo5 at Comdex last November we were expecting it to wipe the floor with its peers, due to its dual-chip configuration, but unfortunately it didn't live up to expectations. 3dfx has also chosen not to equip the Voodoo5 with either transform and lighting (T&L) or hardware environment bump mapping features.

What 3dfx has equipped the Voodoo5 with is full scene anti-aliasing (FSAA), which basically blurs the edges of polygons to make 3D models have smoother curves. There are, however, a couple of problems with this

WHEN WE LOOKED at the full retail release of the Voodoo5 5500 last month we had warmed to it a little since the initial preview the previous month. That said, it's only when the Voodoo is up against a full range of its peers that its inadequacies become truly evident.

feature. First, the performance takes a serious hit when the FSAA is applied and second, both the GeForce2 and the Radeon chipsets also support it. That said, the FSAA on the Voodoo does look very good, especially on games such as Tomb Raider, and the Voodoo has the

added advantage of having the largest back catalogue of 3D titles due to the proprietary 3dfx GLide API. This means that you could go back and play the first Tomb Raider episode with superior graphics, should you want to.

As well as the two VSA-100 chips, there's also 64MB of memory and a power socket. This board draws so much power that the AGP slot alone can't supply it with enough so it has to be connected directly to your power supply. This board is absolutely huge, so make sure your drive cage won't get in the way before you buy.

Ultimately, the Voodoo5 can't compete on performance, but if you want to get the best from your back catalogue games it's worth considering.

DETAILS

★★★★

PRICE £210.32 (£179 ex VAT)

CONTACT dabs.com 0800 138 5154

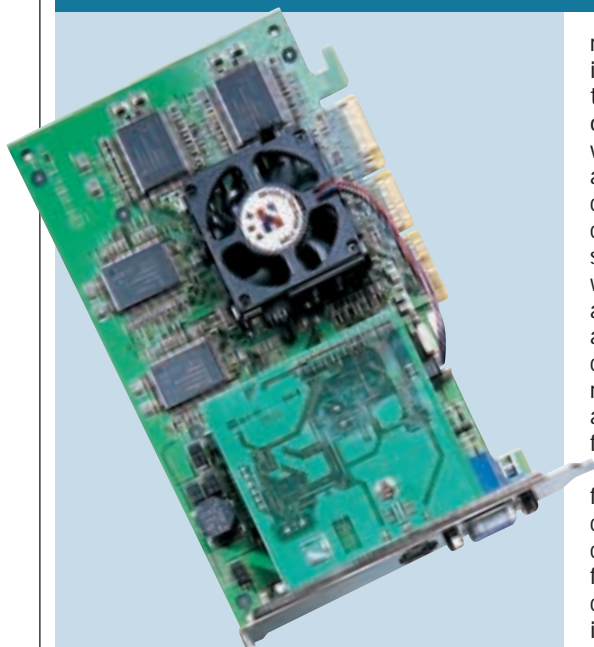
www.3dfx.com

PROS Reasonably cheap, good backward compatibility

CONS Poor performance, lack of features

OVERALL The Voodoo is eclipsed by the competition that has better performance and more features

AOpen PA256 Deluxe



required. The software also includes an OpenGPU utility that displays the temperature of your card, along with voltages across the memory and GPU, as well as the fan's current speed. For the compulsive overclocker, this same utility can be used to wind the frequency of the core and memory up to 255MHz and 450MHz respectively. The card is set to nVidia's recommended 200MHz core and 333MHz memory frequency.

Trying out the utility we found a few extra frames could be sucked out of the card by increasing the frequencies by around 10 per cent; any higher than this and it became unstable. You can also get quick access to the

THE AOPEN PA256 Deluxe was the easiest of all the cards tested to install. Most were fairly simple, but the AOpen involved only one click, then all the relevant software is transferred to your system, saving you the trouble of trawling the CD for drivers, which some cards

card's BIOS during POST (Power On Self Test), by pressing the Insert key. This allows you to reduce the overlocking before the operating system boots, if you've pushed it beyond its limits.

AOpen has gone for a conventional green PCB look. A riser board sits above

the main card, with the hardware for the S-Video socket built into it. The 32MB of SGRAM sits on both surfaces.

The AOpen's performance was among the best, regularly beating all but the 64MB GeForce2 cards, and with 28.5fps in Quake III at 1,600 x 1,200 with 32bit colour and textures, it's only marginally behind the ELSA Gladiac 64MB which managed only 28.7fps at the same resolution and colour depth.

With its easy install, a copy of InterVideo's WinDVD 2000 and a couple of games, the AOpen PA256 Deluxe is an excellent card. If you want to play Quake III with a GeForce2 card, and want it to look its best, this is worth a look.

DETAILS

★★★★

PRICE £249 (£212 ex VAT)

CONTACT Majestic Technologies

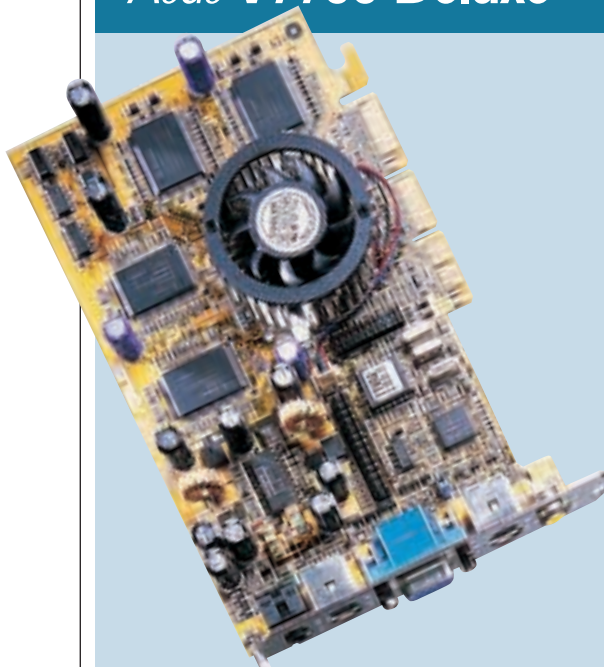
0845 6000 144 www.aopen.nl

PROS Excellent performance from a 32MB card

CONS More expensive than other 32MB models

OVERALL This card is one of the best performing 32MB cards in the test. With a good software bundle and TV-out, you could do a lot worse

Asus V7700 Deluxe



BASED ON THE V7700 (below), this Asus all-round multimedia card comes with a variety of outputs that extend its versatility. These include composite and S-Video out ports as well as an S-Video in port and it has all the necessary S-Video and composite leads to get you

up and running straight away.

Carrying on the tradition of its 'Deluxe' cards, Asus has included its 3D glasses that are meant to create a virtual reality environment for gameplay. We were not impressed as the 3D effect is minimal and makes on-screen text difficult to resolve.

The board has the same cosmetic circular fan as the V7700 Pure, bordered by the DDR SGRAM memory chips. These equate to a total of 32MB, running at two times 166MHz – typical of most of the nVidia GeForce2 GTS boards. The GPU core is clocked at 200MHz with the option of increasing this to 220MHz using the bundled Tweak Utility. Using the same tool the memory frequency

can be pushed to 364MHz if you dare.

In terms of performance, the V7700 Deluxe put in excellent scores in most of the tests. At a resolution of 1,280 x 1,024 with 16bit colour the card ranked third with a 3DMark score of 4,906. Elevating the resolution to 1,600 x 1,200

in 16bit, put the Deluxe in fourth place with a score of 3,702. As for Quake III the V7700 Deluxe did not fall beyond fifth place at all the settings, with frame rates of 77.5 and 27.3 for 1,280 x 1,024 in 16bit colour and 1,600 x 1,200 in 32bit colour, respectively. Test Drive 6 frame rates are adequate apart from the fail in the 1,600 x 1,200 at 16bit test, and the flickery 22fps at 32bit.

Driver installation went smoothly and you get a good selection of software. The card also comes with Asus Live Utility to view and capture video from the video input port.

Rather than appealing to the full-on gamer who wants a decent level of refreshing frames with great detail, this card will find a different market. You pay a premium for the extra features though.

DETAILS

★★★

PRICE £284 (£243 ex VAT)

CONTACT Ultimate Hardware

0845 1000 170

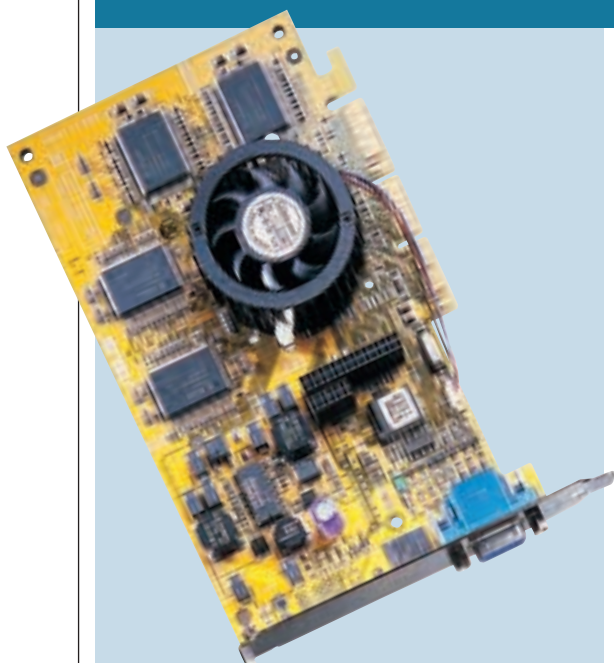
www.ultimate-hardware.co.uk

PROS A decent and versatile performer

CONS Relatively expensive

OVERALL A good set of features for the video enthusiast, or those concerned with security

Asus V7700 Pure



ASUS, POPULARLY known for its motherboards, was one of the first manufacturers to utilise the nVidia GeForce2 GTS chipset in a retail graphics board. The no-frills design of the Asus V7700 Pure is very similar to nVidia's reference card we previewed back in July.

The GeForce2 consumes less power and therefore produces less heat than the original GeForce. This suggests that the circular heatsink on the V7700 is more cosmetic, rather than offering any extra cooling over a standard square heatsink.

Like most of the other GeForce2-powered cards here, the core of the GPU on the V7700 is clocked at 200MHz, while the 32MB of DDR memory runs along at 333MHz. In 3DMark at 1,280 x 1,024 with 16bit colour, the V7700 scored an adequate 4,843, which ranks this card in ninth place. Like all the other 32MB GeForce2 cards tested this month, the V7700 failed to complete the 3DMark test at

1,600 x 1,200 with 32bit colour. Upgrading to the latest drivers when they are released may resolve this. In the Quake III tests at 1,280 x 1,024 with 16bit colour, the card scored 76.2fps placing it slap bang in the middle of the group. The V7700 also came top with a

very respectable 73fps in Test Drive 6 at the same resolution settings.

Although this model lacks the variety of outputs seen on the V7700 Deluxe, you have the option of adding a TV-out module at a later date. For software, Asus has included SmartDoctor and Tweak Utility, allowing you to monitor and adjust such hardware settings as fan speed and cooling, overclocking, overheating, and the AGP power level. Asus DVD2000 and a games package are also bundled so that you can watch DVDs and begin gaming on your PC.

At £269.07 inc VAT this Geforce2 model is a little overpriced and for the extra money you do not get any extra features. For a little more cash, you could go for either of the two Editor's Choices.

DETAILS

★★★

PRICE £269.07 (£229 ex VAT)

CONTACT dabs.com 0800 138 5144

www.dabs.com

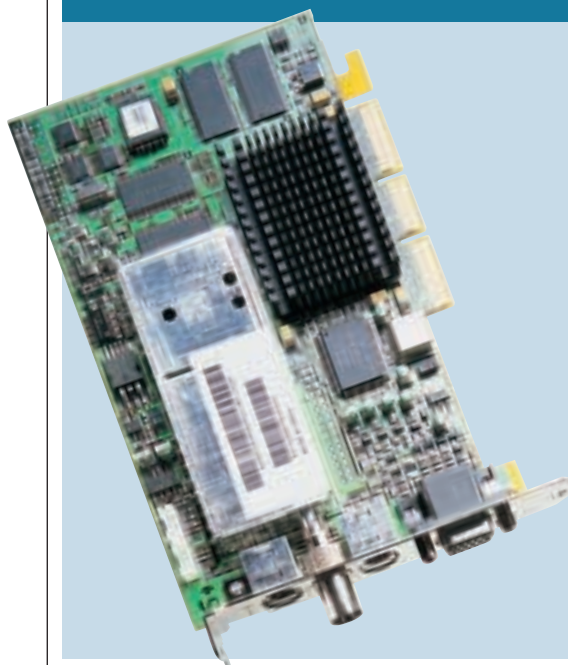
PROS The chipset and software utilities

CONS Expensive; no hardware features

OVERALL A middle-of-the-road graphics card that neither shone nor under-performed – difficult to recommend because of the price



ATi All-In-Wonder 128 Pro



INCLUSION OF THIS card from ATi may seem misplaced in what is a group test of fast gaming cards. That it is included is testament to its versatility and its niche in the video card market. It is an ideal solution for those interested in playing DVDs or editing video.

Although it is not the fastest 3D card in the world, when it comes to connectivity, it is a high-quality offering that is cheaper than the Asus V7700 Deluxe, which has similar features.

Based on ATi's Rage 128 Pro chip, the name All-In-Wonder is no misnomer when the possibilities for connectivity are considered. Not only does it have a multitude of input/output options (including S-Video and composite out), but cables are also supplied to ensure you have everything included in the box to attach your video peripherals.

With ATi cards known for quality DVD playback due to their excellent motion compensation, the All-In-Wonder removes the need to buy a separate MPEG2 decoder. This second card is usually required to gain the level of high-quality DVD playback achieved as standard with ATi cards, and as all the cabling is included to connect your PC to your TV (and with inclusion of a

3.5mm audio jack to stereo phono converter, to connect your sound card to your hi-fi), this is an ideal solution for you to turn your living room into an incredible home theatre. There's even a built-in TV tuner, complete with Teletext thrown into the bundle.

Admittedly, at the resolutions we were testing, the performance wasn't wonderful for 3D gaming. But then if you don't mind playing Quake III at 1,024 x 768 in 16bit, it will be more than adequate. If your main concern is video editing or DVD viewing, though, this card is ideal. Cheaper than most of the other entrants, the ATi All-In-Wonder 128 Pro is excellent value and extremely versatile.

DETAILS

★★★★★

PRICE £169.20 (£144 ex VAT)

CONTACT dabs.com 0800 138 5154

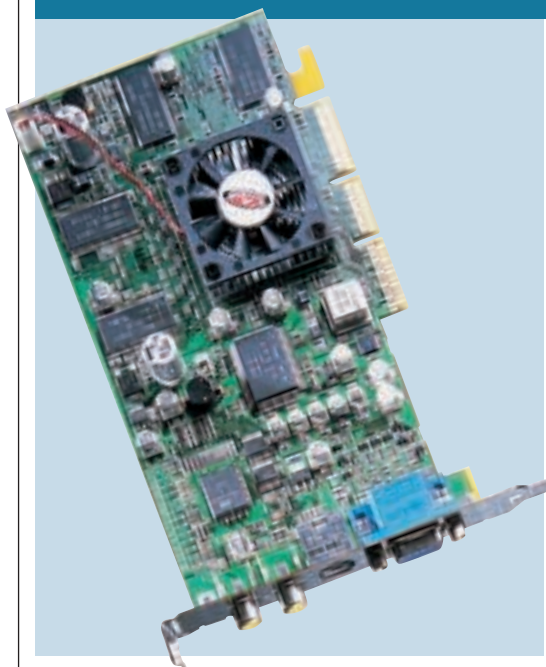
www.dabs.com

PROS Incredibly versatile card ideal for those with an interest in DVD and video editing

CONS Not a gaming card

OVERALL Overall If gaming is not your thing, then the All-In-Wonder is an excellent card for everything else you might want to do with your PC and video

ATi Radeon



WE PREVIEWED the ATi Radeon in August when it looked like ATi was about to pull something very special out of the bag. The production card proves that our initial reaction was justified and that ATi has produced a very impressive graphics solution. It's been a while since

ATi has come up with a cutting-edge graphics chipset, but the Radeon is a step in the right direction.

The original spec was for a 200MHz chip speed with corresponding 200MHz DDR memory, doubling up to 400MHz. Unfortunately a lack of fast DDR memory has resulted in the production Radeon boards sporting a 183MHz chip with 64MB of 183MHz DDR memory doubling up to 366MHz. This puts the processor speed 17MHz behind the GeForce2 chip, but the memory speed 33MHz ahead.

Performance-wise the Radeon couldn't keep up with the GeForce2 cards in 16bit colour, but switching to 32bit colour saw the Radeon rising to the top of the performance chart. The GeForce2 chipset has more raw horsepower due to its four pipelines as opposed to two on the Radeon. ATi could have equipped the Radeon with four pipelines, but decided to increase its feature set.

Like the GeForce2, the Radeon has an integrated T&L engine to offload geometry calculations from the CPU and leave it free for other duties. However, unlike many other cards currently available, the Radeon also supports hardware environment bump mapping. This creates far more lifelike surfaces without the need for massive polygon counts, but like T&L we're waiting for games to take full advantage of it.

As well as the most comprehensive 3D feature set, the Radeon also sports video in and video out (VIVO) capabilities, so you can use it for video editing as well as playing games. The ATi is good value, and has great features and 64MB of the fastest graphics memory around.

DETAILS

★★★★★

PRICE £299 (£254.46 ex VAT)

CONTACT ATi 01628 533 115

www.ati.com

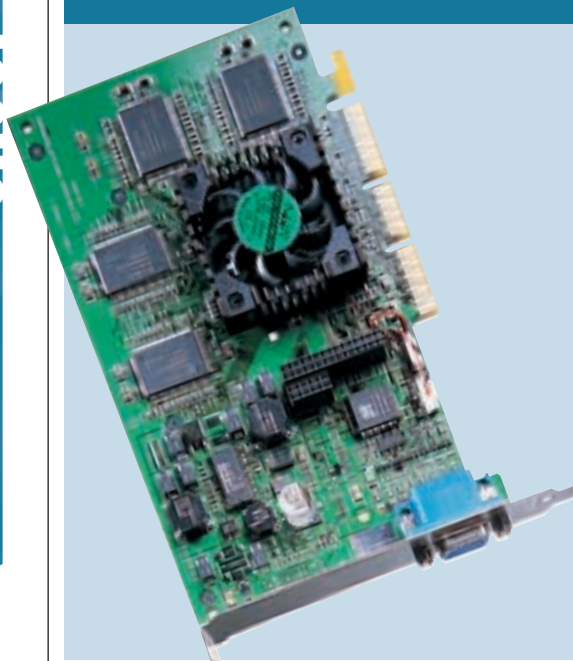
PROS The most feature-rich graphics card available

CONS Not as fast as the GeForce2 in 16bit colour

OVERALL A superb card from ATi, every feature you could want and 64MB of memory



Creative 3D Blaster GeForce2 GTS



THE 3D BLASTER is one of the cheapest 32MB versions of nVidia's new chipset at £215.02 inc VAT. This means it takes advantage of the 0.18micron die process, rather than the 0.22 process of the original GeForce. As with the other cards here this allows the GPU to run at

the higher clock speed of 200MHz. Curiously, the Creative's default setting was found to be 199MHz, and unlike the other graphics boards, it didn't have an overclocking facility. The memory nevertheless can be pushed up to 366MHz.

Driver installation was a slightly lengthy process with the option of installing Sonnetech's Colorific together with 3Deep to help you adjust the colour and display more accurately. BlasterControl 4.0 allows you to add shortcuts to the BasterControl interface, run the card in safe mode, and set the colours and refresh rate. It also gives info on the drivers and BIOS. You can also diagnose your

card and adjust the OpenGL and Direct3D settings.

As far as performance goes the 3D Blaster GeForce2 is much the same as the other cards with the same chipset and quantity of SGRAM. It scored 4,852 in the 3DMark test at a resolution of

1,280 x 1,024 in 16bit colour. As for frame rates at this setting the Creative managed 74.9 for Quake III and 69 for Test Drive 6. Moving on to 32bit colour and the story is much the same as the rest of the 32MB GeForce2 field with no results for 3DMark at 1,600 x 1,200 in 32bit colour. The fact that the Creative wasn't the only GeForce2 card to fail in Test Drive 6 at 1,600 x 1,200 with 16bit colour, suggests that it may be driver related. We would recommend installing the latest drivers for all of these when they become available.

What the Creative lacks is any form of extra outputs other than the standard D-SUB connector. On the surface, there are sockets for an S-Video output board, but this is not part of the package.

DETAILS



PRICE £215.02 (£183 ex VAT)

CONTACT dabs.com 0800 138 5154

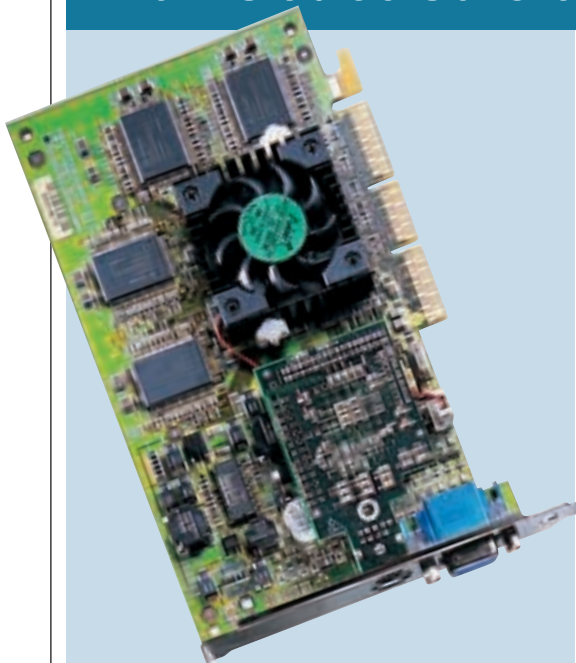
www.europe.creative.com

PROS A well-priced GeForce2 GTS graphics board

CONS No outputs and no option to overclock memory with supplied driver

OVERALL A cheaper option to get your hands on nVidia's latest graphics technology

ELSA Gladiac GeForce2 GTS 32MB



ELSA MAY NOT BE the best known graphics card manufacturer in the UK, but in Europe it's one of the most prevalent. ELSA used to be best known for its high-end graphics workstation cards costing well over £1,000. These were the forerunners of the now

commonplace T&L enhanced graphics cards, where much of the geometry calculation is taken away from the CPU to enhance overall performance.

ELSA's recent less exotic graphics cards have the latest chipset from nVidia, the GeForce2 GTS. This very advanced chipset features an integrated T&L engine and allows multiple textures per pixel, but it doesn't support hardware environment bump mapping, so you won't get the incredibly realistic textures that the ATi Radeon can achieve. This version of the Gladiac sports 32MB of RAM although a 64MB version is also available with a price premium attached.

Even though this card has only half the memory of its

bigger brother, it does have a feature that its sibling lacks. As well as the standard D-SUB monitor connector there is also a video input/output connector. This small din plug connects to a supplied cable which offers S-Video in and out ports. This is a pretty good

addition as this is one of the cheapest GeForce2 cards on test.

The 32MB Gladiac took fourth place in the 3DMark test at 1,280 x 1,024 in 16bit colour, although most of the GeForce2 cards produced similar scores. In all the tests the Gladiac was no better or worse than the majority of similarly specced cards.

If you want to buy a 32MB GeForce2 card, there's not too much between them as far as performance goes. What you should consider is any extra features and how much they cost. The Gladiac scores well on both these counts, it has the extra video in and out feature and sports one of the lowest prices on test.

This is a great graphics card offering a cutting-edge chipset and added video functionality at a reasonable price.

DETAILS



PRICE £216.20 (£184 ex VAT)

CONTACT dabs.com 0800 138 5154

www.elsa.co.uk

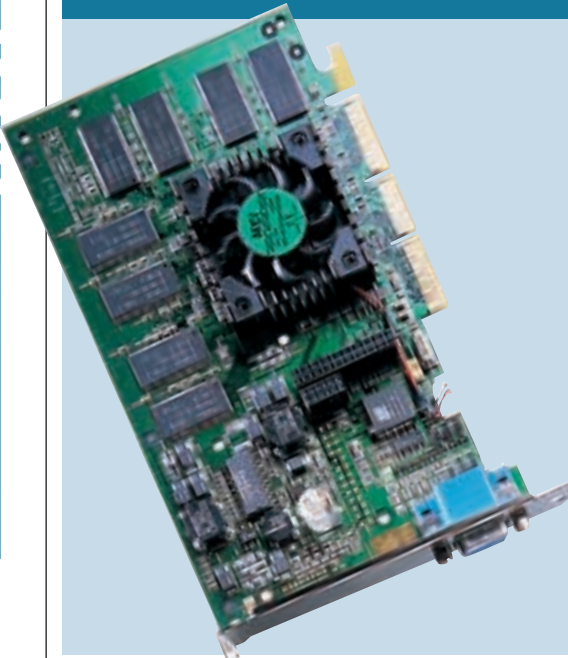
PROS GeForce2 chipset, video in/out, reasonable price

CONS Faster cards available

OVERALL A good card with a solid price/performance ratio



ELSA Gladiac GeForce2 GTS 64MB



ELSA WAS ONE OF the first vendors to release a graphics card based on the GeForce2 GTS chipset and 32MB of DDR SGRAM. This month, the company has gone one step further with the release of the Gladiac GeForce2 GTS 64MB. Based on a GPU core running at

the standard 200MHz, the Gladiac is one of four boards in this test that sport a whopping 64MB of memory.

At a resolution of 1,280 x 1,024 in 16bit colour, the card scored pretty much the norm with 4,783 in the 3DMark test. The effectiveness of the Gladiac's extra memory is shown in our tests, since it was one of the few cards that was able to record a result in 3DMark at 1,600 x 1,200 in 32bit colour. If the resolution or the colour depth is bumped up the ELSA rises towards the top of the field in all the tests. It also hits top in the Test Drive test at both 1,280 x 1,024 and 1,600 x 1,200 in 32bit. The Gladiac 64MB is, however, overshadowed by the Hercules 3D Prophet II in the 3DMark tests. The Quake III scores paint a similar picture. At a resolution of 1,600 x 1,200 in 16bit colour, the Gladiac manages 54.1fps – second to the 64MB Hercules card, one of the Editor's Choices. ELSA hasn't included video in/out

functions on the Gladiac GeForce2 GTS 64MB – features that are included on the 32MB version. Bundled software includes a DVD player, while overclockers will be able to tweak the memory from 320 to 380MHz and the GPU core from 180 to 240MHz. Be careful though, as unlike the 64MB 3D Prophet II no heatsinks are present on the memory chips.

In terms of raw power, the Gladiac is not the fastest in this test, but the frame rates it achieves are more than enough for the current crop of games. Even though the Gladiac comes into its own when higher resolutions are important, it's unlikely that the majority of users will benefit from the extra memory, apart from the true gaming junkie.

At the time of going to press, ELSA could not give us a price. Therefore, we are unable to give the card a star rating.

DETAILS

N/A

PRICE Not supplied

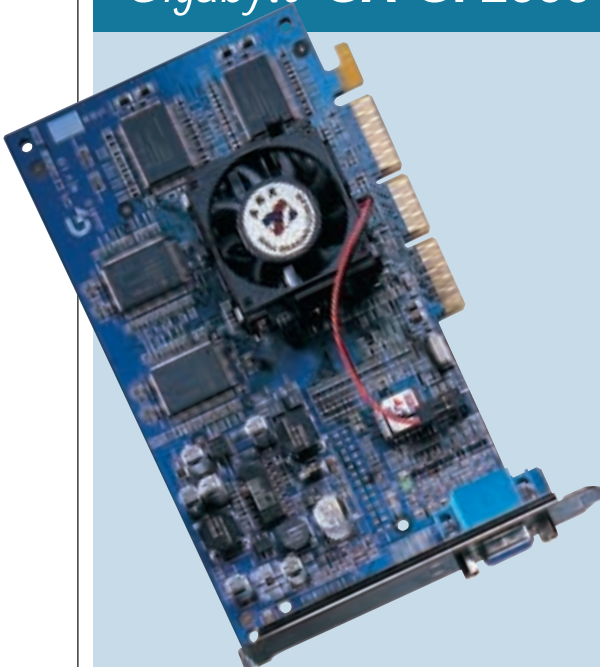
CONTACT www.elsa.co.uk

PROS Excellent results at higher resolution and colour-depth settings

CONS Video outputs are optional extra

OVERALL A card that performs well at high settings but isn't strong on features

Gigabyte GA-GF2000



MORE ASSOCIATED with motherboard manufacture, Gigabyte has turned to graphics cards with the GeForce2-driven GA-GF2000. The board is blue in colour, but is otherwise unspectacular-looking. As with most GeForce2 cards it has 32MB of onboard DDR SGRAM and

a fan over the GPU to keep things cool as it pumps along.

Of all the cards employing the GeForce2 chipset, the GA-GF2000 is not the fastest, with an average position around seventh place. Its strongest performance was in the Test Drive 6 demo at 1,600 x 1,200 in 32bit colour, where it achieved a respectable fourth place with 22fps, which is an admirable score for such a demanding resolution and colour depth. Strangely, its poorest performance was in 3DMark 2000 at 1,600 x 1,200 with 16bit textures and colours where it came tenth (and last among the GeForce2 cards).

The GA-GF2000 was unable to run 3DMark at 1,600 x 1,200 in 32bit, as were

all the cards employing the GeForce2 chipset coupled with 32MB of SGRAM. In fact, of the GeForce2 cards, only the 64MB versions could run this test

For the overclocking enthusiast, this card has sliders in the software drivers allowing the core to be overclocked

from its recommended 200MHz to 220MHz, and the memory from 333MHz to 370MHz. Although overclocking the core has little effect, bumping up the memory frequency gives a few extra frames, although we wouldn't recommend it as the memory runs fairly hot on all GeForce2 cards at the recommended frequencies, and overclocking may reduce the life of the card.

For gaming, this card is easily as good as any of the others available. The bundled drivers are based on nVidia's reference drivers 5.30, and so are right up to date and utilise all the card's features. However, with no added extras on the card to recommend it, the Gigabyte GA-GF2000 doesn't represent the best value in this test.

DETAILS

★★★

PRICE £239 (£203.40 ex VAT)

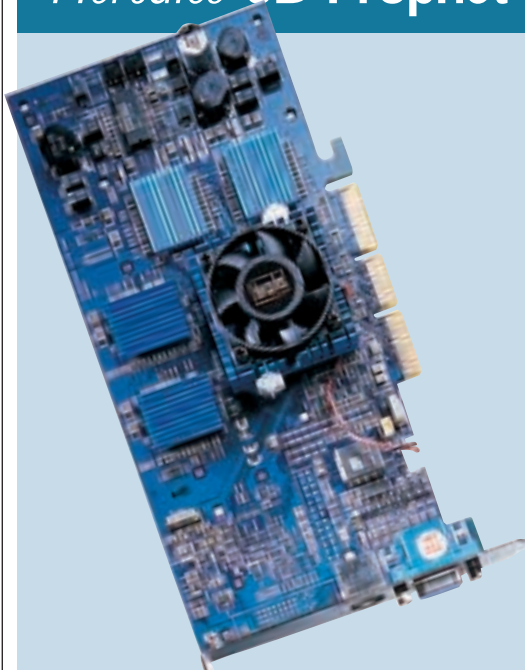
CONTACT Gasteiner Technologies
020 8345 6000 www.gasteiner.com

PROS It's fast, but not the fastest

CONS Not the best of the no-frills GeForce2s

OVERALL A perfectly good GeForce2 card, although there are some alternatives that get more from the chipset

Hercules 3D Prophet II 32MB



Looking like a sleeker version of the 64MB card, the 32MB board is blue, quite large and has blue heatsinks over the DDR SGRAM chips, four on the upper surface and four on the lower. The heatsink over the GPU is of a similar blue to the others, giving this card excellent overall looks.

The Prophet's memory runs at 333MHz, but can theoretically be clocked up to 420MHz. The heatsinks will be of use if you choose to overclock it, helping to dissipate the heat generated by the memory chips over a larger surface area. The core runs at 200MHz as recommended by nVidia, but can be clocked up to 250MHz for those who dare. Although

THE 32MB VERSION of the Hercules 3D Prophet II may seem overshadowed by its 64MB big brother, but its performance in the tests showed that it is still a good contender – and that's without the overclocking the 64MB uses to burn its way to the top of most of the tables.

the sliders in the software go up to these higher frequencies, this does not mean the card will run at these speeds, it's more likely that it will just lock up.

The 32MB Prophet II performed well at all resolutions in 16bit. Not the highest of the 32MB cards in any test,

but neither is it the worst performer. Its best performance was at 1,600 x 1,200 in 16bit colour in Quake III and the Test Drive time demo, where it came sixth and fourth respectively; and since most of the cards that beat it were 64MB versions, this is fair performance.

The card comes with an S-Video socket complete with a composite converter if you don't have S-Video on your TV. Power DVD software is included so you can play DVD movies through the card to your television.

With its performance as good as most other GeForce2 cards, and a DVD player and TV-out as standard, the Prophet II 32MB may not be the ultimate card its 64MB counterpart is, but it does offer good value.

DETAILS

★★★★★

PRICE £246.74 (£209.99 ex VAT)

CONTACT Jungle.com 0800 0355 355

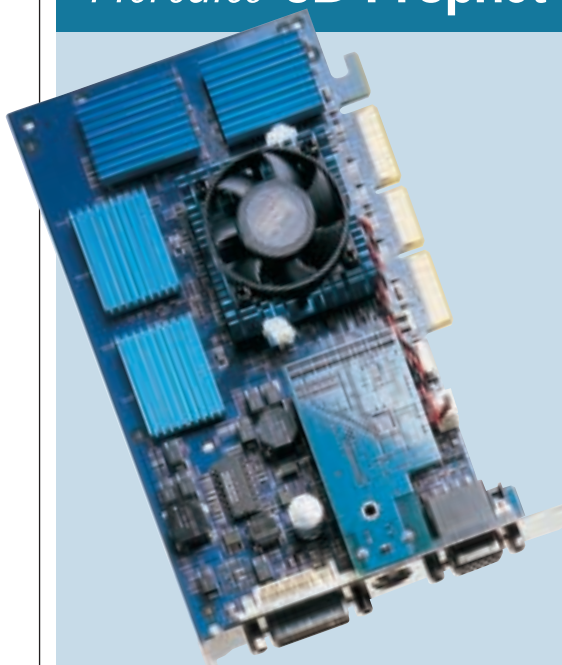
www.hercules.com

PROS With heatsinks to keep the memory cool, this card is not only functional, but it looks great too

CONS Not one of the fastest card on test

OVERALL Good performance and value from a card with S-Video out and a DVD player

Hercules 3D Prophet II 64MB



is it so hot? Because as standard, the drivers supplied by Hercules overclock both the memory and the GPU core of the 64MB Prophet II. So instead of nVidia's recommended 200MHz core and 333MHz memory, this card runs a 220MHz core and 365MHz memory – and it flies.

The overclocking may have implications for the longevity of the card. However, the presence of the heatsinks over the memory ensure as much heat is dissipated as is physically possible. Besides, in the extensive testing we put the card through we found it remained stable despite the high temperature, only crashing once (and that

HERCULES' 64MB 3D Prophet II is one hot card – literally. If you were a very small person, with some very small burgers, you could have a fair go at cooking them on the heatsinks that cover the 64MB of DDR SDRAM, such is the heat generated by this monster. Why

wasn't even during a test). Hercules has gambled on overclocking, and it appears to have paid off; and what's more, if you don't want it running hot, all you need to do is use the utility to return the frequencies to the recommended levels.

So how fast is it in its standard

configuration? In 16bit colour and textures in 3DMark 2000, at 1,280 x 1,024 and 1,600 x 1,200, it topped the tables with scores of 5,145 and 4,050 respectively. At 32bit colour, at the same resolutions, the ATI Radeon was the only card to beat it. In the Quake III tests it achieved a blistering 81.8fps at 1,280 x 1,024 at 16bit, zipping through the time demo at an incredible rate.

With Power DVD software and DVI and S-Video out sockets as standard, this is the fastest GeForce2 card we've seen. Hot it may be, but if you're looking for a card to make your graphics burn along as fast as possible, this is an absolute must.

DETAILS

★★★★★

PRICE £311.38 (£265 ex VAT)

CONTACT dabs.com 0800 138 5154

www.dabs.com

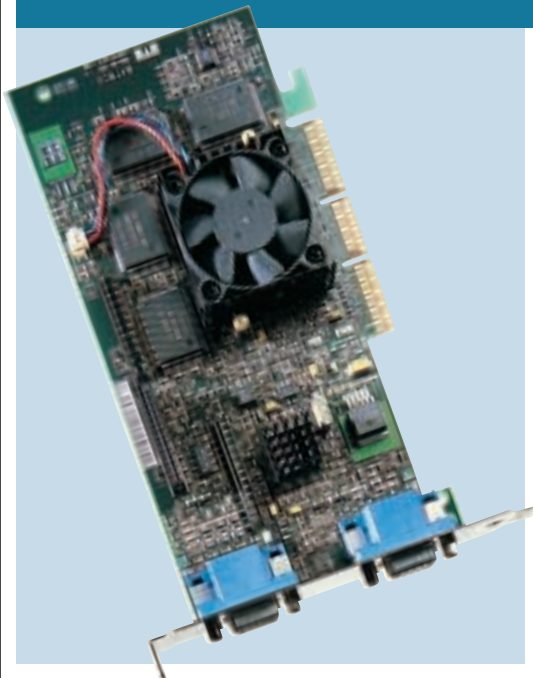
PROS DVI socket; incredible speed from a GeForce2-based card

CONS This is achieved by overclocking the memory and core which may reduce the life of the card

OVERALL Despite the overclocking we found the card to be stable. If it's the fastest card you want, then this is the one. If it's features you need, the Radeon has more



Matrox Millennium G400 Max



WE FIRST REVIEWED the Matrox Millennium G400 well over a year ago and we knew then that Matrox had created something special. The G400 was the first graphics chipset to incorporate hardware environment bump mapping, a DirectX feature

designed to produce more realistic 3D environments. The G400 was also one of the first consumer-based cards to incorporate dual head technology, allowing you to connect to two monitors. Shortly after its release, Matrox improved upon the original G400 by adding a faster processor and RAMDAC, the latter running at 360MHz instead of 300MHz. Aptly named the G400 Max, the extra power of the new card meant that a fan had to be used to cool the heatsink. There's been a lot of activity on the graphics cards front since its original release so how does the Max fare against the current crop of hot chipsets?

In terms of performance, the Max is starting to show its age. At a resolution of 1,280 x 1,024 with 16bit colour, it only scored 2,212 in the 3DMark tests, which places it second from the bottom in the group. In the Quake III tests, it only managed 17.6fps at 1,280 x 1,024 with 16bit colour,

placing it last. The G400 Max did surprise us by achieving 800 3DMarks at 1,600 x 1,200 in 32bit, but gameplay at these settings would be impossible.

The G400 Max is lagging behind the rest of the field in this month's test. That said, it isn't just about raw power. Superb image quality and a second D-SUB allow the Max to retain some of its original appeal. There's also a supplied composite and S-Video out all-in-one cable that plugs into the spare D-SUB port. However, if it's cutting edge 3D performance you're after then look elsewhere or wait for the upcoming G450. However, if playing the latest games isn't your top priority, and you're just after a 2D no-nonsense card then the G400 Max still has a lot going for it.

DETAILS



PRICE £151.57 (£129 ex VAT)

CONTACT dabs.com 0800 138 5154

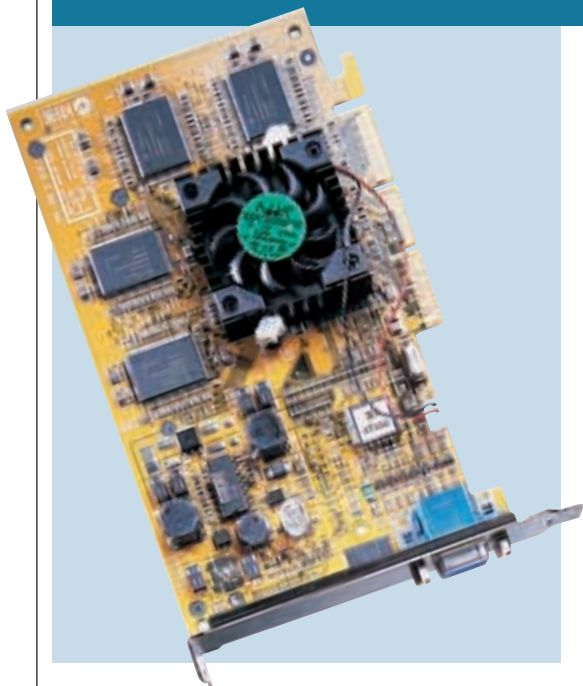
www.dabs.com

PROS An excellent reputation for 2D; second display output

CONS Poor 3D performance; not for serious gamers

OVERALL A good feature set and good 2D, but is out of its league in terms of 3D

MSI MS-StarForce 815



MSI is a Taiwanese company that's best known for its motherboard production. In fact MSI produced the first (and only for a while) AMD Athlon motherboard and was also showcasing the first 1GHz AMD Athlon Thunderbird system on its stand at Computex Taipei a couple of

months ago. Like many Taiwanese motherboard manufacturers, MSI has now expanded into the graphics card market, although this area is getting more cut-throat all the time. Not long ago manufacturers could produce graphics boards based on chipsets from nVidia, 3dfx and S3, but now only nVidia produces chips for other companies. So, the MSI, along with most cards in this test is based on nVidia's GeForce2 GTS chipset.

Backing up the nVidia GeForce2 chip is 32MB of memory, which is more than enough to handle the size of textures in current games. In fact, if games developers ever start using texture compression properly, we

may see the end of the ongoing spiral of increasing video memory. The MSI performed no better or worse than any other 32MB GeForce2 card in the 3DMark tests, but in Quake III and Test Drive 6 it performed slightly better, placing in the upper half in most tests.

Inside the box you'll find installation instructions, a driver CD and a copy of WinDVD in case you want to watch movies on your PC, assuming you have a DVD-ROM drive of course.

There's nothing special about this card, it doesn't have the video in/out feature of the 32MB ELSA Gladiac, and it doesn't even have the expansion connector to fit it as an upgrade. You're getting a no-frills GeForce2 card that performs well enough in 3D applications. Of course, you're not getting hardware environment bump mapping in the feature set, but you are getting those four pipelines that help it outperform the Radeon in 16bit. If you're looking for a good value 32MB GeForce2 graphics adaptor, the ELSA offers a stronger feature set at a great price.

DETAILS



PRICE £245 (£208.51 ex VAT)

CONTACT Microteq Innovations

01733 896 667 www.msi.com.tw

PROS GeForce2 chipset; solid performance

CONS Light on features; better value options available

OVERALL A basic GeForce2 card that's eclipsed a little by the ELSA

Smoothing out the bumps

Anti-aliasing is used to smooth out the pixellation that appears in graphics generation, most notably when a diagonal straight edge is drawn. What it does in simple terms is to remove the step effect that is especially noticeable on straight diagonal lines and curves, by blurring the on-screen pixels, thus removing the pixel corners and smoothing the image. The effect of this can be quite spectacular in removing the 'step' effect, especially in lower resolutions where the pixels are larger and, by definition, the problem is more pronounced.

Until recently, anti-aliasing has been confined to small areas of the scene, thus reducing the processing requirement across the whole scene. Recently, though, cards have started to support full scene anti-aliasing (FSAA) which means the whole image has anti-aliasing applied to it, thus removing pixel edges across the whole screen. This certainly looks good – and you have the time to see the effect on some cards because the frame rate drops so low that it's like watching a slide show.

3dfx has recently drawn a lot of attention to FSAA with the launch of its Voodoo5 5500, which boasts two and four-sample realtime FSAA. And unfortunately it has been slammed in the press for the frame rate hit that accompanies use of the feature. In the interest of fairness (and



Smoother pantie line: Lara without FSAA enabled on the left. FSAA has been turned on for the shot on the right – see the smoother lines where pixels have been blurred

curiosity) we therefore decided to test a few cards to see how all of them coped with FSAA. We tested the Asus V7700 Pure, the ELSA Gladiac 64MB, the Voodoo5 5500 and the new ATi Radeon. All were tested first without FSAA enabled, then with it enabled for direct comparison. For the GeForce2-based cards this involved using nVidia's most up-to-date reference drivers (version 5.32), as previous versions did not have the FSAA element enabled, while with the Voodoo5 we tested first at two-sample FSAA and then at four. The results are extremely interesting.

With 16bit colour and textures enabled in Quake III at 1,280 x 1,024 frame rates ranged from 76.2fps from the Asus V7700 to 51.6fps from the ATi Radeon. The Voodoo5 achieved a respectable 63.4fps, while the 64MB ELSA Gladiac achieved 75fps. All are excellent frame rates for the

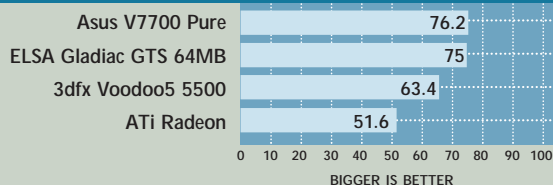
resolution. When FSAA is turned on all the cards suffered a substantial frame rate hit. What is most interesting is how much their original frame count is knocked down while the FSAA feature is enabled. The Asus suffered a massive 60 per cent drop in fps, the Gladiac a 52 per cent drop, while the Radeon suffered a 65 per cent drop. Interestingly, at two-sample FSAA the Voodoo5 did best of all, losing only 47 per cent of its non-FSAA fps, while at four-sample FSAA it was comparable to the Radeon, losing 65 per cent of its non-FSAA fps. So despite the fact that the Voodoo5 had the lowest frames per second after application of FSAA (achieving only 17.8fps), it was not affected as badly as any of the other cards. At 1,280 x 1,024 in 32bit the results were similar. The Asus suffered a 60 per cent reduction to its frames per second, the Gladiac 54 per

cent, the Radeon 67 per cent, and at two-sample FSAA, the Voodoo5 lost 56 per cent, where at four-sample FSAA, it would not run at all. All the frames per second at this resolution and colour depth were between 15.9 and 19.6fps.

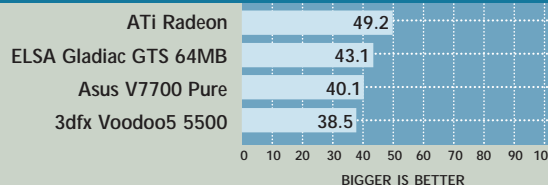
The results are interesting because they actually go some way towards vindicating the Voodoo5, which is in reality not affected by FSAA as greatly as other cards in general terms. As for FSAA generally, it appears it is just too much for today's hardware to process efficiently; and considering its effect on performance, FSAA should probably more accurately stand for 'frame-rate suffers after activation'. That said, if you have a back catalogue of games that don't support today's high resolutions, FSAA could be a real bonus. But ultimately, you have to ask yourself if you really want to play old games anyway.

SCOTT MONTGOMERY

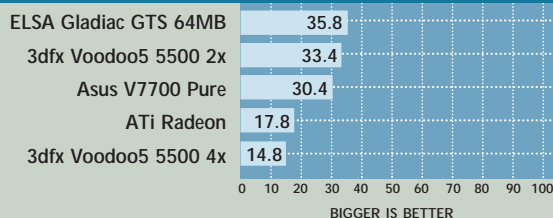
Quake III 1,280 x 1,024 at 16bit (fps)



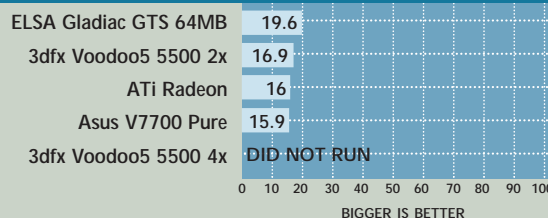
Quake III 1,280 x 1,024 at 32bit (fps)



Quake III with FSAA enabled 1,280 x 1,024 at 16bit (fps)



Quake III with FSAA enabled 1,280 x 1,024 at 32bit (fps)



How we did the tests

The needs of every user are different and this makes it very hard to put together a comprehensive benchmark test. Some people may place more emphasis on 2D performance – with the ability to play a few 3D games a bonus. Others are willing to sacrifice 2D performance to get the best gaming platform possible, at whatever price. Even if this is true, then they may have certain games in mind, which further complicates matters. With all this in mind, we put together the following combination of tests: 3DMark2000, Quake III demo1 and Test Drive 6 Time Demo, running them on one of our PC reference machines, a 733MHz Intel Pentium III plugged into an AGP 4x equipped motherboard with 128MB of RDRAM, all under Windows 98 SE. We decided not to run 2D tests since there is very little difference between these cards in a 2D environment.

3DMark 2000

This is an instruction-set optimised version of 3DMark99 from Futuremark, which tests the 3D capabilities of PCs. It uses a Real World DirectX 7 3D game engine to produce one result in the form of 3DMarks. For standalone reviews and group tests, we usually perform all tests at 1,280 x 1,024 resolution in 16bit colour depth with the test suites set to loop three times. In this test, to push the cards that little bit harder, we also ran the tests at 1,280 x 1,024 in 32bit colour, 1,600 x 1,200 in 16bit colour and 1,600 x 1,200 in 32bit, if those modes were

supported by the card. The higher the score, the better the result.

Quake III

This game gives a good overview of OpenGL performance. Testing cards with Quake III consists of running a recorded game on the test system and getting a final frames per second (fps) score at the end. The higher the score the better, with an fps of 30 or more providing visibly smooth playback.

A couple of demos are already built into the Quake III test – part of the full version game – and we opted for demo 1 which puts a greater demand on the graphics subsystem due to it being



Above: Quake III highlights OpenGL performance
Left: We pushed the cards hard in the 3DMark tests
Below: A racing game put the cards under pressure during the Test Drive 6 demo



Test Drive 6

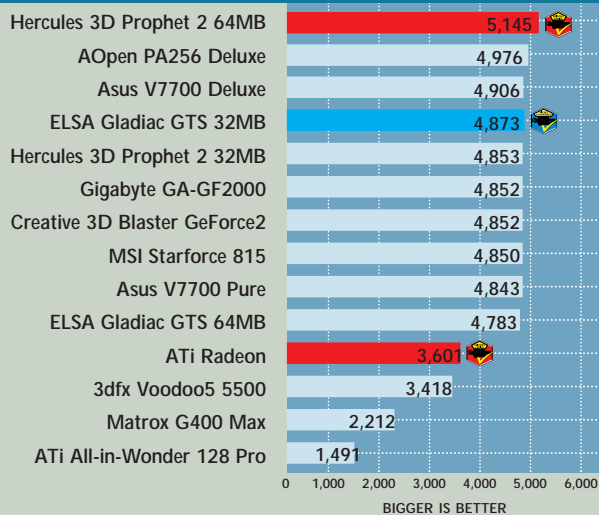
It is hard work putting graphics cards through their paces, involving a lot of repetitive testing and quantitative data collection. Instead of only using the standard first-person shooter game, we further enhanced the quality of our results by including Infogames' Test Drive 6 Time Demo, giving us another fps score. Although first-person perspective games tend to be some of the most popular on the PC, we thought adding a driving game into the mix would cover the interests of more end users. Furthermore, this racing game comes with transform and lighting support, putting many of the graphics cards under more pressure. As with the other tests, we ran the demo four times per card at 1,280 x 1,024 and 1,600 x 1,200 resolutions in both 16bit and 32bit colour.

staged in an open area with no walls. To run the test you need to bring up the console and enter the following commands: `timedemo 1` then press return, followed by `demo demo001`

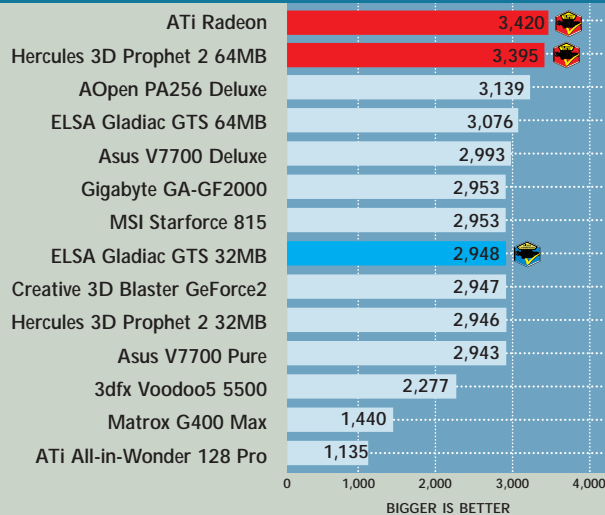
After the demo has finished, bringing up the console again will display the overall fps score. We ran the test four times for each card at 1,280 x 1,024 and 1,600 x 1,200 resolutions in both 16bit and 32bit colour, with the game settings at their maximum.

3DMark 2000

3DMark 2000 1,280 x 1,024 at 16bit

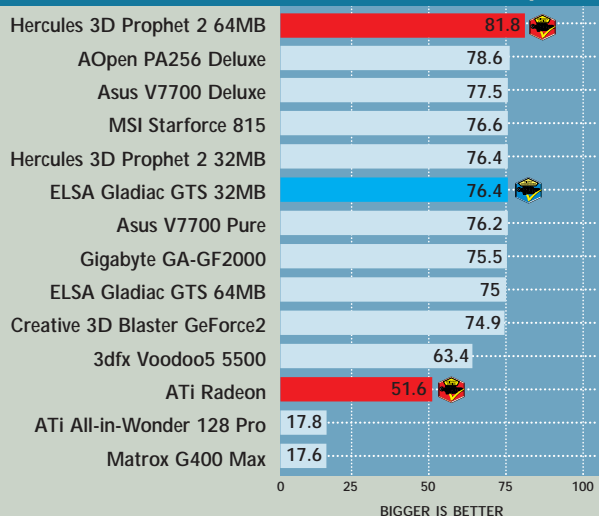


3DMark 2000 1,280 x 1,024 at 32bit

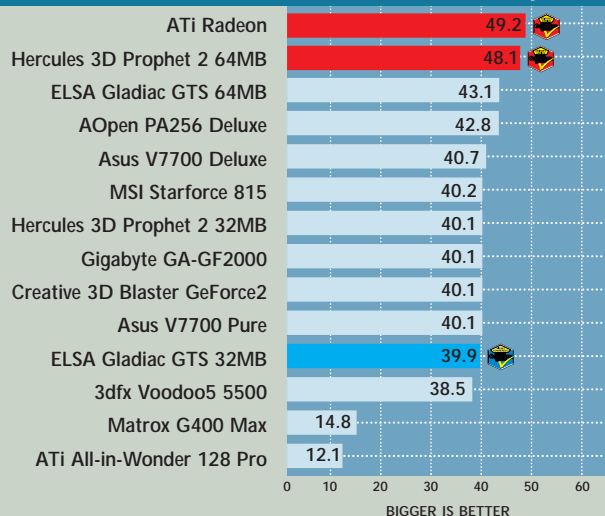


Quake III Demo

Quake III Demo 1,280 x 1,024 at 16bit (fps)

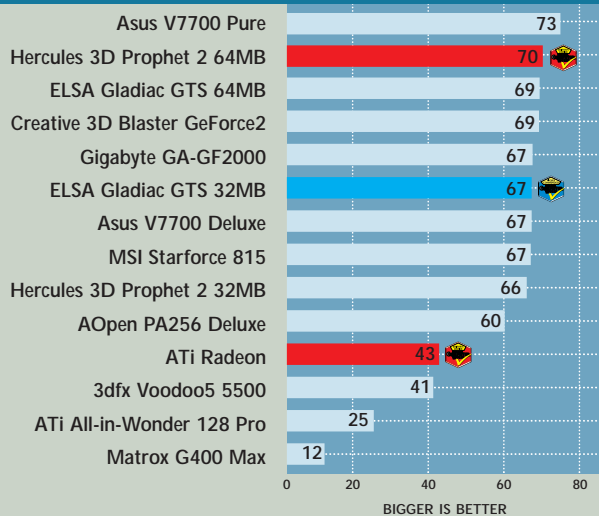


Quake III Demo 1,280 x 1,024 at 32bit (fps)

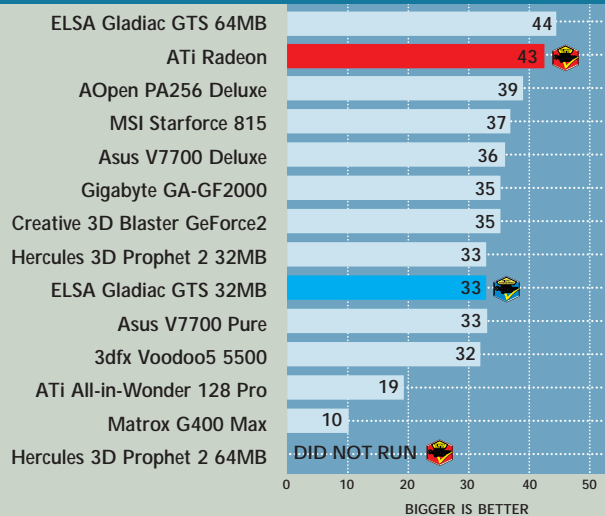


Test Drive 6 Time Demo

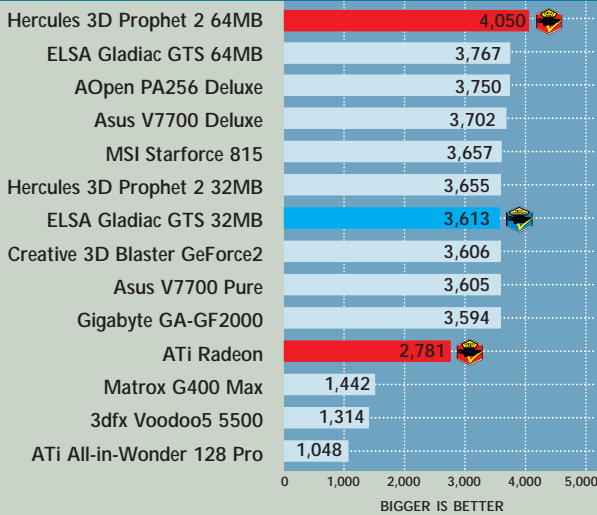
Test Drive 6 1,280 x 1,024 at 16bit (fps)



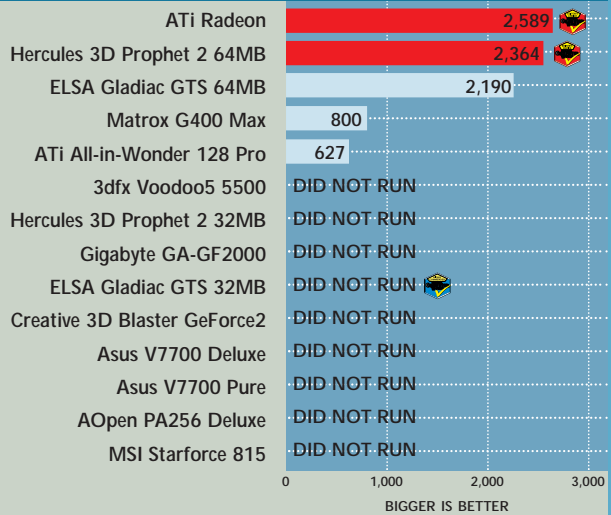
Test Drive 6 1,280 x 1,024 at 32bit (fps)



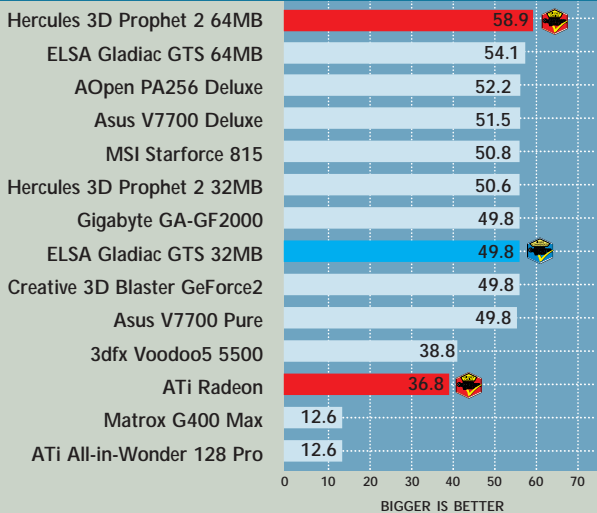
3DMark 2000 1,600 x 1,200 at 16bit



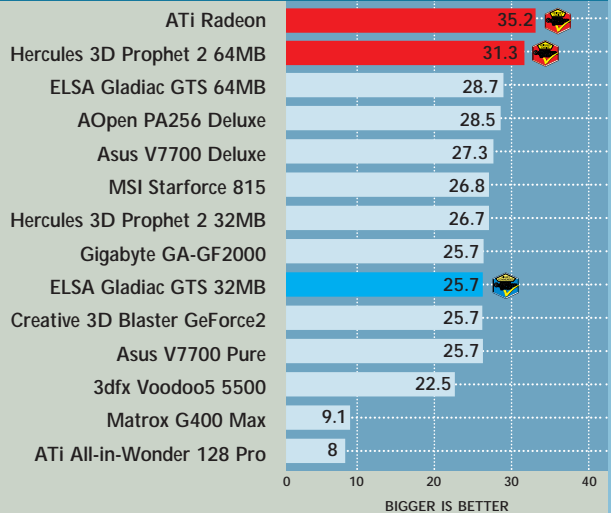
3DMark 2000 1,600 x 1,200 at 32bit



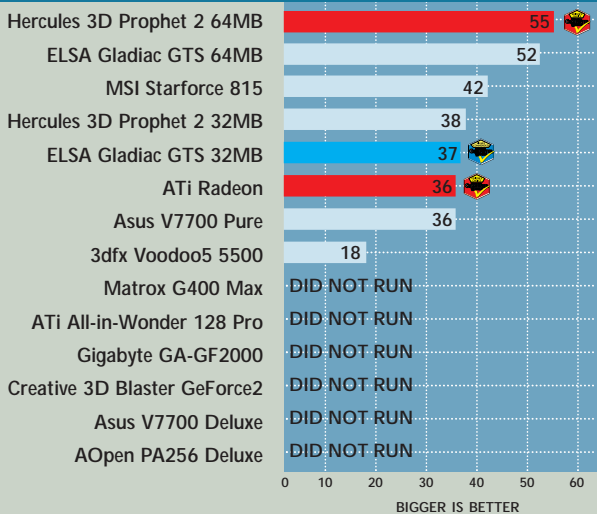
Quake III Demo 1,600 x 1,200 at 16bit (fps)



Quake III Demo 1,600 x 1,200 at 32bit (fps)



Test Drive 6 1,600 x 1,200 at 16bit (fps)



Test Drive 6 1,600 x 1,200 at 32bit (fps)

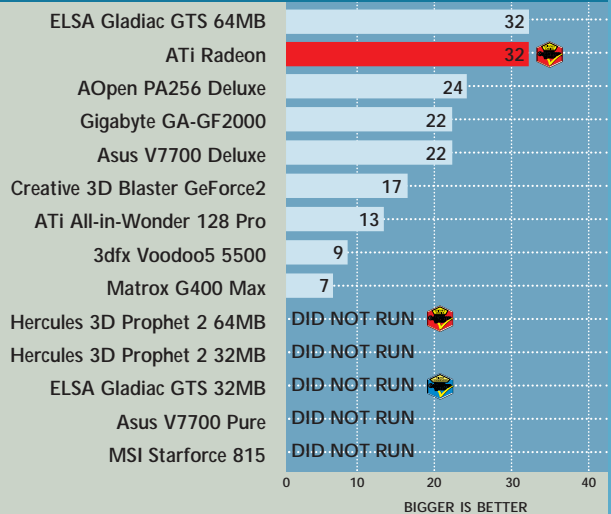
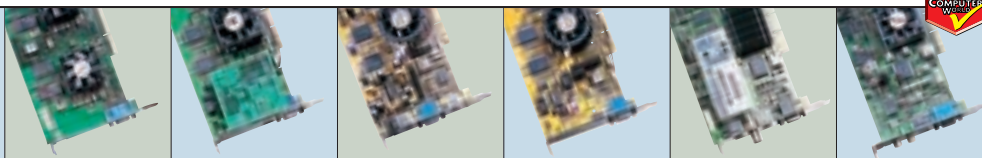












Table of features



MANUFACTURER	3DFX	AOPEN	ASUS	ASUS	ATI	ATI
PRODUCT	VOODOO5 5500 AGP	PA256 DELUXE	V7700 DELUXE	V7700 PURE	ALL-IN-WONDER 128 PRO	RADEON
Price inc VAT (ex VAT)	£210.32 (£179)	£249 (£212)	£285.52 (£243)	£269.07 (£229)	£169.20 (£144)	£299 (£254)
Manufacturer URL	www.3dfx.com	www.aopen.nl	www.asus.com	www.asus.com	www.ati.com	www.ati.com
Supplier name	dabs.com	Majestic Technologies	Ultimate Hardware	dabs.com	dabs.com	dabs.com
ESSENTIALS						
Chipset	Dual VSA-100	nVidia GeForce2 GTS	nVidia GeForce2 GTS	nVidia GeForce2 GTS	ATI Rage 128 Pro	ATI Radeon
GPU core clock speed (MHz)	166	200	200	200	Not supplied	183
RAMDAC frequency (MHz)	350	350	350	350	300	350
Overclocking facility	X	✓	✓	✓	X	X
Interface	2x/4x AGP	2x/4x AGP	2x/4x AGP	2x/4x AGP	2x/4x AGP	2x/4x AGP
Memory/type	64MB/SDRAM	32MB/DDR SGRAM	32MB/DDR SGRAM	32MB/DDR SGRAM	32MB/SDRAM	64MB/DDR SDRAM
Memory frequency (MHz)	166	333 (166 x 2)	333 (166 x 2)	333 (166 x 2)	Not supplied	366 (183 x 2)
Hardware mpeg2 assist	✓	✓	✓	✓	✓	✓
Software DVD player	✓	✓	✓	✓	✓	✓
Composite output	X	X	✓	X	✓	✓
S-Video output	X	✓	✓	X	✓	✓
Other/software	WinDVD 2000	S-Video to RCA video cable, Drakan, Rollcage	3D glasses, S-Video in, games, video-editing software, SmartDoctor	Drakan, Rollcage, Asus SmartDoctor	TV Tuner, S-Video in/ out, stereo audio in/ out, ATI multimedia centre, Ulead Video 4	ATI multimedia centre, cables, S-video in
MAX 2D REFRESH RATES (Hz) AT 16/32BIT COLOUR DEPTH						
1,024 x 768	120/120	200/200	240/200	240/200	200/200	200/200
1,152 x 864	120/120	200/170	200/170	200/170	160/160	150/150
1,280 x 1,024	100/100	170/150	170/170	170/170	130/130	130/130
1,600 x 1,200	100/100	120/100	120/100	120/100	90/90	90/90
3D SUPPORT						
Alpha blending	✓	✓	✓	✓	✓	✓
Anisotropic filtering	X	✓	✓	✓	X	✓
Embossed bump mapping	✓	✓	✓	✓	✓	✓
Hardware environment bump mapping	X	X	X	X	X	✓
Anti-aliasing	✓	✓	✓	✓	✓	✓
Full scene anti-aliasing	✓	✓	✓	✓	X	✓
Bilinear-filtering	✓	✓	✓	✓	✓	✓
Trilinear-filtering	✓	✓	✓	✓	✓	✓
Gouraud shading	✓	✓	✓	✓	✓	✓
Bilinear mip mapping	✓	✓	✓	✓	✓	✓
Fogging	✓	✓	✓	✓	✓	✓
Perspective correction	✓	✓	✓	✓	✓	✓
Transparency (colour & alpha)	✓	✓	✓	✓	✓	✓
Transform and Lighting	X	✓	✓	✓	X	✓
Z buffering bit depth	24bit	32bit	32bit	32bit	32bit	32bit
DRIVERS SUPPLIED						
Windows 95/98	✓	✓	✓	✓	✓	✓
Windows NT4	X	✓	✓	✓	X	✓
Windows 2000	✓	✓	✓	✓	X	✓
Direct3D	✓	✓	✓	✓	✓	✓
OpenGL	✓	✓	✓	✓	✓	✓
Glide	✓	X	X	X	X	X

	 CREATIVE	 ELSA	 ELSA	 GIGABYTE	 HERCULES (GUILLEMOT)	 HERCULES (GUILLEMOT)	 MATROX	 MSI
	3D BLASTER GeFORCE2 GTS	GLADIAC GeFORCE2 GTS 32MB	GLADIAC GeFORCE2 GTS 64MB	GA-GF2000 32MB	3D PROPHET II GTS 32MB	3D PROPHET II GTS 64MB	MILLENNIUM G400 MAX	MS-STARFORCE 815
	£215.02 (€183)	£216.20 (€184)	Not supplied	£239 (€203.40)	£246.74 (€209.99)	£311.38 (€265)	£151.57 (€129)	£245.00 (€208.51)
	www.europe.creative.com	www.elsa.co.uk	www.elsa.co.uk	www.gasteiner.com	www.hercules.com	www.hercules.com	www.matrox.com/mga	www.msi.com.tw
	dabs.com	dabs.com	Not supplied	020 8345 6000	jungle.com	dabs.com	dabs.com	Microteq Innovations
	nVidia GeForce2 GTS	nVidia GeForce2 GTS	nVidia GeForce2 GTS	nVIDIA GeForce2 GTS	nVidia GeForce2 GTS	nVidia GeForce2 GTS	Matrox G400	nVidia GeForce2 GTS
	199	200	200	200	200	220 (overclocked)	Not supplied	200
	350	350	350	350	350	350	360	350
	x	✓	✓	✓	✓	✓	x	✓
	2x/4x AGP	2x/4x AGP	2x/4x AGP	2x/4x AGP	2x/4x AGP	2x/4x AGP	2x/4x AGP	2x/4x AGP
	32MB/DDR SGRAM	32MB/DDR SGRAM	64MB/DDR SGRAM	32MB/DDR SGRAM	32MB/DDR SGRAM	64MB/DDR SGRAM	32MB SGRAM	32MB/DDR SGRAM
	333 (166 x 2)	333 (166 x 2)	333 (166 x 2)	333 (166 x 2)	333 (166 x 2)	365 (183 x 2 overclocked)	Not supplied	333 (166 x 2)
	✓	✓	✓	✓	✓	✓	✓	✓
	x	✓	✓	x	✓	✓	✓	✓
	x	✓	x	x	x	x	✓ (with supplied cable)	x
	x	x	x	x	✓	✓	✓ (with supplied cable)	x
	Rage Rally, Sonnetech Colorific, 3Deep, LAVA! Player	ELSA WINman Suite	ELSA WINman Suite	Not supplied	TV-out, Composite converter, Cyberlink PowerDVD	DVI-out, Cyberlink PowerDVD	Dual D-SUB, Micrografix Picture Publisher, Simply3D, PointCast	WinDVD 2000
	200/200	200/200	200/200	200/200	240/200	240/200	160/160	200/200
	170/170	170/170	170/170	200/170	200/170	200/170	140/140	150/150
	170/150	170/150	170/150	170/150	170/170	170/170	120/120	120/120
	120/100	120/100	120/100	150/120	120/100	120/100	100/100	85/85
	✓	✓	✓	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✓	✓	✓	✓
	x	x	x	x	x	x	✓	x
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	✓	✓	✓	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✓	✓	✓	✓
	x	x	x	x	x	x	x	x



Editor's Choice

Our last look into the rapidly changing world of graphics cards was a mere 10 months ago (*PCW* December 1999). Less than a year has passed, yet you would hardly even recognise that we were looking at the same component, such is the performance of today's cards. The Editor's Choice last December was Matrox's G400 Max, which appears in this group test as it is still the best 2D card on the market – and because it acts as a marker to highlight how much better current cards perform.

Since the last test 3D performance has literally skyrocketed through two generations of GPUs (the GeForce and now the GeForce2), allowing 3D games to run at incredible resolutions, yet still look spectacular. In the December tests, the Matrox Millennium G400 Max card was topping some of the tables with scores of 51.1fps in Quake III at 1,024 x 768 in 32bit. Back then this was quite a score for this resolution, and for those still running mid-range machines, it is still a more than acceptable frame count.

Today, similar frame rates can be achieved at 1,280 x 1,024 in 32bit, and even at 1,600 x 1,200 in 16bit for most cards, compared to 30fps by the best cards in the last test. The card manufacturers have made a lot of progress since December.

Graphics performance of cards has reached such a level now that not only is the frame count relevant, but also how refined the image is. However, as the section on full-scene anti-aliasing highlights, some visual refinement can

come at too great a cost. Still, ATI has managed to get hardware environment bump mapping onto its Radeon chip (the first card to do so since the Matrox G400) and it looks absolutely spectacular. Crowded round a monitor in the lab when we first got this card in, we ran some demos of bump mapping, and what we saw was breathtaking.

Unfortunately, nVidia has still opted not to include environment bump mapping on the second-generation GeForce2 GPU, although this is probably a space constraint due to the four pipelines. With graphics cards though, one still has to respect raw polygon-shifting power. The ability to drive the graphics to such a level that ultra-smooth jerk-free gaming occurs no matter what is on the screen, certainly demands admiration and that is where the GeForce2 cards are excellent.

The winners

The top runners were grouped tightly together in terms of performance. Thankfully it wasn't the one-horse race we feared, and ATI cut it fine to get its new Radeon into us in time for testing. But we got the card and, as king of 32bit rendering, the ATI Radeon is our first **Editor's Choice**. This was based on many things, although most notably on the multitude of features the card boasts. Not only does it have hardware environment bump mapping as well as a powerful Transform and Lighting engine, but it also sports video in and out, making it an ideal card for the home video enthusiast. The Radeon, like all ATI

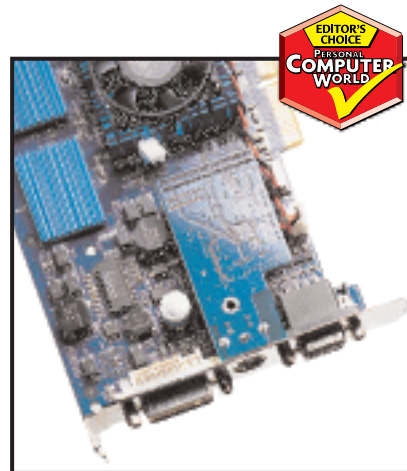
cards, also has great motion compensation, which gives the highest quality DVD playback from a card not solely dedicated to MPEG2 decoding.

Features are one thing in the arena of graphics cards, raw power is quite another. On the basis of this, it seemed only fair to award a second **Editor's Choice** award based on raw power alone. The winner is the 3D Prophet II 64MB from Hercules, which was far and away the fastest (and hottest) card in the tests. Overclocked by 10 per cent in both its core and memory, the heatsinks strapped onto the card are both practical and attractive. With S-Video (and a composite convertor) and a DVI socket as standard, it also has some connectivity variation that other cards do not. Only one thing concerned us, and that was the longevity of an overclocked card. But then if Hercules thinks it'll be all right, it probably will.

The final award winner was chosen on value for money. For the gamer, all that is important is getting the fastest, cheapest option. Fitting best into this category is the ELSA Gladiac GTS 32MB, the winner of this month's **Highly Commended** award. Considering most of the 32MB GeForce2 cards run at much the same speed, the cheapest of them will give you almost the same performance as the best. Common sense therefore dictates plumping for one of the cheapest cards on test. As well as a reasonable price, the ELSA also includes video in and out, which will come as a welcome addition for the video enthusiast, too.



The great features of ATI's Radeon make it ideal for home-video enthusiasts



Hercules' 3D Prophet II 64MB was the hottest card in the test – literally



ELSA's Gladiac GTS 32MB has a reasonable price and some good features



Getting great graphics onto a web page is a totally different ball-game to conventional image editing, but we've checked out a selection of software packages that can help you produce great results

When you look at a web page what do you see? Unless you've had the misfortune to lose your way in some dried-up backwater last updated before the war, chances are you'll be looking at lots of graphics.

Yes, there will be text, but even some of this will be created and displayed in a graphic format. We get around the web thanks to graphics – nav bars, image maps, buttons and banners provide the links we use to navigate our way around the planet.

Web graphics are a breed apart from their paper-bound relatives. Regardless of their physical size on the page, file size needs to be kept to a minimum so download times are no more than a few seconds.

Waiting for a slow graphic-burdened site to appear on a screen is as much fun as standing in the queue at the supermarket checkout. Slow sites don't attract or keep visitors.

Although the situation is changing, many

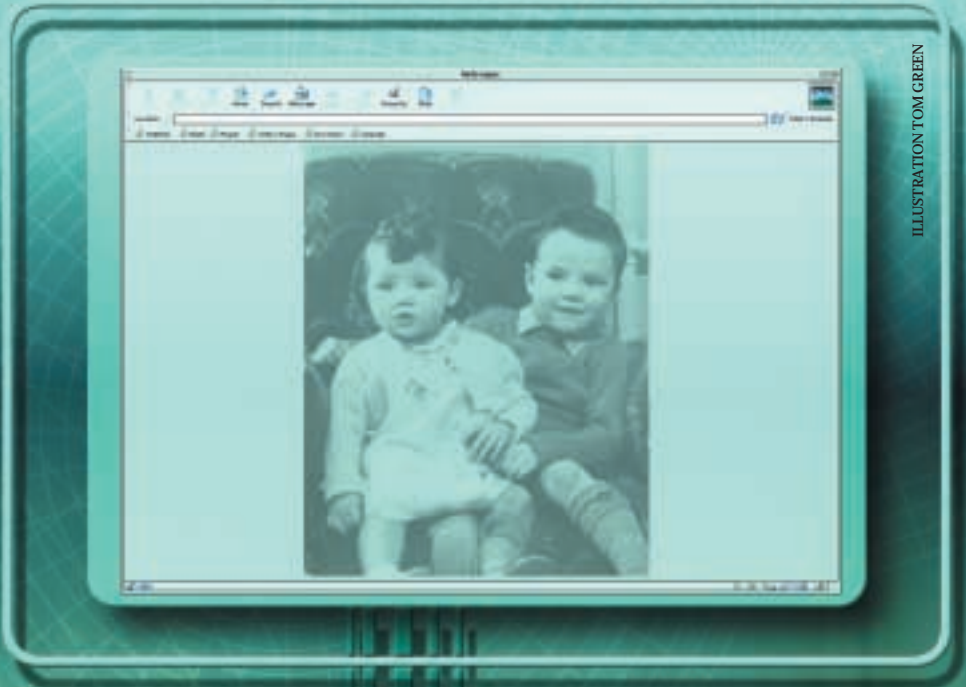
displays do not support 24bit colour, so web graphics must be carefully formatted to appear at their best on these screens.

Animation has brought the web alive. Animated gifs and new formats like swf and svg are pushing the boundaries of what's possible on the web.

The web graphics authoring applications reviewed in this group test do all these things and more. At their simplest they provide a means of reducing the file size of web graphics by removing colour information and by file compression. Some of them also provide tools for assembling graphics created in other applications into an animated sequence.

More sophisticated applications provide a raft of tools for adding HTML and JavaScript functionality to web images and offer an integrated pathway to the web page via wysiwyg HTML authoring applications.

Thanks to these applications creating good looking, fast moving web graphics has never been easier.



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• *Software tested and reviewed by Ken McMahon*

Internet image



Adobe ImageReady

IMAGEREADY WAS initially released as a standalone application. Adobe didn't want to burden Photoshop with a raft of tools and features that wouldn't be needed by its core users – mainly producing high-quality graphics for print – but couldn't ignore the growing market for web graphics tools.

But with Adobe's relentless quest for tighter integration of its products it was only a question of time before the two products were brought together. Now a button at the bottom of the toolbar allows you to switch between Photoshop and ImageReady.

Actions, history, layers and almost everything else make the journey across with your image file and the interface is near identical. So the web features are there for those who want them and invisible to those who don't.

Not all of the web tools reside in ImageReady. Photoshop provides a save for web feature so you can compare image size and quality given particular file types and compression options, but for anything else ImageReady is where the web action is.

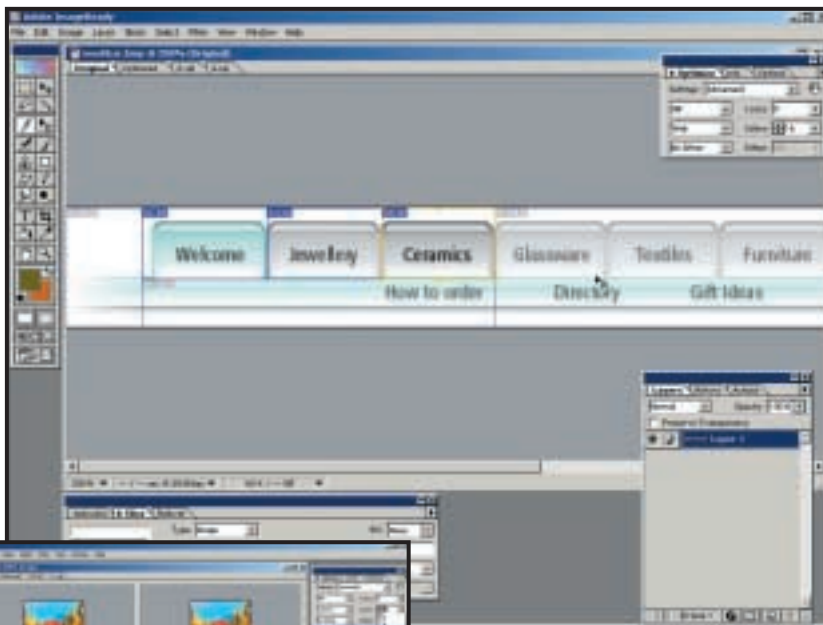
When you first jump to ImageReady from Photoshop, everything looks pretty much the same, except for a couple of web-specific tools and palettes.

The image-editing window is tabbed, enabling you to easily toggle between your original image and a preview of the optimised version. As with the save for web dialog box in Photoshop you can display optimised previews two or four-up to make visual comparisons – file sizes and predicted download times are displayed below each thumbnail.

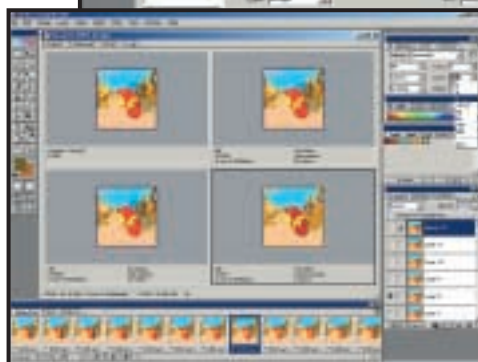
You can select file format, compression settings and palette options in the optimise palette and these can be saved and added to a pull-down menu of commonly used pre-sets. A neat droplet feature lets you save optimised palette settings to a desktop icon. You can then drag and drop folders of images onto this for batch optimisation.

The final giveaway that this is ImageReady and not Photoshop is the floating palette at the bottom of the screen that holds the animation, slice and rollover tabbed palettes.

Image slicing facilities are comprehensive, flexible and easy to work with. ImageReady automatically creates one big slice including the whole document. You add user slices with the slice tool to carve the page up into rectangular segments. Gaps are automatically filled in for you and each slice is sequentially numbered. You can also create slices automatically from guides or a rectangular selection.



Slicing the ImageReady way: The slice boundaries snap to each other and additional slices (5 and 6) are automatically created to fill gaps



Optimising animated gifs four-up in ImageReady using the optimise palette and colour table

To optimise slices just apply settings from the optimise palette to the selected slice and you can apply the same settings to a group of slices. ImageReady provides plenty of scope for slice editing, allowing you to combine, divide, duplicate, resize, arrange and order slices.

In the slice tabbed palette you can define slice content as image and no image, the latter containing solid background colours or text. Here's where you also define the link URL and, if you're using frames, the frame in which the linked page is displayed.

Rollovers are layer-based; changes you make using layer palette commands and options affect only the current rollover state, and anything that changes the layer's pixel values affects all states. Layers can be turned on and off selectively for any of the rollover states, making the creation of multi-state rollovers from layer-based graphics simple. Like Macromedia's Fireworks, you can also create rollovers where the action occurs in a different slice to the trigger, and you can display animations in rollover states.

ImageReady has nothing to match Fireworks' rollover preview facilities, though, so it's back to the browser to check that everything works.

Animation is also based on layers –

the contents of each animation frame being determined by layer visibility. Each frame is displayed as a thumbnail in the animation palette and you can set inter-frame delay rates with a pop-up menu.

Tweening – the automatic creation of intermediate frames – is also layer-based. ImageReady can insert frames displaying a smooth transition of layer opacity, position or effects.

For anyone working with Photoshop, ImageReady is perfect for producing web graphics as it works in the same way.

If you're already using another image-editing application you'd need to think carefully before investing in a package that duplicates much of what you already have. You can do most if not all of this with standalone applications and shareware, it's just not all conveniently to hand in one place.

DETAILS



PRICE £468.83 with Photoshop 5.5
(£399 ex VAT)

CONTACT Adobe 020 8606 4001

www.adobe.com

SYSTEM REQUIREMENTS Pentium processor, Windows 95/98/NT4, 64MB of RAM, 125MB of disk space, CD-ROM

PROS Great slicing, animation and rollover tools

CONS Lack of previews

OVERALL ImageReady has the best graphics tools, but it's just pipped into the runner-up position when it comes to the web side of things

Anark Emotion 3D

ANARK'S EMOTION 3D is unlike anything else reviewed in this group test – it takes a totally original approach to developing web graphics. The software is the web equivalent of the Playdoh Fun Factory – the children's sausage machine toy where you shove brightly coloured plasticine in one end and, depending on the template, starfish, flowers or plasticine sausages come out of the other.

Emotion's brilliance lies in the combination of a wide range of superbly animated graphics, a large degree of control over their appearance and a simple linear interface to tie it all together.

You don't need the manual, although one is supplied, because everything is obvious right from the start and the temptation to play is, in any case, irresistible.

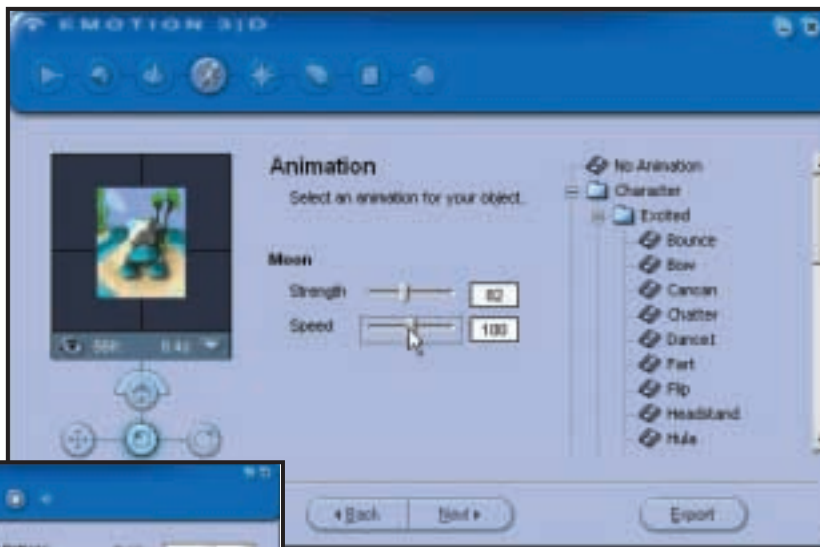
There are no conventional menus, dialog boxes, or any of the other tools you'd expect to find in a normal image editor. Eight buttons take you to any one of the editing processes, or alternatively you can follow through sequentially using the wizard.

The first step is to select a template. The sample templates that Anark provides are divided into classic and fun. The former features bullets, check marks and symbols, which are more suited to serious business use, while the latter offers a collection of cartoon flowers, birds, fish and other unlikely looking objects.

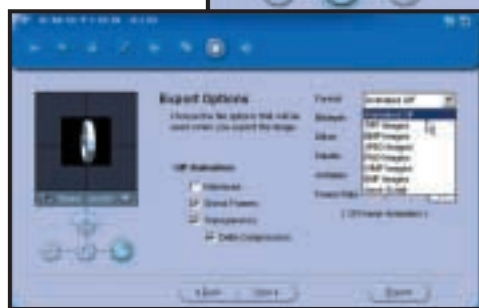
This is the first taste you get of Emotion's stunningly smooth animation. If you've seen the Pixar Trademark animation featuring an anglepoise lamp, you will have a good idea both of the smoothness and realism of the movement. Of course, these are running at 24 frames per second (fps), so when it comes to exporting gif animations there will be a considerable quality hit.

Before you move on to the next stage there's actually quite a lot you can do to customise the template animation. You can rotate the object around three axes, scale it and change its position on the background. This is achieved by clicking on the appropriate adjuster button below the display and simply dragging with the mouse. You can also change the light source and rendering style.

Next you can add a background from a template selection in the same way as you chose the animation object. Given



Adding character to animations in Emotion 3D



Emotion's export options: You can go back to any editing stage using the blue buttons at the top

the profusion of fish it's a shame there are no sea backgrounds, but you can always create your own and there's an option to create any plain coloured background you want.

The next bit is where it starts to become really fun. The animesh engine is where you apply a range of animation effects to your object. These range from simple rotation and looping to complex effects that simulate human activities like bowing, laughing and breaking wind!

Even the simplest of these is more sophisticated than you'd expect. Applying a 'bend up and down' loop effect to the dolphin object makes its fins and tail oscillate, other body parts – the head and eyes – move in harmony to give a fairly realistic impression of the mammal swimming.

Character animations are categorised as excited, goin' places and mellow, providing a wide range of possibilities from walking, skipping, dancing and sneaking to merely looking, breathing or snoring. Strength and speed of effect can be adjusted by slider controls.

Next in line is the effects department, which provides a fair degree of image adjustment, including brightness and contrast, hue/saturation, transparency and posterisation, in addition to mosaic, shadow, blur and glow effects.

Emotion has a limited JavaScript

rollover capability. You can select which of the effects is displayed on mouseover. You could, for example, have the animation activate on mouseover, or change the transparency, or add a glow. The program exports the two states as gifs and the JavaScript in an HTML document.

The penultimate panel provides comprehensive optimisation and export options. You can set the frame rate, check the preview and export an animated gif, or export individual frames in a variety of formats and work on them in another application.

Gif options include bit depth (in sensible 1bit increments), dither, palette and anti-aliasing. A small status bar under the preview window can be configured to display the frame rate, duration, file size, or download time.

Emotion 3D is so simple to use, a child could produce an animated gif in minutes that would outshine most of what you see on the web, or anything you could create in the other applications reviewed here given all the time you wanted. It has a good range of templates that, in combination with the animation pre-sets and user controls, provides diverse output as well as being a lot of fun.

DETAILS

★★★★★

PRICE \$24.95 (free trial version also available for download)

CONTACT www.anark.com

SYSTEM REQUIREMENTS Pentium 133, Windows 95/98/NT4, 32MB of RAM, 75MB of disk space, OpenGL

PROS Easy to use, stunning animation

CONS Limited, but great at what it does

OVERALL Emotion 3D is simple quick, cheap, easy, lots of fun. All in all, it's just brilliant



Beatware e-Picture Pro

COMBINING DRAWING, animation and export tools in a sophisticated package, e-Picture Pro takes a bit of effort to get used to, especially if you are not familiar with timeline-based animation techniques. The rewards, however, are impressive 3D animations that would be difficult to produce using conventional frame-based packages. In terms of what it does and how it works it's probably closest to Macromedia Fireworks.

The list of features is impressive. It can do all the usual stuff such as image slicing, JavaScript rollovers and optimisation, but it also provides powerful image-editing tools and supports a wide variety of object types. These can be created in situ, using an array of drawing tools, including text on a path, 3D text and a Bezier pen. A wide range of image types can be imported including Photoshop and Illustrator files, as well as 3D models in 3ds and dxf format.

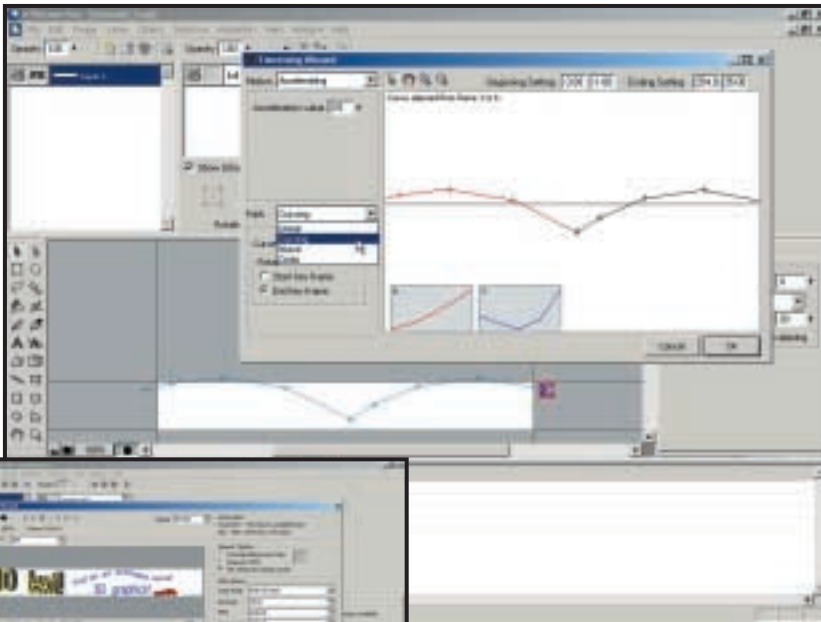
The interface is pretty scary to start with, but once you find your way around it's less intimidating. The document window is surrounded by an overscan area that makes it possible to animate objects outside the image boundaries, or you can just use it as a pasteboard.

The document window is hemmed in by a plethora of palettes, although you don't need all of these open all the time. The most important are the Inspector – where you change object attributes; the Object palette, which lists all the objects in the document and can be used to select them; and the Animation Palette. This displays objects down the left-hand side and frame numbers along the top in a timeline-type format familiar to anyone who's used Flash or a home video-editing package. Most of the editing action takes place within these palettes.

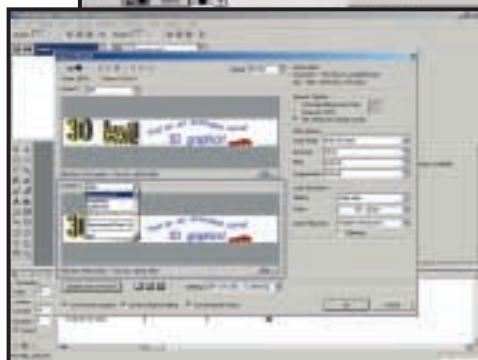
The Objects Palette is tabbed into several context-sensitive sections. If you select a 3D object the front tab displays model info and provides rotation through three axes, as well as rendering and lighting options. The next one provides layer opacity and blend options, followed by one for applying filters. Lastly, you can apply one of five shadow and glow effects, these are fully editable and can be removed at any time.

It is easy to produce complicated animation effects using tweening. Short for in-betweening, tweening refers to the process of creating the intermediate frames of an animation between the start and end points.

To create tweened animation you first select the start frame in the animation palette, draw or import the object you want to animate and position it where you want it to start. Then you



*Above: Using the tweening wizard to create a bouncing ball animation
Left: e-Picture's export wizard provides two and four-up file format comparisons*



click on the end frame and drag the object to its finishing position. As you drag, a motion line appears between the start and end positions with a square dot representing the tweened object position in each intermediate frame.

Pressing the Play button confirms that your object moves from start to end position in a straight line at a constant speed. That's all there is to it. To add keyframes you go to the relevant frame and drag the object to a new position.

For more complex tweening, the tweening wizard provides a high degree of control over every aspect of an animated object's appearance. Attributes, which are displayed in nested Explorer-style format in the Animation window, include Visibility, 3D Properties, Text Properties, and Transformation. So, as an object progresses along its path you can make it change colour, fade in and out, rotate, speed up and slow down.

Tweening wizard path pre-sets provide a quick method of setting up curved, circular and wave-shaped paths, as well as applying simple formulae to vary the object's speed. Complicated animation effects, such as a bouncing ball or falling leaves can be produced fairly effortlessly this way.

Inevitably, these sophisticated effects work best at high frame rates that, due to bandwidth considerations, are impossible, or at least unwise to maintain when exporting for web use. Animation export formats include

RealVideo, Quicktime, svg and Macromedia Flash, making it an ideal tool for all kinds of animated content creation in addition to animated gifs.

The Export wizard provides no means of reducing the frame rate, though, so you need to think about the intended destination before you start. Having said that, a 19-frame animated banner came down to just over 3KB with a 128-colour websafe palette, which is small enough for even the most demanding users.

The export wizard dialog box has a big preview window that can display two or four-up comparison previews. So it's possible, for example, to compare gif and Flash versions of the same banner.

Macromedia has some serious competition on its hands. Put simply, e-Picture Pro provides the means to create and generate good-quality animated graphics with a fraction of the learning effort required to master more complex authoring applications.

DETAILS

★★★★★

PRICE \$179 (order online)

CONTACT Beatware www.beatware.com

SYSTEM REQUIREMENTS Pentium 200, Win95/98/2000/NT, 32MB of RAM, 20MB of disk space

PROS Easy tweened animation; lots of export formats; good documentation and tutorials

CONS No frames setting in export wizard

OVERALL A feature-rich package that is a serious alternative to Flash and Fireworks



Compression and file formats

Compression and file formats are so closely bound together that it's hardly possible, or even desirable to talk about one without reference to the other. The most important thing to be aware of with compression is whether it is lossy or lossless, or to put it another way, whether the reduction in file size is achieved through removal of image data or by a more efficient method of representing and storing it.

The most widespread lossy compression algorithm is jpeg, which is also the name of the file format which uses it. Jpeg stands for Joint Photographic Experts Group, the committee that established the format.

The jpeg format stores images as either greyscale or 24bit (sometimes called true) colour. It's well suited to photographic subjects because of this and also because the compression algorithm works on the basis that the colour data removed is largely unnoticed by the human eye.

One of the great things about the jpeg format is that you can dictate by how much the images should be compressed. It is capable of compression rates up to 20:1, but the greater the compression, the lower the quality of the resulting file.

Most applications provide a sliding scale from 0 to 100, with the best quality and lowest compression settings at the top of the scale, but



What jpeg does to text. Notice the halo effect at the dome edges

though they cover the same range the scales aren't uniform and a 50 setting in one application may not render the same results as another.

Settings are also fairly arbitrary and don't give any indication of compression ratio – using the 50 setting won't necessarily compress your files by a factor of 2:1.

Using a setting of 70 to 80 usually produces results that are indistinguishable from the original; anything less than that and you'll start to notice a degradation in image quality.

The jpeg format has most difficulty dealing with contrasting boundaries and this is where you start to get problems at the lower quality settings. To compensate, some apps provide a softness setting – basically a blur filter.

Another thing to watch for



216 websafe colours as displayed in ImageReady's colour table palette

is recompression. If you continually open, edit and resave a file with jpeg compression the quality of the image will cumulatively degrade. If you need to do this, save the file in a lossless intermediate format and only save the final version as a jpeg.

Its inability to cope with edge detail makes jpeg unsuitable for line art, illustrations using flat colour, (logos, typographic art). For non-photographic subjects gif is a better choice, not just because of its compression, a lossless algorithm called LZW (though there's a lossy gif option available), but for the control over the colour palette it provides.

Jpeg is a 24bit colour file format. Whether your image has one colour or several million all 24 bits are used to display the colour information for each pixel. With gif you can alter the colour palette, or bit depth, to suit the image. If there are only four colours in the image you need use only a four-colour palette – two bits per pixel to display them.

Reducing the colour bit depth has drastic consequences for file size. A 468 x 60 pixel banner contains a total of 28,080 pixels. A 24bit uncompressed file would be around 82KB. Gifs use an 8bit 256-colour palette (216 if you are using websafe colours) so, uncompressed and using the full palette, the file would come out at 27KB. But if you reduced the palette to eight colours (3 bits) that would come down to 10KB. The LZW compression would further reduce this.

One way to represent more colours in a gif than are available in the palette is dithering. This doesn't mean taking forever to decide which of the limited colours is the best option, but combining two colours using a pixel pattern block to create a third. Dithering can give poor results when viewed in a browser, though some applications provide safe colour combinations for two-colour dithers. On the whole it's best to stick to the websafe palette, reduce the bit depth as far as possible without compromising image quality too much and don't dither.

A new file format called png (Portable Networks Graphics, pronounced ping) has recently been developed to replace gif. Like gif, png offers (slightly more efficient) lossless compression. Unlike gif, it supports up to 48bit colour, multi-level transparency, gamma correction and faster interlacing. Another advantage of png for software vendors is that they don't have to pay a licence fee to Unisys, which owns the patent on the LZW compression algorithm used by gif. One disadvantage is that browsers have only just begun to support the png format.

All this fiddling with bit depth and optimising to websafe palettes is only necessary because there are still many people in the world using graphics cards incapable of displaying more than 256 colours. As 24bit-capable displays become the norm, gif and websafe palettes will be rendered obsolete.



To dither or not to dither. Clockwise from top left: original, websafe dithered gif, websafe undithered gif, jpg



Equilibrium DeBabelizer Pro 4.5.1

DEBABELIZER PRO is an industrial-strength application for editing and optimising images for the web and multimedia applications. DeBabelizer's powerful and flexible scripting and automation features make it ideal for busy studios or people who have many hundreds or thousands of images to knock into shape on a daily basis.

DeBabelizer's interface is a little intimidating to begin with and can quickly become cluttered. This is possibly the price you pay to be able to do so much to so many images.

The program was last updated in 1998 and then only minor features were added, such as support for Quicktime 3, improved handling of other video formats, scripting enhancements and better plug-in support. However, it was well ahead of the game to begin with and DeBabelizer remains the best way to optimise images in quantity.

Although best known for its optimisation and batch processing, the software provides a set of image-editing tools, including competent selection tools, cloning, transparency, compositing, text and resampling. These are, however, beginning to look extremely dated by comparison with what's available in even the most limited of home digital darkroom applications.

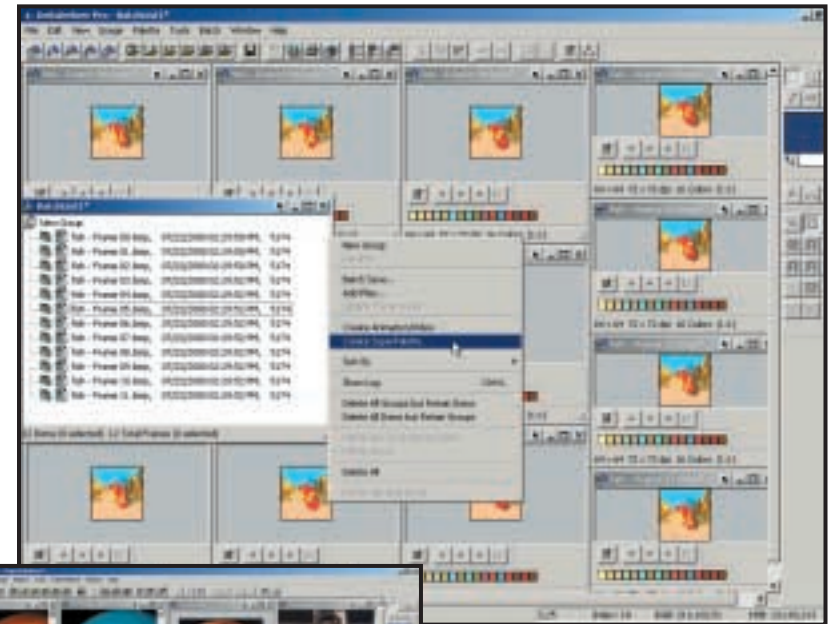
DeBabelizer gives as much precedence to palettes as to images. Other editors provide a single palette that displays the colour table for the current image, but DeBabelizer shows each image with its associated palette below.

Superpalettes – custom palettes that work across groups of images – are central to the optimisation process. When you create a superpalette, equal weight is given to all the images that contribute to it. You can, however, skew the palette in favour of a particular image or group of images.

The action arrow is a handy way of applying attributes from one window to another. To add an image to the superpalette you just drag its action arrow onto the superpalette window. The more times you do this, the more the palette is skewed to favour colours in that particular image. You can likewise apply the superpalette to individual images by dragging the action arrow in the opposite direction.

Although you can optimise small groups of images like this, say for an animated banner, website, or CD-ROM, DeBabelizer's real strength lies in its scripting and batch-processing features. The WatchMe feature records actions to an open script as you execute them in the workspace, or you can drag and drop operations from the log window.

In the script window you can edit,



*Above: Creating a Superpalette for an animated gif from the batchlist
Left: Applying the superpalette to the open images in the batchlist*

delete and re-order actions, add special operations such as pauses and loops and change operation parameters.

Scripts can be applied to individual images or animations, but when combined with a batchlist, DeBabelizer's real power becomes apparent. Batchlists let you create and organise groups of images, animation frames, palettes and superpalettes for automatic processing, either directly in the workspace, or by scripts.

Batchlists are reference pointers to files so you can use files from any source and organise them as you please without affecting the location of the source files.

Batchlists are easy to create and edit. You can drag images into a batch window using the action arrow, right-click on the batchlist window to add files, or drag them in from Windows Explorer. When adding an animation file to a batchlist, DeBabelizer creates a new file for each frame and adds the filename to the batchlist. You can also easily extract files from an HTML page into a batchlist, run a script, then re-save them. You can even drag in the entire website folder and DeBabelizer will create a group for each page. This makes it possible to quickly optimise all the graphics in an existing website.

Applying scripts to batchlists provides a convenient way to automate

all kinds of processes, from simple file-format conversion to image editing and optimisation. DeBabelizer also provides off-the-peg batch-automation processes – essentially script templates.

Automation process commands include Create Superpalette and Remap, Save With Superpalette, Compare and Composite. Compare works on two files and generates an alpha channel with differing pixels, while Composite overlays pixels from one image onto another.

ProScripts wizards take batch automation a stage further, providing an easy way to create scripts for generating common graphic types.

Much of what DeBabelizer pioneered has been adopted by more mainstream web-editing applications over the past few years. All the same, if you want complete control over optimisation and need the sheer muscle of an application designed with bulk processing in mind, then there's no better way to do it.

DETAILS

★★★★

PRICE £328.88 (£279.99 ex VAT)

CONTACT Computers Unlimited

020 8358 5857 www.equilibrium.com

SYSTEM REQUIREMENTS 486 processor, Windows 95/NT4, 16MB of RAM, 20MB of disk space, CD-ROM

PROS Powerful scripting and batch processing

CONS Too much on-screen clutter; steep learning curve

OVERALL With all the control DeBabelizer offers, it's a real image-processing workhorse

Fluffy Clouds Ignite 2.0

IGNITE CAN BE USED either as a standalone application or as a Photoshop-compatible plug-in. It's produced by a British company, Fluffy Clouds, and a 30-day trial version is available at www.ignite-it.co.uk. The install file is only just over a megabyte, so it doesn't take long to download.

When we downloaded the installer it recognised several compatible image editors on the test PC including Corel PhotoPaint and Paint Shop Pro, as well as Photoshop, and installed a plug-in for all of them. With the plug-in installed you can export files directly to Ignite from your image-editing application.

Ignite does not claim to be a graphic-design application. Like most of the products in this group test it provides a range of tools you can use to make your images better suited to web display. Those tools include optimisation, animation and image slicing.

The Ignite way of working is a little unorthodox. Rather than working on an image file, then exporting the edited/optimised file, you set up and save output files at the outset, which you can then view alongside the original source file.

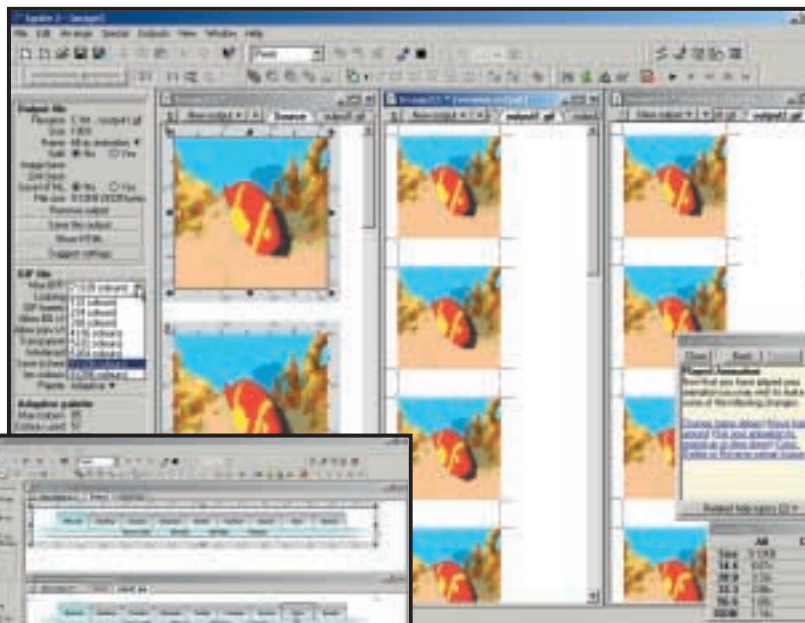
To experiment with different formats or palette settings you simply create several output files. The original source view, along with any output files you have created, are then displayed in a tabbed viewing area. You can toggle through them simply by clicking on the appropriate tab.

There's no limit to the number of viewing windows you can have open at one time so it's possible to make side by side comparisons between the original and numerous output files with different palette settings.

With animated gifs, the frames are displayed in filmstrip fashion, with rulers in the source view and trim marks in the output view.

In practice, with something like a banner, use more than four windows and things start to get a little cluttered. This is especially true if you have a number of floating palettes open as well as the excellent cue card window. You can quickly set things up to emulate something like ImageReady's more ordered layout, but the window layout can't be saved with the file, so you'll need to do this every time you open the application.

Editing changes made to the source file are automatically updated in the output file. The inspector panel provides access to all the editing tools other than those you select from menus or the five toolbars docked at the top of the screen. The inspector is context-sensitive, displaying editing tools and feedback



Changing the bit depth for one of the output files – download times are displayed bottom right



Displaying the HTML for a sliced navbar – the cell download times are only displayed for gifs

when a source window is active and palette information for output windows.

Clicking on the split image divides it into four and you can further subdivide and join cells using a floating toolbar. The HTML code can be viewed in a separate window and copied to the clipboard for insertion into an existing page. Alt text, hyperlinks and the image slice name are all input to fields on the inspector.

In output mode, the inspector allows you to set the gif file parameters – transparency, interlacing, looping and so on, and choose the palette. Three options are available, websafe, adaptive and specified and you can choose the bit depth via another pulldown menu.

Using the inspector in combination with the output views in this way you can quickly find the optimal palette settings for an animation. You can preview the animation using the cassette-style buttons on the toolbar, or open it in a browser. The built-in preview is more useful, offering 256-colour and Apple simulation. There's also a handy animation sequencer which you can use to rearrange frame order and set delay timings. This has a linear change feature which sets delays of decreasing or increasing length for each frame, allowing you to produce animations that get progressively faster or slower.

Ignite hasn't quite got to the stage of having a really hot product, but it's

smouldering nicely. The interface is flexible enough to be organised to suit your personal preferences, but needs to be more tightly ordered to prevent confusion. Far too much information is presented textually and with several output windows open at once it can be difficult to know to which file the inspector information applies. More use could be made of drag and drop. Being able to drag the tabbed output panels to create a new window would be an improvement, as would some kind of docking system for the multitude of floating palettes.

It could also use a little more automation, some palette pre-sets would be a good start, and basic batch processing should be a priority for the next release.

Despite those shortcomings it's basically a well put together piece of software with everything you need to create animated gifs from individual source files.

DETAILS

★★★★★

PRICE £99.88 (€85 ex VAT)

CONTACT Fluffy Clouds 01865 318103

www.ignite-it.co.uk

SYSTEM REQUIREMENTS Pentium 100, Windows 95/ 98/2000/NT, 16MB of RAM, 20MB of disk space

PROS Sound features; good guidance

CONS Needs work on interface and automation

OVERALL Well crafted basic gif animator held back slightly by its cluttered interface



Shareware and plug-ins

Creating web graphics on a budget couldn't be easier. There's very little worth having that's absolutely free, but there's an abundance of cheap plug-ins, shareware and demo software to try out.

If you have a full copy of Photoshop 5.5 you probably won't want to bother with them as most of what they offer is included in the latest version of Photoshop, or ImageReady 2.0.

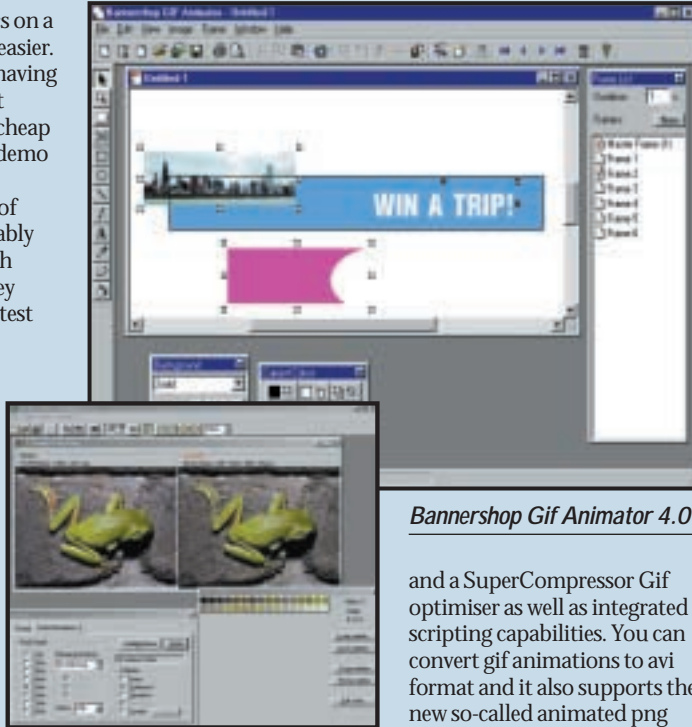
If, on the other hand, you're working with an older version of Photoshop, or another image-editing application that is plug-in-compatible, such as Paint Shop Pro or Corel PhotoPaint, these shareware plug-ins can provide many of the functions of our group test applications at a fraction of the cost.

One place that is a goldmine of applications for optimising and compressing web graphics is www.boxtopsoft.com. It's not strictly speaking shareware, rather commercial applications that you can download in demo format. Some of these are save disabled, others have limited functionality, for example **Supergif** cannot batch process.

All the Boxtopsoft products are available for Windows and Mac, they feature simple elegant interfaces which enable you to do optimisation quickly and without fuss. **ProJpeg** has a dual-image preview window with live file size, compression ratio and download time info and supports progressive (the image displays at progressively higher resolution as it downloads in the browser window) and baseline encoding.

PhotoGIF also provides comparative previews, good palette editing and control features and an edge tool for cleaning up anti-aliased edges on transparent gifs.

Colorsafe is a Photoshop plug-in that allows you to create hybrid browser-safe



Webgraphics Optimizer 4.2

Bannershop Gif Animator 4.0

and a SuperCompressor Gif optimiser as well as integrated scripting capabilities. You can convert gif animations to avi format and it also supports the new so-called animated png format mng.

GifMaster 1.4 (<http://kote.nev.hypermart.net/GMaster/info.htm>) is a suite of applications comprising Gif Viewer, Gif Optimizer, Gif Explorer, Gif Comment and Gif Convert. The Optimizer can work on an entire folder of single-frame or animated gifs. As well as gif, jpg, and png file formats are supported. GIF-Explorer is a gif file browser that supports animations, returns palette and header information, and provides some basic editing techniques. Version 1.4 is a beta with a registration fee of \$35.

Webgraphics Optimizer 4.2 software automatically optimises images for you using its intelloptimize feature, which analyses your images and decides optimal settings for you (www.webopt.com). So even if you haven't read the page on compression there's no excuse not to produce small perfectly formed gifs.

If you want to take a more hands-on approach, up to five variations can be compared while you change the file format, compression ratio, colour depth, dithering and colour palette in real time. Optimizer reads 24 file formats and writes 16,

including gif, jpeg, png, Photoshop 3 and tiff. It also has a wide range of effects filters, colour manipulation functions and TWAIN support for scanner input, all presented in a slick professional interface. The professional version also provides batch optimisation features.

Newly released **Bannershop Gif Animator 4.0** has a built-in image editor with drawing, retouching and text tools for creating single-frame and animated gifs <http://www.selteco.com/>.

It has an optimisation wizard and uses plug-in extensions to provide a range of animation and effects tools. Fly, fade, motion blur, zoom, stretch and peek extensions are included. You can download a limited time demo, or own it forever, as they say on the Disney video commercials, for \$39.

Best of the rest

<http://www.agentur-simon.de/pedit/> PEdit 0.8: Simon Bertram's PEdit is a simple, but powerful manual palette editor plug-in.

www.jpg.com Pegasus imaging: Jpeg Wizard and PicPress.

<http://www.risoftsystems.com/palex.asp> RI Soft Systems: Palette Express Palette editor.

<http://www.crayonsoft.com/> Crayon Software: Magic Viewer v1.2 shareware batch converter and optimiser.

<http://www.coffeecup.com/> Coffeecup Software Shareware Gif Animator, Image Mapper and Button Factory.

<http://stud1.tuwien.ac.at/~e8925005/> www Gif Animator v1.1 (that's not a URL by the way) Shareware Gif animator with lots of effects and transitions.

<http://www.spg-net.com/product1.html> SPG Webtools 4.0 pro Expansive suite of plug-ins

colours from a combination of two existing colours in the browser palette, thus expanding the range of websafe colours. A program called **Ditherbox** made such an excellent job of this technique that it was bought by Adobe and incorporated into ImageReady.

At www.spinwave.com you'll find **HVS ColorGIF 2.0**, a Photoshop plug-in gif optimiser. It includes programmable pre-sets, live previews and a gif animator. Other spinwave products include **JPEG Cruncher**, **GIF Cruncher** and **OptiVerter** – a scriptable command-line batch converter and optimiser for more than 50 file formats including eps, tiff, gif, jpeg and hvs animator. All are available as free trial downloads, or you can crunch online.

At www.mindworkshop.com/alchemy/gifcon.html, you'll find **Alchemy's Gif Construction Set Pro 2**, a fully featured shareware application for producing animated gifs and optimising files. It's a 4MB download and the registration fee is \$20. It has an animation wizard and banner generator, transition effects,

Jasc Animation Shop 2.0

THIS IS A COMPONENT of Paint Shop Pro 6.0 and you can download a 30-day trail from www.jasc.com. Version 1.02, which accompanied Paint Shop Pro up to version 5.01, was a basic application for stitching together gif animations. It had a clean filmstrip interface and a few transition effects, but little else. Version 2.0 adds new banner and optimisation wizards, editing tools, support for opening and saving Autodesk flc and fli plus avi file formats, more and better transitions and effects as well as enhanced integration with Paint Shop Pro.

That said, working from scratch in Animation Shop is not recommended. Its level of functionality would have been considered primitive a decade ago. There is a limited range of drawing tools for producing simple shapes and lines, a paintbrush, fill bucket, and eraser text tool.

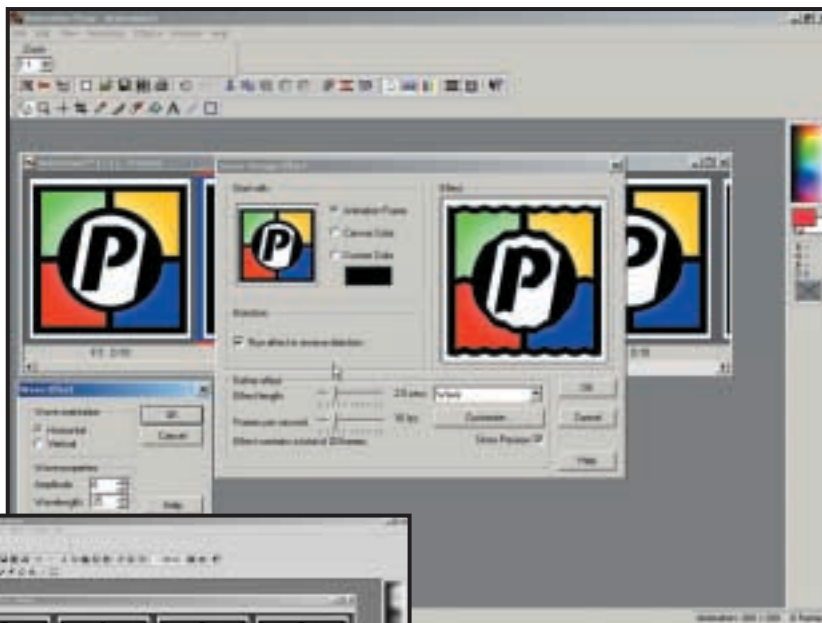
All of these work in the conventional destructive pixel mode of old – anything you produce with them is instant bits and can't be moved or otherwise edited (other than filled with a different colour from the bucket). If your text ends up not quite in the right place, or the wrong size or colour (there's no preview to help you judge this) you hit undo and start over. In the absence of layers, or any kind of selection tools, this is a big obstacle to any kind of productive work.

Were Animation Shop a standalone application, that's all you'd need to know, but tightened integration with Paint Shop Pro makes it less of an issue. You can drag layered images from Paint Shop Pro into Animation Shop where each layer will appear in its own frame.

You can also create new frames in Paint Shop Pro and drag to replace, or insert in an open Animation Shop file. Working in the opposite direction, animations can be exported to Paint Shop Pro, edited, then updated back to Animation Shop.

Transitions have a new preview dialog box that displays the start and end frames with a big preview in the middle. There are 24 available transitions including all the usual suspects – blinds, chequer wipe, dissolve, fade – and a few more interesting candidates such as spin and twist.

All the transitions are customisable to a degree and you can set the length and frame rate with sliders. Image effects work in a similar fashion and include motion blur, shakycam, spiral, underwater and wave. These can be run in reverse direction, which means you can use them to bring text or images into sharp focus from a blurry, shaky, or watery beginning.



*Above: Adding transition effects is easy and Animation Shop has a good selection
Left: The wizard has no visual feedback so it's pot luck with settings sliders*

Text effects combine a text input dialog box with an effects engine so you can generate woody text in one step. As with all of these things, some are more useful than others, depending on your personal preferences. Marquee provides quick-scrolling banner text, while wheel, flag and backlight are also worth a look.

The animation wizard has changed little, if at all from version 1.0 and is basically little more than a sequence of steps for importing several files into an animated file. Given that you can now do this more easily from a layered Paint Shop Pro file, it's hard to imagine anyone using it other than to import files from another source and standardise frame size. You can set an arbitrary frame size or opt to standardise to the first image and the wizard scales each image as required. Other than selecting the frame rate and a couple of other gif parameters and ordering the images, that's about it.

The banner wizard has little more to offer. You can select a background colour or image, choose from a selection of standard template sizes, set frame rate and looping options, enter text and specify a transition. The big drawback here is that you don't get a really good look at the text until you get to the final panel, inevitably it's the wrong size so you have to backtrack, amend it then take another look, but this is a minor quibble.

The optimisation wizard can be used

on two levels. The simple way is to drag the slider that appears on the first panel to one of four positions that range from low quality at the bottom to best quality at the top. A status panel to the right tells you what settings will be applied.

The second option is to press the customise button that gives you control over the individual settings via three tabbed panels for colour depth, optimisation parameters and transparency settings.

You can specify the bit depth from a pulldown menu, but at anything less than 256 colours it isn't possible to choose a browser palette, although you can select custom palette and then select a saved browser palette.

Animation Shop is a basic gif animation application with good transitions and effects. In combination with Paint Shop Pro you have a more powerful and versatile solution that, for the price, offers good value at this level.

DETAILS

★★★★★

PRICE £93.94 (£79.95 ex VAT)

CONTACT Digital Workshop 01295 258335

www.jasc.com

SYSTEM REQUIREMENTS Pentium processor, Windows 95/98/NT4, 32MB of RAM, 12MB of disk space

PROS Transitions and effects; integration with Paint Shop Pro

CONS Limited toolset; lacklustre wizards

OVERALL While not stunning, Animation Shop 2 is a good value basic animation package



Macromedia Fireworks 3

LIKE ADOBE, MACROMEDIA wants to integrate its products so that you can get everything you need without having to venture outside its product suite. You can buy Fireworks 3 with Macromedia's web authoring application Dreamweaver, or as a standalone product.

Because Macromedia has no mainstream image-editing product with which to integrate Fireworks (unless you count Freehand) it needs to provide everything you might require to produce stunning web graphics. Although it lacks many of the tools you'd expect to find in an image editor, it is nonetheless a very self-contained application.

It provides all you need to produce optimised graphics, buttons, nav bars, rollovers, animated gifs and other web graphics. It offers tighter integration with Dreamweaver, greatly improved previewing, and a history panel that can be used as a sort of mini script player.

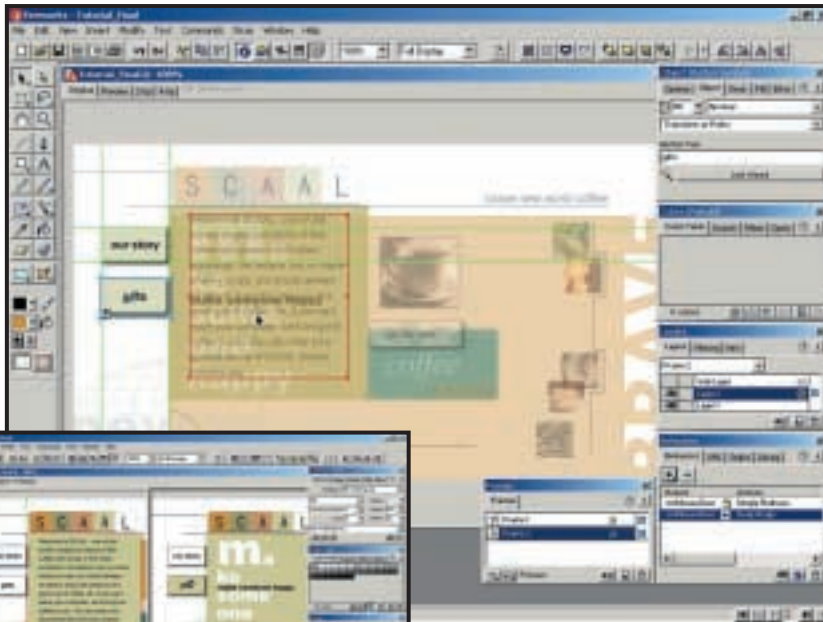
Macromedia has hedged its bets, or as it would see it, broadened Fireworks' appeal, by making it Photoshop-friendly. You can import psd files with layers intact and text layers editable. Photoshop plug-ins, which appear on the Xtras menu, can be applied as live effects, so the object to which they apply remains editable in the Fireworks file.

The Fireworks interface is clearly designed to appeal to Photoshop users. The central editing window is tabbed to provide original, preview, two and four-up optimised views. A profusion of complicated looking palettes down the right-hand side of the screen looks a little intimidating, but once you get to grips with Fireworks' object-based approach they provide the most direct means of defining object attributes.

Like Flash, Fireworks makes use of symbols to short-circuit the production process for repeating objects. Eventually, everything is rendered into bitmaps, HTML and JavaScript, so this doesn't help to reduce file sizes, but it does cut out a lot of the repetitive work.

The new button editor is where you create simple two-state buttons and more complex nav bars, including down and over while down states. For more advanced rollovers, including what Fireworks calls disjoint rollovers – where the pointer over one graphic causes another graphic to change – you need to attach JavaScript 'behaviours' to objects using the Behaviours inspector.

Animation in Fireworks is frame-based, so if you want to create a two-state button frame one would contain the up state and frame two the mouseover state. To attach a behaviour to an image slice you select the event



Above: Creating disjoint rollovers – mouseover on the gifts button changes the panel to its right

Left: And you can preview the rollovers in situ – no need to fire up the browser



and choose from the available JavaScripts. Swap image, for example, changes the contents of a specified slice with another frame under the same slice and Swap Image Restore brings you back to the default frame. The two behaviours are combined to provide a simple rollover behaviour that uses frames one and two of the selected slice.

Gif animation uses the same frame-based approach. The combination of frames and layers makes deciding what will appear and when less complicated. You can share a layer so that its contents appear in every frame and distribute multiple selections to separate frames for sequential display.

Rollovers and gif animations can be previewed from within Fireworks, so you don't have to fire up a browser every five minutes to check the results. As a means of checking everything is functioning, this is convenient, but when combined with Fireworks' optimisation controls it's an absolute godsend.

Again, it's impossible not to draw comparisons with Photoshop, which Fireworks' Optimize palette resembles very much. The palette provides the kind of pre-sets you would expect – jpeg at various compression settings and gif using a variety of palette and dither options – there's even a lossy gif option, just like Photoshop.

By selecting an individual slice you can specify optimisation settings for it alone, regardless of the general setting for the rest of the image and in this way you can go through the image, piece

by piece, selecting the optimal settings.

Likewise with animated gifs you can mess about with the optimisation settings while previewing the animation.

An export wizard automates the optimisation process to a degree, and provides an option to specify the file size, useful now so many sites have file size restrictions on banner ads, though you may prefer to do your own tweaking.

Fireworks' combination of bitmap and vector features, JavaScript routines, animation and optimisation tools makes a compelling combination for designers who want to pack graphics with HTML action while at the same time squeezing files until they squeak. It's not as simple to use as ImageReady, so not ideal for quickfire bits and pieces, but well suited to more demanding projects that require lots of graphics with ready to run JavaScript and HTML functions built in.

DETAILS

★★★★★

PRICE £163 (£139 ex VAT) £299

Fireworks/Dreamweaver 3 Studio
020 8358 5857 www.macromedia.com

SYSTEM REQUIREMENTS Pentium 120 (III recommended) Windows 95/98/NT4, 64MB of RAM, 60MB of disk space, CD-ROM

PROS Creative tools and web functionality perfectly integrated

CONS Steep learning curve

OVERALL Fireworks is the only choice for dedicated web designers



Ulead Gif Animator 4

THERE'S SOMETHING about Ulead's Gif Animator 4 that makes your heart sink. The grey interface has no life and certainly doesn't entice you to delve into the software further to produce moving graphics for websites.

Like many animation programs, Gif Animator works on the assumption that you will create the frames of an animation in an image-editing application. The grandly titled 'animation wizard' is a dialog box that you use to browse for and arrange in order individual frames. You can also opt for dithering and set the frame rate.

Our test animation, consisting of five sequentially numbered tif files came in order 5,2,3,4,1. Although you can drag and drop to change the order, the wizard dialog box isn't wide enough to view the filename, only the first section of the path so, unfortunately, you can't tell which file is which.

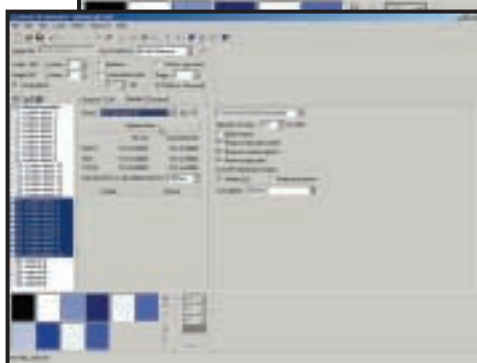
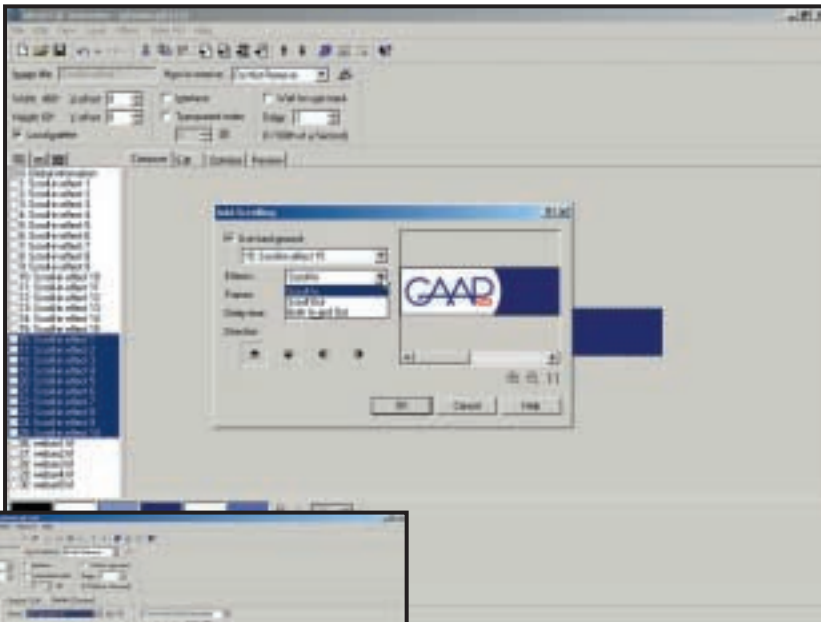
The tabbed editing window provides four functions: compose, edit, optimise and preview. It's surrounded by an attribute toolbar at the top, a palette toolbar at the bottom, a layer pane on the left and a toolbar that appears on the right when you select the editing tab on the workspace window. Other options are compose, optimise and preview.

The compose section doesn't appear to serve any function, so you may as well click on the Edit tab. This provides access to the editing toolbar that has a few basic image-editing tools like crop, rotate, fill and erase. In addition, there are zoom buttons, an onion skin button that displays the previous frame underneath the current one, and a magic wand.

Additional image-editing functions can be accessed from the menu bar, available in any of the editing modes. If you buy Gif Animator as part of the WebRazor 2.0 suite you get a bonus set of video transition and filter effects.

The layer pane displays each frame either in list, thumbnail, or filmstrip format. Whichever format you're in you can't drag and drop the layers to rearrange them, you have to go to the layer menu and select move layer up, or down (there is, though, a keyboard shortcut and a toolbar button). Unfortunately you will be doing a lot of this because Animator is unable to import files in the correct order.

The layer menu is also the route to a whole bunch of effects, including video transitions, a rotating cube animation, a banner text applet, scrolling, and something called moving sprites. There's an abundance of these



The optimise panel – but where the preview thumbnail should be – a big grey area

effects and features, but the question is do you want them? Mostly, they exist because they are easy to program, rather than for any aesthetic or productive reason.

Moving sprites is a sort of poor man's tweening that applies an offset to a series of duplicated frames to produce movement. Colour animation creates new frames with all pixels of a particular colour changing to another colour. Have you seen those delightful banners where the background, text and anything else visible cycles through every luminous colour perceptible to the human eye?

One effect that is worth having and produces quicker results than by hand is add scrolling. This allows you to scroll the frames of your animation (most likely a banner) into and out of the frame from any side. As well as the scroll direction you can set the number of frames used to achieve the effect, delay time and background colour and a small preview window shows you how it looks. Sadly, there doesn't appear to be a way to scroll a frame out while the subsequent frame scrolls in.

There are two options for optimising animated gifs. A three-step wizard takes you through palette selection, dithering and removal of redundant pixels, comments etc, then gives you a report

Quickly add scrolling to your banners with Gif Animator's one good feature

and you can view a preview, but you can't compare it with the original.

Alternatively, you can choose from a number of pre-sets. There are two pulldown menus, one for bit depth and another that gives three palette options: optimise, browser safe, and user defined. You don't get the report until you've pressed the Optimise Now button and if you don't like the results you have to undo and start again with different settings.

To see the results of the optimisation you go to the preview pane and try to guess how your latest effort compares with the previous effort, or the original.

Web graphics packages have reached a stage of sophistication where, to have something to offer, they need to be easy to use, provide powerful editing features, or have an original approach.

Gif Animator 4 is none of these things. It provides the kind of features that shareware applications have been offering for years, bound up with a miscellaneous collection of effects and filters of little practical use.

DETAILS



PRICE £29.95 (£25.50 ex VAT)

CONTACT Bit 01420 83811

www.ulead.com

SYSTEM REQUIREMENTS Pentium processor, Windows 95/98/NT4, 32MB of RAM, 16MB of disk space

PROS Inexpensive; an abundance of moving sprites...

CONS ...but do you need them? Poor interface

OVERALL There are better options available

Ulead SmartSaver Pro 3.0

ULEAD SMARTSAVER PRO 3 neatly covers the four core areas of web graphics production – image slicing, JavaScript rollovers, image maps and optimisation. It can be run as a standalone application or Photoshop-compatible plug-in from your image editor. You can download a free 15-day trial version from www.ulead.com, alternatively SmartSaver 2.0 is available as part of Ulead's WebRazor Pro 2.0 suite, which also includes Gif Animator 4 (see previous review), Cool 3D 2.5 and Photo Explorer 5.0, but you'll need to upgrade to version 3.0 of SmartSaver Pro.

Utilitarian, but functional, SmartSaver's tabbed palette approach lets you get straight down to business.

Clicking on the Function tab above the Edit window displays the properties panel, colour palette and floating panels for the task in hand and activates the tools in the toolbar.

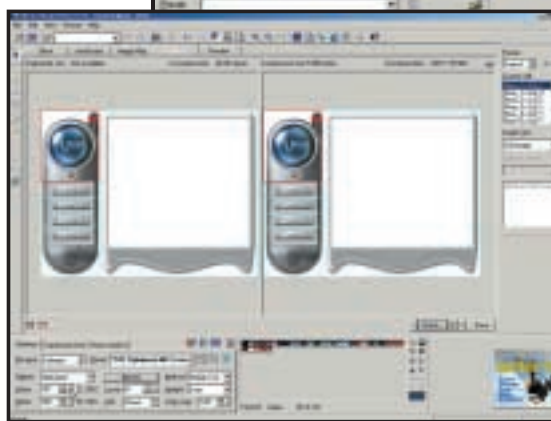
Three tools are provided for slicing, a 'slice evenly' grid – enter the number of rows and columns in a dialog box – an 'add sliced line' tool, and a slice line eraser. The last of these is crucial as the first two tools provide a less than ideal way of dividing up the image.

The slice line creates a horizontal or vertical line at the exact spot on which you click, you can't drag to place the line more accurately, though you can edit it afterwards. Once you get the hang of it it's easy enough, but not nearly as intuitive as Photoshop's slicer and it lacks the editing features.

Moving on to the Optimizer, the properties panel houses three tabbed palettes, the first of which provides all the settings and pre-sets for file format and compression settings. First you pick your file format by clicking on the gif, jpg or png button, then you can select from a list of pre-set options on a pull-down menu. If you choose gif or one of the png pre-sets the colour palette is displayed.

You can optimise individual slices, either by clicking to select or highlighting the relevant cell in the frames and cells panels, but there doesn't seem to be a way to apply these settings to multiple slices.

Having selected your pre-set you can then tweak the palette to try and skim bits without sacrificing quality. The gif settings give you the choice of an optimised palette based on image pixels, a websafe palette, or a user-defined one. The degree of dither, number of colours in the palette, and adherence to the websafe palette can all be set by sliders.



The Optimization tab – plenty of control, but no way to optimise multiple cells

In practice dither will be set either on or off, and the same goes for the websafe colours – you either use them or you don't, there's no half way, so the provision of sliders is a bit daft.

As for number of colours, some indication of the boundary at which you lose bits would be helpful. Reducing the number of colours from 256 down to anything above 128 isn't going to make any difference to file size, but will have an impact on image quality.

You can give portions of unsliced images a quality boost using the emphasize area tab. For jpegs you use a slider to set a higher quality/lower compression setting, with gifs you can give precedence in the palette to colours that fall within the selected area.

On the face of it, facilities for creating JavaScript rollovers are good, but let down by the need to reference external files for additional states. In Fireworks and ImageReady you make use of layers to create alternate button states, it's easy to see what you're doing, keep elements in register and judge the impact of changing elements.

SmartSaver provides all the right controls and even lets you assign audio to a rollover, but when it comes to

Tags on JavaScript for rollovers, but the real work needs to be done elsewhere

displaying the rollover graphic you have to specify an existing file. This means you really create the rollover in an image-editing application, all SmartSaver does is provide a convenient front end for adding the JavaScript.

The toolbar at the top of the screen adds some nice convenience features. Show project info displays a dialog box with details of each cell's size and type together with total download time on a specified bandwidth link. Full-screen preview mode shows your graphic against a specified colour background and a buttonbar provides 256-colour preview, and a Mac preview (graphics display lighter on Macs). Furthermore, you can drag and drop your graphic for absolute positioning on the HTML page.

If your primary requirement is for image optimisation and you don't want to spend a fortnight reading manuals, SmartSaver will get you there quickly and with minimal effort, while providing plenty of control if it's in your nature to tweak. If you want to create JavaScript rollovers there are many better options.

DETAILS



PRICE £29.95 (£25.50 ex VAT)

CONTACT Bit 01420 83811

www.ulead.com

SYSTEM REQUIREMENTS Pentium processor, Windows 95/98/NT4, 32MB of RAM, 16MB of disk space

PROS Easy to pick up and get going

CONS Not a good choice for rollovers

OVERALL Not much to shout about beyond the optimisation

Table of features					
MANUFACTURER	ADOBE	ANARK	BEATWARE	EQUILIBRIUM	FLUFFY CLOUDS
PRODUCT	IMAGE READY	EMOTION 3D	E-PICTURE PRO	DEBABELIZER 4.5	IGNITE 2.0
Price inc VAT (ex VAT)	P'shop £468.83 (£399)	\$24.95	\$179	£328.88 (£279.99)	£99.88 (£85)
FEATURES					
Image slicing	✓	✗	✓	✗	✓
Image maps	✓	✗	✗	✗	✗
JavaScript rollovers	✓	✓	✓	✗	✗
Gif animation	✓	✓	✓	✓	✓
Tweening	✓	✗	✓	✗	✗
Colour table editing	✓	✗	✗	✓	✓
Hex colour values	✓	✗	✗	✗	✓
Comparison preview	✓	✗	✓	✗	✓
256 colour preview	✓	✗	✗	✓	✓
Size/download time display	✓	✗	✓	✗	✓
Batch processing	✓ (in Photoshop)	✗	✗	✓	✗
Scripting	✓	✗	✗	✓	✗
Auto banner creation	✗	✗	✗	✗	✗
Gif optimisation	✓	✓	✓	✓	✓
Jpeg export	✓	✓	✓	✓	✓
Png export	✓	✓	✓	✓	✓
HTML export	✓	✓	✓	✗	✓
Notes		15-day full version trial	30-day full version trial		

Table of features				
MANUFACTURER	JASC	MACROMEDIA	ULEAD	ULEAD
PRODUCT	ANIMATION SHOP 2.0	FIREWORKS	GIF ANIMATOR 4	SMARTSAVER PRO 3
Price inc VAT (ex VAT)	£93.94 (£79.95)	£163 (£139) (£299 Fireworks /Dreamweaver 3 Studio)	£29.95	£29.95
FEATURES				
Image slicing	✗	✓	✗/✗	✓
Image maps	✗	✓	✗	✓
JavaScript rollovers	✗	✓	✗	✓
Gif animation	✓	✓	✓	✓
Tweening	✗	✓	✗	✗
Colour table editing	✗	✓	✓	✓
Hex colour values	✓	✓	✓	✓
Comparison preview	✗	✓	✗	✓
256-colour preview	✗	✓	✗	✓
Size/download time display	✓	✓	✓	✓
Batch processing	✗	✓	✓	✓
Scripting	✗	✓	✗	✗
Auto banner creation	✓	✗	✓	✗
Gif optimisation	✓	✓	✓	✓
Jpeg export	✗	✓	✗	✓
Png export	✗	✓	✗	✓
HTML export	✓	✓	✓	✓



Editor's Choice

There's a lot of talk about how rapidly the web is developing, how increased bandwidth and convergence is pushing the drive for new kinds of rich visual content.

Despite this, many web graphic tools are focused on producing content in a format that owes more to the last century than this one and will soon, hopefully, be obsolete, namely the gif, both in its single-frame and animated format.

Ulead's SmartSaver Pro and Gif Animator, Jasc Animation Shop 2, and to a lesser extent Ignite and DeBabelizer, all offer little in addition to file optimization and basic frame animation tools.

So what should you be looking for in a web graphics application that will still be in the running when everyone has a true colour display and an ADSL connection, and when web banners rival TV commercials in terms of sophistication of content and leave them standing where interactivity is concerned?

First, it must integrate seamlessly with the application being used for wysiwyg production of web pages and sites. Integration with other graphics applications providing both vector and raster-based images and the ability to import common vector and raster file types also matters. Web graphics production is only one part of the workflow and it has to fit as seamlessly as possible with all the others.

It must be able to export a wide range of formats and, of course, it must provide support for the web technologies that improve performance and enhance interactivity.

The winners

The application that fully meets all these criteria is Macromedia Fireworks 3, which wins our **Editor's Choice** award. Fireworks is about much more than optimisation and animation. Its drawing tools combine vector and bitmap approaches in an object-based environment that provides a high level of editing control.

It happily opens Photoshop, Freehand, Illustrator and CorelDraw files with layers intact and with drag-and-drop support for all of these plus Microsoft Office 97 onwards, IE and Netscape 3 onwards and Flash 3 onwards. Fireworks' native file format is png.

It has a broad range of colour options including accessible palette optimisation and editing as well as transparency, anti-aliasing and halo removal tools and has the kind of compositing and masking tools usually only found in high-end image editors.

Fireworks' JavaScript and HTML features may take a little more effort to get used to than some of the other packages featured, but time spent here will be amply repaid later. There is an unprecedented degree of control over the appearance and behaviour of graphic elements plus many export options.

It takes a while to get your head around Fireworks' method for creating rollovers, which requires juggling frames, layers, objects and behaviours, but once you get the hang of it you wonder if there could be any better way to do it anyway. The new Set Nav Bar Image and button editor further simplifies the creation of common page components.

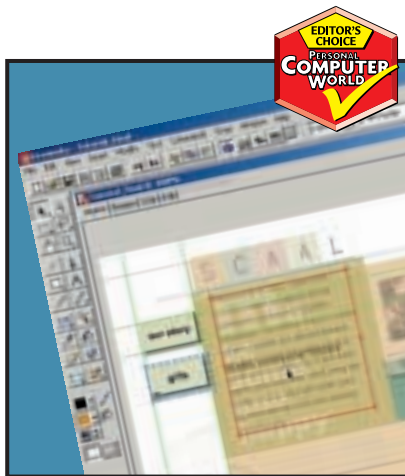
It's not too difficult to imagine a future where Fireworks, Flash and Dreamweaver play the same dominant role in web production that Quark Xpress has established in the print world. Certainly on the basis of what it currently has to offer, there's nothing to touch it.

The first of our **Highly Commended** awards goes to Beatware's e-Picture Pro. It deserves this on the basis of its tweened animation features alone. Add to this a well-organised interface (albeit one with scope for improvement), excellent compression performance and a raft of export formats including gif, png and Flash and you have what adds up to one of the best ways to produce web animations that doesn't involve pyrotechnics.

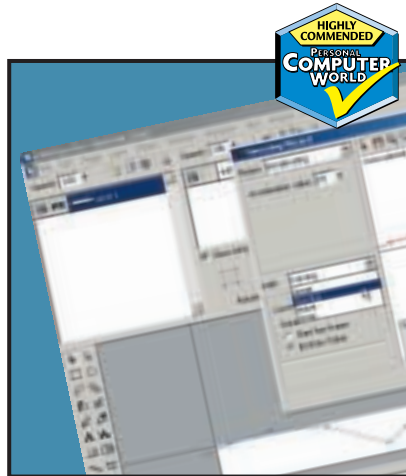
While e-Picture falls some way short of Fireworks in terms of features, tools and overall scope, it does, however, offer unsurpassed animation controls that are relatively easy to use. It is also particularly strong in its support for 3D graphics and text handling.

Anark's Emotion 3D takes our second **Highly Commended** award on the grounds that, by any definition it's just a great piece of software. Download it, play with for 10 minutes and if you don't think it's for you, at least it will have given you something to smile about.

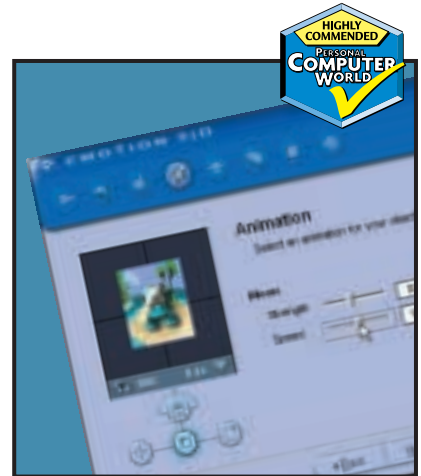
You just can't help but warm to the sight of stupid looking cartoon characters bouncing about the place in a very human sort of a way. Emotion is one of those products that quickly attracts a crowd around your monitor, so, if for no other reason than it enhances your popularity it's well worth a look.



Macromedia's Fireworks is streets ahead of other web animation software



e-Picture's tweening features and compression performance impressed us



Have a play with Emotion 3D's cartoon characters and you'll be hooked

Shareware and plug-ins

Creating web graphics on a budget couldn't be easier. There's very little worth having that's absolutely free, but there's an abundance of cheap plug-ins, shareware and demo software to try out.

If you have a full copy of Photoshop 5.5 you probably won't want to bother with them as most of what they offer is included in the latest version of Photoshop, or ImageReady 2.0.

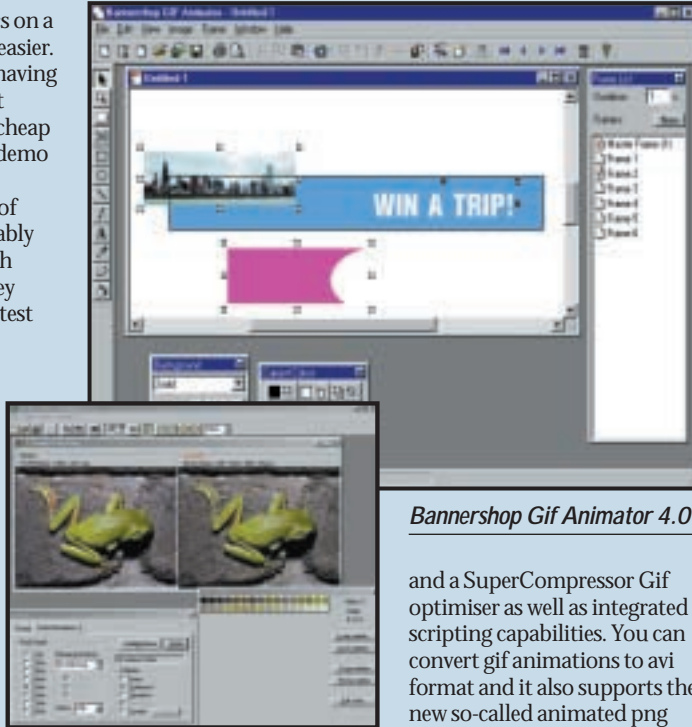
If, on the other hand, you're working with an older version of Photoshop, or another image-editing application that is plug-in-compatible, such as Paint Shop Pro or Corel PhotoPaint, these shareware plug-ins can provide many of the functions of our group test applications at a fraction of the cost.

One place that is a goldmine of applications for optimising and compressing web graphics is www.boxtopsoft.com. It's not strictly speaking shareware, rather commercial applications that you can download in demo format. Some of these are save disabled, others have limited functionality, for example **Supergif** cannot batch process.

All the Boxtopsoft products are available for Windows and Mac, they feature simple elegant interfaces which enable you to do optimisation quickly and without fuss. **ProJpeg** has a dual-image preview window with live file size, compression ratio and download time info and supports progressive (the image displays at progressively higher resolution as it downloads in the browser window) and baseline encoding.

PhotoGIF also provides comparative previews, good palette editing and control features and an edge tool for cleaning up anti-aliased edges on transparent gifs.

Colorsafe is a Photoshop plug-in that allows you to create hybrid browser-safe



Webgraphics Optimizer 4.2

colours from a combination of two existing colours in the browser palette, thus expanding the range of websafe colours. A program called **Ditherbox** made such an excellent job of this technique that it was bought by Adobe and incorporated into ImageReady.

At www.spinwave.com you'll find **HVS ColorGIF 2.0**, a Photoshop plug-in gif optimiser. It includes programmable pre-sets, live previews and a gif animator. Other spinwave products include **JPEG Cruncher**, **GIF Cruncher** and **OptiVerter** – a scriptable command-line batch converter and optimiser for more than 50 file formats including eps, tiff, gif, jpeg and hvs animator. All are available as free trial downloads, or you can crunch online.

At www.mindworkshop.com/alchemy/gifcon.html, you'll find **Alchemy's Gif Construction Set Pro 2**, a fully featured shareware application for producing animated gifs and optimising files. It's a 4MB download and the registration fee is \$20. It has an animation wizard and banner generator, transition effects,

Bannershop Gif Animator 4.0

and a SuperCompressor Gif optimiser as well as integrated scripting capabilities. You can convert gif animations to avi format and it also supports the new so-called animated png format mng.

GifMaster 1.4 (<http://kotenev.hypermart.net/GMaster/info.htm>) is a suite of applications comprising Gif Viewer, Gif Optimizer, Gif Explorer, Gif Comment and Gif Convert. The Optimizer can work on an entire folder of single-frame or animated gifs. As well as gif, jpg, and png file formats are supported. **GIF-Explorer** is a gif file browser that supports animations, returns palette and header information, and provides some basic editing techniques. Version 1.4 is a beta with a registration fee of \$35.

Webgraphics Optimizer 4.2 software automatically optimises images for you using its *intelloptimize* feature, which analyses your images and decides optimal settings for you (www.webopt.com). So even if you haven't read the page on compression there's no excuse not to produce small perfectly formed gifs.

If you want to take a more hands-on approach, up to five variations can be compared while you change the file format, compression ratio, colour depth, dithering and colour palette in real time. Optimizer reads 24 file formats and writes 16,

including gif, jpeg, png, Photoshop 3 and tiff. It also has a wide range of effects filters, colour manipulation functions and TWAIN support for scanner input, all presented in a slick professional interface. The professional version also provides batch optimisation features.

Newly released **Bannershop Gif Animator 4.0** has a built-in image editor with drawing, retouching and text tools for creating single-frame and animated gifs <http://www.selteco.com/>.

It has an optimisation wizard and uses plug-in extensions to provide a range of animation and effects tools. Fly, fade, motion blur, zoom, stretch and peek extensions are included. You can download a limited time demo, or own it forever, as they say on the Disney video commercials, for \$39.

Best of the rest

<http://www.agentur-simon.de/pedit/>
PEdit 0.8: Simon Bertram's PEdit is a simple, but powerful manual palette editor plug-in.

www.jpg.com
Pegasus imaging: Jpeg Wizard and PicPress.

<http://www.risoftsystems.com/palex.asp>
RI Soft Systems: Palette Express Palette editor.

<http://www.crayonsoft.com/>
Crayon Software: Magic Viewer v1.2 shareware batch converter and optimiser.

<http://www.coffeecup.com/>
Coffeecup Software Shareware Gif Animator, Image Mapper and Button Factory.

<http://stud1.tuwien.ac.at/~e8925005/>
www Gif Animator v1.1 (that's not a URL by the way) Shareware Gif animator with lots of effects and transitions.

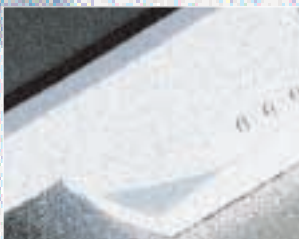
<http://www.spg-net.com/product1.html>
SPG Webtools 4.0 pro Expansive suite of plug-ins

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PHOTOGRAPH PATRICK LLEWELYN-DAVIES

monitors

Written by David Fearon

Welcome to this month's **pcwexpert**. Over the next 16 pages we take an in-depth look at both CRT and LCD monitors.

We start at their origins and go on to their inner workings and explain how you can get the best results. Read on to find out more and become a PCW expert on monitors.

Bringing monitors into focus

Despite being around since the 19th Century the CRT faces stiff competition from a technology based on frozen carrot juice

Of the 300 million or so PCs in use around the world today, the vast majority are connected to a display technology that predates the digital computer by about 50 years. The basic technology on which these displays are based, the cathode ray tube (CRT), was invented in the 19th Century, when the closest thing to a digital computer was Charles Babbage's notional Analytical Engine.

The man credited with developing the basic technology that would, in a modified form, make its way into practically every household in the western world within the next 60 years, was a German physicist named Karl Ferdinand Braun.

Cathode ray tubes had been around for a while, but in 1897 Braun invented the cathode ray oscilloscope, a device with all the basic elements of a modern picture tube: a focused, steerable electron beam with a fluorescent screen that could be used to produce patterns. The cathode ray oscilloscope was invented to enable plotting of time-variable voltage and currents on the screen, and oscilloscopes are still used today in the same way by electronic engineers. But people started to realise very early on that the device could be used for more than plotting single lines

and producing pretty patterns. Just a decade or so later, over in Russia, Boris Rosin and Vladimir Zworykin used what was then still called a Braun tube to demonstrate one of the first ever television systems.

But in 1889, even before Braun had developed the cathode ray tube, an Austrian botanist by the name of Reinitzer was doing what botanists apparently did in those days, namely freezing carrot juice. Looking at the structure of the material as it thawed, Reinitzer noticed that at a certain temperature, rather than making the transition from liquid to solid directly, it appeared to hover between the two. The juice would flow like a liquid, but retain some of its crystal structure. He and German physicist Otto Lehmann called this fourth state of matter the liquid-crystal state.

As the properties of liquid crystals continued to be investigated, it was discovered that the semi-crystalline structure of some liquid crystal compounds could be influenced by an electric field. This fact, combined with the fact that the orientation of the crystals, called the director, affected the transmission of light, meant it was only a matter of time before someone put liquid crystal



A state of the art monitor circa 1962

to use as a display device.

In the event, it was rather a long time. Because liquid crystal is less suited to displaying analog quantities and is more 'digital' in nature, the world had to wait for the invention of the silicon transistor and digital electronics before the first viable LCD (liquid-crystal display) was

developed. The first one was the offspring of the scientists at the Radio Corporation of America (RCA) laboratories in 1963. This didn't use the principle of polarising light that modern displays use, but was based on a principle known as the dynamic scattering mode (DSM). Applying a small voltage to the display

pcwexpert timeline

1889	1897	1910	1963	1963	1968
Austrian botanist Friedrich Reinitzer is mucking about with a carrot and discovers that certain types of organic matter have a fourth state between liquid and solid - the liquid-crystal state.	German physicist Karl Ferdinand Braun develops the first cathode ray oscilloscope, the basis of modern CRT displays.	Russians Boris Rosing and Vladimir Zworykin show a crude television system at the Imperial Institute of Technology in Moscow. The system uses a Braun cathode ray tube as its display.	Ivan Sutherland's Sketchpad is the first interactive computer graphics system, but because of the vast cost of memory it is a vector rather than raster-based system.	The Radio Corporation of America (RCA) demonstrates the first crude liquid-crystal display (LCD), based on the dynamic scattering mode of operation.	Sony invents the Trinitron aperture-grille picture tube, a breakthrough design that's flat in the vertical direction and gives very high brightness, but at this point it makes its appearance in televisions only.

made the display elements turn cloudy. Unfortunately, this display proved to have a limited lifetime and wasn't especially clear.

The first LCD to use liquid crystals in the same manner in which they are used today appeared a few years later in 1971. This was the familiar display that has been used in digital watches and calculators ever since. It used the mode of operation whereby the twisting of the liquid crystal under a voltage causes light to be blocked by a polarising filter. This is called the twisted-nematic effect and all modern LCDs, whether in watches or high-end flat-panel displays, work on this principle.

The major factor that influenced the development of the computer monitor was, of course, the development of computers themselves. After all, there was no point in developing a display capable of high-resolution graphics when no computer existed to use it.

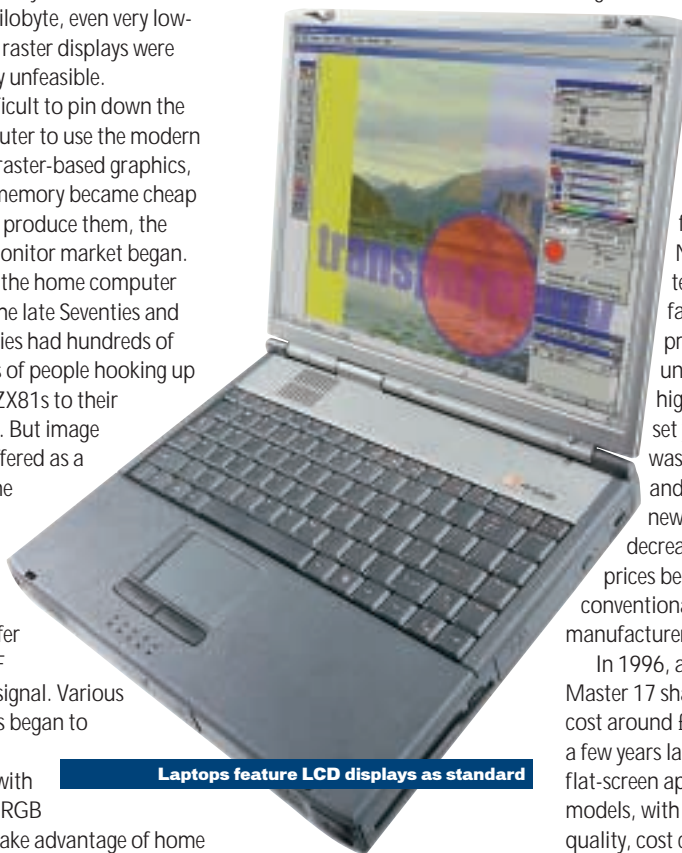
Computers migrated from punch cards and tape in the 1960s, and that's when the first graphical displays were developed specifically for computer use. Ivan Sutherland's Sketchpad, designed in 1963, is regarded as one of the first interactive graphics systems, but like most computer systems up until the Seventies, its display was vector-based. The CRT display's electron beam was steered directly around the screen to create wireframe objects, rather

than using the modern raster method where the image is built up line by line, in the manner of a television image. The reason for this was simple: raster-based computer displays require a memory buffer that stores the colour of each pixel in the image. When memory was a million dollars a kilobyte, even very low-resolution raster displays were completely unfeasible.

It's difficult to pin down the first computer to use the modern system of raster-based graphics, but once memory became cheap enough to produce them, the modern monitor market began. In the UK, the home computer boom of the late Seventies and early Eighties had hundreds of thousands of people hooking up their new ZX81s to their televisions. But image quality suffered as a result of the computer having to convert the RGB image buffer into a UHF television signal. Various companies began to produce monitors with dedicated RGB inputs to take advantage of home micros with the appropriate RGB outputs, such as the BBC Micro. One of the best-known and most popular dedicated monitor ranges of the 1980s in the UK was Microvitec's Cub, made famous by its use on the BBC's

Computer Programme and its ubiquity in schools.

Driven by the drops in memory prices, the resolution of home computers, and latterly PCs, steadily increased. In the early 1990s, Windows 3.1 and PCs with VGA graphics resulted



Laptops feature LCD displays as standard

in display resolutions of 640 x 480, then 800 x 600.

With the advent of the Swedish TCO trade union's interest and the computer's entry into offices around the world, the

health implications came to the fore, and it wasn't long before 'flicker-free' monitors with refresh rates of 72Hz and above became available. Flickering screens weren't the primary source of concern, however: the idea that low-frequency EMR (electromagnetic radiation) could affect vulnerable groups such as pregnant women gave rise to the MPRII and latterly TCO92 standards.

After that, and for most of the Nineties, monitor technology remained fairly static, as did prices. In 1994 a 17in unit was a luxury and a high-end model would set you back £1,500. It was only in late 1996 and early 1997 that the new threat from ever-decreasing LCD flat panel prices began to prod the conventional CRT manufacturers into action.

In 1996, an Iiyama Vision Master 17 shadow-mask display cost around £550, but now, just a few years later, the latest 19in flat-screen aperture-grille models, with vastly better image quality, cost close to half that.

The threat from LCD displays has yet to make an impact: CRT-based displays continue to give the best price-performance ratio, with a high-end 21in flat-screen CRT costing around the same as a decent 15in LCD flat panel.

1971	1980s	1990s	1994	1996/7	1999
Hoffman-La Roche develops the first commercial twisted-nematic LCD of the type later used for calculators and digital watches. The basic principle is the same as that now used in flat-panel PC displays.	The advent of mass-market home computers in the UK means dedicated computer monitors like Microvitec's classic Cub range start to replace televisions for home computer use.	Windows 3.1 demands a resolution of 640 x 480, setting the baseline for new monitors. The TCO is formed to set standards for ergonomics and emissions. The first 'flicker-free' monitors begin to appear.	Prices for decent monitors are still high: a good quality 17in unit costs over £1,000 and 14in displays are still the norm for home user and office systems.	LCD flat panels become viable for home users, albeit those with very deep pockets. This gives CRT manufacturers a kick up their backs and CRT prices rapidly start to drop while quality improves.	Sony produces the FD Trinitron tube and Mitsubishi releases the rival Diamondtron NF, the first CRT-based displays with perfectly flat screens, initially in 19in sizes. A flat-screen 17in monitor now costs as little as £200.

Shots in the dark

Here we take a detailed look at the inner workings and refinements that have kept the cathode-ray tube in line with progress

The vast majority of the world's monitors are still based on the fundamental principle that physicists like Braun were using back in the 19th Century: the cathode ray tube. But there's a world of difference between that basic device and the phenomenally complex piece of engineering that's resulted from the CRT's 100-odd years of development.

Principles of the CRT

To make a basic CRT you need four major parts: an evacuated glass tube into which you put an electron gun, a deflection yoke and a phosphor coating (see diagram top right). The gun produces a stream of electrons that are fired toward the screen.

Electrons can be influenced by electromagnetic fields, so the deflection yoke, which is essentially an electromagnet, can steer the beam of electrons to a particular point on the screen as they shoot past. The electron beam itself is invisible, hence the phosphor coating on the rear of the screen. When the electron beam hits the phosphor, energy is released and a point of light appears where the beam is directed.

In a monitor or television, the picture is built up by splitting an image into rows of lines, known as a raster, and painting the image on the screen by using the deflection yoke to start at the top of the tube, scan the beam from left to right and vary its intensity to produce the first line of pixels, then zipping the beam back to the start of the next row a little further down, painting that line, and so on.

The combined effects of human persistence of vision and the fact that the phosphor continues to glow after the beam has moved away from a particular spot means that if this process is done fast enough (at least 25 times a second, but preferably much faster) the

illusion of a complete, continuous picture is achieved.

CRTs in close-up

The gun, which produces the stream of electrons, has a heater, which literally heats up a negatively charged metal plate called the cathode. Metals have a supply of free electrons that are not permanently bonded to any of the metal atoms – this is why metals conduct electricity.

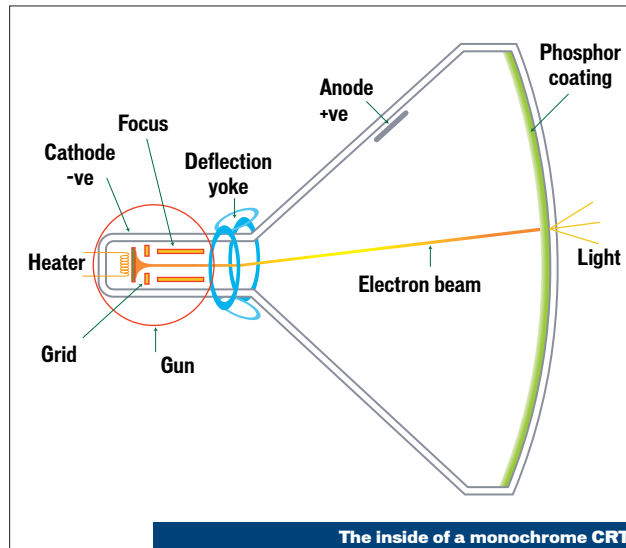
Applying heat to the metal gives the electrons enough energy to free themselves from the cathode, resulting in an electron cloud. An electrical terminal called the anode, which is usually placed at the top of the tube near the screen, is given a very high voltage relative to the cathode (tens of thousands of volts), which has the effect of accelerating the electrons very strongly towards the screen at somewhere around one-tenth the speed of light.

On the way, they pass through plates called the focus plates that are at a negative voltage relative to the cathode, which has the effect of compressing the stream into a fine beam. A metal grid in the gun assembly, between the cathode and anode, controls the intensity of the beam. Applying a voltage to the grid counters the attraction of the anode and reduces the speed of the electrons, producing less intense light on the phosphor.

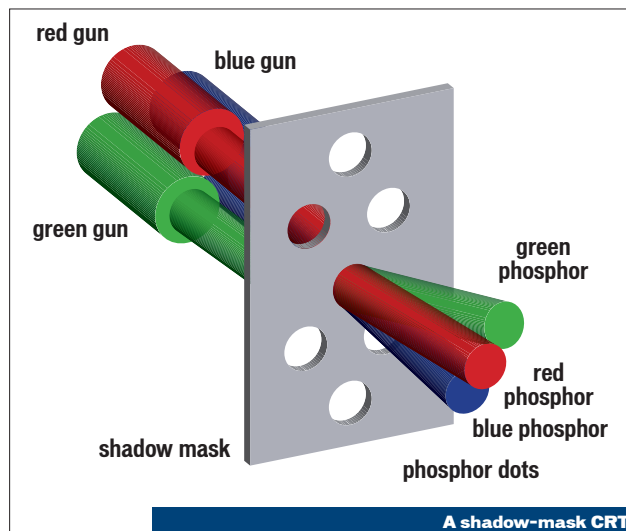
Colour displays

In a simple, monochrome CRT like the kind you would find in an A-Level physics text book, there's just a uniform coating of phosphor on the back of the screen. But to produce a sharp, colour image of 1,600 x 1,200 pixels that refreshes 85 times a second, things need to be a tad more complex.

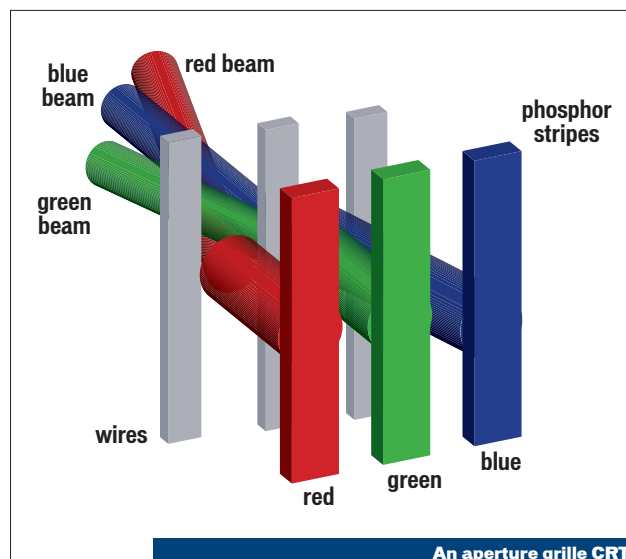
For a start, one beam isn't enough. To make a colour picture you need to combine red, green and blue elements for every pixel



The inside of a monochrome CRT



A shadow-mask CRT



An aperture grille CRT

to produce the full colour gamut. Three individual colours means three individual electron beams. And remember that the beams themselves have no colour – it's the glowing phosphor that produces the colour, so three colours means three different types of phosphor with different chemical compositions to glow red, green or blue when bombarded by electrons.

In a traditional CRT, the different colours of phosphor are arranged in groups of three dots, known as triads, across the screen – these triads are small enough that their individual colours seem to mix together when viewed from a distance, producing any colour of the spectrum.

An electron beam can't, however, be perfectly focused, so something is needed to prevent the individual red, green and blue beams from spilling over and illuminating the wrong dots. The oldest method of doing this is with a shadow mask. This is simply a sheet of metal with minute holes drilled in it, each one coinciding with the position of a phosphor triad. This mask cleans up the electron beam, making it sharper and preventing the beams from straying into the wrong territory.

Masks and apertures

Unfortunately, the shadow mask has a disadvantage. In doing its job, the mask prevents a significant percentage of the energy from the electron beam reaching the phosphor, so the intensity of the image is reduced. This problem was first solved when Sony introduced the Trinitron tube in the Sixties, which was the first example of an aperture-grille tube. An aperture grille still uses a mask to clean up the electron beams, except that it's formed not by a sheet of metal but by extremely fine wires, strung vertically behind the screen. Also, rather than groups of circular phosphor dots in clusters, aperture-grille tubes have continuous vertical stripes of red, green and blue phosphor.

The vertical-only masking is sufficient to give the required

masking effect, and has the bonus that much more of the energy from the electrons makes it through to the phosphor. This means that aperture-grille tubes can have a much darker tint of glass and still get a brighter picture than would be possible with shadow-mask displays. The result is far better contrast and a more vivid display.

However, there's a slight downside. By itself the row of aperture-grille wires is too susceptible to vibration to be practical – the picture would shimmer and distort whenever someone walked past your desk. To stop the vibration, damper wires are strung horizontally across the grille, making contact

with the vertical wires and damping out the movement. There are usually two of these wires, at one-third and two-thirds of the way up the screen. Because they're in the path of the oncoming electrons, they cast a shadow on the screen that is usually just visible as a couple of faint black lines if you're displaying a pure white background. This is one of those things that most people don't mind, but some find unbelievably irritating. So, try before you buy, but bear in mind that it's getting increasingly difficult to buy higher-end monitors that aren't aperture grille-based, particularly flat-screen CRTs, although Samsung's IF (infinite flat) tubes

are shadow-mask units.

It's not just Trinitron displays that have aperture grilles these days – Mitsubishi is the second most prominent aperture-grille manufacturer with its Diamondtron tubes. NEC makes its own aperture-grille tubes too, as well as being the inventor some years back of CromaClear tubes, which are a slot-mask design – a shadow mask with vertical slots rather than holes to give some of the benefits of an aperture grille.

Sticky problems

A monitor's electron beams originate from a single fixed point and have to be swept from side to side by the deflection yoke. This

Graphics cards: The other half of the equation

Over the past couple of years, LCD flat panels have started to become more popular, mainly because of the slow but steady reductions in price. But, as we all know, analog CRT-based monitors remain massively prevalent. For this reason, graphics cards contain a rather anachronistic bit of circuitry – the RAMDAC. Computers are digital, CRT monitors are analog, so the RAMDAC (random access memory digital to analog converter) sits between the graphics card's frame buffer and the monitor's input, and converts the digital frame store into an analog video signal.

This has a couple of ramifications. First, it means that a significant part of the image quality of a system is independent of the monitor: if the RAMDAC is poorly designed and has insufficient bandwidth, it'll feed a poor signal to the monitor. And a poor signal, fed to the best monitor in the world, will result in a bad picture. So, if you're disappointed by the image quality of your brand spanking new flat-screen CRT monitor, check your graphics card. The best for 2D image quality as far as consumer boards go is still Matrox – if you're not interested in the best 3D performance, Millennium G400s are now a good deal, but if you're intending to run at resolutions over 1,280 x 1,024 the slightly enhanced RAMDAC sported by the G400MAX is a better bet, and it's also pretty cheap relative to the likes of the newest nVidia GeForce 2 cards.

The fact that the majority of graphics cards



produce an analog signal is also rather daft from the point of view of LCD flat panels: most still have analog inputs to cater for the fact that the majority of graphics cards only have analog outputs. So, the digital frame buffer gets converted to an analog signal, passed to the monitor, and then converted back to a digital signal, introducing two entirely unnecessary stages of D/A and A/D conversion. Up until now, the solution to the problem has been to get yourself a panel with a digital input and a graphics card with dual analog/digital outputs. But now the industry is starting to look at the problem from the other direction. Viewsonic and Sony both have CRT monitors with digital inputs in the pipeline, and you can expect the trend to become industry-wide in the coming year.

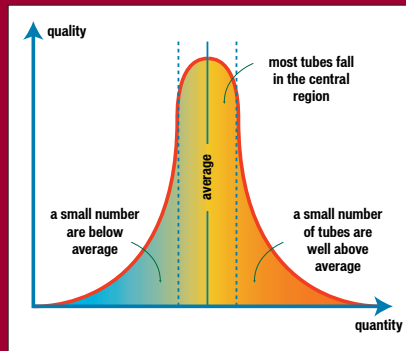
It's a fuzzy old world

The world of computing is fundamentally a digital one. One of the things that makes digital systems great is that they're consistent and repeatable, so if we benchmark a 1GHz Pentium III system and it gets a certain score, you can be sure that if you buy the same system it'll be just as fast.

Unfortunately, monitors based on conventional CRT technology are fundamentally analog devices. And analog devices vary. This can happen from moment to moment, as you'll see if you adjust your monitor's picture just after switching it on. Come back half an hour later and it'll likely need adjusting again having warmed up.

But analog devices also vary from device to device, and monitors are no exception. Picture tubes are particularly susceptible to this, and manufacturers are well aware of the fact. Consequently, their picture tubes are tested and graded as they come off the production line.

The variations in almost any system in the real world will form a bell-shaped graph known as a Gaussian normal distribution curve. This applies to analog monitor manufacture too. Most of the samples manufactured will be pretty good and are represented by the hump in the middle of the curve. But a few will be poor -



these are the ones to the left of the hump, while those better than average, or even very good indeed, produce the right-hand side of the hump, which tapers off. In general, manufacturers will take the large middle sample of tubes and use them in their medium-range monitors and save the smaller bunch of better quality units for use in their higher-end units.

This is why, when you're comparing manufacturers or models, you shouldn't just rely on the published numbers such as dot pitch, video bandwidth and so on. If you really want quality, go for the highest-end range at your chosen screen size, even if the paper specifications appear broadly similar to a cheaper model.

means the edges of the screen are further away from the gun than the centre, which creates three problems when it comes to keeping the image sharp right into the corners: beam focus, beam shape and colour convergence. In practice, the electron beam coming from a gun isn't perfectly straight like a laser. The electrons tend to spread out like normal light, so they need to be focused into a spot on the phosphor mask. In the past, when the focusing plates in the gun were fixed, the need to maintain focus dictated that screens had to be curved to maintain a constant distance from the gun to the screen regardless of deflection angle - the screen was essentially a section of a sphere.

The screen had to be curved for two more reasons as well: first, because at the extreme

edges the shape of the beam would appear elliptical as it cut through the shadow mask and met the phosphor, reducing resolution; and second, the three individual red, green and blue beams need to be focussed together so that they converge at the same point. These three factors are the reasons that traditionally it's been very hard to find monitors whose focus, sharpness and colour convergence are as good at the edges as they are in the middle of the screen, and why old and cheap monitors have goldfish bowl screens.

Modern beam trickery

The aperture-grille tube was one of the first technologies to start flattening out monitors - it allowed the screen to be flat in the vertical direction, another reason aperture grilles have often

been preferred over shadow-mask displays. But to flatten out the screen in the other direction - and generally improve corner-to-corner performance over the past decade - dynamic beam shaping and focusing methods were introduced, and have been getting cleverer.

As the name suggests, rather than relying on fixed magnets or plates to focus and shape the electron beam, dynamic focusing techniques use electromagnetic coils in a similar way to the deflection yoke to constantly influence the focal point of the beam, as well as its shape, as it gets scanned across the screen. As the techniques have progressed, monitors have got flatter and flatter, and last year the first completely flat-screen CRT monitors started to appear, manufactured by Mitsubishi with its

Diamondtron NF (natural flat) tubes and Sony with the FD (flat display) Trinitron.

Drive electronics

Having the world's best tube in your monitor is all very well, but the design of its supporting electronics can be just as important. In these digital times, analog electronic expertise is fast disappearing, and consequently this is where a smaller manufacturer can fall foul of the major players' expertise. Combining high-power, high-tension power supplies with the design accuracy and finesse required to place an electron beam to within fractions of a millimetre in two million-odd separate places, 80 times a second, is a pretty tall order. The electronics of a monitor, in particular the bandwidth of its video amplifier, are what limits its maximum practical resolution.

The video amplifier, which is the system that turns the extremely low power signal from your graphics card into something powerful enough to sweep the electron beam across the display, has to work harder and harder as the resolution and refresh rate increase. At Windows' default Safe Mode resolution of 640 x 480 at 60Hz, the monitor must paint around 18 million pixels on the screen every second - the video amplifier is working at 18MHz.

Put a modern high-end 21in CRT on your desk, set the resolution to 1,800 x 1,440 at 85Hz and its video amplifier must run at 220MHz. These frequencies are harder to achieve than they are in, for instance, your graphics card, because of the much higher power required. You can see when your monitor is reaching the limits of its video bandwidth, whether through increases in resolution, refresh rate or both, because the picture will lose its sharpness. The fact that higher refresh rates need more bandwidth means that if you're happy with your display and can't see any flicker at 85Hz, there's no need to increase the rate, even if the monitor can theoretically achieve it.

Two dimensions with a twist

High costs and manufacturing hitches have held LCDs back, but by overcoming these hurdles they threaten to usurp CRTs

As we saw when tracing the history of displays, the principles of liquid crystal technology were known in the 19th Century and were actually around before the invention of the cathode ray tube. Despite this, viable colour LCD displays for computers have only been around for the last few years, for several good economic and technological reasons.

The basics

All modern liquid crystal displays work on the twisted-nematic principle. Fundamentally, a twisted-nematic display consists of five layers. The liquid crystal layer is sandwiched between two substrates, which have been rubbed at 90 degrees to each other, so that the direction of the liquid crystals is twisted by 90 degrees when no voltage is applied.

At the top and bottom of this sandwich are polarising filters, also arranged at 90 degrees to each other. Because the twisted liquid crystal has the effect of twisting the polarisation of light, when no voltage is applied, the light can pass through the display. But applying a voltage untwists the crystal. Now, because the polarising filters are at 90 degrees to each other, the light is blocked and that segment of the display goes dark. Varying the voltage varies the amount of

twist in the liquid crystal, allowing shades of grey.

LCDs to PC displays

Turning a simple, segmented LCD you might find in a pocket calculator into a high-resolution colour display introduces a whole lot of complications.

First, nobody these days wants a monochrome display. So

a voltage to a column electrode, proportional to the colours required for the current line of pixels. Then the row electrode for the current line is pulsed on, and that line of pixels is set. This happens for every row. But because each pixel is only briefly pulsed on, rather than being held on for the duration of the frame, passive matrix screens must use

use very fast-twist liquid crystal, and the lag and smearing are avoided.

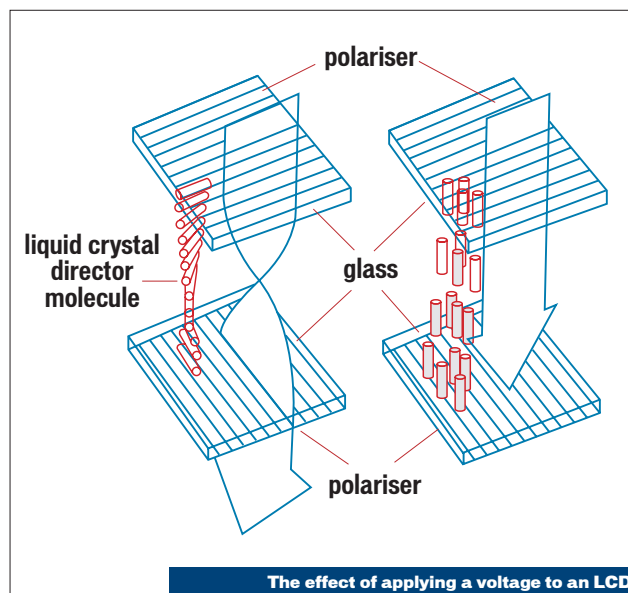
The big problem

The traditional trouble with TFT displays is the fact that the whole unit is a big integrated circuit that has to be etched in a fabbing plant in the same way as normal chips, for example CPUs. The fabbing plants are phenomenally expensive, and it's very hard to make silicon wafers large enough and with few enough defects. More than three or four defects in a wafer means more than the acceptable handful of dead pixels on the finished display. Initially, the yields on TFT manufacturing were extremely low, and consequently the prices were phenomenally high.

Things have improved of late, but TFT manufacture is still fundamentally trickier and more expensive than CRT manufacture, hence the price of flat-panel displays.

Viewing angles

Unlike CRTs, LCDs aren't an emissive display technology. In other words, they don't produce their own light. The liquid crystal elements simply control the degree of transmission of light from behind the display through to the front. So, to be able to see anything, LCDs need a pure-white, fluorescent light behind them. This fact gives rise to problems with viewing angle. The light from the backlight doesn't only go where it's supposed to – it can leak across to adjacent pixels, and if you're looking at the display from a point of view that's not head-on, you start seeing this stray light, and the display tends to become illegible. This situation is improving rapidly though, as manufacturers get to grips with filtering methods. The best panels now give a viewing angle of up to 80 degrees to either side as well as up and down.



for each pixel you need three closely-grouped liquid crystal elements, each fitted with a red, green or blue filter, in the same way as the phosphor triads of a CRT.

With all those separate liquid crystal elements to worry about, the main problem is addressability. Each of the nearly 2.3 million red, green and blue elements in a 1,024 x 768 display needs to be able to be activated individually. When you have that many pixels, the normal method of switching individual elements, known as passive matrix addressing, becomes tricky. With passive addressing, each element is connected via transparent conductors to the edge of the display in columns and rows. The on-screen image is built up line by line. The display circuitry applies

liquid crystal that untwists slowly, so that each pixel holds its twist until the next time the screen is refreshed. This leads to fast, or even moderately fast-moving objects being smeared severely.

Active matrix displays

Active matrix TFT (thin-film transistor) displays massively improve pixel response times to get around the screen smearing problem. They also have far better colour and clarity than passive screens. TFT displays are basically one large silicon chip, etched onto a glass substrate. The twist of each pixel is controlled by a separate transistor etched onto the glass. Each transistor can hold the voltage applied to its associated pixel until the next time the screen is refreshed. So TFT screens can

Viable colour LCD displays for computers have only been around for the last few years

Survival of the flattest

As LCD screens become the latest objects of desire does the cathode-ray tube still have something to offer?

As we've seen, the world of monitors is now split broadly into two camps: LCD flat panels and monitors based on more conventional CRT technology.

Because LCD flat panels are the more modern technology people have a tendency to assume that they're inherently superior in every respect. However, while it's true that LCDs do have big advantages with certain aspects of their performance, the good old CRT can still hold its own in a few key areas.

You only need to glance at an LCD flat panel to see that they take up very little space on the desk. While some newer CRTs are fitted with short-neck picture tubes, they're still much larger and heavier than an LCD panel with equivalent screen area. They also consume far more power. A CRT monitor typically needs 100-150w in use, while an LCD panel may need only 15-20w. So LCD panels are at once environmentally friendlier, cheaper to run and far cooler than CRTs. It's this cool-running nature and compact size that makes LCDs a big plus for financial centres where hundreds of displays can be needed in a relatively confined space.

People often refer to the 'perfect' image quality of LCD displays, but that's a claim that unfortunately simply isn't true. You can liken the performance and look of an LCD's image to the euphoria that greeted the advent of compact discs. For a while, everyone simply assumed, with the help of some heavy-handed marketing, that CDs were perfect. But then a few heretics realised that they weren't, that

they could sound cold and hard, and that they preferred the warmth of vinyl. The same is true of LCD panels when compared to CRT displays. Only one aspect of



an LCD's image can truly be said to be perfect: image geometry. The individual pixels of an LCD panel are fixed in place when the panel is manufactured, and the shape of the image can never drift out of alignment in the way that a CRT's can. But as you'll find out if you turn to the back of this section and use DisplayMate to set up your monitor correctly, there's a lot more to image quality than simply geometry.

The idea that LCDs are perfectly sharp is not correct. While it is true that LCDs have very, very good sharpness that will never drift out of sync, the next time you see an LCD panel take a close-up look. You'll see two things: first, a black border surrounds each and every pixel. This is the silicon electrically connecting each trio of transistors to the drive electronics. So a line or character of text that should be continuous is always visibly broken up into its constituent parts. This makes flat panels a poor choice for many graphics applications. Second, the red, green and blue elements of each pixel are not perfectly aligned: they never can be, because the intensity of the three colours for each pixel is controlled by separate transistors

that have to be placed next to each other on the glass substrate.

So, the colour convergence of an LCD, while it will always be good, can never be perfect and can be outstripped by a CRT. In many panels you'll also see a handful of dead pixels that are always black, although the silicon fabrication methods used for panels are getting better all the time and are starting to eliminate this problem.

An LCD panel has a fixed number of pixels. This means that it has a fixed, native resolution above which it's impossible to go. It also means that switching down to lower resolutions produces aliasing distortions as the position of the pixels in the

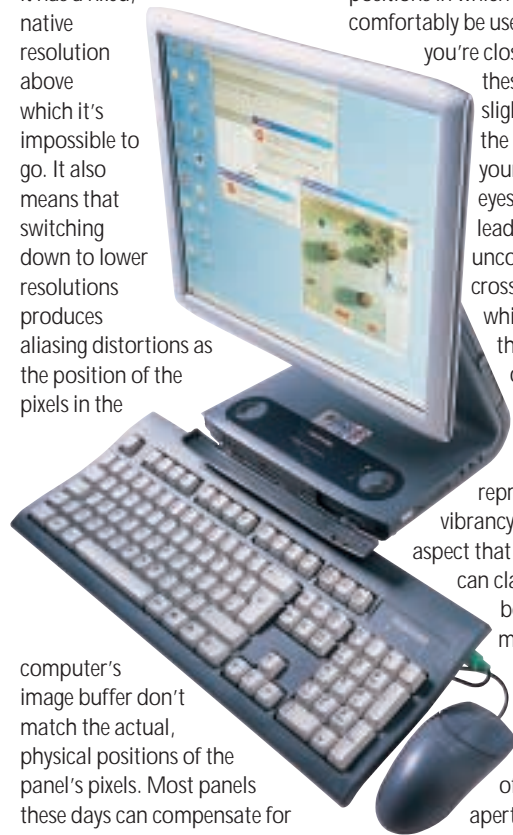
still remain usable. But there's still no commercially available panel that can manage more than 1,280 x 1,024. If you're a resolution junkie and need the biggest desktop possible, a CRT is the only choice.

Viewing angle is also a bone of contention with panels. Although several manufacturers, notably ADI, are now producing panels that can be viewed from the sides with almost no apparent changes in hue, many cheaper panels still have a very limited range of positions in which they can comfortably be used. And when

you're close up to one of these panels, the slight difference in the image seen by your right and left eyes can eventually lead to an uncomfortable cross-eyed feeling, which cancels out the advantages of the flicker-free nature of LCDs.

Colour reproduction and vibrancy is a second aspect that most CRTs can claim to do better than most panels. No LCD monitor can yet match the warmth and richness of a good aperture grille-based CRT.

There are plenty of people who, seeing a flat panel for the first time, will fall in love with them and never want to look at another CRT. But there are also plenty of people that, like the vinyl lovers, will always prefer the warmth and laid-back look of a CRT against the cold edge of a flat panel. It's not an open and shut case and don't let anyone convince you otherwise. Use your own eyes to decide.



computer's image buffer don't match the actual, physical positions of the panel's pixels. Most panels these days can compensate for this with anti-aliasing circuitry that effectively blurs the image to make the effect less pronounced, but you're then left looking at a display reminiscent of the image your BBC Micro produced when you hooked it up to your telly in 1982.

In contrast, a CRT can cope with a much wider range of resolutions. A top-end 21in CRT, for instance Sony's G500, which won our last 21in monitor group test, can reach 1,800 x 1,440 and

Ergonomics and emissions

For anyone regularly using a PC monitor we have some essential advice for reducing its effects on you and your environment

The majority of people in the western world are spending an increasing percentage of their working lives sitting in front of their computers and staring at their monitors. And once they leave work, do they head out for a brisk walk? Er, no. They go home, sit back down in front of another computer and spend the next five hours lost in the web.

Little wonder then, that lots of different agencies and organisations have been getting worried about our health and the ways that all this exposure to computers might hurt us and the planet. Users should give serious thought to ergonomics and emissions, while recyclability and energy efficiency are key to preserving the environment.

In every computer hardware manual these days, warnings of dire consequences abound if you fail to follow the instructions on preventing computer-related injuries like RSI. And while many of us at PCW regularly fail to take any notice of these, there's no denying that you should, at the very least, take note of your posture and display position (see box). You should also take care not to go for more than a few hours in front of your monitor without taking a break to let your eyes, back and brain recover. Beyond these basic common sense ergonomics, however, there are still the issues of emissions and the environment to consider.

The problem with emissions was the first to cause concern and set the standards ball rolling. Back in the Eighties, when monitors were starting to become widespread in offices, the cocktail of electromagnetic radiation emitted by displays at the time was a prime cause of worry, particularly for pregnant women. So, in safety-conscious Sweden, the MPRII standard for electromagnetic radiation was developed. This was a standard designed to reduce emissions to very low levels, while keeping a

close eye on the economic implications for the manufacturers. However, the Swedish trade union TCO wasn't satisfied, and came up with the far more rigorous TCO92 standard. TCO95 followed, addressing environmental and ergonomic issues, such as the use of toxic heavy metals in CRT manufacture, the degree of screen reflectivity and so on. It also covered energy-efficiency, as does the US Government's Energy Star programme.

Under both Energy Star and TCO95, office electrical devices must now be able to put themselves into low-power

standby mode after a preset period of inactivity.

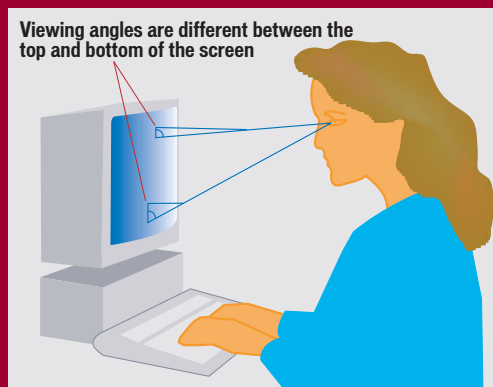
With the release of TCO99 last year, the stringency and scope of the TCO label reached new levels. If a monitor has that TCO99 sticker, it mustn't just be recyclable: the company that produced it must have a recycling policy in place, and should be able to prepare the display for recycling at the end of its useful life. TCO99 also covers a massive array of ergonomic and environmental factors like acoustic noise, image quality performance; including geometric distortion and light levels, and even the operation

of tilt and swivel mechanisms.

There was initially some industry cynicism over the TCO99 standard. Some claimed it wouldn't really have an environmental impact over what TCO95 had achieved, while many argued that it was simply too expensive to implement. But every major display manufacturer has taken it up and we've seen very few new monitors in recent months that haven't been certified. It may be a little over-zealous in its reach, but there's no denying that a monitor with TCO99 certification should give you confidence that it's completely safe to use.

How low can you go?

Traditionally, users were advised that the centre of their screen be positioned more or less at eye height, so their head was straight and level - having your head tilted forward was believed to lead to neck strain.



The thinking is now based on consideration of how vision has evolved in humans. In everyday life, if your head is level, you're likely to be focusing into the distance, not at an object a foot or two away. It's far more natural to be focusing closely on an object that's below you, either on the ground or in your hands.

A neat way of exaggerating this effect for

illustration is by trying to read a book held above your head: your physiology is used to focusing into infinity when you're looking up, consequently your eyes will start feeling strained, even though it's only your neck position that has changed.

So, the best compromise between what your body and brain is used to and minimising the risk of neck ache is by positioning your screen so that the top of the viewable area is level with your eyes. This means you're looking slightly downward, but not so much that the weight of your head will start straining your neck.

Common sense dictates where you should and shouldn't place a monitor in a room. Avoid positions that result in reflections from lighting - if you have uplighting, where the light reflects off the ceiling and is diffused into the room, you're less likely to be bothered by glare than with the clear reflections

you tend to get from offices that have exposed fluorescent tubes.

You also need to avoid having the monitor directly in front of a window, where the light from outside could be brighter than the display itself, resulting in your squinting. If you have to be close to a window, having the monitor side-on to it is your best bet.

The persistence of vision

As display technology gets bigger, better and cheaper, researchers are setting their sights on a 'digital paper' display

Like the rest of the computing world, it's pretty easy to predict the trends in display technology in the short to medium term – bigger, better and cheaper. With conventional CRTs, this means the replacement of old shadow-mask tubes with flat-screen aperture-grille versions, across the board from 15in displays upwards.

Companies like Sony and ADI have already done this, and others are sure to follow their lead. And within a year or so, the normal analog inputs on CRT monitors will start to be replaced with digital connectors as digital-to-analog conversion circuitry migrates from graphics card to monitor. This makes economic sense, since it should mean graphics cards get cheaper, and most people upgrade graphics cards far more often than they do their monitors. In addition, the ability of monitor manufacturers to tailor the D/A convertor to their particular monitor will mean quality gains as well.

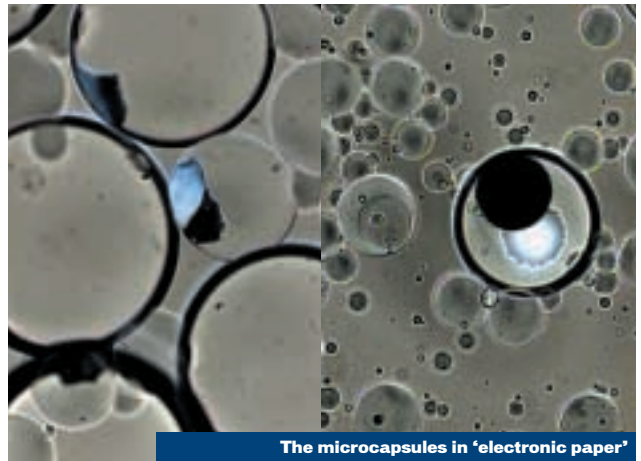
As for flat panels, you can expect the first widely available panel with a native resolution of 1,600 x 1,200 very soon. It won't be cheap, of course, but it should have the knock-on effect of a price drop for lower resolution panels. An increase in the number of graphics cards with digital outputs will mean that panel makers can drop the analog to

digital conversion circuitry and flat panels will be able to live up to their full, pixel-perfect capabilities.

So far, so predictable. In the long term, display technology gets exciting but weird. There are dozens of companies and university research groups working on the displays of the future. With modern monitors managing resolutions of 1,800 x 1,440, the desktop display market is pretty much covered. But everyone knows the world is going mobile, and that's where the major research is going on.

Conventional colour TFT displays are very expensive and need a lot of power for their fluorescent backlight – no good for cheap phones with small batteries. The most promising technology on this front is light-emitting polymers (LEPs). LEPs work in the same way as the ubiquitous LED (light-emitting diode), but they're flexible and can be produced as a liquid, and literally printed onto a substrate. British-based Cambridge Display Technology (www.cdtltd.co.uk), the main developer of LEPs, has already joined forces with Seiko-Epson and produced a prototype colour mobile phone display. The really interesting part is that the display is actually made by printing it with a modified inkjet printer. A conducting polymer layer is printed onto a substrate, to form the electrical pathways needed to power the LEPs, then the pixels for the display are printed using liquid red, blue and green LEP 'ink'.

The reason many people are getting excited by LEPs is the possibility that in the future the Holy Grail of display technology could be realised: digital paper. A medium that feels like the normal paper everyone knows and loves, but that can display anything at all, any time. But obviously, LEPs differ from normal paper in one crucial respect: LEP displays are emissive rather than reflective;



The microcapsules in 'electronic paper'



CDT is developing LEP displays for mobiles

they emit light, whereas normal paper doesn't. So, although they're low power, LEP displays still need a fairly significant battery.

Over at that hotbed of whacky digital media research, the Massachusetts Institute of Technology, they're working on a system of reusable electronic paper that really does look and feel like normal paper, but that can display anything you like, any time, with near-zero power required (www.media.mit.edu/micromedia). The current system works by printing a layer of microcapsules onto a substrate. The capsules contain black ink and a white titanium powder. Applying a tiny voltage to the capsules forces the white powder to the top, making that

pixel appear white, or forces it to the bottom where it's covered by the black ink, turning the pixel black. This still needs current applied all the time, but the lab's aim is for a system whereby the capsules contain tiny freely rotating balls, white on one side and black on the other. This wouldn't need any power at all once the display had been set.

It all sounds far-fetched, but researchers at Xerox's famous Palo Alto Research Center have also got a similar system that they've demonstrated. The technology already exists and it really works, albeit fairly crudely. It seems that the notion of the ebook, which is currently no more than a PDA showing text files, could become a reality sooner than many would think.

**Everyone knows
the world is
going mobile, and
that's where the
major research
is going on**

Monitor terminology

This month's pcw expert cuts through the confusing jargon and acronyms that comprise the modern monitor's glossary

Active matrix: A type of liquid-crystal display with improved pixel response time over passive matrix versions.

Aperture grille: Performs the same job as a shadow mask, but uses vertical wires instead of a perforated sheet. The aperture grille allows a darker tint of glass for better contrast.

Bandwidth: The frequency range that a system can reliably transmit or amplify. In CRT monitors, the video bandwidth determines the monitor's maximum practical resolutions and refresh rates.

CRT (cathode ray tube): The evacuated glass picture tube that conventional monitors are based on.

Diamondtron: Proprietary name for Mitsubishi's aperture-grille tubes.

Degaussing: Method of demagnetising a monitor to get rid of unwanted colour blooms. Most monitors have a degauss option that sends a large burst of current through a coil around the outside of the tube.

DSTN (dual-scan twisted nematic): Type of passive matrix LCD that splits the screen in two, enabling faster twist liquid crystal to be used for faster pixel response times.

Dynamic range: The maximum and minimum levels of signal a monitor is capable of displaying. Monitors with a limited dynamic range will have poor contrast.

Emissive: Display types where the light is produced and the image formed by the same part of the display. CRT displays are emissive.

Gamut: The range of colours a graphics system is capable of displaying.

High-tension power supply: Alternate name for high-voltage power supply. High-tension supplies generating tens of thousands of volts are used in monitors, primarily to accelerate the gun's electron beam toward the screen.

Hz: Hertz Cycles per second. Named after the German physicist Heinrich Hertz.

LCD (liquid-crystal display): A display technology that uses the unique properties of liquid crystals to control transmitted light.

Moiré: An undesirable patterning effect that occurs with CRT monitors due to the frequency difference between the displayed image and the incidence of phosphor dots and holes in the shadow mask or aperture grille.

Native resolution: The fixed pixel resolution of an LCD flat

panel, in other words the number of liquid crystal triads in the display. Because of the inflexible nature of a flat panel's resolution, image quality suffers dramatically at anything other than its native resolution.

phenomenon in humans that allows us to perceive movement from a quick succession of still images. CRTs rely to some extent on persistence of vision in tandem with the chemical persistence of phosphor to give the illusion that the image is stable.

Pixel: Short for picture element, the smallest part of an image. Colour pixels in CRT monitors are composed of red, green and blue phosphor dots, whereas in LCD panels are composed of the light from the fluorescent backlight passing through red, green and blue filters.



OSD (on-screen display): The digital menu system that most modern monitors sport, giving a control menu overlaid on the screen itself.

Passive matrix: Older and less effective type of liquid crystal display that suffers from poor pixel response times, leading to excessive smearing of moving images.

Persistence of vision: The

number of times per second a display is repainted or updated. Minimum refresh rate to avoid noticeable flicker with CRTs is accepted to be 72Hz. LCDs don't suffer from flicker.

Shadow mask: The earliest method of sharpening the profile of a monitor's electron beam to improve definition and avoid colour purity problems. Consists of a perforated metal sheet placed behind the screen. Largely superseded by aperture-grille technology.

Short/medium persistence: Types of phosphor used in CRT monitors. The term refers to the length of time the phosphor glows after the electron beam has moved away. Higher refresh rates in modern monitors means shorter persistence phosphors can be used.

Slot mask: A variation on the shadow mask that uses vertical slots rather than round holes, giving some of the advantages of an aperture grille.

TFT (thin-film transistor): The most common type of active matrix liquid crystal display. Transistors are formed by etching a thin coating of silicon that's bonded to the glass of the display. This is done in exactly the same way that normal integrated circuits, such as CPUs, are made.

Transmissive: Display types where the light is produced by a separate section of the display to the part that forms the image. LCDs are transmissive, relying on a backlight or reflected ambient light.

Trinitron: Proprietary name for the first aperture-grille tube, produced by Sony in the late Sixties.

Twisted nematic: Mode of operation of liquid crystal displays. Refers to the fact that the direction of the crystals is twisted between the top and bottom substrate. Applying a voltage untwists the crystals and allows light to pass through the display.

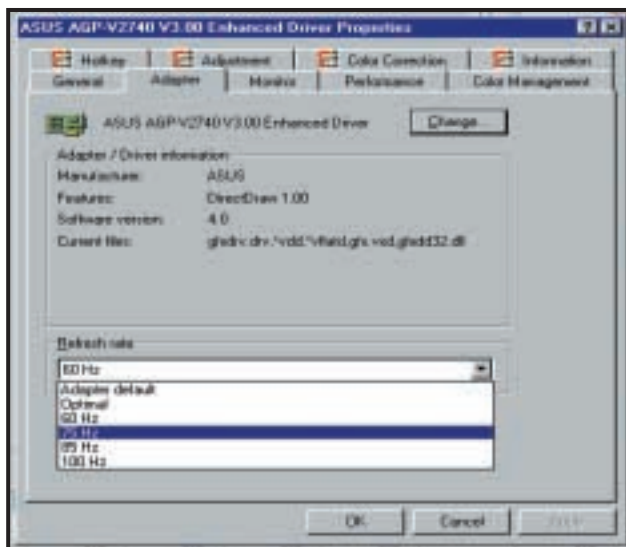
Refresh rate: Expressed in Hz, the number of times per second a

display is repainted or updated. Minimum refresh rate to avoid noticeable flicker with CRTs is accepted to be 72Hz. LCDs don't suffer from flicker.

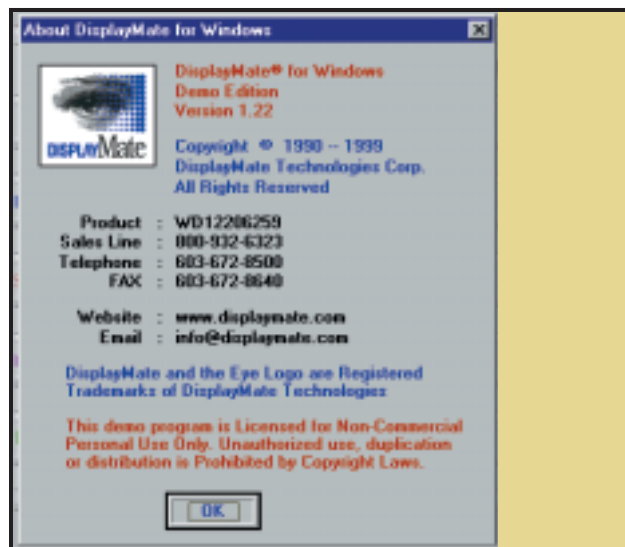
display is repainted or updated. Minimum refresh rate to avoid noticeable flicker with CRTs is accepted to be 72Hz. LCDs don't suffer from flicker.

Setting up your monitor

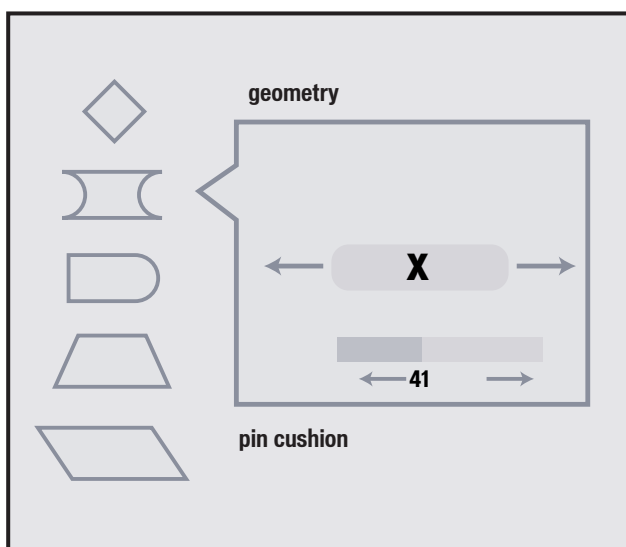
In order to get the best from a monitor you need to take the time to fine tune it and get the right set up



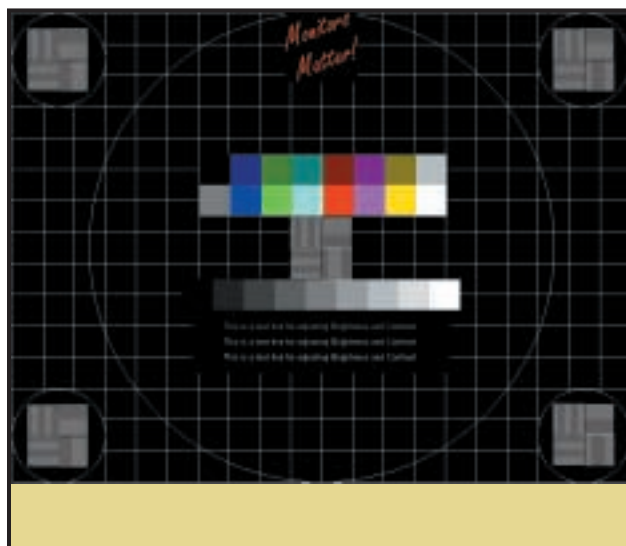
1 Before you touch the monitor controls, make sure your graphics card's vertical refresh rate is set to its best advantage. Remember that, occasionally, going above a display's rated refresh rate can damage it. From the Display Properties dialog, click Advanced, then select the Adapter tab. With most cards, if you've got a monitor profile selected, you can click on the drop-down box and select a refresh rate. Set it to at least 72Hz to avoid flicker, but if you can't see a difference between 75Hz and, say, 85Hz, use the lower setting – image quality will be sharper.



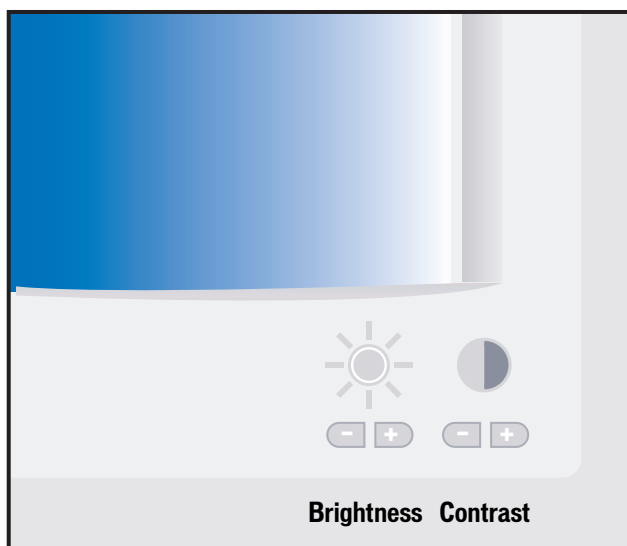
2 As we've already seen, CRT monitors, being analog devices, aren't as plug 'n' play as some of us would like. So, unless you've taken the time to set it up properly, your monitor probably isn't at its best. You don't have to have setup software, but it makes the job easier. So, before you start, install the demo copy of DisplayMate from this month's cover disc. Second, switch your monitor on, then go away and have a cup of tea. Leave the monitor to warm up for at least half an hour before you adjust it. If you don't you'll just have to do it again.



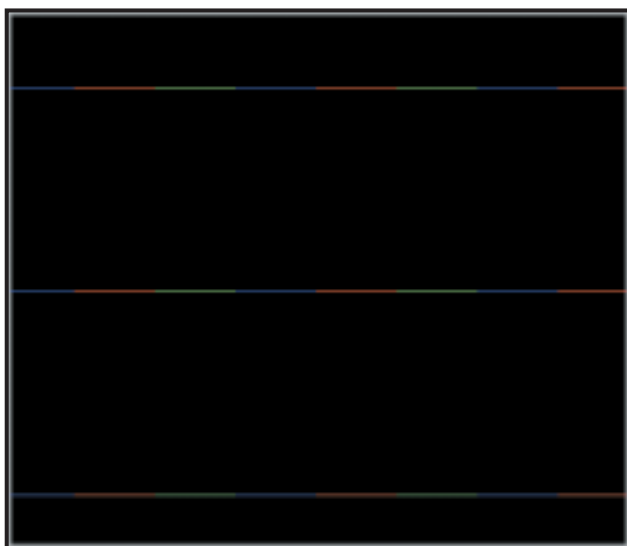
5 Few monitors have perfect geometry straight off the bat, even using VESA standard display modes. So, find the geometry controls in your monitor's OSD (on-screen display) menu. The most important are pincushion, which sets the inward and outward bowing of the screen, trapezoid (also called keystone), which equalises the width of the top and bottom of the image, and rotation. The picture should be as square as you can get it, which may mean going back and forth between adjustment categories – only being off by a millimetre or two isn't bad.



6 Now set the screen size – you'll generally find that focus and performance drops off at the edges and particularly the corners, so you need to find the best compromise between sharpness and screen size for your unit. Use something like the test screen from the CSF's free CheckScreen utility, available from www.csf.org.uk. Use the height and width adjustments to adjust the display so that there's a border of about 5mm around the edge of the tube. If things look too fuzzy, pull the image in a bit or, if it looks OK, try expanding it slightly.



3 The setting that almost no-one gets right is the contrast and brightness controls. When you set these controls, you're setting the monitor's overall dynamic range – the brightness sets the lower black level, and the contrast sets the upper white level. Set the brightness first. Turn the contrast right down, then increase the brightness to the top while looking at the corner of the screen. When the background of the tube's viewable area turns grey with respect to the black non-phosphor area, turn the brightness down again until the grey *just* turns black.



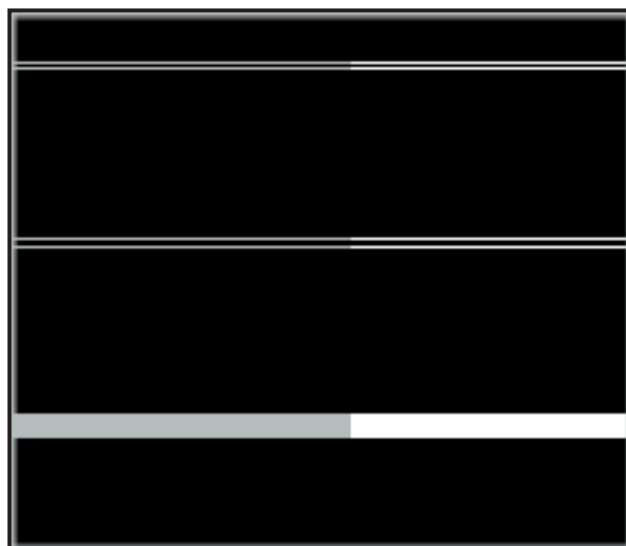
7 An important aspect of image quality that affects the perceived sharpness of the display is a monitor's colour convergence performance. To set this, you need the full version of DisplayMate to use its convergence test screens. Do the horizontal convergence first. DisplayMate calls the test screen Horizontal Colour Registration. Concentrate on the middle of the screen and adjust your convergence controls until the three colours are as closely lined up as possible. Now do the same with the Vertical Colour Registration screen.

This line is written in Dark Gray and should be
To adjust the intensity of this line use the Brightness Control.

This line is written in Gray and should appear in intensity between Dark Gray and White.

This line is written in White but should not appear. Use the Contrast Control to adjust the intensity.

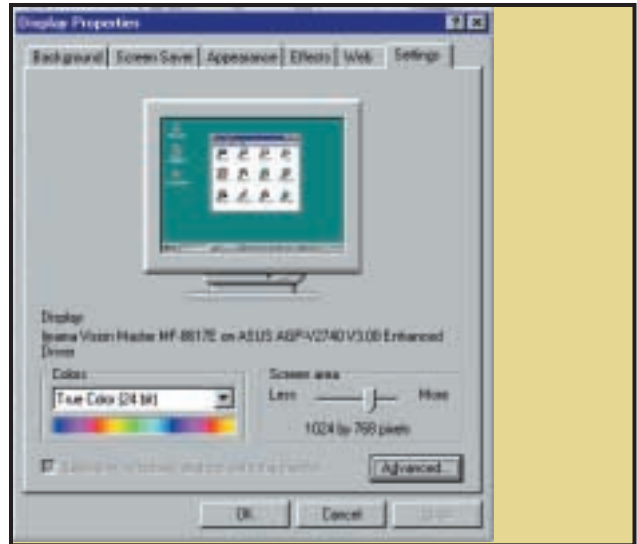
4 Use the DisplayMate demo and click on the 'sample demo screens' button. Left click until you reach the brightness and contrast adjustment screen. This lets you set the contrast. You need to increase the contrast until the 100 per cent white text is pure white, without going too bright. In general, you'll probably find the contrast will be near its maximum setting – usually around 90 per cent. If you overdo it, you'll see that an effect called blooming starts to occur and the text will look slightly less sharp.



8 Finally, try experimenting with the contrast setting using DisplayMate's Defocusing, Blooming and Haloes test screen, located under Miscellaneous Effects. Again, you'll need the full version for this. Adjust the contrast setting, while paying particular attention to the third pattern from the top – the four solid bars. If you increase the contrast to maximum, you may see that the white bar appears thicker than the grey bars. This blooming effect is what you want to avoid when setting the contrast control.

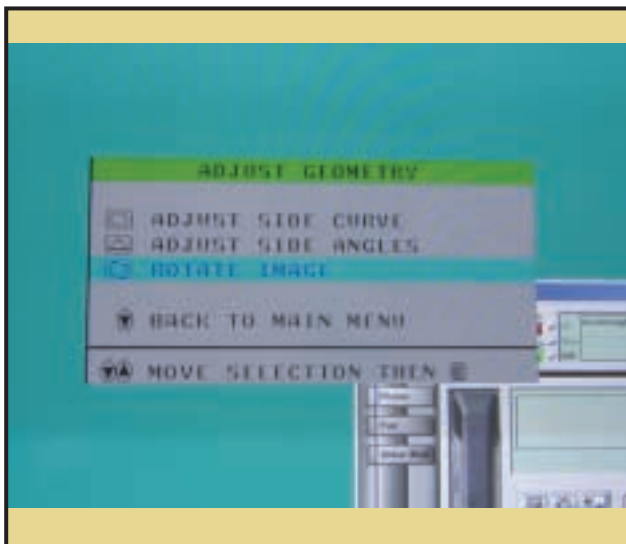
Comparing and assessing monitors

If you're able to try before you buy, follow these tips to make sure you get the best monitor to suit your requirements



1 It's an unfortunate fact of life that image quality is a subjective thing so, if at all possible, before spending a lot of cash on a new monitor you need to compare a few. However, you must ensure that each display is given a fair crack of the whip. In many circumstances it's impossible to achieve the ideal setup that we can manage when testing monitors in the labs, but you should at least be aware of some of the factors that can affect a monitor's performance.

2 First, you must make sure that every display is allowed to warm up for at least half an hour before looking at it. Also make sure that every display you look at is running at the same resolution and refresh rate. Obviously, the best way to compare displays is to have them running side by side, but there are points to consider here too. If they're running from one graphics card via a cable splitter, the quality of either unit will not be at its best. If they're running on separate cards, you need to make sure the cards are identical makes and models.

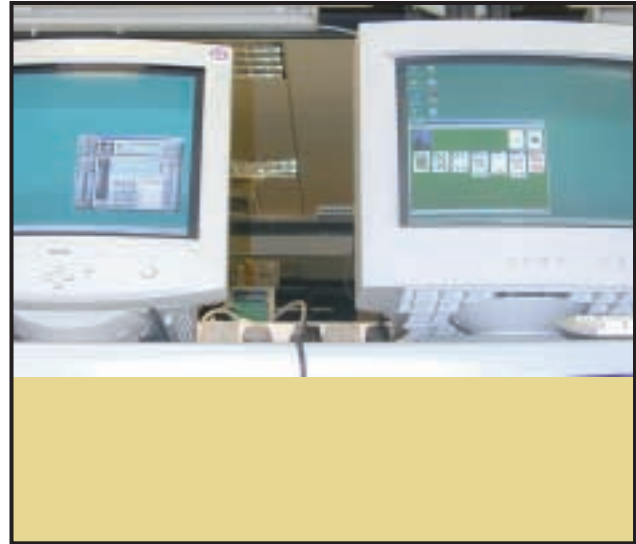


5 First of all, set up the displays as we described in the workshop on the previous pages. Try and adjust the geometry of both displays so it's as good as you can get it. Slight flaws in geometry are worth noting, but for most users aspects such as sharpness and colour performance are more important, so unless you do a lot of high-precision CAD work, don't mark a unit down too badly for less than perfect geometry. Linearity problems, in particular, are very hard to notice in everyday use and don't affect productivity.

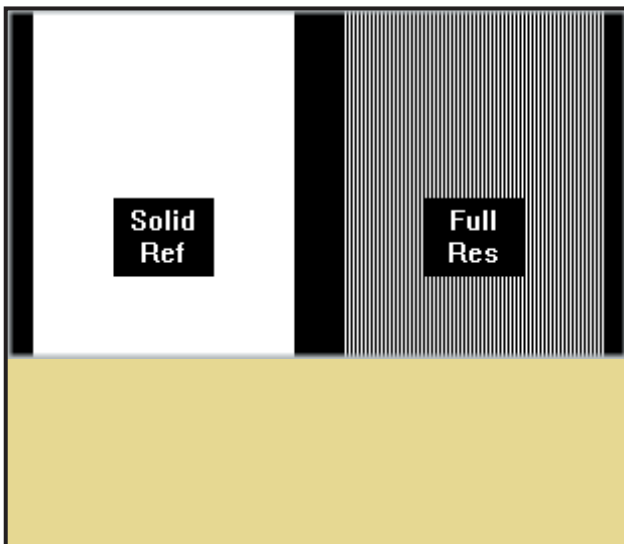
6 Click through DisplayMate's Geometry and Distortion tests until you reach the Screen Regulation category. This presents you with a large white flashing rectangle, with a white line border around the screen. Screen regulation often gives a good general idea as to the quality of a monitor's electronics. A poor monitor will struggle to regulate itself as the rectangle flashes on and off, with the result that the white border will distort and wobble noticeably. Any more than a couple of millimetres distortion and you should watch out.



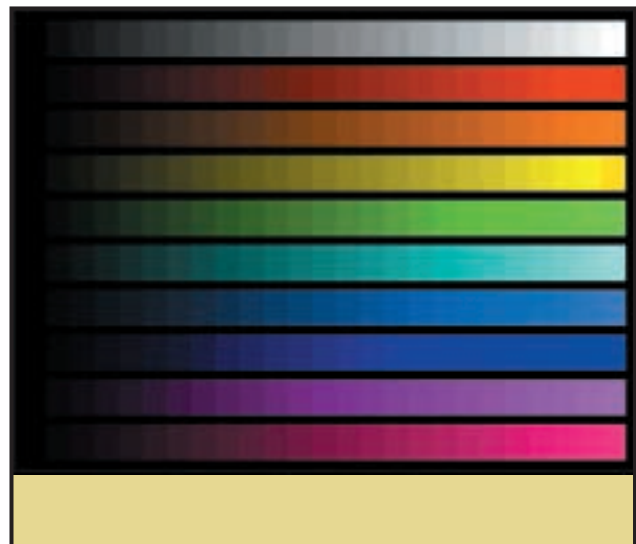
3 There should be a minimum distance of half a metre between the two displays, preferably more, since the magnetic fields of one can affect the display quality of the other. Have a look round to check that there aren't any other monitors or likely sources of electrical interference nearby – monitors are very sensitive to external magnetic and electrical fields. Any shimmering or oscillating movement on a monitor's display, or even corner discolouration, is almost certain to be down to external interference rather than being the fault of the monitor itself.



4 Positioning of the monitor is important for other reasons too. If comparing two side by side, make sure they're both in even lighting and facing the same direction. If you really want to be picky, set them both facing east – believe it or not, that's the way all monitors are set to face when they're calibrated at the factory! Finally, once that's all done, you're ready to sit down and look critically at each unit in turn. DisplayMate is the best tool for this, but its raft of different tests need pruning, since some of them are fairly redundant for most purposes.



7 Go to the Sharpness and Resolution category and click through to the Horizontal Line Resolution screen. Look at the Full Res vertical line pattern. You should be able to clearly make out the individual lines, with definite black space between them. If the lines merge into one, the monitor's resolution isn't up to much. In general, you can ignore the vertical resolution test – most modern monitors will be pretty flawless on that score. Now click through to the Focus Matrix pattern. This is great for seeing how well the monitor focuses into the corners.



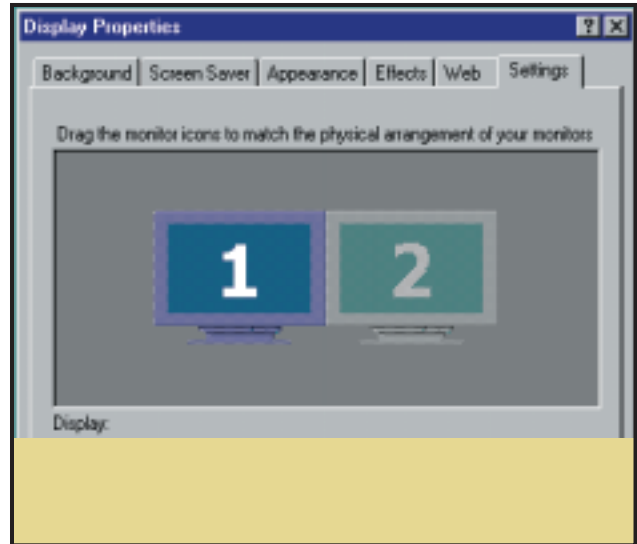
8 Finally, select the Colour and Greyscale category and move to the Streaking and Ghosting section. Look for faint streaks to the right of the solid bars, which indicate the monitor doesn't quite have the grip on its guns that it should. Using the Colour Scales pattern (above), look at the quality and richness of the colour. Then look closely to ensure the scales fade uniformly – check that the last visible blocks of each colour are vertically aligned. However, colour fading performance probably isn't as important as the resolution, sharpness and power regulation tests.

Dual monitors under Windows 98/2000

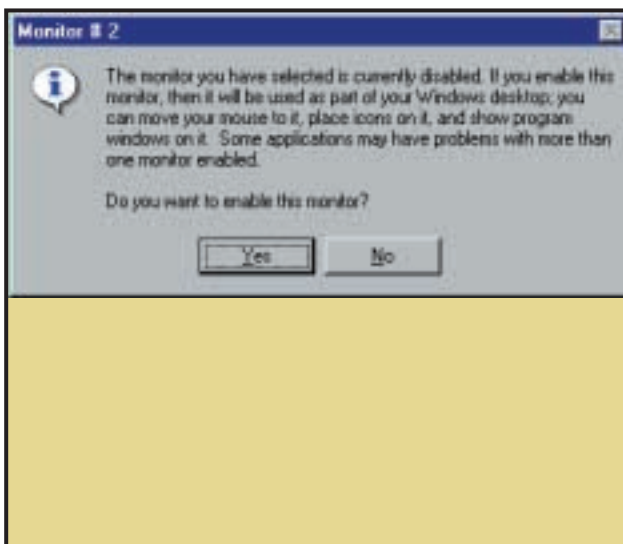
If you've just upgraded your monitor, don't consign the old one to the dustbin. Instead, hook them both up to your system



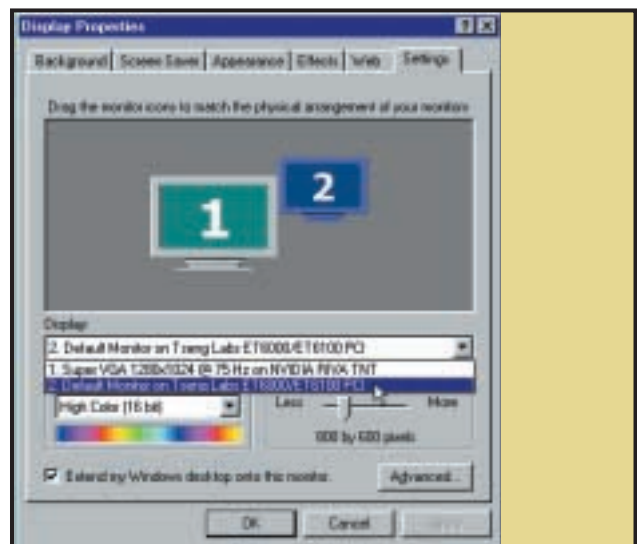
1 All versions of Windows since the first release of Windows 98 can now support two monitors, each attached to a separate graphics card. So, the first thing you'll need is a second PCI graphics card in addition to your primary AGP card. Any PCI card will do – Windows isn't fussy about chipsets. Don't worry if your new monitor is a 21in beast and your old one is a 14in goldfish bowl – give it a try anyway. You can independently set the resolution of each, and even a low-quality monitor is fine, since it's a secondary unit that you won't be staring at all day.



2 You don't need any special setup procedures to install the second card – just whack it in your PC, connect the second monitor up to it and switch it back on. During the reboot, you should get a DOS-type text message on the second monitor, telling you that Windows has detected and initialised the card. It then goes blank and Windows will continue to boot in your primary monitor, prompting new drivers in the normal way. You should then right-click on the desktop, choose Properties and the Settings tab will give you a dialog with two monitors.



3 The second monitor will be greyed out, because you haven't explicitly activated it yet. Click on the secondary monitor and you'll get a polite warning that some applications won't work with dual monitors. Few apps have ever given us any problems, so just click Yes, apply the changes and the second monitor should spring into life. If Windows rebooted thinking the 14in monitor was the primary monitor, your PC's BIOS is probably set to initialise PCI graphics first. Go into the BIOS setup program and see if there's an option to change it.



4 With both monitors on, you need to drag the two monitor icons into their correct places with respect to how they're physically positioned – this ensures that the mouse pointer will know which direction it needs to wrap across from the primary monitor. Clicking the drop-down box lets you select which adaptor you want to alter. You can then alter resolution, colour depth and refresh completely independently, so there's no need to cripple your high-end monitor by running it at the same resolution as your secondary unit.



hands on

In this month's *Hands On* we're turning up the power. We've got the usual dose of overclocking madness, the low-down on how to switch NT to dual-processor support, and how to power up your website with ecommerce abilities.

Not content with frying his CPU and chipsets, Gordon Laing is now terrorising the humble graphical processor. Check out this month's **Hardware** (p276) column to find out how you can turn up the heat on your GeForce 2 card.

In NT, Roger Gann stuffs another processor in his aging Compaq 5000 and turns **Windows NT** (p270) on to the joys of processor cohabitation.

Boo.com may have gone belly up, but it doesn't mean you can't be the next ecommerce winner. Nigel Whitfield shows you how to commerce-enable your website using the free MiniVend software in the **Ecommerce** column (p297).

Of course there's loads more. Ben Woolley shows you how to get lost between dimensions in **3D Graphics** (p288) and Ken McMahon makes light work of labour-intensive tables in **Graphics and DTP** (p286).

NIALL MAGENNIS, FEATURES EDITOR

NIALL_MAGENNIS@VNU.CO.UK

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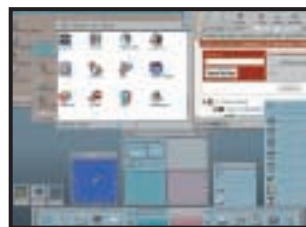
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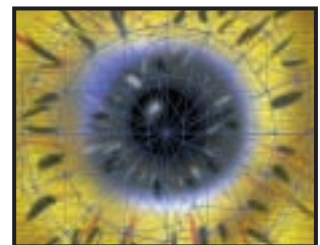
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Advice from our experts

Got a problem? Our *Hands On* columnists answer questions and solve your problems

Windows

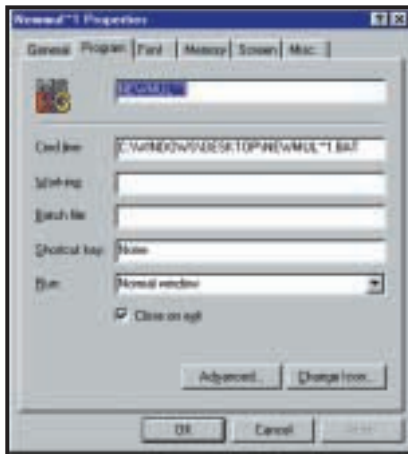
Q How can I use my right mouse button and the 'Send to' menu option to send the file to more than one destination at a single stroke? I've tried putting the two destinations (one is the floppy drive A and the other is a folder elsewhere) one after the other, separated by a space, a comma and combinations thereof as the target, but it doesn't work.

Steve Yentis via email

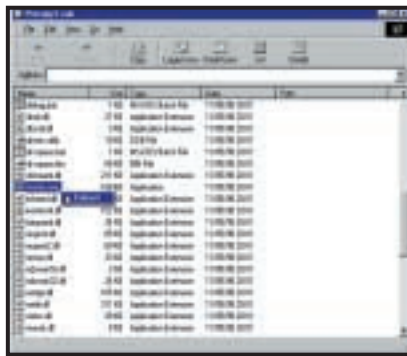
A How about a good old DOSbatch file? Use Notepad to create the following:

```
copy %1 c:\myfolder
copy %1 a:\
```

Then save it anywhere (except the Send To folder) as NEWMULTIFILE.BAT. Now right click on NEWMULTIFILE.BAT and select Properties. In the Program tab, tick the 'Close on exit' box. Click OK to exit the Properties window and you'll see a new file created in the same location as NEWMULTIFILE.BAT - this file has no visible extension, but is of the 'Shortcut to MSDOS program' type. Drag this latter into the 'Send to' folder - you can rename the shortcut if you want, as it will probably have a truncated file name, eg, NEWMUL~1. Now you can right-click on a file and send it to your new shortcut, and a copy will be made at each destination.



Shut that window after creating multiple file copies



Extracting the Hardware Info tool from the Windows 98 CD

Q You mention in Windows, Hands On, p238, August issue of PCW, running HWINFO/UI in order to obtain Windows 98 hardware setup. I tried running this file in the way you describe but got a 'Cannot find file...' message. Is it possible my (original) copy of Windows 98 does not contain this file? If so, can I obtain it from somewhere else?

Alan Pywell via email

A If you look in the Win98 folder on the Windows 98 CD-ROM, you'll see a file named precopy1.cab. This is a cabinet file that, rather like a ZIP, serves as a container for a number of other files. Double-click on it to view the contents. You'll find hwinfo.exe in there. Double-click on the latter and you'll be prompted to browse to a folder in which to extract the file: this should be your Windows folder.

Q The 'Stand by' item has mysteriously disappeared from my Shut Down Windows dialog, taking with it the 'System Stand by' options in Control Panel, Power Management. How has this happened and how can I get it back?

Stewart Halfteck via email

A The answer to the first question is that if Windows encounters problems restoring from 'Stand by', it will either warn you of this, offering you the option to disable 'Stand by', or if the PC fails to restore twice in a row, will disable 'Stand by' on its own initiative.

If you want to restore 'Stand by', then you need to reinstall Advanced Power Management (APM). In Control Panel, System, Device Manager, expand the System Devices branch, highlight Advanced Power Management Support and remove it. Restart, then go to Control Panel, Add New Hardware. Follow the prompts to let Windows find and install support for APM. You should then find 'Stand by' is back on the menu. If this is not the case then the problem may be with hardware or a BIOS setting.

Spreadsheets

Q Can I enter a number representing hours and minutes in one cell in Excel and have another cell show the total number of minutes?

Sara Smith via email

A If you want to enter three hours, 27 mins in cell A1. Enter 3, then a space, then 27/60. In the other cell enter =CONVERT(A1, "hr", "mn")

This will give the correct answer, 207. Just ignore whatever displays in cell A1. It can be 3.45 if formatted as a Number with two decimals; 3 9/20 if formatted as a fraction; and even 10:48 if formatted for Time. The CONVERT function is part of the Analysis ToolPak. Choose Tools, Add-Ins and check the Analysis ToolPak box.

Q Is there a keyboard shortcut for jumping from a cell on one worksheet to the same cell on other worksheets in an Excel workbook?

Ron Bigden via email

A Group the sheets by right-clicking on a tab and choosing Select All Sheets. Or hold down Ctrl & Page Up or Page Down to choose other sheets.

Q Using Lotus 1-2-3, how can I convert percentages of an hour into minutes? In other words, I want to enter 2.5 (hours) in one cell and have it display as two hrs 30 mins in another; or enter 3.33 (hours) and display three hrs 20 mins?

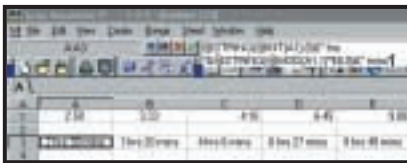
Nat Fox via email

A If the original number of hours is in cell A1, in another cell enter the following code:

```
@STRING(@INT(A1),0)&" hrs ✓  
"&@STRING(@MOD(A1,1)*  
60,0)&" mins"
```

(Key: ✓ code string continues)

This formula changes the number to text; converts the decimal fraction of hours to the equivalent number of minutes; and adds the labels hrs and mins.



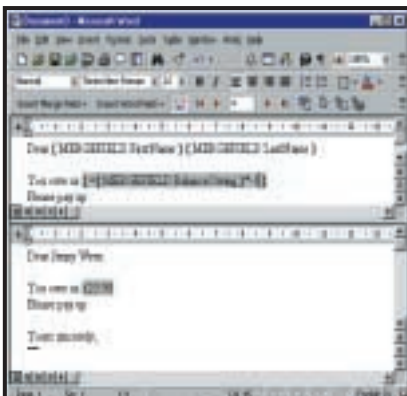
Changing decimals to hours and minutes

Word Processing

Q When doing mail merges in Word 2000 I pull certain values from a database. Unfortunately, the database needs to hold the relevant values as negative numbers in order that the accounts are balanced correctly. This means that when we send the letters out to customers they are told that they owe -£315 (for example). Although the meaning is still conveyed, I feel it would look more professional to get the formatting correct. I've tried using the formula function in Word but with no joy.

Andrew Gordon via email

A This is far simpler than the interface would have you believe. Create an empty field (Control & F9) and type an equals sign in it. Then insert your merge field. Then type *-1 after the merge field, but still within the braces of the original field. Hit F9 to update the field and you'll get a positive result.



Accentuate the positive: Changing signs in merge fields to get the right figure

Q One of my colleagues (all right, me!) created a Word 97 document many moons ago, password protected and then forgot the password. I've tried everything that seemed remotely likely to bypass the password without success. Is it possible, and if so, how? Get me out of this one and I'll force the company to buy a subscription!

Computer systems trainer
(Name and email address supplied)

A It isn't possible to bypass the password protection of an unopened Word 97 document. Otherwise there wouldn't be a lot of point to protecting it in the first place, would there? There are, however, various services and utilities available that use a 'brute force' method of password cracking – at a price. Try www.lostpassword.com/msopass97.htm.

Hardware

Q I have an Asus P2BS motherboard, rev 1.02. The manual says it can be run at speeds of up to 112MHz, but there's no 133MHz option for overclocking, as suggested in earlier Hardware columns. Will a Slocket convertor somehow control the front-side bus (FSB)?

Steve via email

A Although most Slockets have an FSB setting, this doesn't control the actual FSB used in your system. Several motherboard manuals don't reveal the whole truth of various overclocking capabilities. Our Asus P2B has four jumpers controlling the FSB up to 150MHz, although some earlier revisions may only have three jumpers, with a limit of 112MHz. Don't rely on your manual though – open your case and see if there are in fact four jumpers!

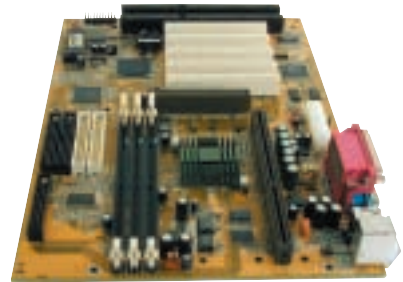
Q How do I upgrade my BIOS? I know that an upgrade is available for my motherboard, but fear making an installation error. Are they automatically installed?

Alan Greenwood via email

A Most motherboard BIOS upgrades involve downloading the required binary file from the manufacturer's website, along with a 'flashing' utility. Normally these are copied onto a floppy disk that has been pre-formatted as a system disk. After restarting your PC with this floppy, run the utility, which 'flashes' your BIOS with the new data.

Q I'm considering a motherboard with two UltraDMA66 channels and two UltraDMA33 channels. Does this mean it can run a total of eight devices or only four like a normal IDE system?

Robert Morriss via email



Some motherboards have two IDE controllers (the black and white sockets in the middle of the left-hand side)

A Sounds like it can support four devices on each IDE controller, hence eight devices in total. Intel's BX chipset features a single UltraDMA33 IDE controller, but modern BX motherboards frequently boast an extra third-party UltraDMA66 IDE controller, to match the performance of newer chipsets. However, since the built-in UltraDMA33 controller is operational, these new BX motherboards uniquely support a total of eight IDE devices.

Q I have overclocked a 600MHz Flip Chip-Pin Grid Array (FC-PGA) PIII to run at 798MHz using an Asus P2B, by using the 133MHz FSB option. However, I cannot achieve the same result by leaving the FSB at 100MHz and changing the clock multiplier from six-times to eight-times.

Sajid Raza via email

A Intel locks the clock multiplier on all its recent chips to prevent overclocking. Therefore, the only way to overclock is to increase the FSB. When running the FSB at 133MHz, ensure the PCI bus is running at 33MHz and the AGP at 66MHz, or you could run into trouble.

Modern chipsets allow you to do this and while the old BX chipset can normally be run at 133MHz FSB and 33MHz PCI, the AGP divider remains at 2/3 – hence driving the AGP bus at 89MHz, instead of 66MHz. However, many graphics cards don't like this, although some only show the strain when playing games.



Q What does the Scroll Lock button on the keyboard actually do? I can't sleep without knowing the answer!

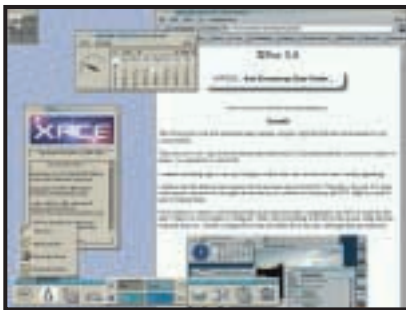
Hussein Jodiyawalla via email

A The Scroll Lock key is used in certain (usually older) applications to move the screen and not the cursor position when the arrow keys are pressed. Sweet dreams!

Unix

Q I've read in many places about how Linux is very efficient, making it a natural choice for older hardware. OK, so I installed SuSE 6.1 on a retired 100MHz Pentium machine. I suppose I was expecting some sort of miracle. Unfortunately, Linux – well, SuSE anyway – turns out to run even slower than Windows 98. Really horribly slow, in fact. Is there something especially slow about the SuSE distribution, or has everybody been just a wee bit mendacious about Linux in general?

Andrew McIntosh via email



Olivier Fourdan's XFce is a great replacement for heavy-duty desktops, such as Gnome and KDE, if you think your machine's a little too sluggish

A The IT industry's full of marketing hype. Commercial software vendors can be economical with the truth and are likely to be, er, optimistic about their product's capabilities.

Now that we've got that out of the way, let's get down to the facts. Yes, we've said in the *Unix* column that Linux is efficient, and it is. We've also said that distributors such as SuSE generally package for current machines and want to show off their product in the best light. This tends to mean that the distribution by default comes with a ton of goodies that eat up memory, disk space and processor cycles. An out-of-the-box installation of SuSE Linux is of an order of magnitude far greater than any

Windows 9x distribution, but because it's modular, if you know what you're doing, you can strip it down.

For example, your SuSE Linux installation is probably running the mighty Apache web server. Remove it: `(rpm -e apache)`

If you must have a web server, install a nouvelle cuisine equivalent such as Jef Poskanzer's 95KB of code (www.acme.com/software/micro_httpd), and excise the KDE Desktop. It's great, but it's a resource hog. Lightweight substitutes are BlackBox (<http://blackbox.alug.org>) or XFce (see this month's *Hands On, Unix* column for more).

Graphics and DTP

Q Is there any way to put crop marks on a PDF file?

Mike Peer via email

A I assume you mean once the file has been created. You can include crop marks on a PDF by specifying them in the output dialog box of your application when you create the PostScript file for distillation.

The Enfocus Pitstop 4 plug-in will allow you to add crop marks to an existing PDF document. It also lets you make global changes to PDFs and adds new tools to the toolbox that provide enhanced editing of text and graphics in a PDF. Get a demo at www.enfocus.com.



Enfocus' Pitstop plug-in allows you to make changes to your PDF files

Q We recently produced a brochure with a small selection of product photos. To keep the cost down it was decided to print in two colours. We thought it would make a big improvement to print the pictures as duotones, rather than black and white. We used Quark Xpress 3.32 for the layout and the duotones were done in Photoshop 4.

When the job was printed, though, we were very disappointed in the quality of the pictures. On screen we had produced gentle

sepia-coloured images, but the printed result was dark and heavy and you could hardly see the sepia colour. Is it just bad printing or did we do something wrong in Photoshop?

Miles Emerson via email

A The problem is more likely to lie in the separation setup in Xpress, than with your printer or Photoshop. When you specify a spot colour in Quark Xpress 3.32, the default screen angle for printing is black. If your other colour is also black this means the halftone dots in duotone pictures will print on top of one another. This is what is causing the dark, muddy effect – the sepia-coloured dots are printing on top of the black ones. Set the screen values in the Edit Colour dialog box to one of the other process colours and you should see a big improvement in the quality of your duotones.

Sound

Q I have recently installed DirectX 6 over DirectX 5. However, I now need to record sound using a microphone but cannot do this due to DirectX. After pressing Restore Audio Drivers at the Add/Remove Programs panel for DirectX6, I still cannot record. I then tried removing dsound.vxd and some other drivers in the Windows system. dsound.dll will not budge, however, because it is being used by Windows. Can you tell me how to remove all traces of Direct Sound from my system and restore normal recording?

FC via email

A First, check that the microphone level is set correctly in your sound card's mixer applet and that the Mute button is disabled. If everything is OK, go to Control Panel, double-click on Multimedia and select the Audio tab. Make sure that your sound card is selected in the Recording, Preferred Device window.

You should install the latest version of DirectX, version 7, as there may have been a compatibility problem between version 6 and your sound card's drivers. It's generally not a good idea to manually try to remove complex installs such as DirectX from your system as this may make your computer unstable.

CONTACTS

All of our experts welcome your queries, simply respond to the appropriate address at the end of their *Hands On* columns.



Letters of distinction

Tim Nott shows you how to project a professional image by making use of templates in Word

Despite the steady march of electronic mail, running any kind of business still involves writing a lot of letters. Word templates provide an ideal way of making this process painless and quick. They also add a professional uniformity to your corporate identity, even if you're a sole trader rather than a large organisation. Microsoft provides letter templates – and a rather erratic Wizard – with Word, but these are dreary and not suitable for personal or small-business use. Also, the Times New Roman and Arial fonts used in Word's built-in styles are designed primarily for legibility on screen, rather than paper. Other fonts can bring a more subtle and personalised appearance to your correspondence.

This workshop is aimed at the small-business user, although the techniques apply equally to private correspondence. If you write a lot of letters, it's worth taking time to get the template right, as the time invested will be repaid many times over.



Well-planned templates will give your business letters a consistent and professional look and feel as well as saving you time by formatting the elements automatically

We'll show you how to create styles that automate the formatting of the elements of a letter; manipulate text to create a professional-looking letterhead; include graphic elements without using up all your disk space; line up address blocks for window envelopes and how to add the current date automatically. We've included a short VBA macro that saves you having to trudge down through nested folders when you first save a letter and means you'll never have to endure the Office Assistant remarking that 'It looks like you're writing a letter...'

Although this workshop was written using Word 2000, nearly everything in it applies to Word 97, except that some dialogs are different and the VBA code to remove the Office Assistant has not been tested in that version. The majority of the steps will also work in Word 6 and 7, as the basic principles of templates and styles have remained unchanged.

Fun with templates

Word's Autotext feature saves you having to type the same thing over and over

Graphics troubleshooting tips

If your graphics don't appear in the right place or at all, check the following:

- You are in Print Layout view
- In Tools, Options, View you have Drawings ticked
- Ditto Picture placeholders are unticked
- Ditto Field codes unticked
- Check the link (Edit, Links) – click the Change Source button and go to the file again
- There can be a problem if the graphic resides in the same folder as the template – Word will only insert the filename,

not the path, into the file. This can be rectified by editing the field as described below.

If your graphics are saved in each document, a one-page letter may be hundreds of kilobytes and the Edit, Links menu item will be grayed out. Try the following:

- Delete the picture and insert it again, taking care that the 'Link to File' option is chosen (Word 2000) or the 'Link to File' box is ticked and the 'Save with document' box is unticked (Word 97)

- Make sure you haven't changed the 'In line with text' option (step eight in the workshop) – this can make Word spontaneously embed, rather than link, the file

- Check the linked picture's field code appears when you press Alt & F9. This should be of the form

```
{INCLUDEPICTURE
"E:\my folder\
subfolder\picture.
tif" \d \*
MERGEFORMAT}
```

(Key: ✓ code string continues)

The \d switch links, rather than includes, the picture – note there should be quotes round the file path and the latter should contain double backslashes

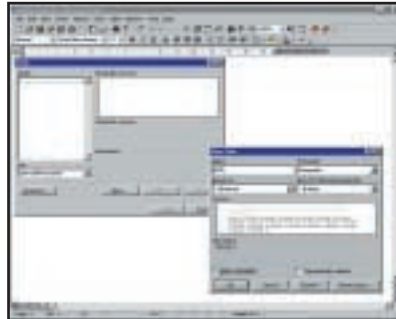
- Try inserting the link directly as a field (Insert, Field, Links and References, IncludePicture)
- Do the resizing and image processing in the program that created the graphic
- Check that the 'Save preview picture' option is unticked in File, Properties, Summary.



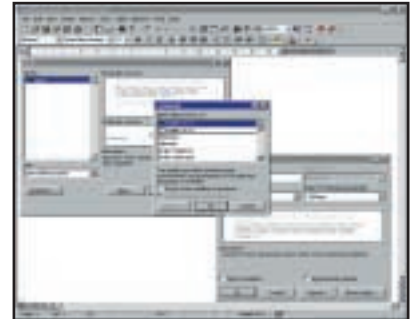
Step-by-step guide to creating Word templates



1 The first step is to create a new template based on the 'Blank Document' template. Although this will be blank, it will have available all the styles, macros, autotext and toolbars that have been saved in the global template Normal.dot. Save this with an appropriate name in the folder where Normal.dot and other templates are stored. Note that if your Normal.dot is in a mess, you can rename it and Word will create a mint-condition replacement.



2 The next stage is to create the styles. From the Format, Styles menu, choose 'User-defined styles' from the list box. As you haven't yet defined any, this will produce an empty list of styles above. Click on the New button and type in a name for the style. 'Body' will be the primary style in the letter; it should be a paragraph style, based on normal, followed by itself. You don't need to 'Add to template' and should not 'Automatically update'.



3 Now comes the creative bit. We chose Garamond as the font and kept the rest simple. The 'keep lines together' option ensures that a paragraph doesn't break over a page and the Space after gives a blank line between paragraphs. To change a style you go to Format, Style, select the Style, then Modify, Format - this last gives a menu of options you can change. Make sure that the language is set correctly for your location.



7 Now to add a graphic. What you don't want to do is store the graphic in every single letter you save, which would be a waste of disk space. Instead, insert a link to the graphic. Word 97 has checkboxes on the Insert, Picture, From File... dialog, but Word 2000 keeps the option tucked away in a hidden menu within the 'Insert' button.



8 Having used the 'handles' to size the picture, right-click on the picture, then Format. On the Layout tab, make sure 'In line with text' is selected. You can position the graphic by left, centre or right-aligning it, and 'pushing' it around with carriage returns and tabs. For a more sophisticated solution, insert the picture link into a Text Box (see next step), which can then be manipulated directly or via a dialog.



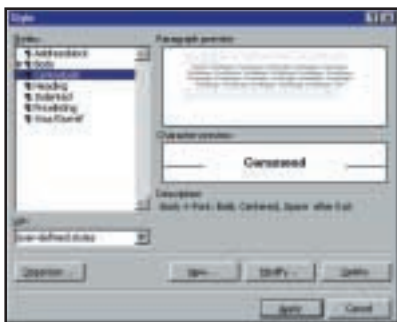
9 Create a text box to hold the address. For a normal DL window envelope this starts 5cm from the top and 3cm from the left of the page - the easiest way is to draw it roughly in position, then right-click, Format. From the Layout tab, choose Square, then go to the Advanced options to set the position absolutely from the Page or Margin. Then go to the Colours and Lines tab to set the Line Colour to 'No Line' - this gets rid of the border.

again, such as 'Yours sincerely,' or 'Our terms of payment are blah blah'. The beauty of this is that you can add Autotext items whenever you are editing a document based on the template - you don't have to be editing the template itself. Just select the text, go to Insert, Autotext, Autotext... then type a suitable abbreviation into the 'Autotext Entries

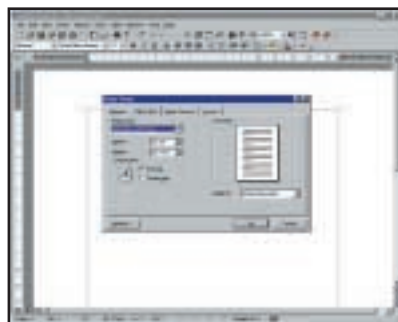
box', making sure that your template is selected in the 'Look in' box. Another good feature of Autotext is that, unlike Autocorrect, it doesn't take you by surprise - you have to press F3 after typing the abbreviation, or if you have Autocomplete turned on, press Enter when the text appears in a Tooltip box. We've not covered automating the

entry of the address, as that would take a lot of space. There are various methods, depending whether you use the Windows Personal Address Book, Outlook, Schedule or a third-party contact manager.

Some methods, especially those involving Outlook, can take more effort than typing the address in manually and



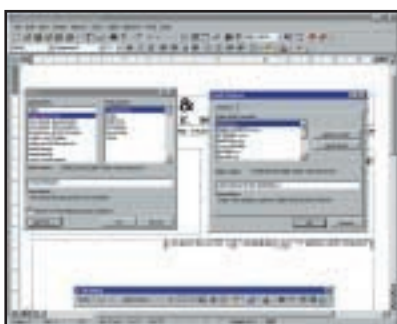
4 Since styles can include a variety of options, you may well want to create more – such as indented paragraphs, bulleted or numbered lists, text with a border, emphasised paragraphs and so on. It really depends on your own requirements, but if you set up these styles now, rather than apply piecemeal formatting to each letter, you'll save a lot of time and achieve a professionally consistent look to your correspondence.



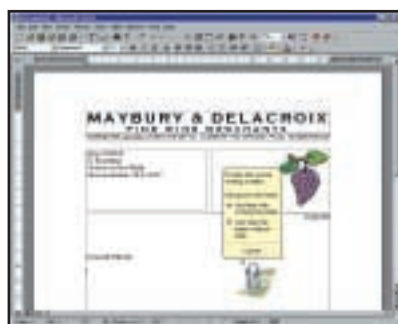
5 Now you can start on the actual layout, so switch to page layout view. We've left the page margins at the defaults, as a 3.17cm (1.25in) side margin with 2.54cm (1in) top and bottom gives good proportions, although it's easy enough to change this from File, Page Setup. Check that the paper size is correct, usually A4 in Europe, and that it is set to portrait orientation.



6 The company name is set in 24point Copperplate, then the character spacing adjusted so it fills the available width exactly. The address line below is condensed – both are a matter of trial and error. Word's treatment of borders using the toolbar is, to say the least, idiosyncratic, so the address line – which is a paragraph in itself – had its top and bottom borders set from the Format, Borders and Shading dialog.



10 Next you want the date automatically inserted for each letter you write. There are several ways to do this – and also several ways to get it wrong. The simplest way is to Insert, Field, Date and Time, CreateDate – hit the Options button to get a choice of formats. When you create a new document using the template, this will insert the document's, not the template's, creation date and this (unlike a plain Date field) will stay fixed.



11 Add whatever else you want, and make sure the address box and the end of the template (where you'll start typing the letter itself) are formatted with the correct styles. Save the template and try it out. If all goes well, you'll see something like the above. You'll probably have some tidying up to do, such as adding unknown words from your letterhead to the spelling dictionary and will doubtless want to stop the Office Assistant stating the obvious.



12 A very simple macro banishes Clippit. Go to Tools, Macro, Macros. Make sure your template is selected in the 'Macros in' box, type 'Autonew' in the Macro Name box, then click Create button. The VBA editor will appear with an Autonew macro prepared – all you have to do is add these lines:

```
Assistant.On = False
ChangeFileOpenDirectory "C:/My Documents/Letters"
```

there's a lot to be said for keeping names and addresses in a simple flatfile database, such as the old Windows 3.x Cardfile, and then cutting and pasting. Cardfile, believe it or not, still ships with Windows 98 and can be found in Win98\WIN98_40.CAB.

Once you've created your initial letterhead template, you don't have to

stop there – you can re-use it by basing further templates on the first. This way you can create purpose-made invoices, statements, quotations and so on, all in the house style. You can also have special templates for regular correspondents, such as regular clients, your bank, the Inland Revenue and so on. And if you remember to alter step 12 to suit, all

these documents will present themselves for saving in the correct folder.

CONTACTS

Tim Nott welcomes your comments. Contact him via the PCW editorial office or email wp@pcw.co.uk.



Touched by your presence

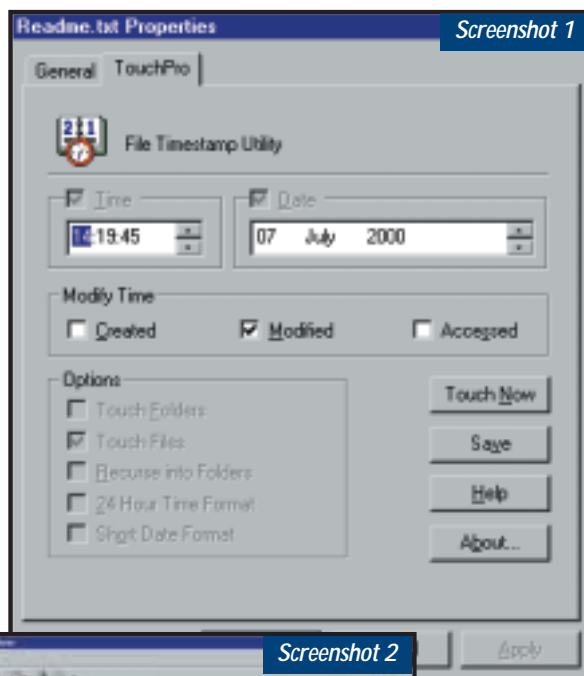
Tim Nott goes application crazy, changing the time with TouchPro and wasting it with IrfanView

Every file and folder on a system has three dates and times associated with it: the creation date, the date it was last modified, and the date it was last accessed. The last of these is fairly ephemeral, as in order to check this you have to access the file (right-click, Properties), so it always returns the current date – as all atomic physicists know, we can change things just by observing them. The other two dates are also confusing, as the modification date often precedes the creation date.

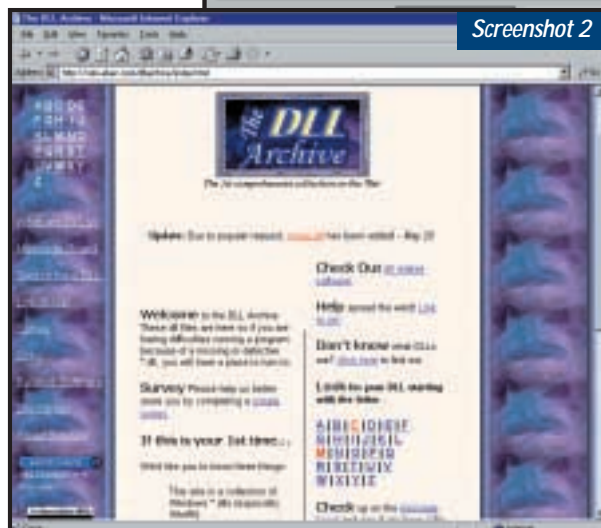
This apparent lunacy is explained by the latter referring to the file's existence on its current storage medium, while the former refers to the file's contents. Hence you can create a text file, say, on Monday, modify it on Tuesday, and the creation and modification dates will reflect this accordingly. If you then make a copy of the file on Wednesday, the copy will have Wednesday's creation date, but Tuesday's modification date. Similarly, if you install an application, the creation date of the program files will be the date on which you installed, but the modification date will be when the developer last saved them.

It's the modification date that we see in

Explorer and DOS directory listings and there are occasions when you might want to change this without opening and saving the file. Several times I've had the eerie experience of the PC clock taking a 100-year leap into the future. I didn't notice this until I found that WinZip wasn't working: not unreasonably, it refused to process files created 100 years hence. This problem can be fixed using the advanced options of Scandisk to



momentous Monday evening with their mouse pointers hovering over the Save button as Bill Gates counts them down to one minute past eight, but sadly that isn't the way it's done. There are utilities that can directly change – or 'touch' – a file modification date, and one such is TouchPro (screenshot 1). This adds a further page to file or folder properties, enabling you to change any of the three dates. It's shareware, costs £7 to register and can be found at www.jddesign.co.uk.



Top: TouchPro – a date with destiny

Bottom: Huddled masses of DLLs, yearning to breathe free

check for invalid times and dates, but there are other reasons to change modification dates.

Developers do it as a handy method of version control. If you look at the Windows 98 system files, they all have a modification time and date of 22:22 on 23 April 1999 for the second edition and 20:01 on 11 May 1998 for the first. It's awe-inspiring to think of all those programmers gathered on that

The curse of Seethru

I don't know why, but the utility Seethru, which lets your wallpaper show through the icon text background, has given me more grief than anything else over the past three years – not, I might add, because of any intrinsic defect, but because of its lack of availability.

Seethru first appeared in this column (and on the PCW cover disc) in November 1997. Over the following two years, I had a steady stream of enquiries from people who, one way or another, had read the article but didn't have that CD. Oddly enough, it didn't seem to be available on the web. So, last November it got another mention in the column and was supposed to make it to the VNU website, but didn't get there in time.

When it did appear it was at an address different from that given in the column. Then it disappeared again, but much to my joy, its author Mike Strong emailed me with another URL, which I passed on in June's column – www.one2three.freemove.co.uk/utilz.htm, to recap. This version, however, doesn't include the necessary Visual Basic files, so if you don't have comdlg32.ocx and msbvm50.dll in the



Windows\System folder, it won't work. Several readers have now pointed this out and, in reply, I can only say AAAAAAAAAAAAAAAAAARGH!

By a happy coincidence, however, while I was rolling on the floor biting the carpet, I found a scrap of paper with <http://solo.abac.com/dllarchive/index.html> scrawled on it. This is a repository for DLLs and if you've lost one you may well be able to find and download it here. It has msvbvm50.dll, but not the ocx file – however, if you search the site (screenshot 2 on previous page), this will point you at several other sources for the latter.

Tales from the script

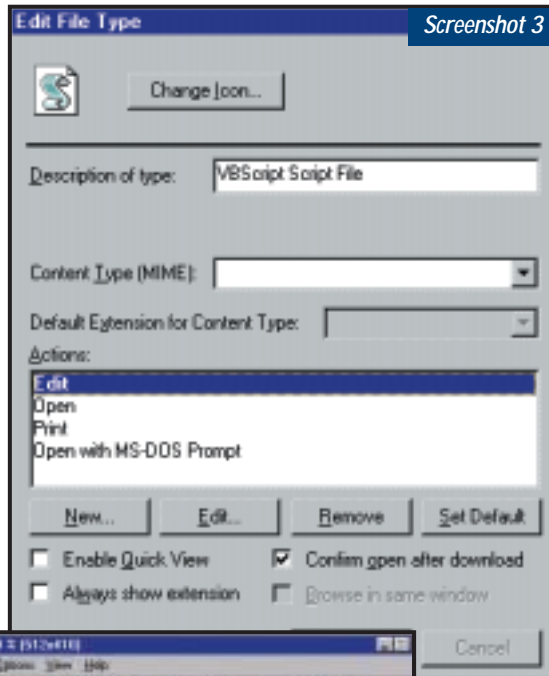
In August's column, written in the wake of the ILOVEYOU virus, I mentioned some precautionary measures, including uninstalling the Windows Scripting Host, so potentially dangerous VB and Java Scripts wouldn't run.

However, doing this means that potentially useful VB and Java Scripts won't run either, so if you've been using either of these to automate Windows, you'll be stranded. There is, however, a compromise, which lets you use your own scripts without having others thrust upon you. Go to Explorer's View Menu, and select Folder Options, File Types. Scroll down to VBScript Script File, and click the Edit button. In the list of Actions, highlight Edit and click the Default button: the Edit action will turn to bold type (screenshot 3). Repeat the process for the Jscript Script File type.

This will make the default action for these files be to open in Notepad, so you can immediately see what is in them. You'll still be able to run trusted scripts by right-click, Open, but you won't run the risk of launching a malicious script by double-clicking it, or, worse still, having it automatically run from the Startup folder. Indeed, the sudden appearance of a Notepad full of script code when you start Windows will provide a warning that someone is trying to infiltrate your PC.

A versatile viewer

Anyone who has any dealings with graphics files is always on the lookout for a better viewer. I've long been a big fan of



Screenshot 3

*Left: Putting the safety catch on VB scripts
Below: The all-singing, all-dancing file viewer*

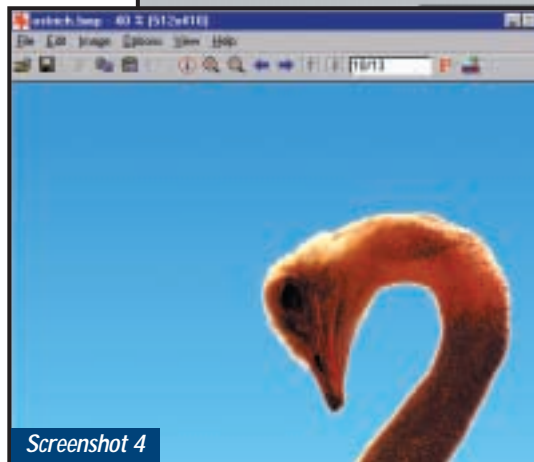
and simple file viewing/ converting tool that first won me over. The native Windows Quick-View is so fragile and its name comes so close to contravening the Trade Descriptions Act, that I've never been tempted to try the 'Pro' version.

So, let's welcome IrfanView, created by Irfan Skiljan of Austria (screenshot 4). It can display all the common image formats, such as gif jpg, tif and bmp, as well as many less common, such as lwf (LuRaTech Wavelet)

and sfw (Seattle Film Works), and convert between many of these.

It will perform basic image-processing functions, such as cropping, resizing or rotating; changing contrast, brightness or colour levels; and blurring, sharpening or pixellating. It can change colour depth, making, in my opinion, a much better job than Paint Shop Pro, and comes with a thumbnail viewer, scanner support and batch file conversion.

Oh, and it's impressively fast and only takes 750KB of disk space, half of which is the Help file. Does it dance? Does it sing? Well, actually, yes. Let's start with playing animated gifs and icons, then move on to wav sound files, or with a suitable (downloadable) plug-in, mp3s. Or in my case, not, as the plug-in crashed IrfanView. I also had difficulty getting it to play audio CDs, but I was in a forgiving mood as it had no trouble



Screenshot 4

Paint Shop Pro, which I use a lot for viewing bitmaps, converting between file formats and generally managing the thousands of screenshots and other images I use in my work. Even eight years ago, it could deal with more formats than image-processing applications costing over £500. Since then, it has

grown, adding more and more features with each release and gradually creeping up in price, so that it's now comparable with performers such as Adobe Photoshop or Corel PhotoPaint in terms of high-end features.

All of which is doubtlessly laudable, but it does rather lose sight of the fast

Does it dance? Does it sing? Well, actually, yes. Let's start with playing animated GIFs

reading avis or mpg movies and I spent a large and satisfying part of the afternoon watching an episode of *Inspector Morse* with IrfanView.

No, I'm not joking, honestly, IrfanView not only does all this (and more), but is free for home users: commercial registration costs £6.25. Go to

<http://stud1.tuwien.ac.at/~e9227474/>
to download the latest version.

Another mystery solved

Whatever the final outcome of the Microsoft trial and appeal, the 'integration' of Internet Explorer into the operating system has a lot to answer for, especially when it all goes wrong.

What's especially annoying is that even if you want to use a different browser – Netscape or Opera, say, you still need Internet Explorer installed to enjoy the benefits of goodies such as the Quick Launch toolbar, graphic file thumbnails, 'View as Web page' and the like. A common complaint is that these

luxuries tend to collectively disappear, leaving, for example, two of the three Folder Options/General choices greyed out. This can be cured with Tweak UI (Windows 98 version).

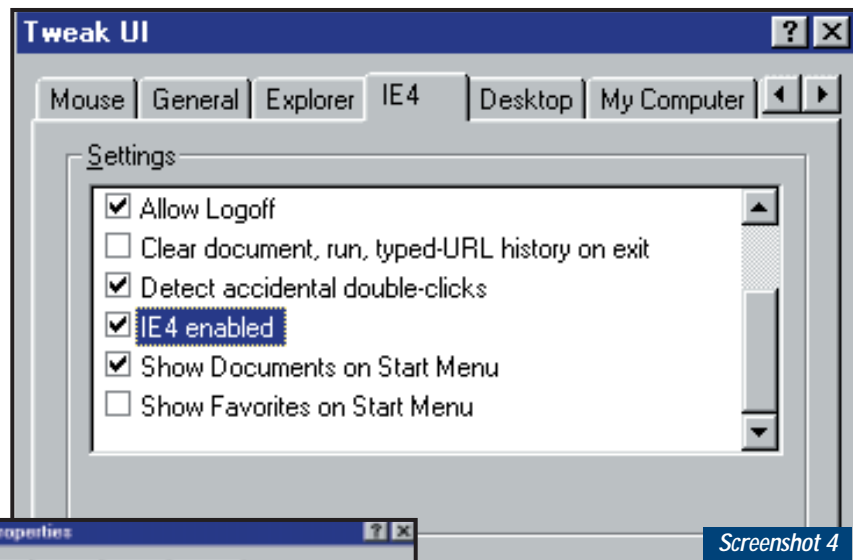
Go to the IE4 tab, and make sure that the 'IE4 enabled' checkbox is ticked – yes, even if you're using IE5 (screenshot 4). If, however, you haven't got Tweak UI, which, as I've said before, doesn't ship with the second edition of Windows 98, all is not lost. Run Regedit, and go to: HKEY_USERS\DEFAULT\Software\Microsoft\Windows\CurrentVersion\Policies\Explorer.

Double-click on the entry 'ClassicShell' and change its value from 01 00 00 00 to 00 00 00 00. Restart Windows and the lost interface features will be restored.

Feedback

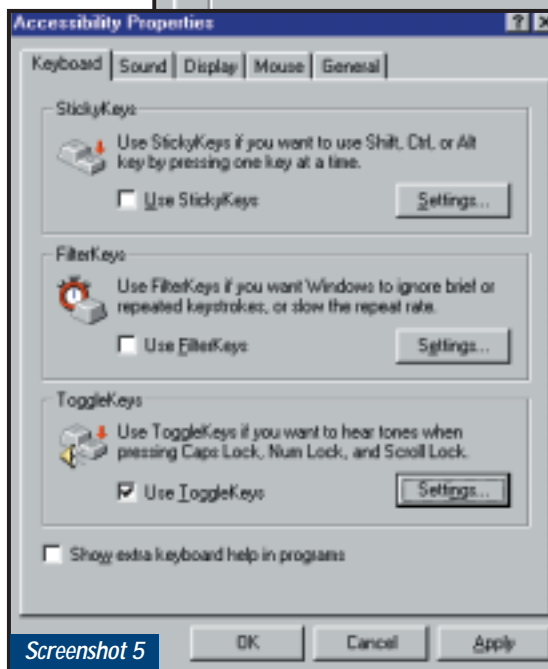
Colin O'Brien sent in a quick tip that may be obvious to some – but others may have never tried it. It addresses the awkward issue of moving or copying files in an Explorer Window. Received wisdom is that you open an instance of Explorer for both the source and destination folders – or just open both folders in single-pane view.

However, if you drag a file from the right-hand pane of Explorer into the left-hand pane, you can expand any folder to reveal its sub-folders by holding the file over that folder and waiting a little while.



Screenshot 4

Top: Keep this ticked – even if you have IE5
Left: Hear those lock keys toggle



Screenshot 5

Hence you can drag-and-drop files to any destination, without leaving the original instance of Explorer. To which I'd add that if the folder or drive you want isn't visible, you can scroll it into view by 'pushing' the file against the top or bottom of the left-hand pane to scroll the contents. You should also be aware that this is another of the IE4-dependent goodies referred to above.

Richard Stutely noticed the juxtaposition, in July's column, of the piece on Windows Accessibility options and the perils of hitting the Caps Lock key by mistake. Richard astutely points out that the former can be used to solve the latter. 'In Accessibility Options check "Use Toggle Keys to hear tones when you press Caps Lock, Num Lock and Scroll Lock" (screenshot 5) – then you'll hear a

squeak when you hit the caps lock.' I should mention that this feature doesn't work on all PCs, including the one I'm using to WRITE THIS.

Tim Goldingham gets the award for email signature of the month. It reads 'This email should arrive without attachments. If there is an attachment, it may have been put there by a virus – DON'T open it.' Booby prize of the month goes to Ron Hopeful, who attached an executable that 'shows what is REALLY running on your computer'. If he does it again I'll tell you his real name.

The campaign for plain, unadulterated, text email is making slow but steady progress – apologies to those who are sick of reading this, but if you are using Outlook Express as your mail program, can you please format messages to this column as plain text, not HTML. You can do this on a per-message basis with Format, Plain text, in the New Message window; on a per-contact basis on the Name tab of the address book entry or globally (Yes! Save the Planet from Unnecessary Verbose Packaging!) from Tools, Options, Send.

CONTACTS

Tim Nott welcomes your comments on the Windows column. You can contact him via the PCW editorial office or email: win@pcw.co.uk. Please do not send unsolicited file attachments or queries concerning the PCW CD-ROM or website



Seeing infra-red

Six months after its launch, there is still no IR support for Palms and mobiles, says Terence Green

One of the aspects of Windows 2000 that is really beginning to niggle is the absence of infra-red (IR) wireless support for a whole range of devices. Sure, Windows 2000 with ActiveSync 3.1 (a free download from microsoft.com) installed can talk via IR to Windows CE clients, but this only works for Windows CE, which happens to be the tiniest niche in the IR-enabled market.

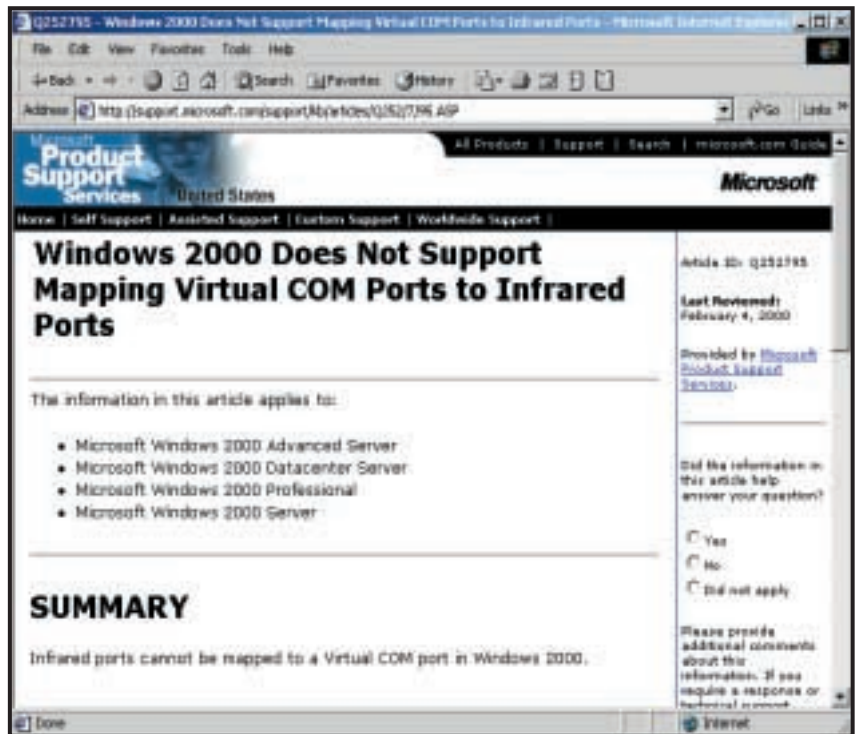
Compared to the number of Palms with IR and mobile phones with IR and inbuilt modems, CE has a minuscule market share, barely into double digits; yet Microsoft, of course, has IR for CE working under Windows 2000. As I write, it is six months since Windows 2000 was released and still there is no IR support for Palms and mobile phones.

Having recently acquired a Motorola TimePort L7089, I know only too well about this problem as neither the IR software supplied by Motorola, nor any of the alternatives I've since tried are able to support Windows 2000. This is really annoying. The L7089 can be used as a modem via an IR wireless link with a laptop running Windows 98, but this wire-free solution simply is not supported on Windows 2000.

When I called the customer support line they offered to put me on the list ('it's becoming quite a long list...') of

Readers' lives

Nick Tucker, or rather his son, has come up with a nifty tip for those of us who like to use CD-R recordable drives for backup. Nick installed Windows 2000 on his desktop as an upgrade from Windows 98. All worked well except for backup. Windows 2000 Backup refused to acknowledge the presence of the CD-R. Nick's son managed to come up with a workaround which Nick deems 'utterly ludicrous'. He set the CD-R up as a shared network drive and voila! Backup to the CD-R works.



Infra-red support for Palm PDAs and mobile phones with modems is still on hold

users seeking Windows 2000 support. Better than a poke in the eye with a pointed stick, but not a lot. If I understood the support response correctly, Motorola has had working software available for yonks, but has not yet been able to release it.

I was told that Motorola's delay in releasing software to support Windows 2000 is down to licensing issues, but I wonder whether it's more to do with a backlog in Microsoft's Hardware Quality Lab that tests drivers and issues digital certificates for those that pass the tests. The situation over at Palm is no better. For months now, virtually since the release of Windows 2000, the Palm website has featured a note on Windows 2000 support that says (among other things) 'you will be unable to carry out HotSync operations through your infra-red port on Windows 2000. Microsoft has changed the way infra-red ports operate under Windows 2000. Palm and Microsoft are working to resolve this issue'.

Microsoft has also posted an

explanatory note on the IR situation that you can read by searching for article Q252795 in the Microsoft KnowledgeBase at www.microsoft.com. Basically it says: 'Windows 2000 does not expose virtual serial ports and does not provide a general implementation of IrCOMM'. What this means is that the Windows 98 way in which an IrCOMM driver maps the IR port to a standard serial port is not reliable enough for Windows 2000. The 'virtual port' thus created can only be used by a single IR-equipped device at a time and it doesn't allow for any error checking.

Making Windows 2000 more reliable than Windows 98 is a laudable aim, but where's the harm in enabling this basic connectivity allowing those of us who only want to use the IR for a single device and are prepared to accept the limitations to do so? What's most annoying about this is that nobody is prepared to say when this blockage will be cleared. Owners of these devices can do nothing other than register on a wish

list for Windows 2000 support with the relevant hardware vendor.

ATI Rage Fury Pro

Palm organisers and mobile phones aren't the only peripherals lacking certified device drivers but the situation is at least marginally better with graphics cards. Six months after Windows 2000 was released to manufacturing there are as yet no certified drivers for the popular ATI Rage Fury Pro. It's also about the only ATI graphics card that doesn't have basic driver support at least on the Windows 2000 CD. ATI has a Windows 2000 FAQ page which ascribes the absence of drivers to 'technical difficulties', but since April the company has at least released what it calls 'special-purpose' drivers and everyone else calls 'beta drivers'.

The drivers and a detailed explanation of the status quo can be found by following the 'Drivers' link from the main support website (support.atitech.ca), selecting 'Drivers by Operating System', choosing 'Windows 2000' and clicking on the 'Windows 2000 FAQ' link.

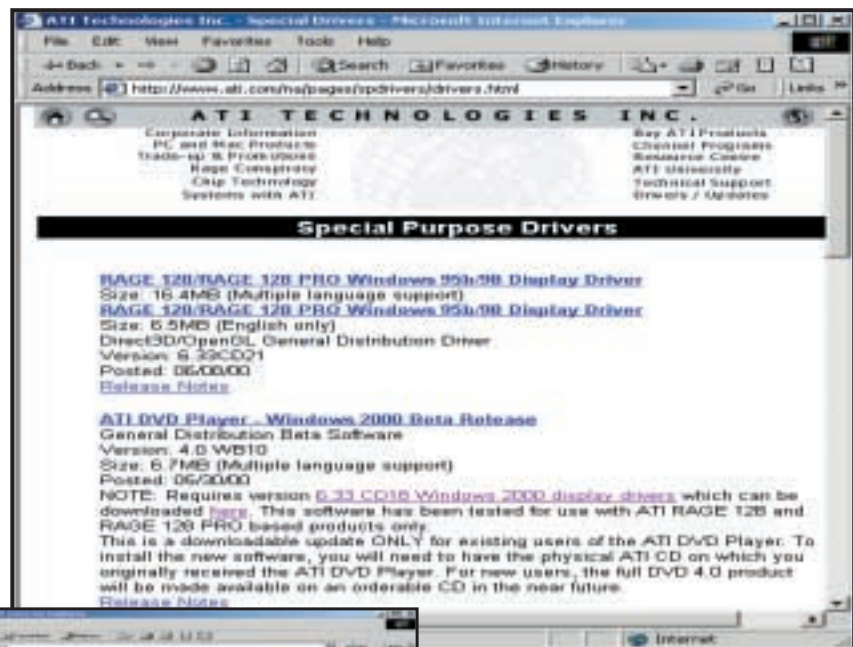
I was particularly interested in the new beta DVD player uploaded at the end of May, as I had unhappy experiences with earlier beta versions. I've tried other software DVD players – both WinDVD and PowerDVD work with Windows 2000



newsgroups for its tardy delivery of drivers – and rightly so because six months after Windows 2000's release a top-selling card should not still be waiting for driver support. That said, at least ATI has managed to deliver reasonable support, albeit beta, for all the card's features, which is some way

beyond what users with IR devices can expect. Somewhere behind all this I suspect that Microsoft may not be entirely free of blame for the absence of pukka certified drivers for popular and widely-used peripherals.

One further issue came up when I started using the beta ATI DVD player. In addition to region locks in the DVD drive and the player software, we now have a region lock in Windows 2000 as well. Region locks are a stupid idea dreamed



*Above: ATI's special-purpose drivers are full-featured but 'beta' releases
Left: The Windows 2000 Region Page at inmatrix.com has workarounds for Windows 2000 region encoding*

up by movie companies looking backwards to protect a film distribution system that obviously won't survive the digital transformation. Region locks try to prevent DVDs from North America (Region 1) playing on UK (Region 2) systems, both hardware and software.

The good news is that there is an easy way around this with DVD Genie, which you can download from www.inmatrix.com. The bad news is that DVD Genie doesn't (yet) touch the new Windows 2000 region lock. But a workaround has been found. It involves deleting an unknown Registry key so saving a copy of the key to a file before deleting it is a good move. The information can be found at www.inmatrix.com/win2000.html, the Windows 2000 Region Page. If you can find (with Regedit) an odd key with strange characters as the very first key in HKEY_LOCAL_MACHINE/Software/Microsoft, delete it and reboot to play DVDs from other regions with DVD Genie.

Microsoft may not be entirely free of blame for the absence of pukka certified drivers

– but the CineMaster engine that ATI licenses is clearly the best (when it's working properly!). With the new DVD player beta and the latest special-purpose drivers I can at last play DVD full-screen and output the image to my TV, which gives me hope for further improvement. But it's still very obviously a beta. The picture is generally good but too many artefacts spoil the view and there's an unpleasant crackle on the audio.

ATI takes a lot of stick in the Usenet

CONTACTS

Terence Green welcomes your comments on the Windows 2000 column. Contact him via the PCW editorial office or email: win2000@pcw.co.uk



More chips, please

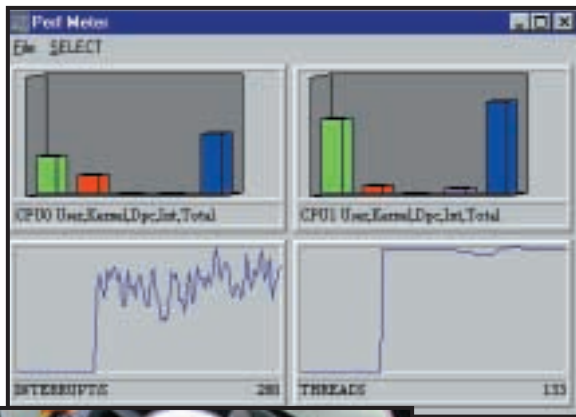
Roger Gann looks at the benefits of adding a second CPU to your NT workstation

Although Windows NT4 has supported multiple processors for many years, for most users it was simply too expensive to implement – processor and motherboard costs were exorbitant and simply not economically justifiable. I can clearly remember reviewing a state-of-the-art, dual-Pentium Pro Compaq Professional Workstation 8000 a couple of years ago – I can guess why Compaq called it the 8000, because that was pretty much its price in pounds.

Today the hardware scene has changed dramatically – not only are processors more powerful and cheaper (you can pick up a 500MHz Celeron for about £100), but motherboards such as the old, £90 Abit BP6 and the newer, low-cost, dual-Flip Chip-Pin Grid Array (FC-PGA) models on their way mean dual-processing power is affordable at last.

Why do it? Well, while you don't get a straight doubling in processor power with a second CPU, you do get a major boost. But a lot depends on the software you're running – while NT4 may be multi-threaded, most apps that run on it aren't and to get the most from symmetric multiprocessing (SMP), multi-threading is a must.

Database servers, such as SQL Server, are perhaps the biggest beneficiaries of multiple processors. By adding a second



Top: Tucked away in the NT Resource Kit is Perf Meter. This makes it easy to track activity on both processors, plus there's a range of other elements **Above:** The Abit BP6 motherboard has given many hand-ons experience of multiprocessor systems

processor to a uniprocessor database server that's suffering a bit from being under-endowed in the processing power stakes, you may almost double your throughput. Adding more processors will

continue to boost performance, but the single biggest gain will come from adding the second one. I understand Quake III Arena might also benefit, too!

I recently picked up an old Compaq Professional Workstation 5000 – prices have come down a bit since 1997 as it only cost me £100. It

was a dual-processor design, but Compaq shipped loads of these workstations with just a single CPU fitted – a 200MHz Pentium Pro. As I had a second, matching, Pentium Pro kicking about, I decided to install it and upgrade NT4 to recognise it.

My first problem, however, was physical rather than logical – the CPU required its own private plug-in Voltage Regulator Module (VRM) but a quick call to Hypertec, UK purveyors of memory and CPU upgrades, solved my problem. With the VRM and the CPU plugged in, the BIOS cheerfully announced that it could detect two processors. My next job was to get NT4 to do the same.

When you perform a clean install, NT, by default, initially installs the multiprocessor kernel until it determines how many processors you've got: it then typically reverts to the single-processor kernel. My problem was getting it to switch back to the multiprocessor kernel now that a second CPU was present – remember, NT ain't Plug and Play!

The good news is that a complete reinstall isn't required – you can upgrade from single to multiprocessor simply and quickly. There's a lengthy manual way and there's a semi-automatic way.

Before I started, I naturally updated my Emergency Repair Disk (ERD). To do this, run rdisk.exe from a command prompt, pop the ERD disk into the drive and then select Update Repair Info.

First, I installed a second version of NT to a separate folder on my hard disk and then restarted the computer to boot

FIG 1

List of available HALs

halast.dll	AST Manhattan SMP
halsp.dll	Compaq SystemPro Multiprocessor or 100 per cent compatible
halcbus.dll	Corollary C-bus Architecture
halmca.dll	IBM PS/2 or other Micro Channel-based PC
halmpsm.dll	Micro Channel Multiprocessor PC
halapic.dll	MPS Uniprocessor PC
halmps.dll	MPS Multiprocessor PC
halncr.dll	NCR System 3000 Model 3360/3450/3550
haloli.dll	Olivetti LSX5030/40
hal.dll	Standard PC (single-processor HAL)
hal486c.dll	Standard PC with C-Step i486
halwyse7.dll	Wyse Series 7000i Model 740MP/760MP

to the new installation of NT. In the %SystemRoot%\system32 folder of my original NT installation, I renamed the following files to alternate names: ntkrnl.exe; hal.dll; kernel32.dll; ntdll.dll; winsrv.dll; win32k.sys.

I then needed to use the correct multiprocessor Hardware Abstraction Layer (HAL) that my Compaq required. The available HALs are listed in figure 1.

I opted for the MPS Multiprocessor PC DLL, which seems to work fine. If I get time I'll visit Compaq's excellent tech-support website and download the SSD patch that has its own HAL.

It's important to ensure that the ntkrnlmp.exe and appropriate HAL file are the same version as that of the NT installation. Failure to match them results in system instability and the dreaded Blue Screen Of Death. This also applies to those files that need to be obtained from the service pack CD-ROM or directory location and then expanded manually with the Expand.exe tool.

Normally you would then copy the ntkrnlmp.exe file and the appropriate HAL file from the NT CD-ROM to the %SystemRoot%\system32 folder of your original NT installation. But as I'd installed a service pack I copied them from the current service pack instead. Once the files were in place, I renamed them to ntkrnl.exe and hal.dll, respectively.

Next, I copied the Ntdll.dll file from the service pack to the %SystemRoot%\system32 folder of the original NT installation. From a command prompt, I expanded the kernel32.dll and winsrv.dll files from the service pack to the same folder, like this:

```
expand kernel32.dl_ ✓
%systemroot%\system32\
kernel32.dll
expand winsrv.dl_ ✓
%systemroot%\system32\
winsrv.dll
```

(Key: ✓ code string continues)

In NT4, the Win32k.sys file is also required. Again, I expanded this file from the installed service pack. I then rebooted the PC and noticed that it now displayed 'Multiprocessor kernel' during startup.

Automatic SMP upgrade

If all this seems like a lot of hassle to you, there is a slightly simpler way. The NT Server 4.0 Resource Kit includes a utility called uptomp.exe, that allows you to perform the SMP upgrade without reinstalling the base NT operating



Instead of displaying one graph that tracks CPU utilisation, in a dual CPU PC you get a pair. Here, Windows Update is revealed as a CPU-hungry task

system. You can download the NT4 Resource Kit Support Tools from: www.microsoft.com/ntserver/nts/downloads/recommended/ntkit/default.asp.

Download the Sp4rk_i386.exe file for x86-based computers or the Sp4rk_αxp.exe for Alpha-based computers. Each of these self-extracting files contains a setup program and all the files necessary to install the NT4 Resource Kit Support Tools and documentation on your computer.

Although uptomp.exe does copy the correct files, it doesn't copy them all. Win32k.sys isn't, but you can copy it manually, expanding it, as above, to the System32 folder. If you do this, modify the %systemroot%\repair\setup.log file in order to modify the CRC value of win32k.sys to equal 13e42a – this value is used when installing future service packs or repairing the system files.

You can, however, get hold of an updated .inf file (uptomp.inf) for uptomp.exe from Microsoft's FTP site at: <ftp://ftp.microsoft.com/bussys/winnt/winnt-public/reskit/nt40/uptomp>.

This updated file needs to replace the one that ships with the Resource Kit, so copy the updated uptomp.inf file from the FTP server to the same directory as the uptomp.exe program. You'll also need to find and copy the txtsetup.sif file to the same directory.

The txtsetup.sif file is needed to display the names and descriptions of the different HALs available under NT Server. This file is accessed when uptomp.exe searches for a list of HALs prior to upgrading the computer.

The txtsetup.sif file is located under the I386 folder or the Alpha folder on the NT installation media. Copy it to where uptomp.exe is located.

When you run uptomp.exe, a dialog box will tell you to: 'Verify the path to the new Multiprocessor HAL DLL files and select the correct HAL for this machine.' Point the uptomp.exe application to the installation folder of the latest service pack you are running. After this is done, uptomp.exe will copy the necessary files and prompt the user to restart

and then run Rdisk to update the saved ERD configuration.

Temporary reversion

It's easy to verify the performance gain of adding a second CPU, as there's a boot-time switch that you can use to temporarily disable the second CPU. You'll need to modify your boot.ini file. This file is found in the root of the system disk (usually C:). In it you'll find your bootup options. Mine looks like this:

```
[boot loader]
timeout=30
default=multi(0)disk(0)rdisk(
1)partition(1)\WINNT
[operating systems]
multi(0)disk(0)rdisk(1)
partition(1)\WINNT=
"Microsoft Windows NT 4.0"
/fastdetect
C:\="Microsoft Windows"
```

To modify the number of processors used, after your Windows NT line add one of the following switches: /ONECPU – this specifies that only one CPU should be enabled. /NUMPROC=n – this specifies that only 'n' processors should be enabled.

CONTACTS

Roger Gann welcomes your comments on the Windows NT column. Contact him via the PCW editorial office or email nt@pcw.co.uk



Think of the environment

Getting to grips with the power of Linux desktop environments, Chris Bidmead lifts the lid on XFce

Is your Linux workstation not performing as lithely as you hoped? Chances are you're running it on your 'second machine', which might otherwise be up in the attic. And you probably have the Gnome Desktop, or KDE installed.

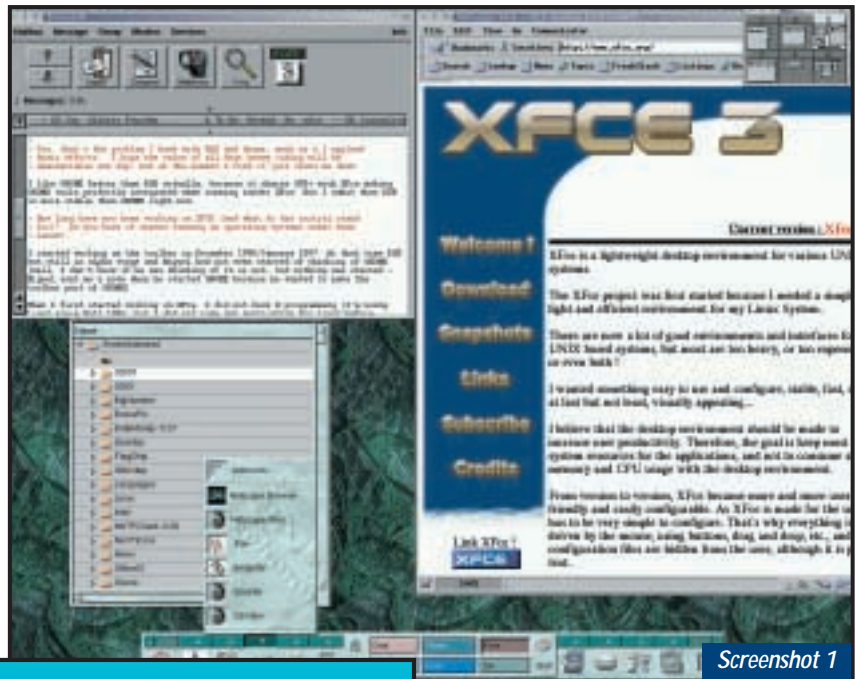
No question, the Gnome and KDE teams have done a brilliant job of turning Linux into a serious challenge to Windows on the desktop. Well, 'challenge' understates it - in my humble opinion Windows isn't even in the same race when it comes to desktop functionality. But some old hands (and many older machines) don't need all that singing and dancing on the desktop. One of them is Olivier Fourdan (fourdan@xfce.org).

A Linux user since 1994, Olivier began working on a simple application launcher at the end of 1996. 'At that time,' says Olivier, 'KDE was still in alpha stage and Miguel [de Icaza] had not even started Gnome.' It was the first application Olivier had ever written and he initially based it around the XForms toolkit from TC Zhao and Mark Overmars. 'That's what XFce

originally came from: XF was for XForms and "ce" for "cool environment". I wanted a name that reminds you of CDE, but not too close to avoid any law suits.'

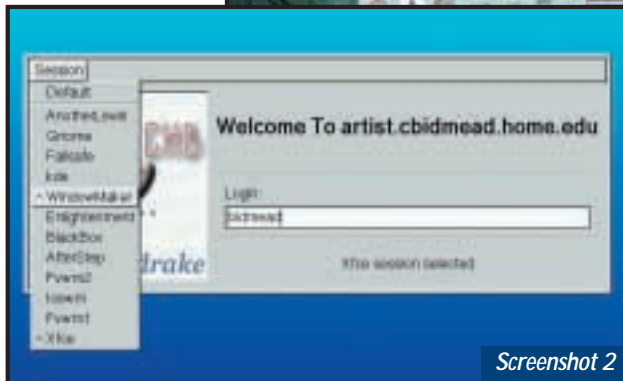
The XForms toolkit is somewhat old-fashioned, not least because it isn't free software and it's only available in binary form. 'In March 1999,' says Olivier 'I took the decision to move to GTK+, which is a very good library, fully GPL.' Olivier had to rewrite nearly all the code, and was left to find a new meaning for the 'XF' in the name. 'Some people have suggested "Xtra Fast",' says Olivier. 'Xtra Fast Cool Environment' seems a pretty fair description to me. Download it from Olivier's page at www.xfce.org.

Linux users can get their hands on



Screenshot 1

Above: This is what CDE looks like on IBM's Unix variant, AIX. The key piece of furniture is the LaunchPad along the bottom of the screen - you'll notice that XFce's Main Panel is very similar. Thanks to Dave Williams of IBM's RS/6000 division for supplying this screenshot



Screenshot 2

Left: Here's the gdm Greeter, set up by default in the Mandrake 7.0 distro to offer a large choice of different desktops

RPM binary packages from the usual places, but XFce will also compile and run on FreeBSD, Solaris, HP-UX, Irix, AIX, Digital Unix and what have you. Some of these operating systems - see screenshot 1 - already come with CDE. But, notes Olivier: 'XFce is much faster, uses about half the memory of CDE and is 10 times easier to configure. That's why XFce is also used on systems that are shipped with genuine CDE.'

XFce below decks

As regular readers will know, this column is interested not just in what stuff looks like on the screen, or what it does - we also like to know how it does it. I'm not necessarily talking about the deep nitty

gritty, although it's instructive to take a look at Olivier's underlying source code for XFce. What is well worth knowing is the way XFce powers up and what configuration files it consults and where.

The details are going to be different for different operating systems, but the principles of exploration will be similar, so you don't need to run Mandrake 7.0 Linux to keep up with what follows.

My copy of Mandrake 7.0 (happily not from Macmillan, see below) offers an amazing choice of desktops when you log in, including Gnome, KDE, BlackBox, Enlightenment, AnotherLevel, WindowMaker and AfterStep (see screenshot 2). This login window, known as the 'Greeter', is started up by gdm, the

Gnome variant of xdm, which is the X Display Manager (see *Unix, Hands On*, September and October 1999). Whenever the system hits runlevel 5, gdm is started. Well, strictly speaking a utility called pxfdm is run, as you'll see from the final entry in /etc/inittab, the config file that controls runlevels.

```
x:5:respawn:/etc/X11/pxfdm ✓
-nodaemon
```

(Key: ✓ code string continues)

/etc/X11/pxfdm turns out to be a script that greps through the config file /etc/sysconfig/desktop to decide whether to run plain xdm, gdm, or kdm, the KDE xdm variant.

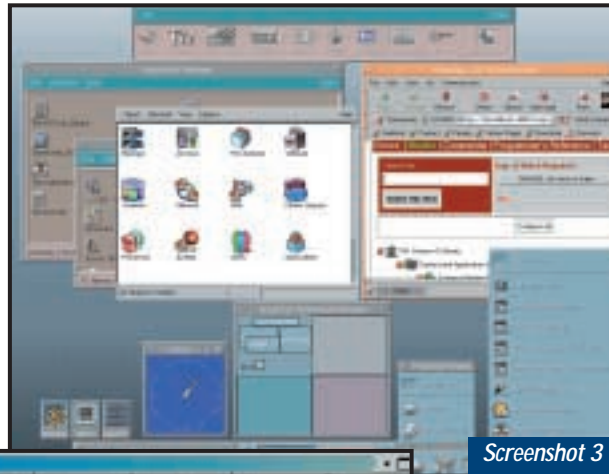
SuSE 6.2 does this rather differently, using a SysV init script called /etc/rc.d/init.d/xdm to check for the value of \$DISPLAYMANAGER (set up in /etc/rc.config) and run the corresponding X Display manager. Other Linux distros may well do something else again, but the bottom line is that xdm or a variant gets kicked into action at whatever runlevel has been chosen to bring up X. The xdm variant then runs the Greeter where you logon.

Traditional Unix Greeters let you log into the standard desktop or, as a fallback, into a 'failsafe' environment consisting of an xterm with or without a minimal window manager. gdm, controlled by another config file called /etc/X11/gdm/gdm.conf, pulls up its own much smarter Greeter. This one looks through a directory (/etc/X11/gdm/Sessions) and automatically offers all the scripts it sees there as items on its pulldown menu called Sessions. The scripts are of course just ASCII text. So as long as you have root access you're in control of what happens next.

Typically, these scripts will be very simple. For example, the BlackBox script, as distributed, just says:

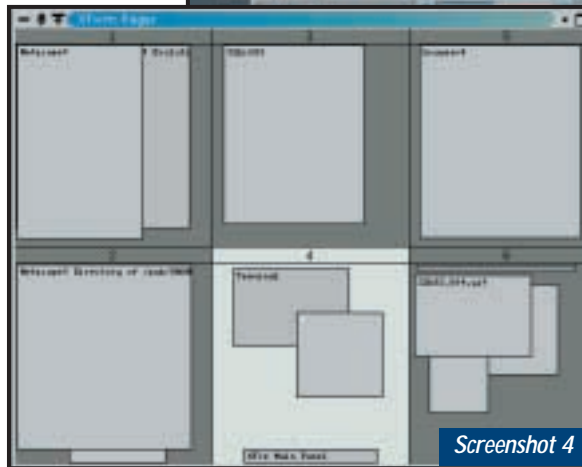
```
#!/bin/sh
exec /usr/X11R6/bin/bbrake
```

However, BlackBox is capable of running Window Maker applets. If you want a selection of these to appear by default,



Screenshot 3

Left: My tailored version of Olivier Fourdan's XFce. Configuration of the floating Main Panel's pop-up drawers is easy thanks to drag 'n' drop between the XFTree file manager and the Panel. You can have up to 10 desktops and switch between them using the Main Panel, the mouse, the keyboard or the Pager



Screenshot 4

Above: A close-up on the intelligent pager, which you can use to switch between desktops, or for moving individual windows from one desktop to another

you can add something like this to the /etc/X11/gdm/Sessions/BlackBox script:

```
# modded chb 2 Jul 00 so we ✓
can
# set up some Window Maker ✓
goodies first
wmrack -w &
wmclock &
wmbad &
wmnetselect &
wmxms &
# now return to the distro ✓
script invocation
exec /usr/X11R6/bin/bbrake
```

But as we're focusing on XFce this month, let's follow what happens to the ../Sessions/Xfce script. It looks like this:

```
#!/bin/sh
[ "x$XFCE_DATA" = "x" ] && ✓
XFCE_DATA=/usr/share/xfce
exec /usr/local/bin/xfwm
```

If you're new to shell scripts, this may seem a little daunting, but in fact it's pretty simple. The first line is the standard 'hash-bang' pseudo comment

that says: 'I'm a shell script and the shell I need to run under is found at /bin/sh.' The next line is a game of two halves, separated by the && Boolean operator.

At first glance you might think the line says: 'Do this AND then do that', but what actually happens is a little more interesting and useful. It says: 'Return a truth value for the results of performing this action AND that action.' A subtle distinction, but one that allows && to be used as a shorthand flow control statement. If the first action delivers the value FALSE the && needn't bother to investigate further, so it's really behaving like an IF-THEN structure.

The square brackets stand for 'test this', and the 'this' inside them is an equation, actually a standard kluge for 'is this variable empty' (["\$XFCE_DATA" = ""] falls over because the shell doesn't understand the empty string ""). Incidentally, try this out interactively in bash with a command line like:

```
[ x$EMPTY = x ] && echo Yes
```

Then do:

```
let EMPTY=full
```

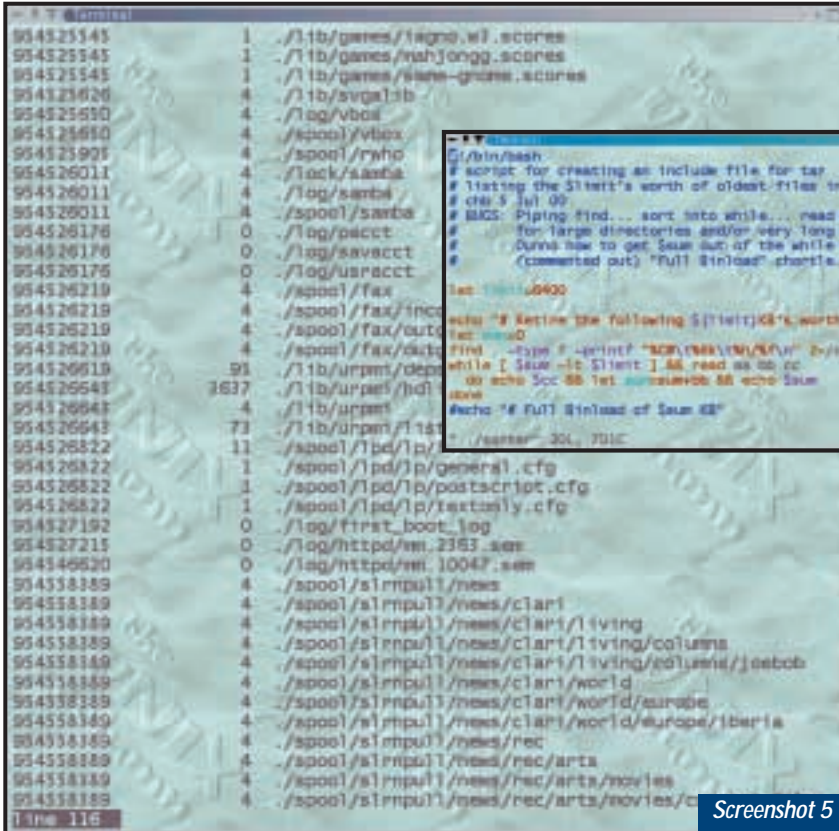
Now try the test statement again.

So this line simply checks to see if the environmental variable XFCE_DATA is already set and if not, sets it to the standard location of /usr/share/xfce.

This is evidently the directory from which XFce's window manager, xfwm, draws its inspiration. Next month I'll tell you how I used this discovery to create my own look and feel for XFce (see screenshots 3 and 4).

Macmillan and Mandrake

So Mandrake Linux is now going to be badged exclusively by Macmillan in the retail channel. This applies to any boxed set of Mandrake Linux anywhere in the



Above: The output from the `find` command, with date, size and full filename, set out in columns as a step towards our CD-archiving solution
Inset: Further along towards the CD-archiving solution: the script that's designed to winkle out a \$limit-sized chunk of the oldest files for archiving. But you probably have better ideas on how to do this

order per directory. "find" can list all files and I can sort the output, but I haven't found an easy way to sort on the date.'

Interesting question, Ges. Is it certainly tempting, but as I learned from the 'newest file' contest we had in this column earlier this year, the immensely powerful Unix `find` command is probably a better starting point. My first stab at it

would be something like this:

```
find . -printf "%C@t%6k\t%h%f\n" | sort
```

...which gives output like screenshot 5. The numerical column on the left is the result of the `%C@` part of the `printf` format string. It's the last change date of each file, measured in 'Unix time', the number of seconds since 1 January 1970. Not exactly a user-friendly format, but it makes for a surefire sort, using the default that puts the oldest file (smallest Unix date) first.

The `\t` drops a tab into the `printf` format string, followed by the size of the file in kilobytes (`%6k`). The 6 here is the width of the numeric field in which the number is to be right justified. The `%f` that follows gives the full path of the filename. The `\n` that terminates the format string is necessary because the `printf` operation doesn't automatically finish with a line ending.

I appreciate that this is only halfway to a solution, Ges, because it ducks your question about peeling off the oldest 650MB for archiving onto CD. I'm currently toying with the script in screenshot 6. It works, but as noted under Bugs: has some things I'd like to improve, if readers would care to pile in with their suggestions. There's also the problem that the 'while' loop exits when the accumulated size of the files exceeds the limit, and this excess could be big if the last file in the loop is big. A properly designed script would assess the size of each file before including it in the loop.

CONTACTS

Chris Bidmead welcomes your comments on the Unix column. Contact him via the PCW editorial office or email: unix@pcw.co.uk

English-speaking world. When I heard the news from Michael Breeze of Interactive Ideas, the company that distributes Mandrake here in the UK, I was a bit concerned.

Mandrake is probably my favourite Linux distribution. On the other hand, Macmillan, the book publisher which is now what the press release describes as 'a unit of the Pearson Technology Group', has managed since it began distributing Mandrake in June of last year to develop a not-so-hot reputation as a Linux reseller. Typical of emails from readers last year, was the complaint from James Winkless about his 'Macmillan DeLuxe' edition of Mandrake Linux 6.0. 'There was no StarOffice CD [as promised on the box] and perhaps the strangest thing was that the package included a bundled CD-ROM called (and this is no joke) "Macmillan Plus Pack for Microsoft Office 2000".'

James never got a reply to his complaint to Macmillan about this, but he told me philosophically: 'This doesn't

matter as I do not intend to buy any more of their products.'

Michael Breeze says he's sending me a review copy of Macmillan Mandrake 7.1. I'll report on it next month.

More on the Command Line
 Ges Cook (gcook@tempatron.co.uk) writes: 'Congratulations on a great column, always the first thing I read each month and always something useful or interesting.'

'I manage the computer systems at work and over the years I have accumulated over a gigabyte of utilities, drivers and shareware which is cluttering up the hard drive of the server. What I want to do is to list the files in reverse date order (oldest first) in a format that would allow me to grab the oldest 650MB of files for archiving to a CD. Either this can go into an ISO image file or just be moved to another directory before later moving to the CD burner.'

'I can get "ls" to list in date order and list recursively, but so far only in date



Tweak or unique?

Overclocking graphics cards is possible, but getting the best drivers is the key, says Gordon Laing

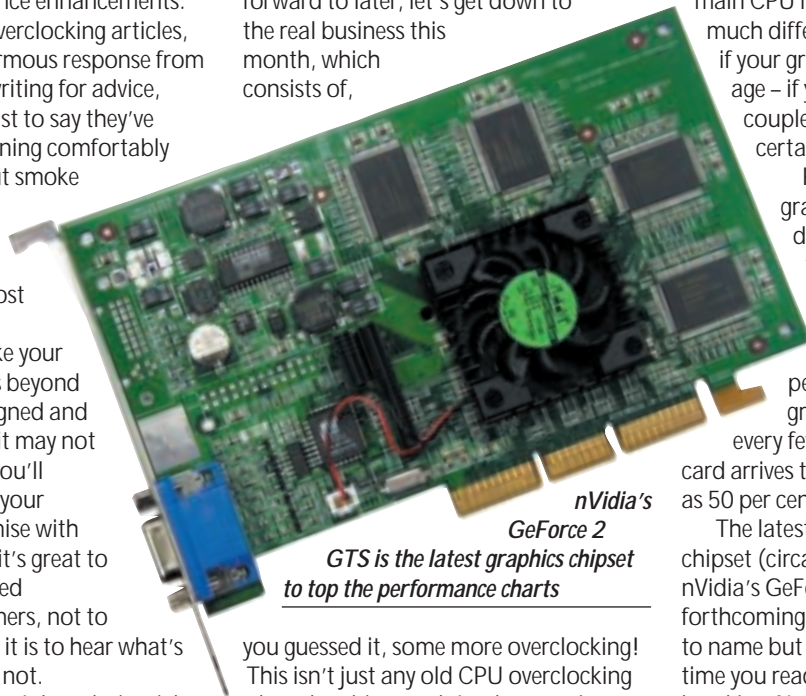
I have to say it's somewhat reassuring to discover you're not the only one who spends hours tweaking your PC and risking silicon life and limb for often minuscule performance enhancements. After the past few overclocking articles, I've received an enormous response from fellow enthusiasts writing for advice, confirmations, or just to say they've got their system running comfortably beyond spec without smoke billowing out of it!

Jokes aside, it is important to remember that almost any tweaking or overclocking will take your system components beyond what they were designed and guaranteed to do – it may not work properly and you'll probably invalidate your warranty, so customise with caution! That said, it's great to hear so many satisfied overclocking customers, not to mention how useful it is to hear what's working and what's not.

So for this reason, I thought it might be fun to debut a new section: 'This month's top overclocker!' Here we'll

briefly celebrate the success of the most worthy readers' overlocks or tweaks that we've received at the *Hands On, Hardware* email address that month (see below).

While undeniably something to look forward to later, let's get down to the real business this month, which consists of,



nVidia's GeForce 2 GTS is the latest graphics chipset to top the performance charts

you guessed it, some more overclocking! This isn't just any old CPU overclocking though – this month I've been seeing how far you can push an nVidia GeForce 2 GTS graphics chipset.

Overclocked graphics

We've long said in *PCW* that if you want faster games performance, then a new graphics card is almost always the answer. In fact, in many cases, a quicker main CPU might not even make that much difference in games, particularly if your graphics card is showing its age – if you haven't changed it for a couple of years, then it will certainly be out of date!

Remarkable as it sounds, graphics cards are the fastest developing components in the industry. If you thought the pace at which Intel and AMD release new CPUs was quick, then that's peanuts compared to graphics cards. It seems like every few months, a new graphics card arrives that offers gains of as much as 50 per cent or even higher still.

The latest and greatest graphics chipset (circa mid-July anyway) is nVidia's GeForce 2 GTS (although forthcoming solutions from 3dfx and ATI to name but two, may surpass it by the time you read this – check our late-breaking *News* and *Reviews* sections).

The GeForce 2 GTS chipset is designed by nVidia and sold to a variety of graphics board manufacturers – there are of course reference nVidia board designs, but many innovative manufacturers incorporate their own ideas, either in terms of slightly different hardware or software drivers.

Board manufacturers that have released GeForce 2 GTS cards include Guillemot/Hercules, AOpen, Asus, Elsa, Leadtek, Gainward and Creative Labs. I got hold of Creative's 3D Blaster GeForce 2 GTS card and put it through its paces.

The main test I used was, of course, Quake III Arena (v 1.11), using the standard *PCW* benchmarking settings: 1,024 x 768 pixels, 16bit colour depth, 16bit texture quality and highest texture detail. Note that my tests were also run with basic stereo sound support on an Aureal Sonic Vortex 2 sound card, which typically knocks around 10 per cent off a silent Quake benchmark.

This month's top overclocker!

August's *Hands On, Hardware* inspired me to see what could be done with my old Asus P2B (rev 1.10) Slot-1 motherboard, so I bought an Asus S370-133 Slocket and a Flip Chip-Pin Grid Array (FC-PGA) Celeron 566. I tried overclocking it by using a 100MHz front-side bus (FSB), but it wouldn't boot. Then I recalled your comments about increasing voltages and upped the voltage to 1.6v on the Slocket. It

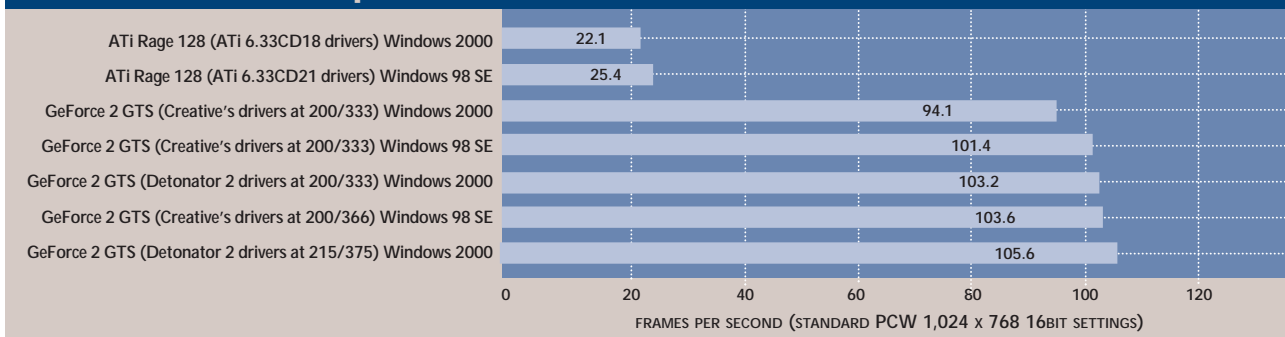
booted at 850MHz and the temperature (after replacing the thermal pad with heat transfer compound) was fine.

Interestingly, despite the Asus P2B's maximum clock multiplier of only eight-times, the 566 Celeron is clearly employing its standard 8.5-times setting. Nothing more to say really, except thanks for your article, and thanks for an 850MHz PC!

BARRY CARPUS

Gordon replies: The 566MHz Celeron indeed employs an 8.5-times clock multiplier and, like other recent Intel CPUs, this setting is locked. So saying, sometimes you must match this multiplier with a setting on your motherboard or your system may not boot. Fortunately for Barry, it worked on his P2B with a great result! Costing only £90 inc VAT (in July), the new Celeron 566 is proving a popular choice with upgraders and overclockers the world over.

Quake III Arena performance scores



Windows 98 scores

Under Windows 98 SE, using Creative Labs' own supplied drivers, the GeForce 2 GTS scored an impressive 101.4fps. Compare this with 62.1fps using a GeForce 256 SDR, 55.3fps on an ATI Rage Fury MAXX and 25.4fps on an ATI Rage 128 under the same conditions. These results came from my trusted Asus P2B BX-chipset motherboard with 512MB of PC133 SDRAM, a Seagate 18XL Ultra160 SCSI hard disk and an Intel Pentium III running at 866MHz. Note that I performed the same tests with all but the new GeForce 2 GTS card a few months back on the same system, except using a PIII 550MHz and, interestingly, got exactly the same scores.

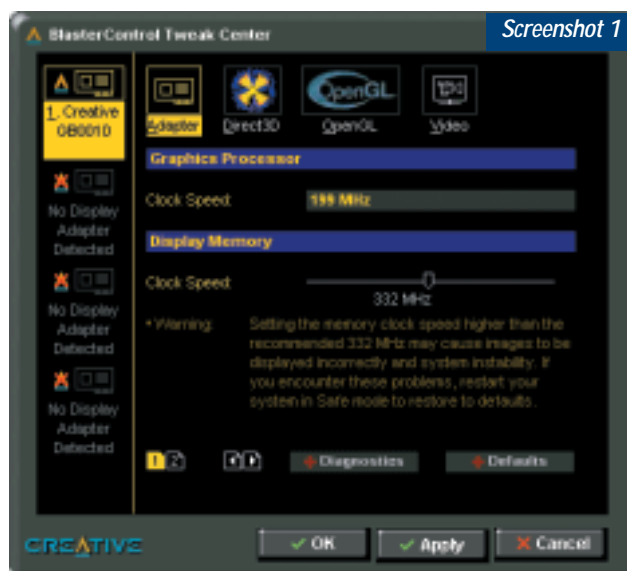
The interesting thing, for me anyway, was that Creative's GeForce 2 GTS driver actually featured an overclocking section. That's right, no undercover stealth tweaking, but an actual above-board graphical slider you can easily drag to overclock the card! (see screenshot 1).

Creative's drivers don't let you change the reference core chip clock speed of 200MHz, but the tweak section lets you increase the memory clock from the reference 332MHz to 366MHz. A quick slide later and Quake scored 103.6fps. OK, only two frames per second more, but beggars can't be choosers!

I had, however, heard about the increased overclocking capabilities of nVidia's own Detonator 2 reference drivers on Anandtech's website (www.anandtech.com). The drivers failed to work with Windows 98 on my system, so I gave the new nVidia Detonator 2 driver for Windows 2000 a shot.

Windows 2000

Much has been written about games performance under Windows 2000 and how it doesn't compare with Windows



The rather stylish control panels that come supplied with Creative Labs' 3D Blaster GeForce 2 GTS let you overclock the memory, but not the chipset core

98 SE. Personally speaking, I haven't been able to give Windows 2000 much of a gaming chance, since the drivers for graphics cards I've owned haven't supported OpenGL. This is a pity, since I dual boot Windows 98 and Windows 2000 on my main PC, which gives a great opportunity to directly compare performance with the same components under each OS. Sadly, with limited driver support under Windows 2000 I've been limited to using certain modest peripherals for compatibility.

Up until the arrival of Creative's GeForce 2 GTS card, I'd been using an aging ATI Rage 128 card, since it at least offered the resolutions and colour depths I wanted for both Windows 98 and 2000. While unforgivably still not supporting the Rage Fury MAXX under Windows 2000, ATI has at least recently posted new Windows 2000 drivers with

Screenshot 1

OpenGL support for its Rage 128 chipset. I dutifully downloaded them and ran Quake III Arena under precisely the same conditions as my Windows 98 partition. Where 98 scored 25.4fps, 2000 mustered a mere 22.1fps – admittedly around 10 per cent slower, but still sufficiently close not to discount Windows 2000 for games.

Creative supplies its GeForce 2 GTS card with Windows 2000 drivers and

on my system it turned out an impressive 94.1fps, compared to 101.4fps (non-overclocked) under Windows 98 – remember that, like the ATI 128 scores above, these are directly comparable results as they're using identical hardware and settings. Sure, Windows 98 was still faster, but not by much.

Detonator 2

The interesting part came when I tried nVidia's latest Detonator 2 drivers for Windows 2000 that, unlike the Windows 98 version, worked fine on my system.

Without changing any settings, I ran Quake and scored a remarkable 103.2fps under Windows 2000! That's almost 10fps faster than Creative's supplied Windows 2000 drivers and faster than my overclocked Windows 98 results.

This really proves that using the latest drivers can make the world of difference.



Occasionally, a new set of drivers introduces its own set of problems, so always check the reports on the various enthusiast hardware websites, but in general you'll reap benefits.

Shame the Windows 98 Detonator 2 drivers didn't work on my 98 partition, as I'm sure I'd see an increase in performance there, too.

But, best of all, I was using nVidia's reference drivers under Windows 2000, which meant I could try Anandtech's overclocking tricks. As standard, the nVidia drivers offer only memory overclocking, albeit further than Creative's cautious 366MHz limit.

Anandtech, however, discovered an additional, hidden, core CPU overclocking facility, which reveals itself after a brief Registry edit.

If you're a GeForce 2 GTS owner using nVidia's latest drivers and are feeling brave, start the Registry Editor by typing Regedit from Run in your Start Menu. Open HKEY_LOCAL_MACHINE, then scroll down through Software until you reach NVIDIA Corporation, then open the Global section.

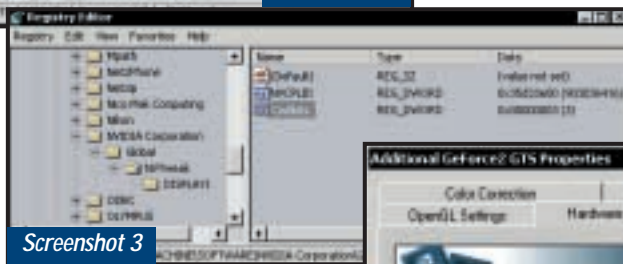
To access the additional controls, you'll need to modify a new Registry Key called NVTweak. If this doesn't exist in the Global key, go to the Edit menu and Add a new Key, naming it NVTweak. My system already had the NVTweak key with a couple of entries, (see screenshot 2). If you're creating it from scratch, it may not have the same entries as mine.

With NVTweak selected in the left-hand pane of the Registry Editor, you must go to the Edit menu and Add a new DWORD value, with the name 'CoolBits'. Once added, double-click on the CoolBits in the right-hand pane and set the Value to 3, with a hexadecimal base (see screenshot 3). After rebooting your system, you'll notice that when you go to the Additional Properties of your GeForce advanced display properties, you'll find an additional tab labelled Hardware Options (see screenshot 4).

Check out those sliders! The core clock frequency can be pushed to 250MHz, while the memory clock frequency can be taken to 420MHz. Remember, this is in theory and the reference card design (as employed by



Screenshot 2



Screenshot 3

Creative) is meant to run at 200/333MHz for core/memory respectively. Like any kind of overclocking, it's a case of taking things one small step at a time, and retreating when your system freezes, crashes or fails to start.

Anandtech claimed it got a Creative card running at 250/395MHz, which sounded impressive. I tried the same settings, but crashed horribly. After much experimentation, I had my card running at 215/375MHz and a Quake score under Windows 2000 of 105.6fps, just over 2fps faster than at the standard 200/333MHz settings.

Without sound and using a PIII 750MHz, Anandtech scored 107fps at 200/333MHz and 110.2fps at 250/395MHz. This was at 1,024 x 768, but greater differences of up to 10fps were measured at resolutions of 1,280 x 1,024 and 1,600 x 1,200.

It's also worth mentioning GeForce 2 GTS boards that aren't based on the 32MB reference design. We've seen a 64MB version from Hercules and heard of another 64MB card from Gainward that uniquely employs extra-fast five nano-second memory, compared to the six nano-second memory of the reference design. According to Tom's Hardware website, Gainward claims this memory runs happily at 400MHz, while the good doctor himself has had it running at 233/472MHz.

The moral of this story? While I enjoy the opportunity to overclock anything, pushing cards based on the reference GeForce 2 GTS design isn't worth it at 1,024 x 768 resolutions. If you're a Quake

Left: nVidia's new Detonator drivers have hidden overclocking features that require a little Registry editing. Download the new drivers from nVidia's website at www.nvidia.com, then run Regedit and find or create the NVTweak key

Below left: Now add a new DWORD value with the name 'CoolBits' and a value of three with a hex base. One system restart later and you're in business!



Screenshot 4

Above: After editing the Registry, the Additional GeForce Properties will reveal a new tab labelled 'Hardware Options', with overclocking adjustments for the memory clock and core clock frequency – we got ours running at a 215MHz core and 375MHz memory compared to the default 200MHz and 332MHz settings respectively

fanatic who runs at higher resolutions or 32bit colour, then cautious overclocking may get you a worthwhile result.

One thing everyone must do, though, is ensure they're running the latest graphics drivers. Just by updating my supplied GeForce 2 GTS driver to nVidia's Detonator 2, I gained a 10 per cent improvement in Quake – more than I got by overclocking my card.

CONTACTS

Gordon Laing welcomes your comments on the Hardware column. Contact him via the PCW editorial office or email: hardware@pcw.co.uk



Paste sandwiches

Tim Nott does his best to ensure that both his snacks and text remain plain and unformatted

A recent gift of a toasted-sandwich maker has changed my life. It's named Daisy, it's amusingly cow-shaped and it provides a total solution to keyboard-based snacking. Gone are the days of crisps, biscuits and those bags of weird things apparently made from tomato-flavoured polystyrene. In just three minutes, I can be in possession of a delicious hot, sealed confection of bread, cheese and the bolognese sauce left over from last night.

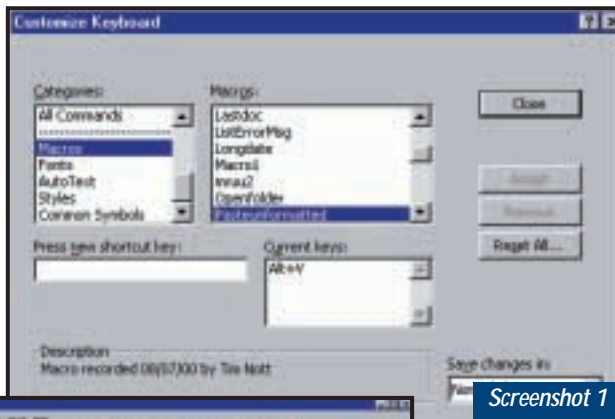
This is true geek chic, as well as being an excellent way of finishing up all those leftovers in little bowls that one traditionally keeps in the fridge for a week before throwing out.

However, once these scraps were exhausted and I'd tried all the recipes in Daisy's instruction leaflet (except the one involving tinned rice pudding and jam) I needed inspiration. Despite the fact that Daisy was made by a company with a French-sounding name, Breville is actually based in Oldham and has a truly British co.uk website, which, joy of joys, features pages and pages of recipes.

So, getting to the point, I decided to collate some of these into a little booklet that could be kept conveniently close to Daisy in a kitchen drawer, using that well-known technique of copying and pasting the text into Word. And, as always, I fell into the usual trap.

Control & A to select the page in the web browser, Control & C to copy, switch to Word and Control & V to watch the hourglass for ages as Word works out what to do with all this HTML stuff it's just been fed.

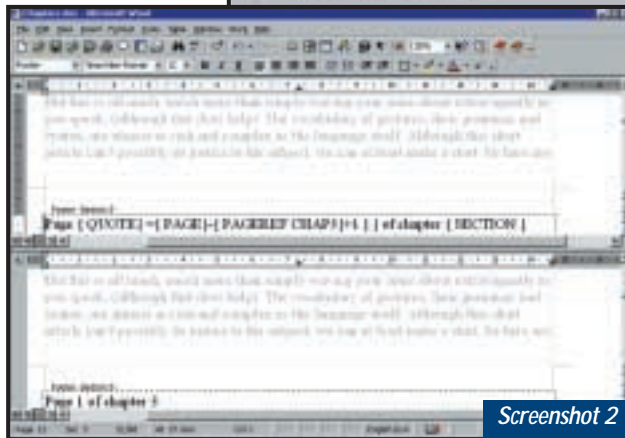
Three things immediately sprang to mind. First, was that I probably now had



Screenshot 1

Macros got it assigned to a keyboard shortcut (see screenshot 1).

This isn't just useful when pasting from web pages – it also gives me the choice of retaining the source formatting or using the current style when pasting text generally.



Screenshot 2

Top: Plain text pasting from the keyboard
Bottom: Automating parallel page numbering

enough time to go and make another sandwich before Word would let me continue. Second was – all right, I know I should have gone Edit, Paste Special, Unformatted Text, but why can't you press the Esc key (for example) to abort lengthy and unintended actions? Third was why can't I change the default paste action to be 'Unformatted Text' while retaining the menu trip for more ambitious pasting feats?

This last proved to be more difficult than expected, as assigning a keyboard shortcut, or a button, can only take you as far as 'Paste Special...' – you still have to make two more keystrokes or mouse clicks to paste unformatted text.

The only answer seems to be via a macro. This is such a simple matter to record, (and is also only one line), that I'm not going to bother you with the code. Tools, Customize, Keyboard,

Feedback

In July's column, we covered the problem of running two systems of page numbering in parallel: one that restarts with each chapter (or section) and another that keeps a running total.

My observation that 'had we but world enough and time there is probably some way of automating that further' inspired Nicola Bennett-Jones to do just that. Her solution is to put a bookmark at the start of each section, then in the footer use a PAGEREF field to return the (absolute) page number of that bookmark.

This means the arithmetic is carried out automatically, rather than my pretty cumbersome – and accident-prone – method of typing in the last page number of the last chapter. As with most things fieldy, it's easier to show than to explain, so cast your eyes over screenshot 2.

Alan Hitchin mailed me with a little-known WordPro Millennium tip that in fact dates back to AmiPro 3 days. If you hold down the Control key, you can drag buttons around your SmartIcon bars without going through the editor. You can also delete them by dragging them off the bar.

CONTACTS

Tim Nott welcomes your comments on the Word Processing column. Contact him via the PCW editorial office or email: wp@pcw.co.uk. Please do not send unsolicited file attachments.

Sliding axis

Should your x-axis labels become so numerous as to be illegible, Stephen Wells knows what to do

Many people often come up against the problem of having a chart with so many labels on the x-axis (the bottom, horizontal one) that it becomes illegible. One simple solution is to make a smaller chart and slide the points left or right, as though moving a window along a line.

Here's a simple example, using Excel, to show how it's done. All data cells are formatted as numbers because the Forms' Scroll Bar tool doesn't understand dates. Enter 1994 in cells B2 and B8. Right-click on B8 and drag it to T8. On the shortcut menu choose Series, Linear, Step value 1. This gives you the years 1994 to 2012. In the range B9 to T9, enter numbers randomly between 431 and 850. Enter =B2+1 in C2 and drag that to T2 which will have =S2+1.

In cell B3 enter the formula:

```
=HLOOKUP(B2,$B$8:$T$9,2)
```

Drag this along row 3 to column T. Cell T3 will have

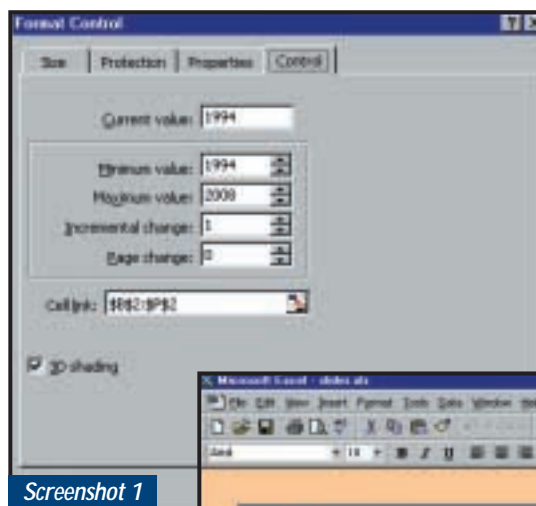
```
=HLOOKUP(T2,$B$8:$T$9,2)
```

The years shown in row 2 will change when the slider is moved. But because of this formula, the cell underneath each year will show the correct data. In other words, the range B8 to T9 is static and the range B2 to T3 is dynamic.

Excel will not only change the date line but automatically adjust the y-axis labels as well

Using the Chart Wizard, make the chart display start at about cell B14. The data range for the chart is \$B\$2 to \$F\$3, with the Series in Rows. In the Source Data dialog box, ensure that the Values are shown as taken from the range \$B\$3:\$F\$3 and the X-axis Labels from \$B\$2:\$F\$2.

To colour the chart background, right-click within the perimeter line and choose Format Chart Area. Then under Patterns Area, choose a colour from the palette. To colour the worksheet, highlight the appropriate range of cells

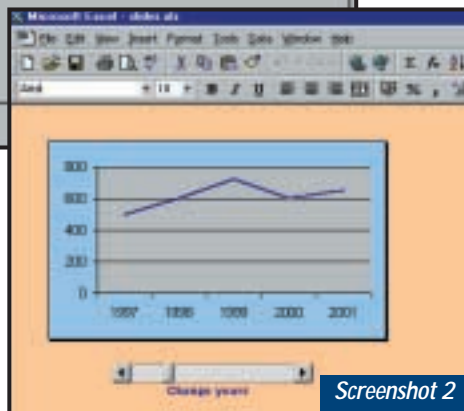


Screenshot 1

and click the Fill Colour tool on the main formatting toolbar.

To add the slider, on the main View menu, choose

Toolbars, Forms. Drag this miniature toolbar out of your way. Click on the Scroll Bar control. This offers a cross, indicating a graphic object you can draw. Drag it to create a horizontal box under your chart. With the left mouse button



Screenshot 2

Left: Setting up the control of the slider for this example
Below: The x-axis of this chart can be shifted left or right by using the slider underneath

Click OK and your slider is now ready. It will shift the x-axis from a range of 1994 to 1998 up to a range of the years 2008 to 2012.

Rather cleverly, Excel will not only change the date line but will also automatically adjust the y-axis labels to an appropriate range. In order to add the title 'Change years', click on a cell on the actual worksheet and

then enter the text there.

Finally, on the main Tools menu, choose Options under the View tab; you may wish to eliminate the usual worksheet gridlines, row and column headers and scroll bars. The result is shown in screenshot 2.

Equation Editor

I've previously mentioned the useful MS Office Equation Editor, which you can access from Excel by choosing Insert, Object, Microsoft Equation. It was contributed to Office by Design Science, which is now offering Tips & Tricks free for it on its website at www.mathtype.com, as well as for MathType, the professional version.

CONTACTS

Stephen Wells welcomes your comments on the Spreadsheets column. Contact him via the PCW editorial office or email spreadsheets@pcw.co.uk. Please do not send unsolicited file attachments.



Unmasking the culprit

When a worried DBA finds dirty data in his input table, Mark Whitehorn steps in to investigate

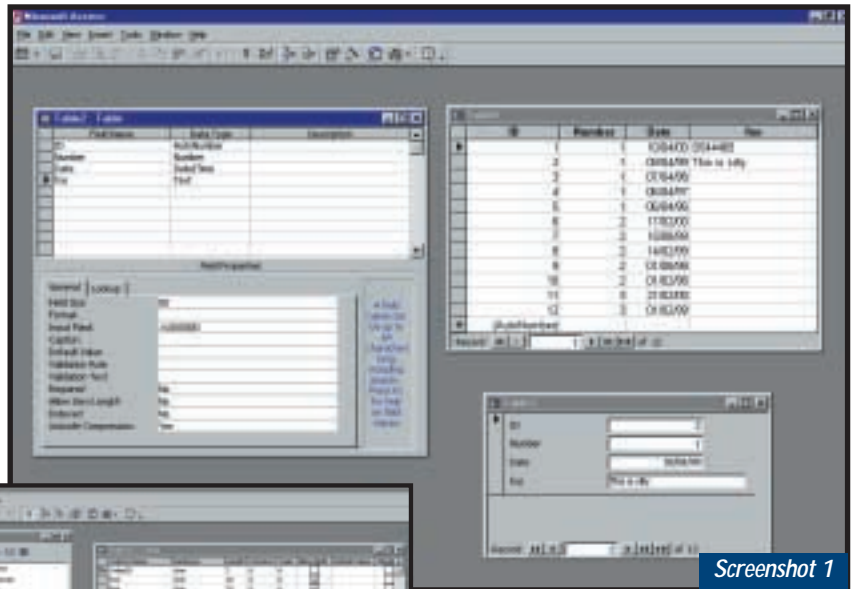
I received an email from a database administrator (DBA) who wishes to remain anonymous. He (or she) feels that colleagues would mock if they found out that a qualified DBA didn't know the answer to this problem.

Before answering the question, I'll tell you a story. Prior to the launch of Access, I was invited to Seattle to meet the people who were building the database. Bill Marklyn was then the development manager for Access – a title that, in Microsoft, equates to 'top guy in charge of the project'. At one stage I asked him about some aspect of the product and he said: 'Hmmm...

interesting. I don't know. Say Bob...' and proceeded to ask one of his team. At the time I took comfort from this and, thinking about it, I still do! If the guy in charge of a major database development project doesn't know all the answers and is relaxed about the fact, we mere mortals are allowed to be equally relaxed about having holes in our knowledge too.

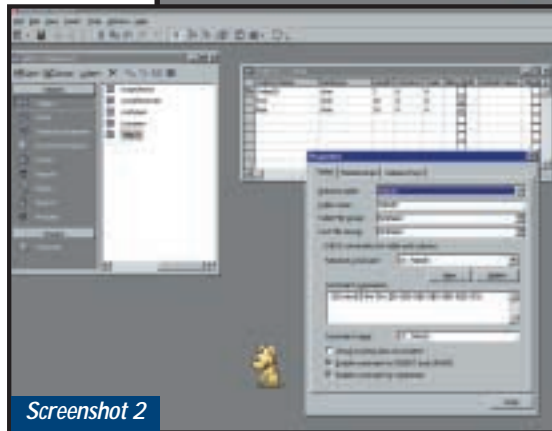
Anyway, the anonymous DBA has set an input mask on a table and given users forms with which to enter data. The DBA was horrified to discover both dirty data in the table (data that doesn't conform to the input mask) and that the input mask was still on the table! The question was – how can this possibly happen? The input mask was still stopping the DBA from entering dirty data, so how were the users getting it in there?

Some background information may be helpful before we get to the answer. All database systems provide some way in which database designers can implement the so-called 'business rules'. These are constraints upon data placed by the business needs of the company – an example might be a rule within a given company that all order numbers are composed of one character and six numbers.



Screenshot 1

*Above: Dirty data can be entered into the table, despite the input mask
Left: Setting a check constraint from Access*



Screenshot 2

You can place such a constraint on the field within a table and/or you can place it on the text box on the form that is used to enter data into that field. So, in a back-end database (SQL Server, DB2, Oracle etc) such a business rule could be implemented as a so-called 'check constraint' on the table (within the database itself) or as, for example, a piece of Java on a data entry page.

So far, so good. But knowing that the constraint can be placed in more than one location begs the question: 'What is the best place to implement such a business rule?'

The answer, unsurprisingly, is: 'It depends' (of course). Consider the following business rule from head office. 'All order numbers are to be constructed as follows – one character and six numbers. The character "A" signifies that the order originated in the UK, "B"

signifies the US and "C" means Canada.

'We currently operate in those three countries, further letters will be added to the list by head office as and when we expand.'

Assume that each country has a different order-entry form. The form used in the branch office in the UK should generate an appropriate number and prefix it with A. It should check for A plus six digits and then send the order to head office. The form used in the US prefixes with B and so on.

Back at the ranch (or head office) a check constraint on the table checks that the incoming data has A, B or C and six digits. At first sight this is overkill – why does head office need to check at all?

However, look at this from head office's point of view. It is responsible for the overall allocation of prefix numbers, so, despite trusting the regional offices implicitly, with this rule in place it knows that no-one can commit the heinous crime of using an unauthorised prefix letter. When a new country is opened up, the people there get a new form and the check constraint is updated. It's as simple as that.

And, crucially, the constraint on the table can never be subverted, no matter how the forms are designed, modified or tweaked.

Now, back to Access. An input mask can be placed on a field and it controls the data that can be entered. In an input mask, L means obligatory letter and 0 means obligatory digit. So:

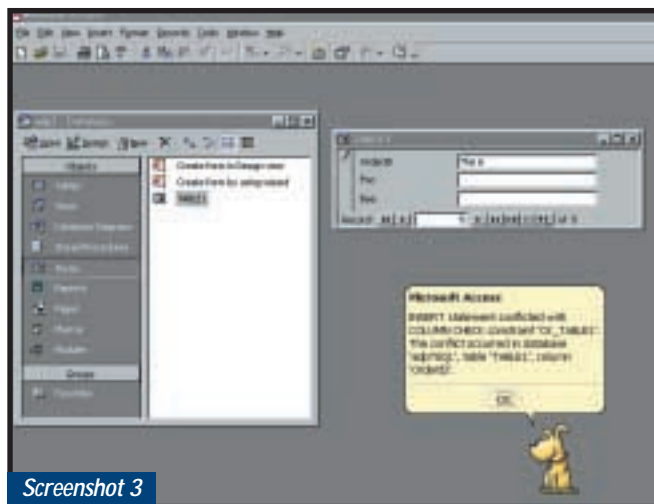
>L000000

allows you to enter, say, D546540 but not 12-32FG.

All versions of Access since 1.0 allow you to put input masks on both the table and on a text box on a form. The anonymous DBA has, quite reasonably, assumed that putting the input mask on the table means that it functions as a constraint on that table, enforcing whatever business rule was required on the table itself.

But, surprisingly, it doesn't work like that in Access. You can try this for yourself. Create a simple table, add an input mask, save the table, and then open it for data entry and try to defeat the input mask. You can't. Generate an auto form from the table and try to enter data that violates the mask. You can't.

Now swap to design mode for the form, remove the input mask from the text box and try again. Now, suddenly, you can enter data that subverts the business rule and yet, if you go back to the original table, the input mask is still there (see screenshot 1, opposite).



Screenshot 3

Now it is impossible to subvert the constraint

In other words, in Access, the input mask that you add to a field in a table is not the final arbitrator of which data may or may not enter the field. In fact, it has no direct power over the data at all. Instead it simply sits there as a resource that is used when forms are generated. And, since those forms can later be edited to remove the input mask, the ultimate control is not there.

'Ah', you are thinking, 'but the input mask does work on the table itself, because when I open the table for data entry, the mask prevents the entry of dirty

data.' True, but remember that a table is simply an abstract set of magnetic marks on a disk. It doesn't actually have any on-screen appearance at all.

So, when you double-click on a table name in Access and the table seems to appear on screen, what is actually happening is

that Access is generating, on the fly, a Datasheet-form view of the data in the table. The fact that you can't edit the properties of this table doesn't prevent it from inheriting the input mask from the table definition in which the input mask sits.

The lack of absolute control worries me, just as it worries the anonymous DBA, but there is now an answer. Straight out of the box, Access 2000 runs against the JET database engine, but if you elect to use a Project file, then Access runs against the MSDE (Microsoft

Database Engine). And since MSDE is compatible with SQL Server, when you use Access 2000 in this way, you acquire the ability to create a check constraint on the table (see screenshot 2).

Forms do NOT inherit this constraint as an input mask and cannot be used to subvert the control that the check constraint imposes. So, if you elect to use Project, you get the full control that is normally the prerogative of a back-end database engine (screenshot 3).

So, to finally answer the question, one of the users must have removed the input mask from the form.

IFS and butts

A couple of months ago, I discussed the fact that the Registry in Windows should be implemented as a relational database, complete with a proper engine that supported transaction control, rollback etc. Oracle has beaten us all to (at least part of) the solution with its IFS (Internet File System). Take a look at www.oracle.com/database/options/ifs.

IFS is an extension to the Oracle8i database that allows you to store



files in a relational database. To tools such as Microsoft Explorer, the file system looks normal, but, because the files are stored as records in an RDBMS, all sorts of extra facilities, such as incredibly rapid content

searching, versioning and event notification, are possible. The really excellent news, however, for Oracle users at least, is that Oracle IFS is available for free to any customer with a database licence.

CONTACTS

Mark Whitehorn welcomes your feedback on the Databases column. Contact him via the PCW editorial office, or email: database@pcw.co.uk



Lumley's theme

Ian Waugh is sick of Windows sounds and gets his PC to sing another tune – but Joanna stays!

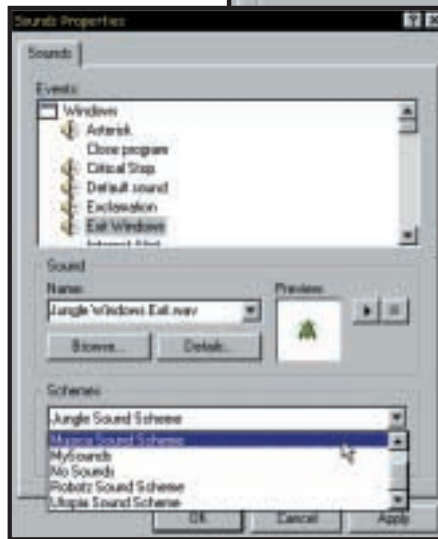
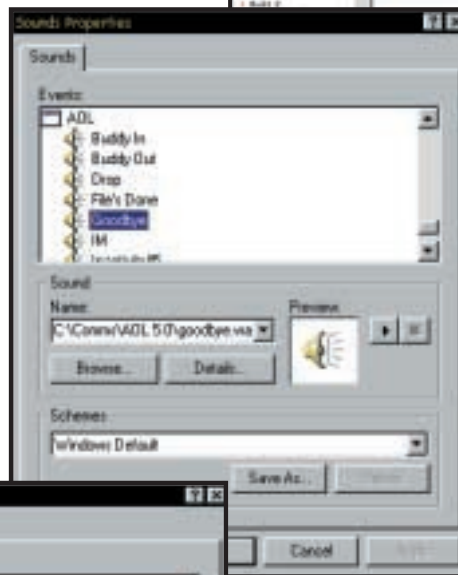
What sound does your PC play when you switch it on? It may be a clap of thunder, a long sweeping chord or a short arpeggio-type riff. If your PC was set up and configured by a third-party PC manufacturer it may well play another sound or even a little ditty. You've probably noticed that your PC makes other noises, too – when you log off, to announce incoming email, when you empty the Recycle Bin or when you scroll to the top or bottom of a document. In fact, Windows can make all sort of sounds in response to various events; an audible way of alerting you to situations when you may not be looking at the screen.

But they can get a bit wearing. There's a sound called Chord that makes a sharp pling/ding sort of noise and grates like hell. It's like a teacher rapping your knuckles for doing something wrong. But the good news is, you can change it all.

The place to start is the Sounds Control Panel (Start Menu, Settings, Control Panel, Sounds). This lists the events to which you can attach sounds and shows those that have been attached. Sounds are Wave files and they can reside anywhere on your hard disk but most will probably be in the Windows/Media directory.

Programs can install sounds and if you scroll down the list you may see such programs and the sounds they use. These include AOL, Microsoft NetMeeting and Norton Utilities. Sounds for programs such as these are usually stored in the programs' own directories. If you select an event and a sound, the latter's name and filepath appear in the Name box.

*Right: Perk up your morning with the sound of a coffee maker from the Microsoft website
Middle: Sounds installed by other programs are likely to be in that program's directory
Bottom: Most folks will already have a range of Sound Schemes in their PC*



case, click on the Save As button, enter an imaginative name such as MySounds1 and click OK.

The first thing you might want to do is to try any other schemes that may be installed. You might have Jungle, Musica, Utopia and Robotz Schemes already available from the Schemes menu.

Also, take a look in the Program Files/Plus!/Themes directory and you may well see a lot more (this depends on which version of Windows you're running and what

was installed at the time). If you have Themes there, click back to the Plus! folder and open the app called themes.exe (this should also be available as Desktop Themes in Control Panels). This lets you change not only the sounds but also the desktop wallpaper, the icons, colours, screensaver and so on.

Select a Theme from the menu at the top and check out the new goodies. We're primarily interested with the sounds and you can preview the sound collection in a Theme by clicking on the 'Pointers, Sounds, etc' button. You can select any aspect of the Theme and transfer it to your current Desktop settings simply by checking the boxes on the right and clicking Apply. If you're happy with the other aspects of your

Changing sounds is easy, but before you start you might want to save the set you have, just in case you devise a worse collection than already exists. Collections of sounds are called Sound Schemes and you can see if any additional schemes exist on your PC by clicking on the Schemes' drop-down menu. You may already be using the Windows Default Scheme but, just in

Desktop you can simply use the sounds in another Theme by unchecking every other box except Sound events and then clicking Apply.

And some of these Theme sounds might suit you fine. For a while. But that cute chimp screech or lion roar that engenders riotous laughter and looks of admiration from friends and colleagues may start to wear thin, too.

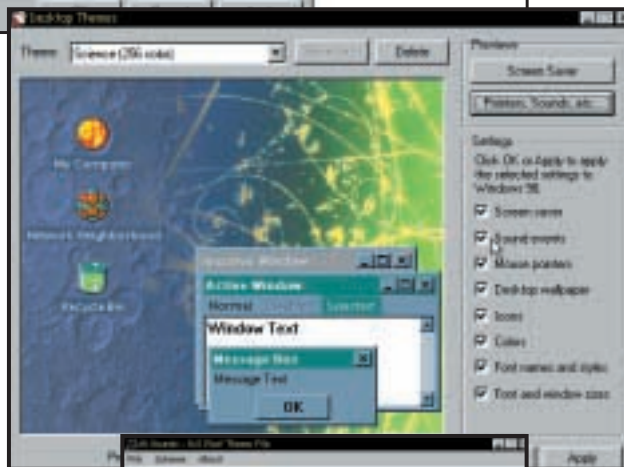
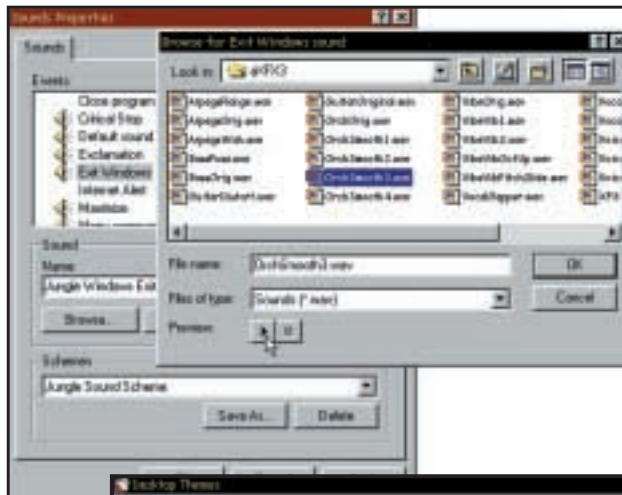
No problem. You can assign any sound at all to any event. Back in the Sounds Control Panel, simply select the event, click on the Browse button and navigate your way to a Wave file. You can audition the file before selecting it which saves much time. Beware of selecting sounds that last more than a second or two other than for startup, shutdown and other 'long' events; they will really grate.

There's an alternative to using the themes.exe program if you only want to change the sounds and that's MiSounds, a shareware program you can find at Themes 'n' Schemes (<http://desktopthemes.com/sound.htm>). This lists the events and the Wave files associated with them, which you can change, of course.

It can also pick up the sounds from a Theme without going through the entire screensaver/desktop/icons thing. And it can wrap up your sound files in a ZIP file which you can email to your friends – or enemies. While you're browsing, check out www.plusthemes.com, too.

If you're of an adventurous bent you can record your own sounds. Actually, even before you do that you can mess with the existing sounds. Even the dreaded Chord Wave can be tarted up.

Open the Sound Recorder (Start Menu, Accessories, Entertainment, Sound Recorder) and open a Wave file of your choice. Start by changing its speed from the Effects menu. Applying



Top: You can assign any Wave file to an event, wherever it resides on your hard disk
Middle: The Desktop Themes Control Panel lets you change any aspect of your Desktop, including the sounds
Bottom: MiSounds makes it easy to change the sounds assigned to system events

Decrease Speed a couple of times turns Chord into a gong. Apply Reverse and it's a backwards gong! See if you can beg, borrow, steal or record a cymbal sound and then play that backwards. Great fun!

Adding Echo can beef up a sound, too. The more times you select Add Echo from the menu, the more echo is applied. Applying Echo several times even to the

raw Chord wave is an improvement.

But let's say you want to record yourself saying 'Good Morning, Brian' (assuming you want your PC to talk to you and that your name is Brian). You need to connect a microphone to your sound card, click on the Record button, say your piece and click on Stop.

Unless you have the timing of Bob Monkhouse there will inevitably be some silence or shuffling noises at the start and end of the recording. No problem. Move the slider to a position just before the start of the section of recording you want to keep and select 'Delete Before Current Position' from the Edit menu. Move it to the end of the section and select 'Delete After Current Position'. Save the file and then you can assign it to an event.

If you don't fancy the DIY approach, there are zillions of Wave files out there on the web. You could do worse than to surf over to <http://msdn.microsoft.com/downloads>, click on the Downloads menu and select Sounds.

There you'll find a range of short sounds, well suited for use as system sounds, plus several music files, too. If you

want to engage your listeners with the sound of a toilet flush each time you empty the Recycle Bin, there are files here to do it (but be warned, this is the most common use of the toilet flush sound that exists in computer land). You can doubtless think of more original and unique sounds with which to pepper your working environment and spice up your PC.

I know a guy who uses the voice of Hal from *2001: A Space Odyssey*, which is kinda neat, if a little dated now. But you could use more up-to-date recordings, say from a favourite movie or a line from a song. Whatever you use, it's got to be more interesting than the Chord wave.

The only sounds I won't change are the delicious tones of Joanna Lumley welcoming me to AOL and telling me I have email. Send me a message someone...

CONTACTS

Ian Waugh welcomes your comments on the Sound column. Contact him via the PCW editorial office or email: sound@pcw.co.uk



Quick Quark tables

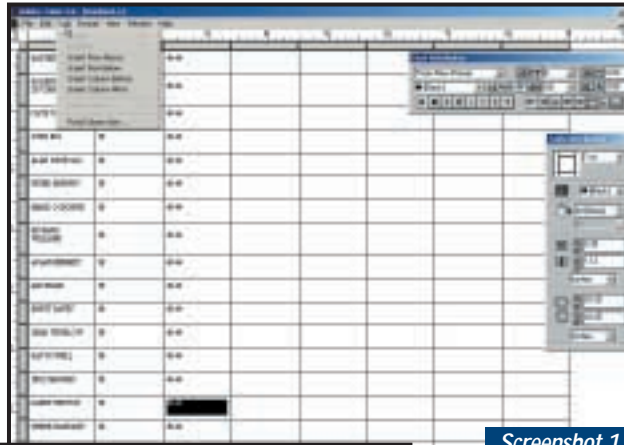
Most of us find tables tedious, so Ken McMahon shows you how to make it easier on yourself

If you've read the title and you're still with us, you've either got a monster table job to finish by tomorrow, or you're trying to avoid eye contact with the mad-looking person opposite you on the 8.45am.

Let's face it, tables aren't what we live for, yet, like many of life's chores, they seem to come around all too frequently. Well, I'm going to show you how you can spend less time producing tables in Quark Xpress and design them so that importing and editing data is easier.

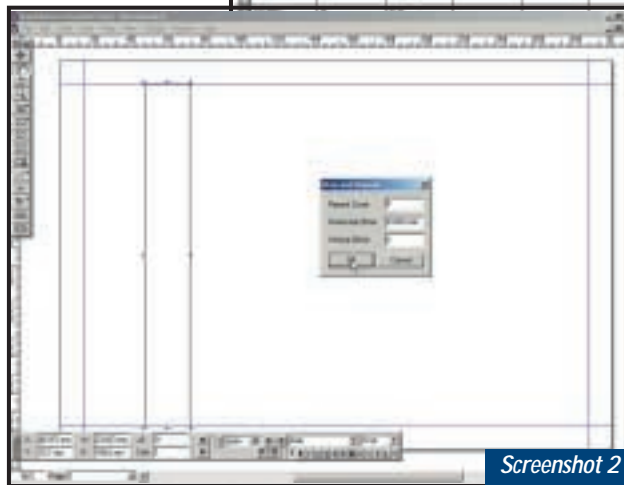
As ever, the same principles apply in pretty much any DTP layout application, although you may need to modify specific steps to achieve the same result. PageMaker has a dedicated table-making application, Adobe Table (see screenshot 1), but you have to export the finished table in text format, which defeats the object, or as an EPS. So, if there are changes to be made you edit in Adobe Table and re-export.

If you use Ventura you can skip forward to one of the other *Hands On* pages, smug in the knowledge that Ventura's table features are on a par with many spreadsheets, allowing you to import data from spreadsheets and



Screenshot 1

Left: Adobe PageMaker has a dedicated table builder, Adobe Table Below: Use Step and Repeat to create additional columns



Screenshot 2

page with an automatically generated text box. Decide how many columns you are going to need and leave some space if you need an extra-wide column on the left. You can make use of Quark's maths functions in the Measurements palette to work out your column width. In the Width window delete everything that

enough clearance from the top of the table. If you want lines between your columns now is the time to add them, on one side only using the Line tool. Create the additional column boxes using Step And Repeat with the horizontal distance set to the exact column text box width and the repeat count to the total number of columns minus one (screenshot 2).

If you've left space for a wide first column you can now stretch it out to the left margin. Alt-click on the Link tool to keep it selected and click through all the column text boxes to link them.

Copy your data one column at a time from Excel; at the end of each column press Enter (not Return) to go to the next column.

Define a Style Sheet for the table text. In the Formats tab set the left and right indents to 1mm or 2mm - to leave a gap between the text and the column edges. Set a Rule Below, based on indents and enter a negative figure in the From Left and From Right boxes that corresponds to the text indent you set in the Formats tab.

In other words, if you set the text indent to 1mm set the rule indents to -1mm. Make the offset about 75 per cent. This ensures that the rules go right to the edge of the text box and butt up with those in the adjacent column.

You can probably get a better idea of what's going on by turning on invisibles (Ctrl & I) and toggling the guides with F7. If everything has gone according to plan you should have something that looks like screenshot 3. It's looking reasonably tidy, but there's still a certain amount of cleaning up to do.

For one thing, the rule below each

As ever, the same principles apply in pretty much any DTP layout application

databases, include pictures as well as text, insert new rows and columns and even sort data.

For the rest of us, though, the first thing to do is create a text box that's big enough to accommodate the entire table. I've started with an A4 landscape

comes after the width and enter the slash symbol followed by the number of columns, for instance for 10 columns enter /10.

Now modify the text box. Make the Text Inset 0, turn off Runaround and set the first baseline offset to 5mm to give

entry is offset so far that it's touching the line of text below. Also, there are some 'cells' where the text has wrapped to two lines, causing misalignment of column data across the table. The only way to sort this problem is to manually insert soft Returns (Shift & Return). Soft Returns retain paragraph Style Sheet formatting and won't generate a rule.

I've inserted soft Returns in the single-line column headings to make them all two lines and done the same for all the columns in the last entry where the name has wrapped onto two lines. I've edited the table-text Style Sheet, putting 0.5mm space after paragraphs and changing the Rule Below offset to 30 per cent.

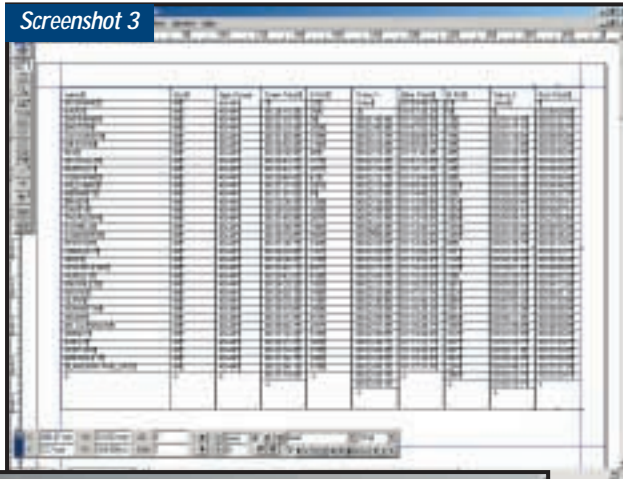
By now your table should be looking fairly presentable, if a little dull. To liven it up and make it more readable make the columns alternate colours. Press F12 to bring up the colours palette and Shift-click every other column starting with

the first one. Check the fill colour box and apply a 30 per cent tint of your chosen colour. Then select the remaining columns and fill with a contrasting tint.

Once you've sorted out the leading, rules and spaces before and after, you can adjust the depth of the table by drag selecting all of the columns and entering a new value in the height window of the measurement palette. To add a border rule to the table, draw a picture box over the top with no runaround and a background colour of none and set a border width and colour. If you want a thick frame, change the framing default of inside to outside in the general preferences tab so the frame doesn't encroach on the text (screenshot 4).

There are several advantages to adopting this column-based approach. It's a simple matter to change the depth of the table to fit your page layout by

Screenshot 3



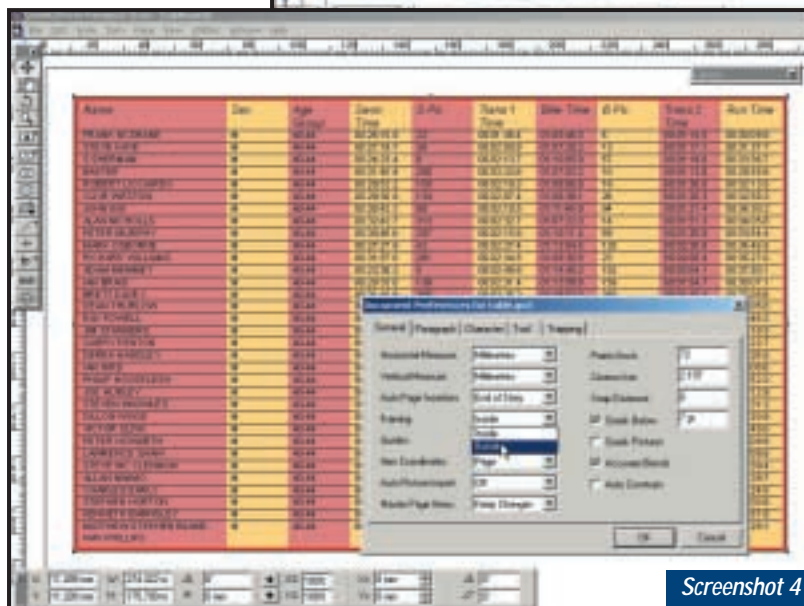
Left: There's still some way to go, but the table is taking shape

the need for post-import editing.

Your Excel chart will need the same number of rows and columns as the Quark one. First, you will need to transpose the rows and columns. You can do this by copying the relevant

cells, creating a new workbook, selecting Paste Special and clicking the Transpose radio button.

You will need to create new columns for the Xpress formatting and Style Sheet tags. There's not room to go into it in depth, but tags are explained in the appendix of the Xpress manual. You'll need a column at the end of the data with the new box tag `` and a column before any Style Sheet changes with the `@stylesheet:` definition. Save the text as a tab-delimited file, giving it an .xtg extension, so that it's recognised as a tags file by Quark.



Screenshot 4

Adding some colour and a thick frame is simple and livens up your table

adjusting the leading and space before and after paragraphs; all of the rules move with the type so no further adjustment is necessary. If the table spreads across two pages you can easily open it up to make space for the gutter, or for that matter add new columns.

If you want to add a new row you will have to cut and paste the data for each column, but if you take care, that's all you'll have to do – the rows beneath the new entry will all still align. Compared with the messing about that's involved if you arrange the text in one tab-delimited box, or in linked row-based boxes, you're looking at an early lunch as opposed to a late night.

Best of all, you can use this table as a template for new data from an Excel spreadsheet and, if you want to be really clever, you can make use of Xpress Tags to minimise, who knows, even eliminate

Import the text into Quark, making sure to check the 'include Style Sheets' button in the Get Text dialog. You'll have some cleaning up to do – primarily using Search and Replace to remove all the tabs and replace them with returns.

OK, it doesn't make producing tables exciting, that's asking too much. But it will mean that you spend less time formatting tabulated data, your tables will look better because you'll have more time to spend on the design and corrections won't keep you up until midnight.

CONTACTS

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Between dimensions

There's more than one way to skin a 3D object, with Texture Weapons, says Benjamin Woolley

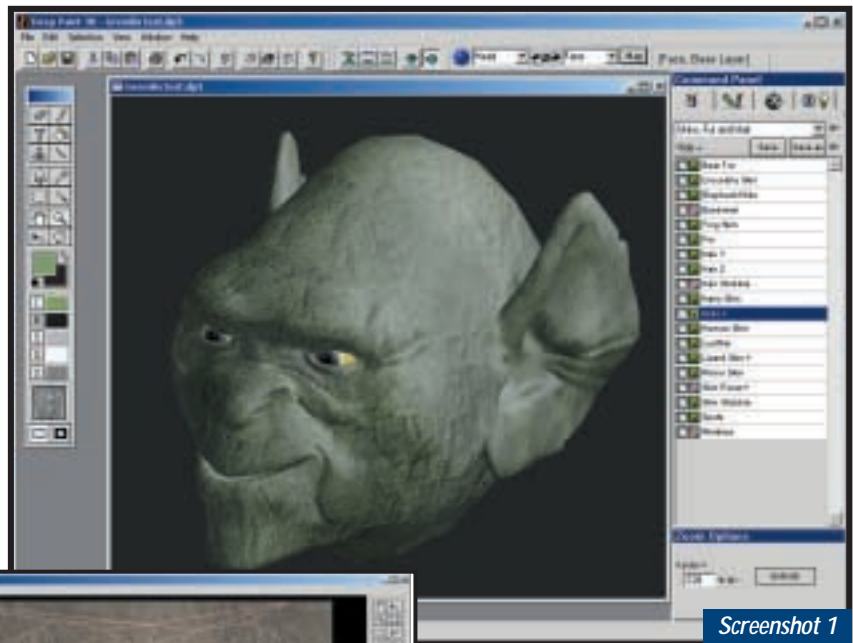
We all know about 3D graphics, of course, and 2D graphics, but 2.5D? How can you have a two-and-a-half dimension? It sounds like an idea from a surreal fantasy, like the seven-and-a-half floor in the film *Being John Malkovich*.

The term is used (not uniquely) in a texturing product called 'DeepPaint 3D with Texture Weapons' by Right Hemisphere and it is being used in all seriousness. It describes that dimension of graphics authoring that is essential to producing good work, but falls neither entirely into the two or three-dimensional realms: texture mapping. When you apply or 'map' a material, which is flat, around an object, you are momentarily suspended in this strange intermediary domain.

This is where tools such as DeepPaint, MeshPaint 3D and Painter 3D (formerly Metacreations' but now owned by Corel) can be so useful, offering tools that, hopefully, will soon be integrated with mainstream 3D-authoring packages.

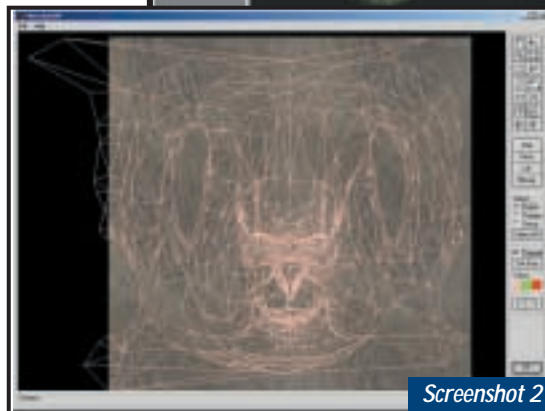
DeepPaint 3D with Texture Weapons costs over £625 and is squarely aimed at the professional market, but it is worth a look at, if only because it takes you so effectively into this 2.5D world and helps make sense of it. You can download a 19.9MB time-limited demo of DeepPaint 3D (but not, at the time of writing, Texture Weapons) from www.us.righthemisphere.com/dpaint3d/download.htm.

Basically, 3D paint packages such as DeepPaint 3D allow you to draw, spray or cover a 3D object with a 2D texture. The texture could be a colour, or even an image. If it is an image, it could be one that is repeated across the surface (you might use a tiled pattern for fish scales, for example), or is applied just once (for example, the iris on an eyeball). The key to applying these textures successfully is



Screenshot 1

Above: The DeepPaint 3D interface, showing a goblin's head covered with a 'hide' texture



Screenshot 2

Left: The 2.5th dimension. The mesh of pink lines are the UV map for the goblin's head, the face is visible in the lower centre portion of the image. The background is the hide texture flattened out

'mapping' and this is where tools such as DeepPaint 3D can really help.

In order to accept a texture, an object needs mapping co-ordinates. These specify how the 2D texture or material is applied to the 3D surface. The mapping co-ordinates for a particular object are usually called (for reasons too obscure to go into here) 'UV' co-ordinates.

When you create an object using a 3D-authoring package, a set of appropriate UV co-ordinates will often be automatically generated. For example, a sphere will have UV-mapping co-ordinates so that you can apply a flat map of the world to it and turn it into a model of the earth (see *3D, Hands On*, April 1997). The problems arise when the object is more complex (a head, for example) and has been heavily edited.

When you delete or add faces to an object or perform Boolean operations, you will seriously compromise or lose the UV-mapping co-ordinates for the entire object. When that happens, the only texture you can apply is a simple colour; you cannot even add colours with texture in them, such as a grain.

The new, aggressively-named Texture Weapons, an add-on to DeepPaint 3D, illustrates the problem nicely. Texture Weapons (like Paint 3D) allows you to see the UV co-ordinates for a model – the 2.5 dimensional view. In screenshot 1, for example, we have DeepPaint displaying a model of a goblin's head, textured using a 'hide' (as in rawhide) material. Screenshot 2 shows the UV map for the head.

The UV map takes a bit of explanation. You can think of it as what you get if you pull the skin off the goblin's

skull (just as the UV map of a bear is a bear-skin rug). The mesh shows the individual faces of the map and, as is obvious, it has a considerable number of irregularities, particularly towards the edges. Applying a chequered material to the head reveals some of these irregularities (screenshot 3).

In contrast, the UV map of the goblin's eyeballs (screenshot 4) is much simpler and therefore easier to handle: a sphere that flattens out into a circle. This is easy to align with the texture, which shows the iris and the speckled whites (or, in this instance, yellows) of the eyes (screenshot 5).

The only way of getting similarly smooth results with the irregularities on the crown of the head is to edit the existing UV map, or add a new one. Using software such as DeepPaint 3D, you have endless options for altering the UV map. One of them is to 'project' paint, which applies the texture to the current view of the object as a projector would apply an image (technically, this involves creating a new planar UV map parallel with the current view of the object). This is useful for covering up seams.

In a 3D package, your best option is usually to play around with the geometry itself. For example, you could select the faces that make up the goblin's crown, detach them, and create a replacement using simpler geometry (a section from a sphere, moulded into the appropriate shape, which will be easier to map using spherical projection). The only problem you will now have is hiding the join between the new crown and the rest of the head. This would probably have to be done by aligning the vertices as neatly as possible at the seam.

Even with tools such as DeepPaint 3D, these operations are not easy and the results are not always predictable. We still await the invention of the true 2.5D tool which allows you to take your 3D scenes into that strange world and emerge with their textures intact.

3D cards

Dr Leask asked a question a couple of months ago about converting statistical data into 3D objects. Evidently a satisfied



Screenshot 3

Screenshot 3: The back of the goblin's head textured with a chequer pattern to highlight artefacts in the UV map

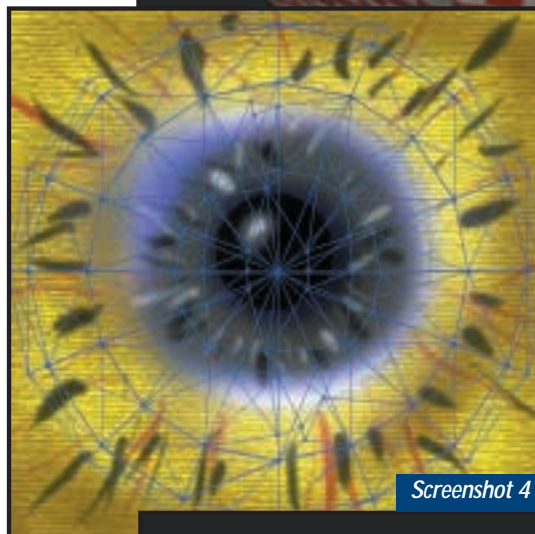
yet faster 3D accelerators. Recently, there has been excitement at the new generation of 'GPUs' (graphics processing units) which accelerate 'T&L' (transform and lighting), ie speed up not just the rendering of scenes, but the calculation of the geometry and light sources they contain.

However, many of these fancy-sounding advances are aimed at accelerating games. For example, nVidia's new GeForce2 graphics chip includes a powerful T&L engine that will work with DirectX (now more or less established as the standard for realtime rendering of 3D on a PC screen, the main alternative being OpenGL). But you can only benefit from this acceleration if the software knows about the way the GeForce T&L engine works, which your 3D-authoring package is unlikely to do.

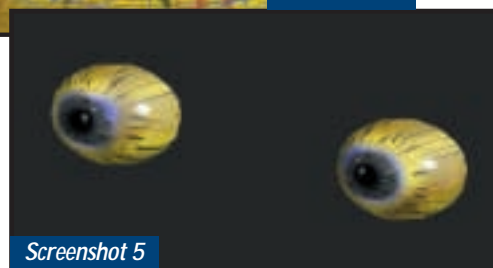
Hence, you should not be too swayed by the claims of the graphics cards manufacturers. What really counts is a card with a solid driver that offers good support for DirectX and OpenGL and your chosen operating system (which, these days, I would say should be Windows 2000 Professional or Linux; Windows 98 is not up to the job). For this reason, I would recommend

cards with a good track record for keeping their drivers updated, such as those produced by Matrox or Elsa.

TrueSpace users might want to check out Caligari's list of recommended 3D cards at www.caligari.com/help/rec_hardware/index.html.



Screenshot 4



Screenshot 5

Screenshot 4: The UV map of the goblin's eyes

Screenshot 5: The goblin's two eyes, with surrounding face temporarily hidden

customer, he has come back with another query and one that deserves an airing because it echoes one I get on a regular basis. He asks: 'Can you advise me on how to choose a graphics card that will give me a significant performance hike when viewing and rotating my 3D models?'

We are constantly bombarded with ads and reviews announcing the arrival of

CONTACTS

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Caught in the .NET

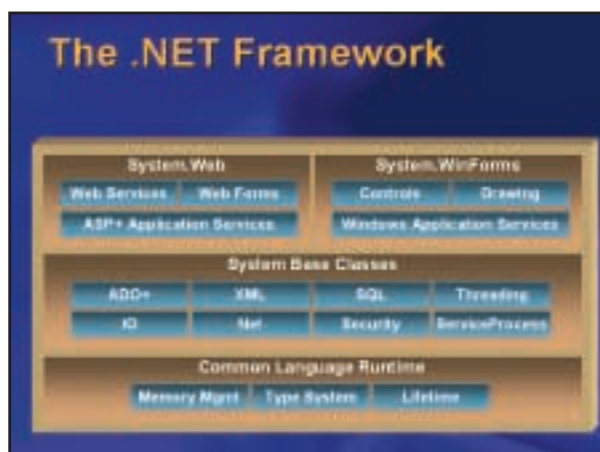
Tim Anderson delves into Microsoft's .NET Framework and gets a clock ticking in PowerPoint

Something old, something new: but with Microsoft's hype machinery in overdrive, probing the reality behind its next-generation development strategy, the .NET platform, takes a great deal of care. The starting point is the common language runtime. It sounds new, but in fact has a lot in common with the old Visual Basic runtime, which Microsoft started to call the Visual Basic Virtual Machine when Java got popular.

Just as VB compiles to pseudo-code that requires the VB runtime, the common language runtime operates on intermediate code – MSIL (Microsoft Intermediate Language). Microsoft also calls this managed code, meaning that the runtime libraries do housekeeping such as allocating and releasing memory and catching errors. The new piece is that in Visual Studio.NET, the next version of Microsoft's suite of development tools, all the languages can compile to MSIL.

Not long ago this would have been seen as a massive step backwards. Faster performance and easier deployment made native code more desirable. Today, advances in hardware have made performance less of an issue, and developers are likely to rate other factors such as productivity, scalability, object orientation and web support as more important. In addition, intermediate code performs better than it did. The common runtime library does just-in-time compilation to native code and performance should be nearly as good as a true native executable.

The big advantage of the common language runtime is interoperability. It has enabled Microsoft to create a shared class library that all the languages can use. There is also a shared data type system. This class library is the heart of the .NET Framework. It should replace MFC (Microsoft Foundation Classes) as well as VB's black-box objects. The Windows API may become irrelevant for business applications. A key feature is WinForms, which are similar to VB forms today. The difference is that all the languages can now use them, giving Visual C++ a RAD (Rapid Application



Development) form designer for the first time. WebForms provide an alternative web-based user interface, based on Active Server Pages. There is also a data access class library called ADO+.

Sounding out C#

The .NET Framework is written in Microsoft's new language, C# (C sharp). This is based on C++ and could probably have been Java if Microsoft and Sun got on better. It is a safer and more productive language, thanks to automatic memory management, full object orientation and simplification of some C++ features. For example, multiple inheritance is not supported and header files are not required. You can drop down to low-level code and do such things as pointer arithmetic and manual memory management when needed, through the unsafe keyword.

To know why C# is necessary, you need only look at the other languages in Visual Studio. In a nutshell, VB is too ugly, Visual C++ is too difficult and obscure and Visual FoxPro is a dedicated database language used by a minority. C or C++ compiled to native code (rather than the common language runtime) will remain the best choice if you need the fastest possible performance, or to write a device driver. For general Windows development, though, C# looks likely to be the preferred language and at last rivals Borland's Delphi and C++ Builder. C# is not a true competitor to Java. It has no cross-platform capability or built-in

The .NET Framework promises more productive Windows development

security features. Rather, it is an important enhancement to Microsoft's arsenal of development tools.

Clock watching

Steve Small asks: 'Is it possible to display a running clock on an

active PowerPoint presentation, so the audience can synchronise their watches? I can't find a method using PowerPoint features or any Visual Basic objects.'

There are several possible solutions. You could dig out the old Windows clock application and run it set 'always on top'. If that will not do, you could create an ActiveX control in Visual Basic, with a label, a timer and a few lines of code, and add it to a PowerPoint slide or to the slide master. This is easy for developers, but is a heavyweight solution that requires the control to be installed on every machine where the presentation is run. Finally, you can use VBA. Although it is unlikely that many will want to add a clock to PowerPoint slides, the general use of a timer could have many uses and the following is a simple example.

The general approach is to put a label on each slide and have a timer update it with the current time at the interval of your choice. Using a timer from VBA requires Office 2000. This is because VBA has no timer control and the API function SetTimer takes a function pointer as one of its parameters. This requires the AddressOf operator, not supported in earlier VBA versions.

Open or start a PowerPoint presentation and display the VB toolbar. Open the VBA editor and add both a module and a class module to the project (see figure 1 overleaf). You need a standard module because AddressOf does not work with functions in class modules. In the class module are three



FIG 1 Code for ClockUpdater class module

```
Private WithEvents app As application
Private Declare Function SetTimer Lib "user32" (ByVal hwnd As Long, ByVal nIDEvent As Long, ByVal uElapse As Long, ByVal lpTimerFunc As Long) As Long
Private Declare Function KillTimer Lib "user32" (ByVal hwnd As Long, ByVal nIDEvent As Long) As Long
Private Declare Function FindWindow Lib "user32" Alias "FindWindowA" (ByVal lpClassName As String, ByVal lpWindowName As Long) As Long

Private apphandle As Long

Public Sub StopClock()
Dim i As Long
i = KillTimer(apphandle, 1)
End Sub

Public Sub StartClock()
Dim i As Long

apphandle = FindWindow("PP9FrameClass", 0&)
i = SetTimer(apphandle, 1, 500, AddressOf UpdateClock)

End Sub

Private Sub app_SlideShowBegin(ByVal Wn As SlideShowWindow)
StartClock
End Sub

Private Sub app_SlideShowEnd(ByVal Pres As Presentation)
```

```
StopClock
End Sub

Private Sub Class_Initialize()
Set app = application
End Sub
```

Code for ClockUpdater standard module

```
Dim cu As ClockUpdater

Public Sub UpdateClock()
Dim s As Slide
Dim sh As Shape
On Error GoTo errhand

Set s = SlideShowWindows(1).View.Slide

For Each sh In s.Shapes
If sh.Name = "Label1" Then
sh.OLEFormat.Object.Caption = "Time: " + Format$(Now, "Long Time")
Exit For
End If
Next

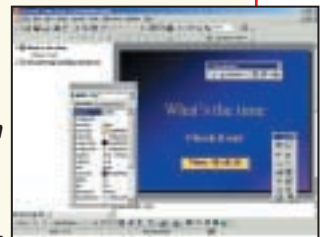
Exit Sub

errhand:
cu.StopClock
MsgBox "Error: " + Err.Description

End Sub

Sub InitializeApp()
Set cu = New ClockUpdater
End Sub
```

You can manipulate a VBA control in code when a slideshow is running



(Key: ✓ code string continues)

API declarations for SetTimer, KillTimer, and FindWindow. The Class_Initialize method gets a reference to the PowerPoint application object and puts it in a variable declared WithEvents. This enables the class to handle two application events, SlideShowBegin and SlideShowEnd.

When a slideshow opens, the StartClock method is called. This gets the handle of PowerPoint's main window using FindWindow. You will need extra code if more than one instance is running. Next, SetTimer is called. The third argument sets the interval in milliseconds and the fourth provides a pointer to the UpdateClock function.

UpdateClock is where the business is done. Objects on a PowerPoint slide are held in the Shapes collection. The code looks for a shape with the name 'Label1'

and, if found, sets its caption to the current time. Finally, the standard module includes a one-line function to create an object of the ClockUpdater class. To use the code, place a label on each slide where you require a clock. Next, run the InitializeApp function. Then run the slideshow. If you use this for real, you will probably want to add further error checking. Disable the timer if things go wrong and bear in mind that API calls make VBA code less safe.

There are several pieces of classic VBA obscurity in this example. Who would guess that to set the caption of a label, you need to write to Shape.OLEFormat.Object.Caption? Or that PowerPoint's window is called 'PP9FrameClass'? Facts like these can be uncovered using the MSDN library. The whole thing would be tidier if you could

use one of PowerPoint's native shapes instead of a VBA label control, but while this is possible, it is harder to identify the control you want in code, since a shape's name property is not editable. Another irritation is that InitializeApp has to be run manually when the presentation is opened. You could overcome this by moving the code into an add-in with an auto_open function.

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For more information on Visual Studio.NET visit <http://msdn.microsoft.com/vstudio/nextgen>

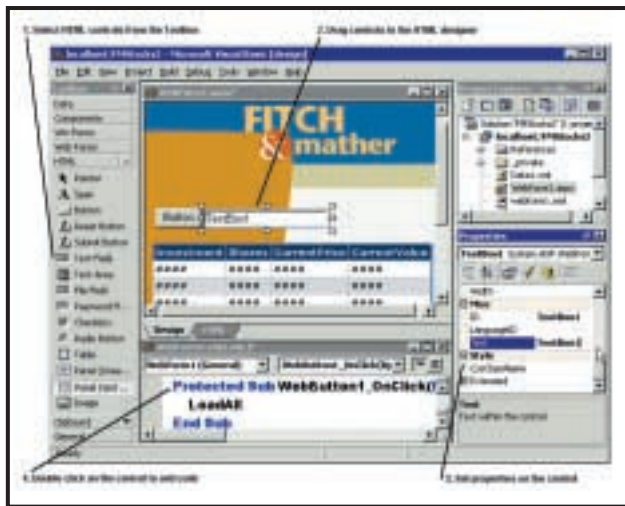


Improving the script

Tim Anderson explains how to get the best out of ASPs and uses a menu for web navigation

Active Server Pages (ASPs) are one of the bright spots in Microsoft's struggle to come to terms with the Internet. In principle they are similar to alternatives such as server-side includes and PHP (Hypertext pre-processor). An ASP page is parsed by the web server before being returned to the browser, so that the content can be modified by scripts, or by replacing placeholders with dynamic data. Through ASP, Microsoft has been able to provide dynamic websites using pre-existing Windows technology, such as Visual Basic, COM automation, and data access via ODBC and ADO.

You do not need anything more elaborate than Notepad to author ASP pages. The only real requirement is Internet Information Server (IIS) or, if you are sufficiently determined, you can use ASP on Unix web servers via third-party extensions. This ease of use combined with familiarity for Windows developers has made ASP a success. That said, the majority of ASP pages out on the web are probably not working as Microsoft designed them to work. What you are



replaced by a new form designer called WebForms, available to all the Visual Studio languages including C#.

replaced by a new form designer called WebForms, available to all the Visual Studio languages including C#. WebForms are essentially ASPs, but instead of generating script, the designer links the web pages to server-side components. For example, you can add a WebForm to a Visual Basic project, double-click a button to open its event handler and add some VB code. At runtime, the VB code runs in a compiled VB component, not as VBScript embedded in HTML. As with ASP today, the browser clients can be running on any platform and need only understand simple HTML, unless you choose to use ActiveX, Dynamic HTML, or other client-side technologies.

ASP+ supports dynamic DLL updates, so you can copy a new version over the old

meant to do is to encapsulate the bulk of your code into COM objects, typically created with the full version of Visual Basic or with the Active Template Library (ATL) in Visual C++. Then you can use minimal ASP script and get native-code performance from the components that are doing the real work. Microsoft also provides server-side component management, using Microsoft Transaction Server or, more recently, Component Services. This can optimise performance by sharing component instances between multiple client sessions, making websites more scalable.

Unfortunately, developers often take the opposite approach, sticking most of the server-side logic into JavaScript or

work and development using server-side components. Microsoft's ASP development tool, Visual InterDev, does little to simplify the process.

There is a useful paper in Microsoft's online Web Workshop (<http://msdn.microsoft.com/workshop/server/asp/server0124000.asp>) that illustrates the point. Entitled *ASP Component Guidelines*, it suggests not using ASP sessions, keeping components to page scope only, not using Request or Response objects in business components, avoiding single-threaded components, using Server.CreateObject rather than CreateObject in script and not using OnStartPage or OnEndPage handlers. These are good tips, but they also

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Application isolation means that each web application can use its own components and component versions without interfering with others. You will also be able to deploy COM components without running regsvr32 to install them.

There are other interesting features in ASP+. Server-side controls, such as listboxes and grids, can be intelligent about the client. What the client sees is pure HTML, so a server-side control is really a piece of code that generates different HTML according to what it knows about the client. You can do the same in ASP today, but only by manual coding. This will be useful, assuming that users will increasingly want to access the web using devices such as mobile phones and PDAs. More web developers will find themselves needing to support tiny browsers that present a few lines at a time.

Finally, both ASP+ and the .NET Framework support web services. This is a technique for accessing remote components using XML over HTTP as the protocol. The significance of web services is that they work well across the loosely coupled network that is the Internet and that using XML as the transport enables you to use components running on different platforms and using different object technologies.

To some extent you can already do this using CGI scripts. You can have a Visual Basic application make an HTTP connection to a remote website, call a CGI script and make use of the results. You can do so without needing to know whether the script is running on Windows, Macintosh or Unix, or whether the script is written in Perl, C, or something different. What web services using the SOAP (Simple Object Access Protocol) do is to enrich this process, adding strong typing, the ability to discover what objects, properties and methods are available in published services and the ability to write code for them using the same kind of techniques that you would for local, native objects.

While not yet a released product, ASP+ is not entirely vapourware and preview versions are already being distributed to developers. The point in writing about this now is to give direction to current ASP development. For websites with modest traffic and straightforward dynamic content, simple ASP scripts work well, as do alternative technologies, such as PHP. On the other hand, for web applications that will scale

well and migrate smoothly to the next generation, it is important to design using components from the beginning. Clearly Microsoft also believes that web development is the future and that, aside from some specialist tasks such as games programming or creating device drivers, most applications will be web applications. I am inclined to agree, although how many will use Microsoft's technologies is another question.

Using a menu for navigation

Philip Benson asks: 'I am trying to create a pull-down menu system – as opposed to a hyperlinks bar – for navigation to the various pages of a website I am developing. Could you please tell me how

to do this? I am using FrontPage 2000.'

To obtain a pull-down menu on a form, use a select object. This does not require any server-side scripting, as it can all be done on the client. You can see an example in figure 1 below. The select object has option elements, each of which appears in the menu. Define the onChange attribute to handle the menu's Change event and write code to navigate to the requested destination. In FrontPage, you can make the necessary edits in the HTML tab of the document.

The Change event only fires when the selection actually changes. This creates a problem, since there is no way to select the default option without first changing it to something else. The

FIG 1

Code for a navigation menu

```
<html>
<head>
<title>Menu example</title>
<script language="JavaScript">
<!--
function GoThere(navmenu) {
switch(navmenu.selectedIndex) {
case 0:
break;
case 1:
parent.frames.targetframe.location.replace
("http://www.itwriting.com/index.html")
break;
case 2:
parent.frames.targetframe.location.replace
("http://www.pcw.co.uk")
break;
default:
parent.frames.targetframe.location.replace
("http://www.itwriting.com/index.html");
}
}
//-->
</script>
</head>
<body>
<h1>Where do you want to go?</h1>
<form name="navform">
<p><select size="1" name="GoWhere"
onChange="GoThere(this)">
<option>Choose a destination</option>
<option>PCW home page</option>
<option>ITWriting home page</option>
</select></p>
<p>&nbsp;</p>
</form>
<p>&nbsp;</p>
</body>
</html>
```

(Key: ✓ code string continues)



workaround is to make the default option a dummy, such as 'Choose where to go'. Another possibility is to have a separate 'Go' button and handle its Click event instead.

The easiest way to inspect the user's choice is to pass the select object to the script function using 'this'. Then you can obtain the index number of the selection with the selectedIndex property and the text value from the options array. Unless you are happy to list URLs in the menu, use a switch statement to navigate to the required page. Early versions of JavaScript do not support switch, so use if statements instead when the broadest reach is needed.

Many websites like to keep hold of users. If you want to keep the menu on screen, you can either have the new page appear in a separate window, or else use a frameset and have the page show in a separate frame. For example:

```
window.location.  
replace("http://  
www.pcw.co.uk")
```

(Key: ✓ code string continues)

browses to the new location. The menu disappears and the Back button is the only way back.

```
window.open("http://  
www.pcw.co.uk")  
creates a new window and points it at the  
new location. The open() method has  
some handy options. A fuller syntax is:  
windowvar = window.open(  
URL,name,features)
```

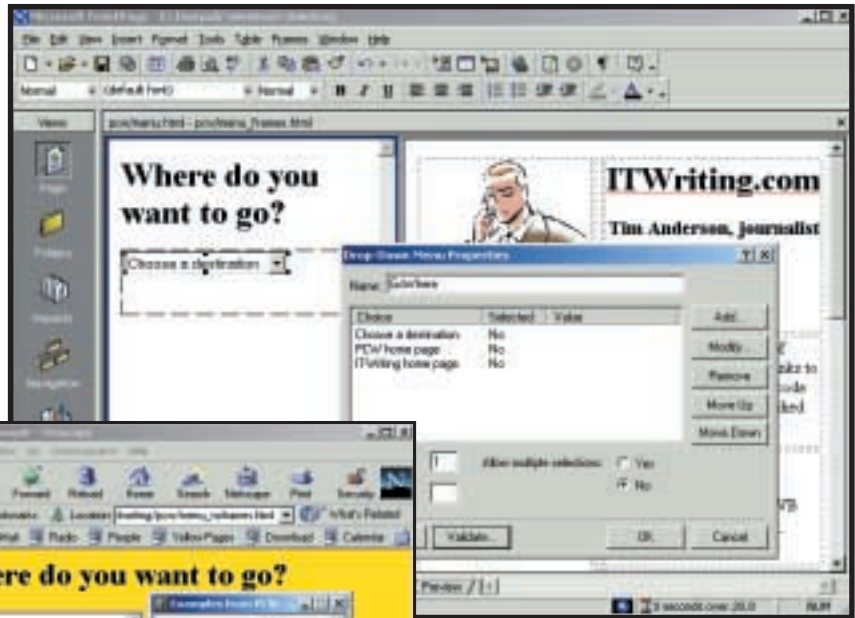
The name option lets you assign a name that you can use with the target attribute in a hyperlink. The features option gives extensive control over the new window's appearance. For example:

```
window.open("http://www.  
pcw.co.uk","newwin",  
"left=200,top=200,  
height=300,width=200,  
location=no,toolbar=no,  
scrollbars=yes")
```

This opens a new window without any toolbar or navigation bar, at a set position and with scrollbars. The user is unlikely to continue surfing the web from the new window, so will probably return to your menu instead. Alternatively, here is the frameset approach:

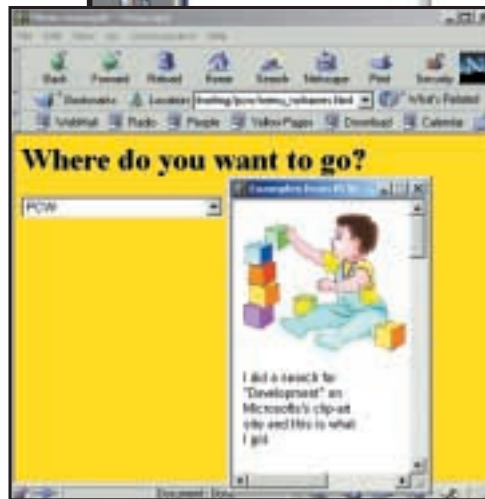
```
parent.frames.targetframe.  
location.replace("http://  
www.pcw.co.uk")
```

In this code, 'targetframe' is the value of



Above: In FrontPage, you can use a dialog to create a select menu. It is just as easy to do so in code

Left: This approach involves opening each link in a new window, with control over its size and position



the name attribute defined in the frameset page. In FrontPage 2000, you can edit this in the 'Frames Page HTML' tab. Examples of all these options are given at <http://www.itwriting.com/pcw/menu.html>.

Special characters in ASP

Bara Mustafa asks: 'I have got to the stage with ASP scripting of writing files, ie writing HTML files via a script. But when I am trying to write ASP files from scratch via ASP I don't seem to be able to use the '<', '%', '>' and other characters that are needed. An example:

```
Sub CreateFile()  
Dim fso, tf  
Set fso = CreateObject(  
"Scripting.FileSystem  
Object")  
Set tf = fso.CreateTextFile(  
"c:\testfile.txt", True)  
tf.Write("This is a test.")  
tf.Close  
End Sub
```

'My problem comes when I wish to write a line such as:

```
tf.WriteLine("<% blah blah  
blah %>")
```

'As the %> instantly cuts off the script and the server thinks that is the end of the script and closes it.'

The general solution to this kind of problem is to use the chr() function. For example, instead of '%>' you could write '%'+chr(62). This will be written to the file as '%>'. The counterpart of chr() is asc() which gives you the numeric value of a character. Further, ASP will only recognise the script delimiters if they literally occur together. Therefore, you can also use:

```
tf.WriteLine("<" + "% blah  
blah blah %" + ">")
```

CONTACTS

Tim Anderson welcomes your comments on the Web Development column. Contact him via the PCW editorial office or email:

webdev@pcw.co.uk

For further information on WebForms see <http://msdn.microsoft.com/vstudio/nextgen>

For information on the .NET Framework see <http://msdn.microsoft.com/.NET/default.asp>

The guide to using components in ASP is at <http://msdn.microsoft.com/workshop/server/asp/server0124000.asp>

The menu examples can be found online at www.itwriting.com/pcw/menu.html



Opening ours

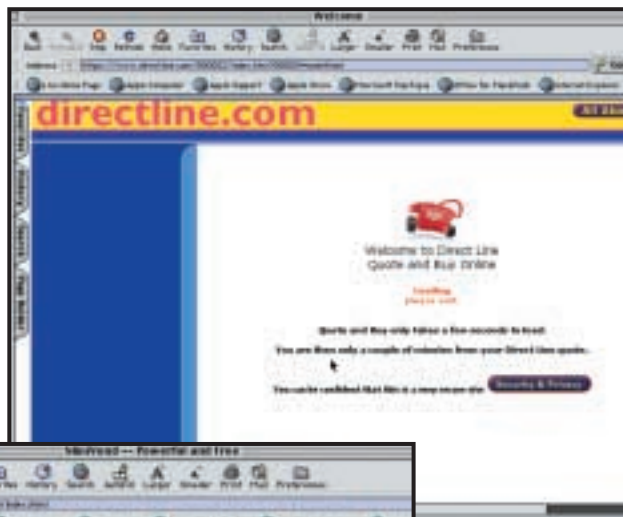
Nigel Whitfield is dismayed at 'pro' webshops and gets down to the nitty gritty with MiniVend

Ecommerce is, we're told, all about making things easier. It's about making it simple to compare prices and get the best deal for the consumer. And one of the areas that's apparently most popular when people want to buy things online is insurance. It's almost the perfect product for ecommerce – you can fill in forms online, send your payment details and just wait for the policy documents to drop through the door.

Well, that's how it should work, but when my car insurance renewal was due, I tried the Internet approach and found it a thoroughly frustrating experience. Bad luck, perhaps. Certainly some bad programming and shoddy sites.

One site insisted that there was no Flat 1 at my postcode, while another had an applet that doesn't work properly with Internet Explorer on the Mac, meaning I had to switch over to Netscape. And then sometimes it couldn't find the details of the car registration I entered. The end result? I gave up on online insurance and phoned my old broker – and got a better deal out of it.

If even people who write about ecommerce find sites frustrating to use, what hope is there for the ordinary punter? My advice: learn your lessons from bad websites and do things differently. Make sure your site works on all major browsers and platforms. Don't overwhelm people with the amount of information you request and if you're providing shortcuts, like using postcode information to speed address input, make damn sure they work properly.



Left: Direct Line's applet doesn't work properly with Internet Explorer on the Mac. Make sure you test your site on multiple platforms



MiniVend is free, but has plenty of features. It can also take quite a while to get to grips with

Shop@ssistant is probably easier to get to grips with and if you design your pages with NetObjects Fusion, you can also download objects that can be

inserted directly in Fusion, for tasks such as 'add to basket' and 'go to checkout'.

The systems do have some things in common – they work on the basis of catalogue pages, featuring items with an accompanying button or link to add to a shopping basket. That's the simple part.

The hard part of the shopping system is tracking a user from one page to another within the site – maintaining a session. You may, for example, have multiple simultaneous requests coming to your website from the same IP address – but that doesn't mean that they're necessarily the same person. It could be a firewall or proxy server. One of the main tasks of the shopping system is to keep track of information from one page request to the next.

Building your own site

A month ago, I'd have said that advice comes in the 'teaching granny to suck eggs' category, but after my recent experiences, I'm not so sure.

So, without further ado, let's carry on where we left off last time, with a promise to look at how to start building your website using a couple of ecommerce applications: Shop@ssistant and MiniVend.

The two are very different in concept. MiniVend is a much more technical solution – although you could, as the FAQ pages suggest, simply take the sample catalogue that comes with it and change the text and images to make your own.

Browser-based baskets

The approach used by Shop@ssistant is to keep much of the intelligence in the web browser. When you enter a site, you'll actually be visiting a frameset, with hidden frames containing JavaScript which sets up the necessary functions in your web browser to control the shopping.

This means that you also need scripts on all the other pages to ensure that if someone comes directly to one of them – perhaps via a bookmark – all the necessary scripts are loaded automatically.

Since all of the processing – up until



the final submission of the transaction – is handled in the web browser, session management is fairly simple. But you will be restricting your site to browsers that support frames and JavaScript. While that's most of the major desktop ones, the same isn't true of the cut-down web browsers used on some handheld devices and may not be true on some set-top boxes, either.

Server sessions

MiniVend handles sessions itself in a way that most people will be familiar with. By appending unique identifiers on URLs and in the links within pages, the server can be sure that a request for a particular page has been generated by a certain visitor.

This allows information to be stored on the server and updated dynamically if necessary. If they're available, cookies are used instead, so that the displayed URLs aren't quite as complicated.

To do this, however, MiniVend can't rely on static pages. Instead, it runs as a CGI program on your web server and filters all your pages, looking for its own tags and substituting them with appropriate information. To distinguish them from HTML tags, they're in square brackets.

You can use MiniVend with a simple link added to existing static pages – but you'll lose most of the benefits of the system if you do.

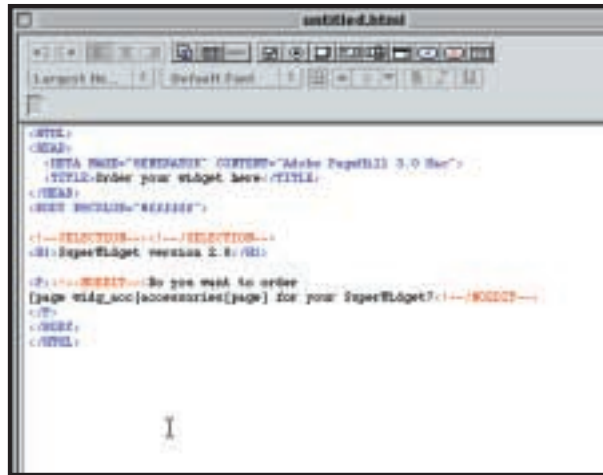
My advice: learn your lessons from bad websites and do things differently

MiniVend will require much more work to set up, tagging pages by hand and configuring the server to run the CGI program that filters your catalogue – but it will mean that your site should be compatible with a broader range of web browsers.

Get started with MiniVend

The current version of MiniVend can be downloaded from www.minivend.com; if you want to test a site using Perl on Windows, you'll need the previous version. A new release with more features is due later in 2000.

You can download the package from the MiniVend site and then run the installer script – on Unix, just type perl



If you use an HTML editor, you'll need to mark MiniVend tags so that they're not altered. In some, that means you might not see all the text on your page in preview mode

Makefile.PL to build the makefile, and then follow the instructions to install and configure the software.

The compile_link program in the MiniVend bin directory creates the vlink CGI program that's used to extract pages from the catalogue. You'll need to install this program in your web server's CGI directory. There's not space here to detail all the steps, but they are covered in the MiniVend documentation.

To start making your site, you need to separate the pages of your site into static pages and catalogue pages; MiniVend puts all the catalogue pages in a separate

location, so that they can be found by the server application.

You might wonder about the wisdom of this – but it's probably a good idea to split up your site like this anyway. It'll be easier for different people to work on the static and dynamic parts of the site.

Not everyone who visits will want to buy, after all. There are other things, such as support, or information, that can easily be kept away from the sales side, and should be easily accessible to all visitors.

Your first catalogue

When a page is requested from MiniVend, it's read from the pages subdirectory of the catalogue and tags

are replaced. This is one of the areas where it's easiest to get into most trouble with MiniVend if you don't read the documentation carefully.

First, if you're using a web editor to design your pages, you'll need to check whether or not you can tell it to ignore HTML code – in some pages, there's a special 'NOEDIT' tag.

Next, if you're using drag and drop, you'll almost certainly

need to manually edit URLs after links have been created in the package. That's because, to ensure the session tracking works, a reference to a URL has to pass through the MiniVend server.

You might design a page for a SuperWidget, with a link to the accessories page, like this:

```
<P>Do you want to order any
<A HREF="widg_acc.html">
accessories </A> for your
SuperWidget?</P>
```

Assuming your web editor respects <NOEDIT> and </NOEDIT> tags, you'll then need to edit the HTML to look like this, instead:

```
<NOEDIT>
<P>Do you want to order any
[page widg_acc] accessories
[/page] for your
SuperWidget?</P>
</NOEDIT>
```

You can replace the [/page] with a standard HTML tag. Note that the .html extension is missed off in the MiniVend tag. One quick way to do some of this work may be by careful use of a search/replace function in a text editor to swap HTML for MiniVend tags.

We'll come back to more on MiniVend next month, and take a look at getting started with Shop@ssitant.

CONTACTS

Nigel Whitfield welcomes your comments on the Ecommerce column. Contact him via the PCW editorial office or email ecommerce@pcw.co.uk



Developing areas

Microsoft offers free CE tools and gives a helping handheld to refugees, says Mark Whitehorn

There's an ongoing power struggle between Palm, Psion and, in the third corner, Microsoft with a bunch of hardware manufacturers, such as Casio and Hewlett-Packard. The victorious platform will be the one on which it is quickest and easiest to develop applications. This is because, as corporates start buying PDAs in bulk, it will become much more important for them to be able to easily develop commercial applications involving the collection and distribution of data.

To do this you need some form of database engine, rapid and accurate communication with centralised PC/server hardware and decent visual programming tools. Pocket PC still undersells the other players by a wide margin, but Microsoft has put together a really workable package to give corporates what they want and need.

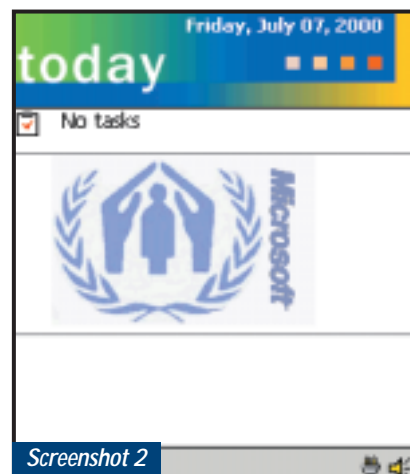
A spontaneous illustration of this occurred at Microsoft's TechEd conference, from which I have just returned. The keynote presentation described Microsoft's Europe-based work with UNHCR (United Nations High Commissioner for Refugees). In a close partnership with hardware suppliers, Microsoft has developed a PC-based system for tracking refugees, with the goal of reuniting families.

Refugees are registered and issued with a photo/barcode identity card to be shown at food and equipment distribution points. Information gathered about a refugee's location is then used to reunite them with friends and family. This whole project sprung not from Microsoft HQ in Seattle, but from people within Microsoft Europe who started asking what they, personally, could do to help.

Attending the presentation was a Pocket PC team who, again as individuals, wanted to contribute. During the four-day conference, in addition to its already full remit, the team put together a complete Pocket PC application to enhance the refugee-tracking abilities of the existing, highly successful, PC-based system.



Screenshot 1



Screenshot 2

This Pocket PC application, which helps track refugees, was developed at high speed

In conflict-torn areas with non-existent infrastructures, it is often impossible to keep data at the PC stations up to date, as there are not enough PCs to equip every distribution point. Given a satellite phone link, the Pocket PCs can send data almost instantaneously to the PCs and thus present a much more accurate picture to those endeavouring to reunite families.

An extra presentation, slipped in as the conference closed, outlined what had been achieved. Impressively, (given the company's track record!) Microsoft stressed the plight of refugees of conflicts the world over without pointing out its own cleverness. In fact, it took some digging to get the people involved to talk about the tools they had used. Nevertheless, the results show that rapid application development is now a reality on the Pocket PC (screenshots 1 and 2).

Tools of the trade

The catchy name of Microsoft eMbedded Visual Tools 3.0 is applied to Microsoft's development tools for its Pocket PC and other sub-Windows platforms. These tools are available free (except for postage and packaging) from Microsoft.

The two-CD set contains all kinds of stuff, including:

- eMbedded Visual C++ 3.0
- eMbedded Visual Basic 3.0
- Software Development Kits (SDKs) for

Handheld PC Professional Edition 3.0, Palm-size PC 1.2 and Pocket PC

- Active Template Library (ATL) for Windows CE
- Driver Development Kit (DDK)
- Microsoft Foundation Classes (MFC) for Windows CE.

So, something for everyone (except for Palm and Psion users) there. The latest product and technical information is to be found at www.microsoft.com/windowsce/embedded.

Looking at the above list, which appears to mention four different platforms, it is apparent that Microsoft's naming conventions for sub-Windows operating systems is as clear as mud. I asked Adam Anger, Microsoft's business manager for Windows CE, to sift the silt.

Confusion arose, he said, because Windows CE was running as the operating system on mobile devices and was also the operating system aimed at developers of customised devices.

'People were getting confused when we released a new version of the operating system, thinking that it meant you needed a new version of the Handheld PC software or that the Handheld PC software had changed to some degree.'

He explained that Microsoft introduced the 'Windows CE-Powered' brand for handheld PCs (devices with a keyboard) and for palm-sized PCs (keyboardless, PDA-type devices). It was



felt the time had come to differentiate between consumer-oriented or corporate-oriented devices – Handheld and Pocket PCs – and the developers who will develop custom devices with the embedded operating system.

The naming convention is now based upon the categories of hardware that use the Microsoft Mobile Devices software. These are the Windows-Powered Pocket PC, which is the PDA-sized device, and the Windows-Powered Handheld PC which is the Handheld PC that's available now and that Microsoft says it will continue to develop in the future.

Both platforms make use of the Windows CE 3.0 operating system: Microsoft decided

that keeping the Windows name was important because users were aware that synchronisation of data between mobile and desk-bound devices was an important feature. So, using the familiar Windows name on both machines signalled this feature clearly. Yep, clear as mud.

Stylus horribilus

I've recently been playing with a Hewlett-Packard Jornada 540 Pocket PC and I could be showing the early symptoms of another love affair. It's a neat and stylish handful of an appealing size and weight, a great colour screen and handwriting-recognition software of impressive accuracy, making more sense of my spidery hand than most humans do.

Furthermore, the 540 plays MP3s and has a diverting range of games. The only niggle is the amazingly horrible stylus, which is far too short and far too light. But that doesn't worry the



Screenshot 3

Left: Well, I like the Jornada as well, but these people...

Below: There's a great range of games available

the company of colourful Bubbles or manic Pac-Man – yes, the chomping smiley face has staged a welcome come-back.

The Jornada mentioned above was borrowed finery, on loan from Microsoft, and it had a fine range of games installed (screenshot 4). There's a golf game that you can get at www.ziosoft.com (screenshot 5) and

several shoot-'em-ups such as Cubicle Chaos and Killer Commute. These last three can be found on the Microsoft Mobile Games Pack. My favourite is Fire Drill: to the sound effect of crackling flames you scurry round an office extinguishing colleagues' desks that spontaneously ignite.

TV control

An issue or so ago I said that, at present, it doesn't appear possible to use your Psion to control your television. However, once more the PDA community has raced ahead of me and 'been there, done that'.

Several people sent email on the subject, including Dipen Lad (dlad@iname.com), who pointed me to a program called S5TV on John Pollock's site (screenshot 6) at www.geocities.com/jpollock_2000/infrared.htm.

Thanks to everyone who wrote in.

Crumbs!

If you read the July column you'll probably recall Mr Toast and his wondrous periodic table of elements for the Psion 5. If you're an Osaris owner and have been feeling disadvantaged by your inability to benefit from this scientific breakthrough, Mr Toast asks you to contact him. If there is sufficient interest, a version for the Osaris might be forthcoming. The address you need is mrttoast@dialstart.net.



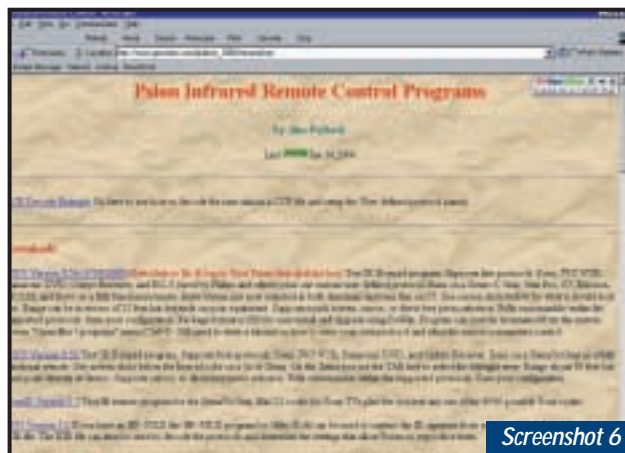
Screenshot 4

Screenshot 5

people in screenshot 3, who are clearly as pleased as I am with the product.

Games galore

There's a pleasing upsurge in the number of games available for the Pocket PC. I'm not reticent in the least about playing games: waiting for a mode of transport to materialise is much more pleasant in



Screenshot 6

You can drive your television from your Psion!

CONTACTS

Mark Whitehorn welcomes your comments on the PDA column. Contact him via the PCW editorial office or email pda@pcw.co.uk



Doing the SAN thing

Roger Gann looks into the pros and cons of installing a bit of SAN-ity into your network

As companies rely more and more on ecommerce, online-transaction processing and databases, the amount of information that needs to be managed and stored on a network can intimidate even the most experienced of network managers.

While servers do a good job of storing data, their capacity is limited and they can become a bottleneck if too many users try to access the same information. Instead, most companies rely on peripheral storage devices, such as tape libraries, RAID disks and even optical storage systems. These devices are effective for backing up data online and storing large amounts of information.

But as server farms increase in size and companies rely more heavily on data-intensive applications, such as multimedia, the traditional storage model isn't quite as useful. This is because access to these peripheral devices can be slow, and it might not always be possible for every user to easily and transparently access each storage device. One way out of this seeming cul-de-sac is the Storage Area Network (SAN).

The most basic way of expanding storage capacity on the network is to hang disk arrays or other storage devices off servers, using the SCSI interface or bus. SCSI has gone through a number of changes over the years, especially the speed the interface supports. Initially designed to handle speeds of 5Mbytes/sec, it supports a throughput rate of 160Mbytes/sec in its current iteration, Ultra3 SCSI. Within the Ultra3 specification is a subset implementation, Ultra160 SCSI, that's gaining popularity among SCSI vendors, as well as server and workstation manufacturers.

While SCSI has been a workhorse over the years for connecting peripherals at a relatively fast speed, distance limitations have kept this particular bus interface from evolving rapidly. The SCSI

standards put a bus length limit of about 6m on devices. While this distance limitation doesn't really affect connecting storage devices directly to a server, it does severely restrict placing RAID and tape libraries at other points on the network.

Enter the NAS

This is where the concept of Network Attached Storage (NAS) comes in. NAS is simple in concept and execution: disk arrays and other storage devices connect to the network through a

traditional LAN interface, such as Ethernet. Storage devices would thus attach to network hubs, much the same as servers and other network devices. However, NAS does have a few drawbacks.

Mr SAN man

Large enterprises that want the ability to store and manage large amounts of information in a high-performance environment now have another option: the SAN. In a SAN, storage devices such as Digital Linear Tapes (DLTs) and RAID arrays are connected to many kinds of servers via a high-speed interconnection, such as Fibre Channel.

This high-speed link creates a separate, external network that's connected to the LAN, but acts as an independent entity.

This setup allows for any-to-any communication among all devices on the SAN. It also provides alternative paths from server to storage device.

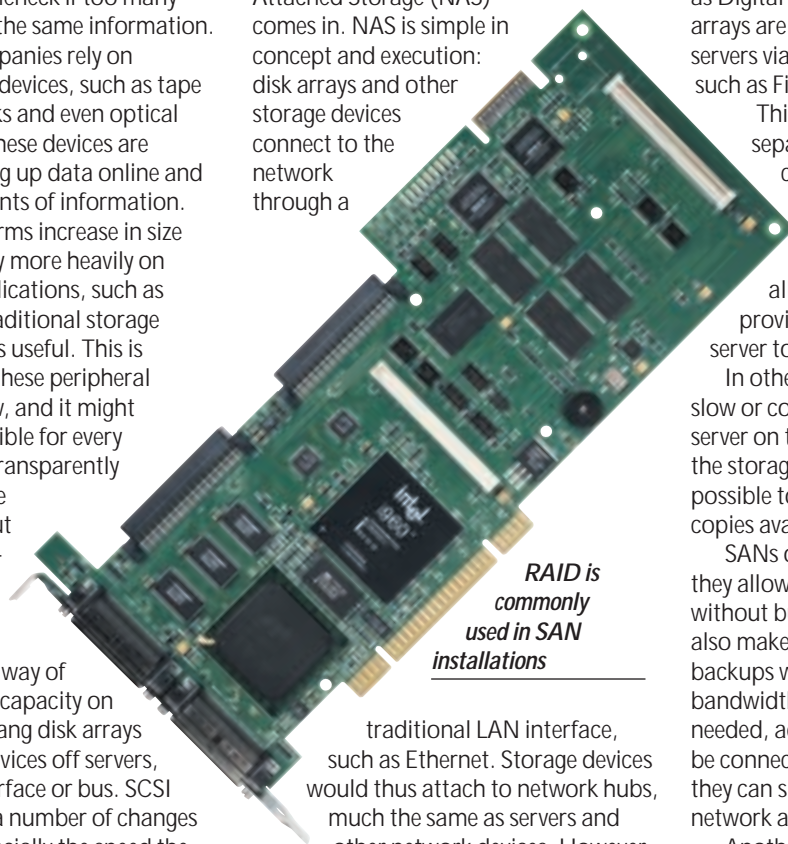
In other words, if a particular server is slow or completely unavailable, another server on the SAN can provide access to the storage device. A SAN also makes it possible to mirror data, making multiple copies available.

SANs offer several advantages. First, they allow for the addition of bandwidth without burdening the main LAN. SANs also make it easier to conduct online backups without users feeling the bandwidth pinch. When more storage is needed, additional drives do not need to be connected to a specific server; rather, they can simply be added to the storage network and accessed from any point.

Another reason for the interest in SANs is that all the devices can be centrally managed. Instead of managing the network on a per-device basis, storage can be managed as a single entity, making it easier to deal with storage networks that could potentially consist of dozens or even hundreds of servers and devices.

Planning a SAN

Mercifully, installing a SAN doesn't entail scrapping your current storage infrastructure. A good SAN strategy is to add SAN functionality to your existing



RAID is commonly used in SAN installations

traditional LAN interface, such as Ethernet. Storage devices would thus attach to network hubs, much the same as servers and other network devices. However, NAS does have a few drawbacks.

First, network bandwidth places throughput limitations on the storage devices. Most NAS servers are placed on 10Mbps/sec or 100Mbps/sec Ethernet LANs, but even if a network is running at Gigabit speeds, most NAS vendors today only offer interfaces up to Fast Ethernet.

Another downside to NAS is the lack of cohesion among storage devices. While disk arrays and tape drives are on the LAN, managing the devices can prove challenging, since they are separate entities and are not logically tied



systems, which you can do by adding SAN adaptors to servers and using bridge-like devices to move older storage systems onto your SAN. New storage subsystems can usually be upgraded to include SAN functionality.

Implementing a SAN is, of course, very different from implementing traditional storage. Any individual server is much less important than the physical SAN network, the storage devices that attach to it and the management tools that provide access to data.

The first building blocks of your SAN are storage units, which can be the existing SCSI devices in your servers, such as disks, RAID or tape libraries. The next pieces are servers. Existing servers can probably be integrated into a SAN and plans should include SAN compatibility. You can connect almost any modern server to a SAN, because SAN-support hardware and software spans most PC midrange and mainframe platforms. Ideally, a SAN will lighten your server's workload by offloading many storage-related server tasks to the SAN and by better allocating storage resources to servers.

Plenty of fibre

The most important piece of any SAN architecture is the underlying network technology that drives it. You can use ordinary Fast Ethernet, but Fibre Channel is emerging as the technology of choice for SAN implementations. Fibre Channel was developed by ANSI in the early 1990s as a means to transfer large amounts of data very quickly. Fibre Channel is compatible with SCSI, IP, IEEE 802.2, ATM Adaptation Layer for computer data, and Link Encapsulation, and it can be used over copper cabling or fibre-optic cable.

Fibre Channel supports several configurations, including point-to-point and switched topologies. SANs based on Fibre Channel may start out as a group of server systems and storage devices connected by Fibre Channel adaptors to a network. As the storage network grows, hubs can be added and as SANs grow further in size, Fibre Channel switches can be incorporated.

The standard will probably be the Fibre Channel Arbitrated Loop (FC-AL), which can connect as many as 126 devices and moves data at 100Mbytes/sec (soon to be 400Mbytes/sec). Cable lengths are impressive under FC-AL – 30m over



Digital Linear Tape drives can be connected to servers via high-speed Fibre Channel



copper and 10km over fibre. Now that's what I call a Wide Area Network!

At the moment that's all theory – the current lack of standard SAN-management tools forces you to keep your SAN as compact as possible, although you could use the extra distance to attach the odd client machine that could benefit from a direct connection to the SAN.

Planning is key and the network has to be correctly specified and installed. Don't forget that 'Loop' is an important word here – break the circle and you break the SAN. To make your SAN circuit, you will need to use Fibre Channel hubs or switches. These devices instantly patch any breaks in the loop and prevent a failure from bringing down the entire circuit. In addition, you can build fault tolerance into your SAN by creating multiple loops.

As you begin to implement a SAN, it pays to interface your existing storage. You can do this with bridges that connect SCSI devices directly to Fibre Channel

networks and gateways that connect Ethernet networks to Fibre Channel networks. It's also possible to upgrade some devices, such as tape libraries, from SCSI to Fibre Channel interfaces. On the server hardware, most vendors offer the host bus adaptors (HBAs) needed to bring a system onto a Fibre Channel SAN. You also need to give workstations on your normal LAN network access to the SAN as well.

You might want to investigate storage management software at this point, such as hierarchical storage management. This lets you shift data from faster to slower media as its frequency of use decreases – there's little point in having rarely used archive material available over the SAN. Other software allows you to map large storage devices, such as disk arrays and tape libraries, to virtual file systems on servers, eliminating many of the server hardware limits

imposed on storage.

Many backup software vendors, including Legato and Veritas, now support SAN architectures in their products and typically connect with other storage management software to make backups

as flexible as possible. After all, you want your SAN system to have enough intelligence to be able to back up a storage device directly to a tape library without having to go through intermediary servers.

As you go through what may be a slow process of moving towards a SAN, you will almost certainly experience the hiccups associated with any new technology. But keep in mind that most of the components of a SAN, including RAID, storage libraries and storage management software, are mature technologies which are only now coming into their prime.

CONTACTS

Roger Gann welcomes your comments on the Networks column. Contact him via the PCW editorial office or email:

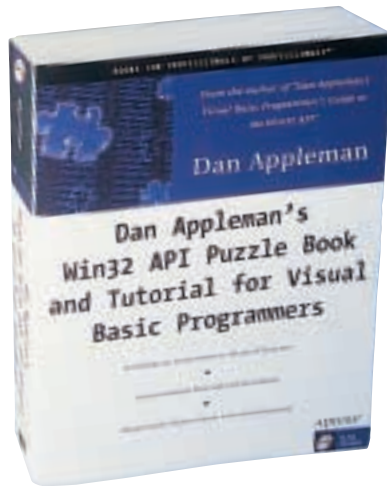
networks@pcw.co.uk

For more information on building a SAN, visit www.fibrechannel.com and www.snia.org

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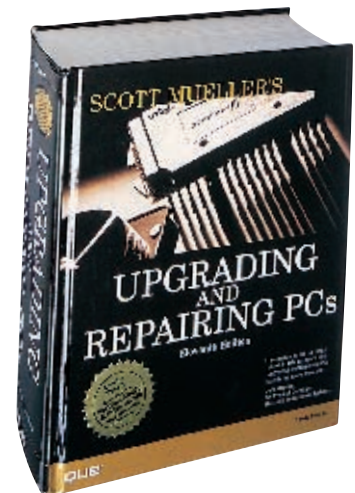
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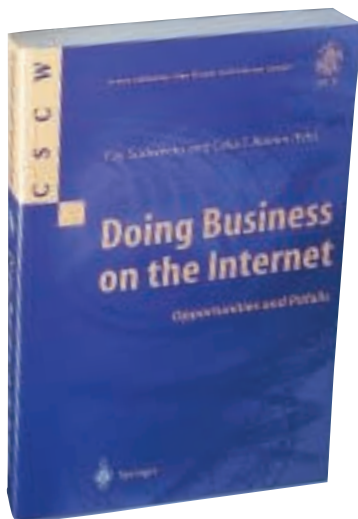
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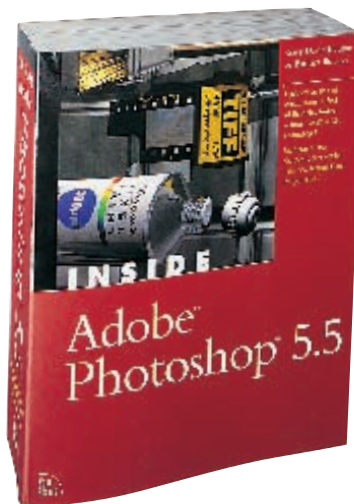
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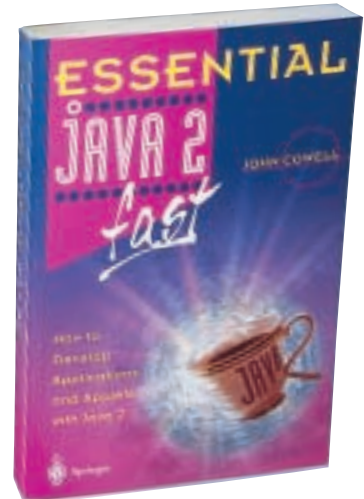
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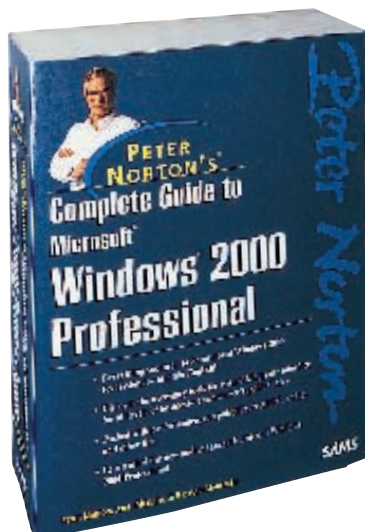
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BE CLEAR ABOUT SUPPORT AND WARRANTIES

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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Crimson skies

The golden age of the swashbuckling hero is about to make a comeback, if Microsoft and FASA Interactive have their way.

Crimson Skies is set in an alternate 1937 where the Depression and Prohibition have rocked the US. The country has fragmented into warring nation states and, without any established means of interstate travel, real power is wielded by ruling the skies.

You play Nathan Zachary, flying ace, and an array of strange and fantastic aircraft take you through 24 missions over locations as exotic as Hollywood, Manhattan and Hawaii. Each mission centres on a primary objective but a number of secondary objectives can divert your attention. So you could go head-to-head with a heavily-defended Zeppelin or simply blast the Hollywood sign.

Although your character is part of a team, the game unfolds in a single-player mode, with your mission goals frequently requiring you to help your teammates.

But don't be fooled into thinking this



is just another flying sim. Its 'intuitive flying system' allows players to concentrate on the art of dogfighting. Although the planes' manoeuvrability is impressive, this is at a cost: namely the in-game graphics that depict each location within a sparse, sprawling landscape with the minimum of detailed structures.

Crimson Skies will appeal to people who have a penchant for aerobatics when it's released later this year. Look out for a full review in the near future.

www.microsoft.com/games/crimsonskies/

ANDY STEWART

Rune

Everything you've heard about the Vikings is true if Rune is anything to go by. This third-person adventure game puts you in the boots of a warrior called Ragnar, who is intent on finding the mysterious force responsible for the destruction of a number of villages. His adventures pit him against a selection of mean humans and even meaner monsters, plundered from Norse legend and the Human Head designers' feverish imaginations.

Based on the Unreal 3D engine, the game creates a deeply textured environment for players to explore, which, in turn, involves combat and puzzle solving. Although its camera angles resemble Tomb Raider you needn't worry about your view being obscured.



Should Ragnar be cornered, he becomes transparent so you don't miss a thing.

However, it is the hand-to-hand combat element that will play a key role in the game. Human Head's designers claim it's easy to grasp but hard to master, focusing as it does on a combination of offensive or defensive

stances with either weapon or shield.

As Ragnar's travels progress he acquires bigger and better weaponry along with runic powers, which help him as he hacks away at his foes. After a number of kills his bloodlust reaches a critical point and sends him berserk, laying waste to anyone who stands in his way, before returning to normal.

The game's graphics come into their own during the fight sequences, as the localised damage feature lets you hack off parts of your opponent's body. To add insult to injury you can pick up your foe's severed arm and soundly beat him with it. Promised for release later this year, it's not for the faint-hearted.

www.humanhead.com/rune.htm

ANDY STEWART

Deus Ex

A game that combines the best elements role-playing, adventure and first-person shoot-'em-ups

Based at Ion Storm, Warren Spector, veteran designer of the Ultima and System Shock series, now brings us the critically acclaimed Deus Ex. At first glance this game appears to be the typical first-person shooter, but after a little gameplay you realise it doesn't conform to one genre. Deus Ex manages to combine the best elements of role-playing, action adventure and first-person shoot-'em-ups.

Set some 50 years in the future, you take on the role of JC Denton, a bionically augmented agent working for UNATCO (the United Nations Anti-Terrorist Coalition). A virulent plague with supposedly no known cure has spread throughout the world, and governments are frantically trying to maintain order. However, a cure does exist, known as the 'Ambrosia Vaccine', and a terrorist group called the North-western Succession Forces, or NSF, has recently hijacked a shipment. This is where you come in, tasked with the recovery of the vaccine. As you dig deeper the plot thickens and you begin to question motives and the trust you had in friends. If you're a conspiracy theorist or *X-Files* fan then you should feel right at home. It also borrows heavily from *The Matrix* right down to your long black trench coat.

On installing the game, you must complete training exercises to get a feel for the weapons and manoeuvres you will need. You start off untrained in a variety of skills, such as computers, electronics, lock picking, medicine, swimming and weapons (comprising demolition, heavy, low tech, pistol and rifle). You need to collect a number of points before you will be able to use these skills well. For example, if you begin using the sniper rifle, you'll find your aim

is shaky. Gain more experience points and you will soon be able to pick off enemies from hundreds of metres away – handy when you're clearing a route through a heavily guarded area.

You control your character through a combination of mouse and keyboard. The

interactive, with the possibility of picking up and throwing trash bags, to practise your aim on the rats and pigeons.

Enemy AI (artificial intelligence) is also responsive, with NSF guards spotting any rash movements and being prepared to hunt you down or raise the alarm. Previous meetings with some of the characters are also remembered if you return to

see them. If you want to up the stakes there are four difficulty levels.

Graphics-wise, Deus Ex was stable at 1,024 x 768 on a GeForce 256 and 566MHz Celeron, but we met with the odd dropped frame. This is probably because the game is based on the Unreal engine that is optimised for Glide rather than Direct3D. The only real issue we had is the darkness, even with the gamma on max. The music is clear and complemented the

mood of the game, while the sound effects and voices are realistic.

Deus Ex gets the thumbs up because it is difficult to leave alone – the sign of a quality game. The bonus of playing the game in your own way also adds to its appeal and longevity. If you really want to get immersed and don't mind missing out on sleep then you can't go far wrong.

JALAL WERFALLI



interface is similar to the one in System Shock 2. You can choose your own appearance and selecting your gear from an unobtrusive inventory. Your health status, in the upper-left corner, can be accessed to reveal a graphical representation of your body's bio-condition as well as the state of your bionic augmentation implants.

What makes Deus Ex so addictive is that there isn't only one way of solving a problem. The first level, set in Liberty Island, New York, has around five solutions. Your environment is also

DETAILS

★★★★★

PRICE £39.99 inc VAT

CONTACT Eidos 020 8636 3000

www.deusex.com

SYSTEM REQUIREMENTS Pentium II 300 (Pentium III/AMD Athlon recommended); 64MB of RAM (128MB recommended); 8MB (16MB recommended) 3D-accelerated DirectX v7.0a-compatible graphics card; DirectX-compatible sound card; 250MB of hard disk space; four-speed CD-ROM; Windows 95/98



Grand Prix 3

You won't have time to watch the accurately modelled tracks fly past on the king of F1 sims

There are few racing simulators that have gained the kudos of Geoff Crammond's Grand Prix series. In fact, when ex-world champion Jacques Villeneuve moved from ChampCar racing in the US to Formula 1 he is said to have learned the F1 tracks by playing the first of Crammond's Grand Prix titles. And up until now, GP2 has been considered the best F1 simulator on the PC, despite its age and relatively crude graphics.

Crammond has been working on this update for four years and the attention to detail really shows. His team of programmers have even worked with the Arrows F1 team to make sure that every aspect of the cars and tracks are modelled as closely as possible to real F1 racing.

The game is based on the 1998 season and every team and driver is included except – rather bizarrely – Mr Villeneuve, who had to be replaced by fictional driver John Newhouse due to licensing disagreements. Also, Verstappen has been chosen as the second driver for Stewart, rather than Jan Magnussen who started the season with the team.

But the strength of the GP series has always been in the way you can tweak every aspect of your car, including brakes, gear ratios and aerodynamics. This is where GP3 really sets itself apart from the rest of the F1 pretenders. It's truly hardcore in its approach, allowing you to perfect car setup.

The tracks in the game are also amazingly accurate – the buildings are expertly modelled, as are other details such as trees and advertising hoardings. The circuits even contain the correct

camber, and if you outbrake yourself and end up in the gravel traps, your car will throw up bits of gravel from the wheels.

One of the most important additions in GP3 is the inclusion of dynamic weather conditions, which can range from blazing sunshine to monsoons and

GP3 is not going to appeal to the casual racing fan who likes arcade thrills rather than simulation. You can, of course, turn on all the driving aids and race arcade

style, but this proves less than satisfactory, as the computer assist tends to make you feel like a passenger with little control over the action.

Also, you'll need a PC with a fair amount of grunt to get

smooth frame rates from the game. It suffered on a 450MHz PII with a 32MB TNT2 graphics card, but really started to shine on a 733MHz PIII with a 32MB GeForce DDR card.

It's a shame that after four years, Crammond's team hasn't come up with added gameplay elements, such as a career mode where you could start out as a test driver and work your way up into the top seat at a team such as

McLaren or Ferrari.

However, if you are a big F1 fan then this is simply the best F1 game ever produced. It certainly dumps on what has gone before it this year, such as EA's F1 2000, and from a great height. Crammond has come up with a cracking title, but next time it'd be good to include some extra gameplay elements.

NIALL MAGENNIS



the weather even causes adjustments to be made to ideal driving line.

It's often said that F1 fans only watch the races for a chance to see multiple car pile-ups. If you're one of these people, you won't be disappointed with GP3. It's extremely entertaining – if a little annoying when you're doing particularly well – to clip another car and watch your own go through a full roll with wings and wheels flying off everywhere, especially into the path of oncoming cars.

Despite such frivolous entertainment,

DETAILS

★★★★★



PRICE £34.99 inc VAT

CONTACT Hasbro Interactive 020 8569 1234

www.hasbro-interactive.com

SYSTEM REQUIREMENTS Intel Pentium II 266MHz or AMD K6-2 (450MHz Pentium III or Athlon recommended); 32MB of RAM (64MB recommended); 2MB video card (16MB 3D DirectX 7.0-compatible video card recommended); DirectX 7.0-compatible sound card; Windows 95/98

Motocross Madness 2

The thrills and spills of motocross will have you glued to your PC as you test your riding skills

When a game has a disclaimer on the loading screen that states 'the bike riding depicted herein may not be realistic, and is potentially extremely dangerous in real life' you have to wonder what other games think they are depicting. Is Quake III Arena suggesting the gunmanship and stamina of the characters in the game is real and accurate? Somehow we don't think so. Regardless of this rather odd disclaimer, Motocross Madness 2 (MM2) builds on the surprise success of its predecessor and is a wickedly addictive game that will have you glued to your PC for quite a while.

One of the most favourable aspects of MM2 is the ease with which you learn to play the game. The controls are easy to pick up, comprising little more than accelerate, brake, left, right, forward and backward leaning – which if used incorrectly results in a back-breaking crash. Stunts are performed by moving the joystick in a specific direction while holding down one of the stunt keys. The controls may be simple to master, but the game is not.

MM2 has various game options including Baja racing, Supercross, Enduro and National racing and the old favourite Stunt option, where you watch your rider perform ludicrous stunts, for which he scores points if he doesn't crash on landing. One major addition to complement its predecessor's race options is the campaign-style Pro-Circuit mode. This involves working your way up from local races on cheap bikes to bigger bikes and more challenging races, with

tougher opponents. Along the way you earn money to upgrade your bike, as well as to pay your medical bills from your inevitable crashes.



Baja Racing is a checkpoint race across varied terrain. The drivable area is absolutely huge

and is rendered in immaculate detail. The object of Baja is simple: go through the gates while staying ahead of your opponents. This is a lot easier than it sounds, as you frequently tend to be leading a race for all but the last lap, when suddenly you see your victory hopes dashed as you clip the top of a hill and find yourself sliding and scrabbling to try to get back to the gate. With a little bit of careful navigation you can ride your way to victory by taking the route that keeps your wheels on the ground as much as possible. Of course, this isn't as

much fun or as spectacular as taking the route with the most jumps, but it does see you installed on the winners' truck at the end of the race.

The Enduro Mode is similar to Baja, although the courses are situated in quarries, complete with mechanical diggers and helicopters, or with their course-crossing traintracks, busy roads or flight paths. The Supercross races, by comparison, are all held in stadiums, and are accompanied by the roar of the crowd as they respond to your every move. In early games this is more likely to be the unified sharp intake of breath of

thousands of people as you spectacularly crash your motorcycle.

National races also involve purpose-built tracks, with tight corners and lots of big air jumps.

MM2 is a highly addictive game, with spectacular graphics. The crashes will make you smile, while the addictive pull of winning will keep you playing. And if you manage to get up the cliff face edging each game's arena and start too head to far

out, watch out for the hilarious cannon sound as you are blasted back to the middle of the arena, complete with a whistling bomb effect as you plummet earthwards. MM2 is a quality game that is both fun to play and looks good, too.

SCOTT MONTGOMERY

DETAILS

★★★★★

PRICE £34.99 inc VAT

CONTACT Microsoft 0345 002 000

www.microsoft.com/games/motocross2

SYSTEM REQUIREMENTS Pentium II 233 (Pentium II 300 recommended); 64MB of RAM; 8MB 3D-accelerated graphics card, DirectX7.0-compatible sound card (optional); 200MB of hard disk space; Windows 95/98



Dino Crisis

Once you've mastered the unusual viewpoints, this game will keep your pulse racing

Third-person adventures have always been a staple of the PC gamer's diet, so now that *Dino Crisis* has been ported from the PlayStation to the desktop, we were keen to find out how well it had survived the trip. There are two main modes of play. You can either go for a timed lizard bash, where you kill as many dinosaurs as you can, or, as we did, set out for the full story.

You play the hot-pants-clad female member of a three-strong crew charged with investigating the whereabouts of a certain Dr Kirk (not the James T kind). You have good reason to believe his recent death was faked and he's up to something in his research labs.

However, it's not only the doctor who's been putting in the overtime. There's good deal of reptilian activity, too.

In the best tradition of another PlayStation success, *Resident Evil*, there's a very cinematic aspect to this game, along with a suspenseful soundtrack. And although there are plenty of cut scenes around, film-like twists are woven right into the gameplay. This is a bit of a double-edged sword. It certainly helps keep you locked into the gripping, if linear, narrative with fear in your veins at every turn. On the downside, it makes you stick to the path as the scenes tell you pretty much exactly where to go.

There are also some odd camera angles that, while they'd look good as part of a film, mean you have no idea what horrors are waiting around the corner as you're looking at the top of your head. It also makes figuring out which direction you're heading a little tricky and you may find yourself accidentally going back through the same door you used to enter.

When you do encounter a member of your own party or a dinosaur, again usually accompanied by a set piece, it's tough to tell when the cut scene has

kicked in and when you can begin completing your next task or start filling that lizard with lead. So keep your finger on the aim key throughout.

The monsters are powerful here – so make sure you have plenty of room to back up or somewhere to

trawl back through the level to retrieve it – and you can only save a game at set points, which makes writing clues down doubly important.

Graphically, it was a mixed bag. While the game itself was perfectly passable, we noted a definite 'blockiness' on the menu screens and other occasions. Another thing we didn't like was the apparent lack of

any mouse control. You can configure the keys, but the PlayStation legacy is that you'll enjoy it a lot more with a gamepad.

In all, in spite of the fact that the game often wrests control from you for the sake of the narrative, the story is so enthralling, if violent, and the gameplay so pulse-pounding, that most faults

we can forgive.

Once you've worked out how to deal with the weird viewpoints, you can start to enjoy the cinematic elements.

Suddenly, creeping down twisting corridors with your heart in your

mouth, listening to the sounds of a dinosaur on the prowl, becomes fun.

MATT WHIPP



run, as they'll make mincemeat out of you in a corner – and they're big and scary, especially when they crash their heads through the window and fill up the whole room or jump down from a ventilator shaft. If you do get caught, it's brutal and gory. It can be difficult to tell when to use the medical kits you pick up along the way. The only hint we had that our health was low was the trail of blood we left behind us from time to time.

It's not just fighting, there are also lots of items to pick up, puzzles to solve and codes to remember – keep a pen and paper handy, you'll need it. There's nothing more annoying than forgetting a vital piece of information and having to

DETAILS

★★★★

PRICE £29.99 inc VAT

CONTACT Virgin Interactive 020 7551 0000

www.vie.com

SYSTEM REQUIREMENTS 32MB of RAM (64MB recommended); P200MHz (P166 with 3D acceleration); Windows 95; four-speed CD-ROM (eight-speed recommended); 1MB of hard disk space (650MB recommended); DirectX-compatible video card

Van mail

The drivers of nine vans delivered nine different parcels to nine different women. Prior to the deliveries, the vans were in a single line, with van number one being at the front. Each delivery was made at a different time from 7.30am to 11.30am inclusive in increments of 30 minutes. From the following information, can you determine the driver of each van, the item or items in each driver's parcel, and to whom and when each parcel was delivered?

Harry, whose grey van was immediately behind Jim's van, delivered the encyclopedia. The white van which held the chocolates for Mrs Redmond was immediately in front of the van driven by Bill, who made his delivery at 11am. The grey van holding Mrs Jones' parcel was immediately in front of the van holding Mrs Green's parcel; the former's parcel was delivered one hour before the latter's. The parcel of CDs, whose delivery time was not 8.30am or 9.30am, and the parcel holding the camera were carried by similar-coloured



vans; the former van was immediately behind the latter in the queue. Mrs Smith's parcel of flowers, which was in a black van, was delivered earlier than any other parcel.

The driver of a white van, who was two vans behind the hamper deliverer, delivered the jewellery one hour before Arthur - who drove a black van - delivered Mrs Gould's parcel. Dick's van was four vans in front of the white van holding the chair; the latter van's delivery time was two hours later than the former's. Pete drove a black van (whose delivery time was 11.30am) which was four vans in front of the van holding the clock.

The van holding Mrs Black's parcel was immediately behind the van driven by Fred, whose delivery time was not 9am or 9.30am. The van that held Mrs Brown's parcel, which was not delivered at 8.30am, was somewhere behind the van holding Mrs White's parcel, which was delivered earlier than Mrs Brown's. Don's delivery time, which was not 10.30am, was later than Sid's; the latter driver did not deliver to Mrs Clark,

and his van was somewhere in front of Don's.

Find the solution to this puzzle for a chance to win a copy of Microsoft Encarta Reference Suite 2000.

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 (October 2000), VNU House, 32-34 Broadwick Street, London W1A 2HG, or by email to: letters@pcw.co.uk.

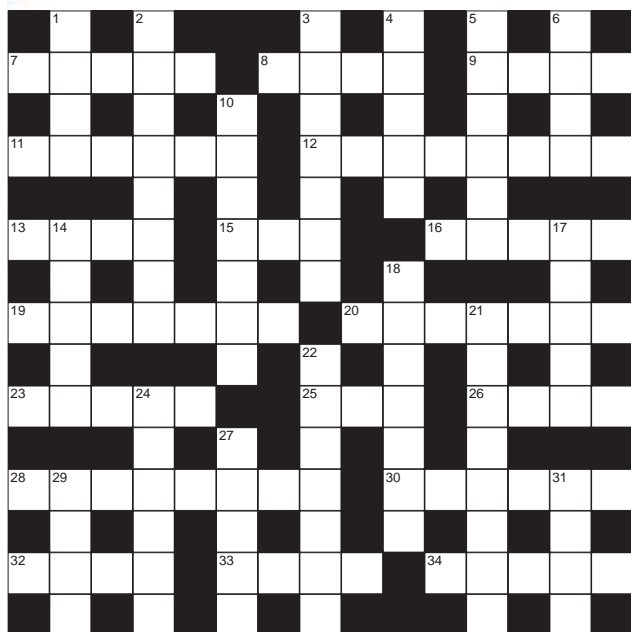
Answers should arrive no later than 20 September 2000. Please note that we DO NOT open attachments.

July's Prize Puzzle answer

The solution to July's puzzle is below. A case of mistaken identity crept in last month with July's winner, C Hodgson of Stockport, being credited as the winner of June's brainteaser. G Shepherd of Chesterfield was June's winner.

A		B		D	C
	D	C		A	B
C	A		D	B	
D	B	A	C		
	C	D	B		A
B			A	C	D

prize crossword



ACROSS

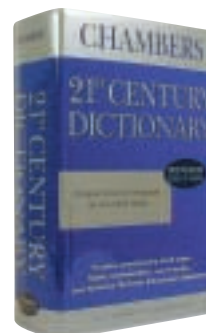
- 7 ___ screen, multiple display method (5)
- 8 ___ function, Postscript halftone procedure (4)
- 9 Tape spool (4)
- 11 Make small software changes (6)

- 12 Restoration of lost data (8)
- 13 Snail ___, web reference to postal services (4)
- 15 BASIC command returning whole numbers (3)
- 16 ___ box, computer based on DEC chip 21064 (5)

- 19 Associating a symbol with its description (7)
- 20 Variant of a language or protocol (7)
- 23 Very small time measures (5)
- 25 Resistance unit (3)
- 26 Cut off part of an image (4)
- 28 General term for a subroutine (8)
- 30 Person highly respected on WWW (3.3)
- 32 ET seeking screen saver (4)
- 33 Illicitly gain computer access (4)
- 34 Lotus ___, organization software (5)

DOWN

- 1 Emit (oil) (4)
- 2 Handicapped (8)
- 3 Perform surgery (7)
- 4 Pile (4)
- 5 Cringe (6)
- 6 Member of the nobility (4)
- 10 Delegates (7)
- 14 Crook's false name (5)
- 17 Metric prefix for 100 (5)
- 18 Darkening (7)
- 21 Film-setting (8)
- 22 Join up (7)
- 24 Periodic (6)
- 27 Easily carried (5)
- 29 Manipulates (4)
- 31 The Young ___, TV sitcom (4)



Each month, one lucky PCW Crossword entrant wins a copy of the Chambers 21st Century Dictionary. The winner of August's crossword puzzle is: A Holland from Hertfordshire.

This time, it could be you. Send your completed crossword to: 'PCW/October - Prize Crossword', VNU House, 32-34 Broadwick Street, London W1A 2HG, to arrive no later than 20 September 2000. Please state clearly on your entry if you do not wish to receive promotional material from other companies.

Solutions to September's crossword

ACROSS: 7 Split 8 Spot 9 Reel 11 Tweaks 12 Recovery 13 Mail 15 INT 16 Alpha 19 Binding 20 Dialect 23 Psecs 25 Ohm 26 Crop 28 Function 30 Net.god 32 Seti 33 Hack 34 Notes
 DOWN: 1 Spew 2 Disabled 3 Operate 4 Stack 5 Grovel 6 Peer 10 Assins 14 Alias 17 Hecto 18 Dimming 21 Location 22 Connect 24 Cyclic 27 Light 29 Uses 31 Ones

WIN a Panrix 700MHz Athlon PC

This month, we've joined forces with award-winning PC manufacturer Panrix to offer one lucky *PCW* reader the chance to win a 700MHz Athlon PC with all the trimmings

Panrix, a frequent *PCW* award winner, is offering one fortunate winner this classic PC based on an Athlon Thunderbird processor.

As you would expect it's fully equipped with 64MB of memory, an AGP Cougar graphics card and a Creative sound card to produce a great visual and sound effect. Not to mention a good display offered by a 17in ProNitron monitor and a 10-speed DVD drive so you can watch all your favourite movies. There's also an internal modem for all your Internet travels.

A set of 200w PMPO speakers adds to the goodies offered by this PC. You'll get peace of mind, too, with Panrix's one-year parts and labour warranty.

Established in 1990, Panrix has developed a reputation for delivering outstanding PC performance at competitive prices. Panrix's range of computer systems benefits from the most advanced technology available to provide high performance, reliable, user friendly PCs.

You can find out more about Panrix by visiting www.panrix.com, or ringing 0113 244 4958.

■ For a chance to win a Panrix 700MHz Athlon PC, just answer this simple question



and follow the 'How to enter' instructions.

What speed is the Panrix PC's DVD drive?

- 1) 8-speed
- 2) 10-speed
- 3) 12-speed

Creative Labs DVD winners

The winners of August's competition are Richard Nunn of Bury St Edmunds, Kenny Sherratt of London, Mike Fisher of Bath and Caroline White of London. They each win a Creative Labs DVD bundle, including a Creative PC-DVD Encore 8x. Congratulations to all the winners.

How to enter

Fill in the coupon on the left and send it to the following address by 30 September 2000:

October PC competition
Personal Computer World
 VNU Business Publications,
 32-34 Broadwick Street,
 London W1A 2HG

Or email 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 Panrix. *PCW*'s Editor is the sole judge of the competition, and his decision is final. No cash alternative is available in lieu of prizes.

PCW October 2000 competition entry form

Name:

Email address:

Daytime telephone number:

Address:

Answer: The DVD drive's speed is:

• 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

Chess for chumps, a PCW machine, and Windows 95 puts Microsoft's monopoly in question

20 YEARS AGO October 1980



September 1980's issue had focused on the world of chess, with David Levy quoting the findings of mathematician Claude Shannon: that in the perfect game of chess

there are 10^{120} possible games to consider, which means it would take a 1980s computer some 10^{90} years to decide its first move. This month, however, saw a breakthrough as Mr Levy had designed his own chess-playing micro. The micro was unique in that it played with itself and could be tortured into revealing its next best move and compelled to play it before you died of old age.

The cover of *PCW* this month featured those two darlings of home computing, the Atari 400 and 800. David Tebbut gained an exclusive look at what Atari was billing as a new generation of computers, aimed at home users who wanted to play games as well as learn from the Atari's audio-visual capabilities. Both machines could be plugged into a television and programs could be loaded from a cassette, disk or cartridge. Powering the machines was the 6502 processor running at a thrilling 1.8MHz.

As for games, the addictive *Star Raiders* was included with both machines. This was similar to many *Star Trek* games available at that time, but additionally boasted a three-dimensional view of space and the opportunity to reach the rank of star commander.

15 YEARS AGO October 1985



We were wondering whether we had received the ultimate accolade – a machine bearing our name? No such luck. It was the latest machine from Amstrad, known as the

Personal Computer Word Processor, or PCW8256 for short. With CP/M, a disk drive, 256K of RAM, a monitor, Basic, Logo and a printer, this was one bargain not to be missed at £399 ex VAT. As a CP/M micro, it undercut the Osborne machines, the Wren (if you could get one) and the Apricot F1e, leaving our own Peter Bright to conclude there was little to criticise about the PCW8256, even though it used our name.

Have you ever thought of your computer as a living entity, capable of thought, movement and reproduction? If so, then Geoff Simons' *New Life?* piece, exploring artificial intelligence, would have been right up your street. Debating the nature of intelligence and how computer systems could be regarded as emerging life-forms, Geoff analysed the arguments for energy intake (electricity), thinking (processing information), reproduction (computers used to design other computers) and human/computer symbiosis (try attacking an important computer and you will probably be arrested). He concluded that when life is seen as essentially a systems phenomenon, then computer-based systems would be able to qualify as being alive.

On a lighter note, if you find the ambiguous definitions derived from today's dictionaries humorous, you may like to know that things were similar in 1985. As described in *Chip Chat*, one microcomputer dictionary explained that 'I'm leaving' signifies that someone is announcing their departure – or, if spoken by a tree, means 'Spring is near'.

10 YEARS AGO October 1990



Two important names of the era were fighting it out on the *PCW* cover. A new low-cost PC, the PS/1, from the world's biggest computer manufacturer at the time,

IBM, was about to hit the market and warranted a front-page report from *PCW*, as did Amstrad's attempt to tackle the corporate market with its PC3000 range.

Unfortunately for IBM, *PCW*'s Simon Rockman was far from impressed, concluding that the PS/1 range aimed at the home market in the US and the small business in the UK was a cheap attempt to broach either market, due to its fast-fading processor and severely limited expansion. Simon went on to say that no-one who knows anything about computers would buy a PS/1. Amstrad's PC3000 fared somewhat better under the inspection of Guy Kewney, who concluded that the 20MHz machine was a safe and reliable bet for corporate users.

Graphics cards were also on test this month, with no sign of any current manufacturers under trial. Instead, *PCW*'s Chris Cain was left to deliberate the power of the Video Seven V-RAM and

Paradise's 8514/a plus, among others. The Paradise 8514/a plus came up tops, due to its superb blitting (a graphics rendering test) and reliability, with NEC's Multisync Graphics Engine coming in a close second.

Finally, *PCW* interviewed everyone's favourite 'boffin' Sir Clive Sinclair, who revealed his plans to build a super-bike. The wafer-like bike, designed to revolutionise city commuting was still on the drawing board at this stage, but sadly ended up travelling down a road to nowhere.

5 YEARS AGO October 1995



Computing on the move gave *PCW* the cover story five years ago, when we put 15 notebooks equipped with a docking station to the test. With 20 per cent of corporate business users favouring the dockable notebook, *PCW* decided it was time to debate the best notebook on the market combining portable and desktop usability.

A number of established names took part in the group test, with Gateway and IBM receiving Highly Commended awards and Toshiba stealing the limelight with the Editor's Choice for its Satellite Pro 400CDT. The only notebook able to boast the inclusion of a Pentium processor and a CD-ROM as standard, the Toshiba was priced at £4,440, which was expensive, especially by today's standards.

Like today, the 1995 *PCW* team was attempting to discover the best way onto the Internet, with Wendy Grossman providing a guide to the worst and best ISPs. A number of big names appeared in the review, including Demon but, unfortunately, many never sustained themselves and have since shut up shop. As the reliability of ISPs remains a controversial issue, it was no wonder that Wendy refrained from awarding a single Editor's Choice and instead provided the pros and cons for each service under review.

Finally, at a time when Microsoft's monopoly was still firmly in place Clive Akass reported on the success of Microsoft's Windows 95 in resisting an anti-monopoly suit, when the US Department of Justice deferred its investigation to a later date – has it taken five years?

CLAIRE MORLEY AND JALAL WERFALLI

The Atom that started it all

It's the micro that time forgot, thanks to that pesky Sinclair chap and a rather steep price point

Everyone remembers the BBC Micro. Some people nod in recognition when you mention you had an Acorn Electron. But the Acorn Atom is one of the lost treasures of home-computing history: even retro geeks who slaver over ZX80s will cock their heads and make a funny face when you mention the name.

Acorn Computers was set up by an ex-Science of Cambridge employee called Chris Curry. If the name Science of Cambridge doesn't ring any bells, it was headed by one Clive Sinclair.

The Atom was Acorn's first real stab at a proper home micro. It was released in the middle of 1980, at around the same time as Sinclair's own ZX80 appeared on the scene. As with the ZX80, the Atom was available ready-assembled, but also came in the cheaper kit form, which was the more popular option for your typical computer geek of the time.

In many ways, the Atom was the dry run for Acorn's BBC Micro (which was originally named the Proton) and the later machine owes a great deal to this one. Inside the case there lurked a 6502 microprocessor, just like the BBC's, except it ran at 1MHz, half the speed of the later model. Externally, the appearance was very similar, although the Atom's case was considerably more compact at 245mm deep, compared to the BBC's 345mm.

The classic typewriter-style keyboard with its instantly familiar echoing key-click is present and correct on the Atom, soldered directly onto the main circuit board rather than being a separate unit, which was the case with the BBC.

The Atom's sound system was the most basic arrangement possible: a single output line from the 8255PIA (peripheral interface adaptor) connected directly to the internal speaker. Tones had to be generated in software by switching the PIA output on and off at the desired frequency.

The computer did have a design feature that wasn't carried over to the Beeb, but was about 20 years ahead of its time: separate video memory. The unexpanded model had just 2KB of RAM: 512bytes for graphics, 512bytes for program storage and

adaptor) provided two I/O ports, one for a printer and one for user projects. Second, you could add internal expansion Eurocard boards, produced by Acorn. These included a network interface that allowed sharing of disk drives and printers.

It's strange, looking back, that this superb machine, with its proper keyboard and awesome technical specification for the time, was so completely



1KB of execution workspace.

Adding extra integrated circuits in the appropriate sockets gave you up to 12KB: 6KB for graphics, 5KB for program storage and 1KB of execution space. But that was just the start of the Atom's expansion capabilities. The basic model had a single 4KB ROM containing Acorn's variant of BASIC and the MOS (machine operating system). But you could also add an extra 4KB floating-point extension ROM, which gave you colour graphics modes to play with, too.

In full flight, a 12KB Atom fitted with floating-point ROM could manage a graphics resolution of 128 x 192, with four colours excluding black and white. It's worth noting that in those days, the extra 11KB of memory to fully kit out an Atom cost £175. These days, that'll buy you 192MB of PC100 SDRAM: nearly 18,000 times as much.

There were two more internal expansion possibilities. The first was another feature to find its way into the Beeb: the 6522VIA (versatile interface

overshadowed by the tiny, membrane-keyboard equipped ZX80. The big difference was price. The ZX80 may have

been totally inferior to the Atom, but it was far less expensive. A ready-assembled ZX80 cost £99.95, but a ready-made 12KB Atom cost £330.

Perhaps the second factor, one that dogged Acorn right up until its demise two years ago, was its inability to market its products effectively. The ZX80 had full-page ads in the national newspapers, while the humble Atom, well, didn't.

It does have one final claim to fame, though. David Braben used one to produce his first three-dimensional graphics routines, simulating a spaceship flying around in a starfield. Those routines eventually became Elite. So, three cheers for the Acorn Atom, the micro that geekdom forgot, but whose soul lives on in the form of its illustrious progeny.

DAVID FEARON