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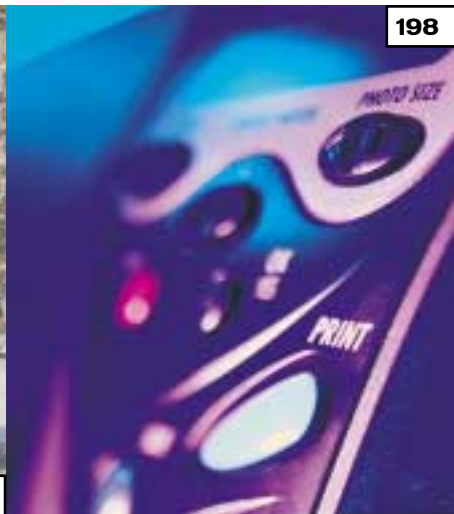**NVIDIA GeForce 2**
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REVIEWS

CONTENTS

Email has become all-pervasive, as the 'Love Bug' illustrated, but we still need to talk to each other.

Exercise your vocal chords

Like most other organisations, *PCW* fell victim to the 'I love you' virus that recently arrived in almost everyone's mailbox. This little beauty (as virus coders the world over will no doubt call it) caused massive disruption and endless headaches for computer users everywhere. Luckily it didn't cause too much bother to the *PCW* team (if it had you probably wouldn't be reading this right now). What amazed me was how widespread the damage was and how quickly it spread. It seemed that everyone I spoke to that day had been affected in some way by the rogue email.

If anything, this incident has proved just how important email is to our everyday lives. Something that was considered a bit of a novelty not too long ago is now a service that few companies or individuals can do without. The fact that everyone relies so greatly on email made it easy for the 'I love you' virus to reach an incredible number of users in next to no time at all. There was a time when companies tried to stop employees from installing their own applications on work PCs for fear of virus infection, but email has made this kind of security measure almost redundant. Add to this the fact that almost anyone who works with a PC also uses some kind of electronic address book, and it's easy to see how viruses these days can spread like, well, viruses.

But surely the benefits of email outweigh the potential risks of attacks like this. The ability to send messages to people on the other side of the world and receive an almost instantaneous response is a very powerful tool. Also, on a personal level, email allows people to keep in touch with distant friends and relatives without incurring prohibitive costs.

However, email isn't always used to communicate with people on the other side of the world, in fact it's often used to communicate with people on the other side of the street, or worse still on the other side of the room. With all the advantages that email has brought, the casualty could well be personal contact. Almost every office in existence will have an email account for each and every member of staff, moving towards the nirvana of the paperless office. Unfortunately, the ability to send email to the other staff in your office often stops people from taking time out just to talk to each other. Even though I'm aware of this problem I'm still a victim of it. Many a time do I find myself sending an email to one of my staff members only a couple of desks away, when I could just as easily walk over there and talk to them directly. In fact we've taken things a step further, with the majority of the team running the AOL Instant Messenger in the background to allow us to communicate electronically even more efficiently, and thus saving us the effort of using our vocal chords.

Communicating with people outside the office is also becoming an email affair all too often, with the telephone becoming the second point of contact. In fact the old phrase of 'putting a face to the voice' when you meet someone you've spoken to could easily be replaced with 'putting a voice to the email' once you're finally forced to speak to someone directly

> **The old phrase of 'putting a face to the voice' could be replaced with PUTTING A VOICE TO THE EMAIL once you finally speak to someone directly**

after communicating electronically.

Even the mobile phone revolution seems to be leaving vocal communication behind. More and more mobile phone users are making use of SMS messaging rather than actually speaking to people, and with the implementation of WAP and mobile email this situation will become more prevalent. That said, at least there's a valid reason for using SMS instead of voice, it's usually cheaper, especially if it's in the middle of the day or if you're abroad.

As with all types of technology, email should be a tool that services us as users, and in many respects it does just that. However, part of the equation should not be the loss of communication skills that have been in place for thousands of years. Email has its place in our work and social lives, but it should be used as a supplement to vocal communication, not a replacement.

Riyad Emeran, Editor

PERSONAL COMPUTER WORLD

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PERSONAL COMPUTER WORLD

WELCOME TO THE JULY 2000 PERSONAL COMPUTER WORLD CD-ROM

July COVER DISC

GAMES **APPLICATIONS** LIBRARY ENTERTAINMENT INTERNET

Heading the software line-up this month is a full version of the powerful 4th Dimension 6 database development software, plus the OUP's Oxford Reference Shelf – no fewer than 16 essential reference texts in one compact package. We've also got BeOS 5 Personal Edition, MessageASAP mail centre software, and much more.

OUP Oxford Reference Shelf FULL VERSION
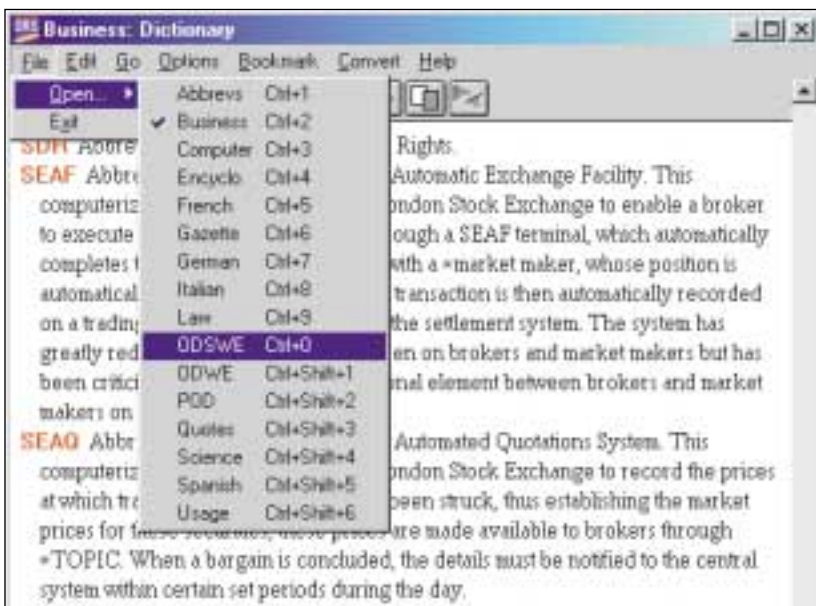
A small amount of disk space will give you an essential reference collection – enough knowledge to convince anyone that you've had an Oxford education

Here's what you get:
- Pocket Oxford Dictionary
- Oxford Dictionary for Writers and Editors
- Oxford Guide to English Usage
- Oxford Minidictionary of Quotations
- A Compact Encyclopedia
- A Concise Dictionary of Business
- A Concise Dictionary of Law
- Oxford Dictionary of Abbreviations
- A World Gazetteer
- Oxford French Minidictionary
- Oxford German Minidictionary
- Oxford Spanish Minidictionary
- Oxford Italian Minidictionary
- Concise Science Dictionary
- Oxford Dictionary for Scientific Writers and Editors
- Dictionary of Computing

The Oxford Reference Shelf, from the highly respected Oxford University Press, is an essential collection of important reference texts, all delivered in a fast, efficient, compact, no-nonsense form. In fact, these superb reference volumes will easily fit onto the most modestly endowed hard disk – keeping them accessible at all times.

Whether you're a budding writer, linguist, business person, or scientist the Oxford Reference Shelf on CD-ROM is guaranteed to satisfy your needs. This 'shelf of books' offers unbeatable value and flexibility with 16 complete texts on a single CD-ROM, giving you fast access to accurate, up-to-date information. With the Oxford Reference Shelf on CD-ROM, an Oxford education has never been easier!

If you want definitions, quotes, help with grammar and usage, or general encyclopedic information, then the collection of five writers' reference works in this package covers all you could possibly want to know.

For those tricky business terms and abbreviations, try the four business and law dictionaries to help you find concise, easy-to-understand definitions.

Use the four Oxford mini-dictionaries in the most popular European languages to impress your colleagues with your grasp of French, German, Spanish and Italian.

Get swift and sure guidance on the correct scientific and computing terms to use. From these three subject-specific dictionaries discover the meaning of terms ranging from allele to ZIF socket.

Actinic Catalog

30-day evaluation

The Internet is no longer just a network, it's a marketplace. Entrepreneurs who use the web can be open for business 24 hours a day, 365 days a year – and find that sales are easier to fulfil and gathered at less cost.

This month, *Personal Computer World* offers you the chance to set up and run your own online sales site with a free 30-day live trial of Actinic Catalog (RP £300 exVAT) – the UK's leading ecommerce solution from Business ISP Zen Internet. (Actinic Catalog is an all-British product).

Actinic Catalog is self-installing and very easy to use. It enables you to publish an illustrated, online catalogue without design or technical expertise. The package includes a shopping cart and secure encrypted ordering. Catalog is approved by major high-street banks, the Which? Association, and most shopping portals.

To use the software, you will need a PC running Windows 95/98 or NT4 and a dial-up connection to the Internet. There are no restrictions on the secure hosting services supplied free of charge by Zen Internet
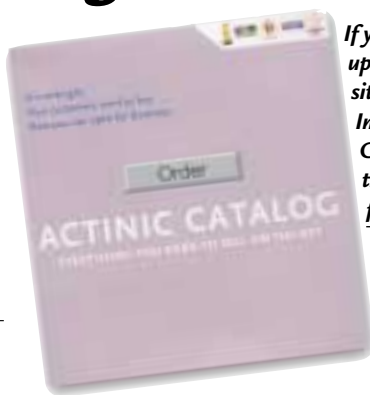
If you want to set up your own sales site on the Internet, Actinic Catalog makes things very easy for you

during the evaluation period, so you could begin taking orders and payments right away. 50MB of secure web space is available for your trial.

Three steps to net profit

Step 1 Begin the Actinic Catalog installation from the cover CD-ROM
Step 2 Complete the registration details online when requested. You will then receive your server login code and the URL of your commerce site by email from Zen Internet.
Step 3 Finish the installation and run

Actinic Catalog. Click 'Bypass' when the software asks you for an authorisation key (this is supplied when you purchase the product). When the software prompts you for a User ID from 'the SuperMall Administrator' (Zen Internet in this case), enter the code you received from Zen when registering.

This is a complete copy of the software. Full context-sensitive help is provided, and an extensive manual is included in Acrobat (PDF) format. For the ultimate in extra customisation, users can download the 'Advanced User Guide' available at: http://actinic.zen.co.uk/advanced/advanced.htm.

For more information about the evaluation, and how you can purchase Actinic Catalog, email: sales@zen.co.uk, telephone: 01706 713714, or visit the Actinic website.

> **GETTING STARTED WITH ACTINIC**
> Read the Getting Started notes on the CD-ROM before installing. You will need to register on the Zen Internet website to get your user name and password before you can get up and running.

Using the CD-ROM

AS OF LAST MONTH, the *PCW* CD-ROM 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 CD (and vice versa); and, 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 options, dialogs and security warnings you normally get. Unfortunately, Netscape doesn't properly support this software. So in the meantime, for those non-Microsoft users, we've included a small installer that will run when you insert the CD, or when you run the program PCW.EXE in the root of the CD-ROM. 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 CD-ROM.

If you have problems running the CD or any

of its content, please follow these guidelines:
● Faulty CD (ie, the disc is physically damaged and will not load) – return the disc for a replacement (see box at the end of CD details).
● You have problems installing/running some of the software – check the support page on the CD, or the support website at

www.pcw.vnunet.com/cd. You should also check the manufacturer's website (the details in most cases are given on the CD).
● For general difficulties you can call 01685 354726
● If you're still stuck, drop us an email at pcwcd@vnu.co.uk – we may be able to help.

4th Dimension version 6.0.6   STANDARD EDITION

4D version 6 allows developers to create virtually any type of database application imaginable easily and efficiently – from simple contact management systems and product catalogues to sophisticated multimedia applications and full-scale accounting packages.

With 4D's intuitive interface and powerful 4GL programming language it is ideal for designing database solutions in single-user, client/server or Internet/intranet environments. Its ease-of-use, reduced development time and straight-forward installation and maintenance also make it a cost-effective solution for companies and organisations of all sizes.

From its release in the mid-1980s, 4D has won awards from the computer industry press and praise from users for its power, elegance and simplicity. Millions of users and developers use it to store vital data. As the first major graphical user interface relational database product on the Macintosh, 4D pioneered the concept of RAD (Rapid Application Development). Now, with Version 6, it has taken Windows and Macintosh RAD to a new level.

4th Dimension has its own built-in programming language of over 500 commands. This makes it a powerful development tool for database applications on desktop computers.

You can use the 4th Dimension language for many different tasks – from performing simple calculations to creating complex custom user interfaces. Check out some of the sample applications on the CD-ROM for a better idea of what 4D can do.

4th Dimension is the ideal tool for all levels of users and developers to accomplish a complete range of information management tasks. Novice users can quickly perform calculations. Experienced users with no programming experience can customise their databases, or developers can use it to add sophisticated features and capabilities to their databases, including file transfer and communications. Developers with programming experience in other languages can add their own commands.

Installing 4D

You can install 4th Dimension 6 directly from the *PCW* browser (provided that you are using Internet Explorer) or from the loader menu that appears when you insert the CD. Follow the on-screen instructions. During installation the following serial number will be required. Type it exactly as shown:
Serial no: 0840B012313E3FF335

There are demo applications that you can install from the browser by running the file Setup.exe in <CD:>\Software\4D\4D Demo Applications\DISK1\. These are a useful way to learn about creating your own applications. There's also a quick-start tutorial (<CD:>\Software\4D\Tutorial\Install Tutorial Files\DISK1\setup.exe) in Acrobat format, which takes you step-by-step through creating your first database with 4D, adding tables and creating relations, reports, labels and graphs... right through to publishing it on the web.

4D EXTRA is a plug-in that will add
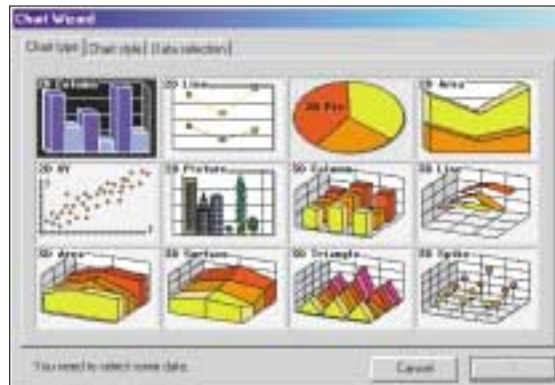
Ease of use makes 4th Dimension unbeatable

extra functionality to your installed copy of 4th Dimension (install within the browser from <CD:>\Software\4D\4D Extras\4D Extras\DISK1\setup.exe).

4D has very comprehensive online help. You can find some very useful additional documentation in Acrobat PDF format in the following directory on the CD: <CD:>\software\4D\documentation\acrobat files.

DETAILS

PLATFORM 4th Dimension requires a Pentium 90 (or faster) system running Windows 95, 98, or NT; minimum 32MB of RAM (48MB recommended); 14in SVGA with 256 colours

UNINSTALLING 4D 4th Dimension comes with its own uninstaller. Ensure that the CD is inserted in its drive, then simply select Start > Programs > Aci > 4th Dimension 6.0.6 > Uninstall, and follow the on-screen instructions. NOTE: The same uninstall procedure applies to the sample applications and 4D plug-ins
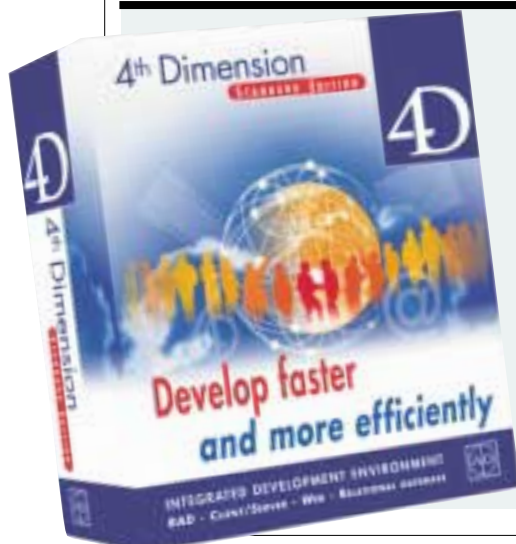
SPECIAL READER OFFER

If you upgrade to 4th Dimension version 6.5 you get even more features and faster applications.
- Faster applications – significant performance gains
- Fully-integrated web server – integrate your database applications seamlessly with the web
- Better forms – produce more functional interfaces, quicker
- 4D Internet Commands – easily implement email, FTP and Internet functionality into your applications
- Execute on Client – distribute tasks between clients
- Find Editor – search for strings in a database structure
- Methods – writing methods is even easier
- Runtime Explorer – view behaviours during development
- PLUS improved Windows support, and many more new and improved features

4D Standard Edition 6.5
Upgrade from 4D 6 for just £95* (RRP £195)
4D Developer Edition 6.5
Upgrade from 4D 6 for £295* (RRP £495) (*prices exclude £12 shipping and VAT, offer closes 31 July 2000)
CALL: 01625 536178 or email: sales@aciuk.com
To find out more about the latest version of 4th Dimension, why not visit the 4D website at www.acius.com.

Software Library

Each month the library section brings you some of the best shareware and demonstration programs from vnunet's downloads section on the net. This month we've brought you seven useful and interesting programs – SiSoft Sandra, AudioCD MP3 Studio 2000, CDH Image Explorer Pro, LaserAge, Paint Shop Pro 6.02, Paragamus SpeedNet, and WinOptimizer 99 Deluxe.

SiSoft Sandra 2000.3.6.3

SiSoft Sandra (the System ANalyser, Diagnostic and Reporting Assistant) is an information and diagnostic utility. This shareware can provide you with most of the information you would ever need to know about your PC and the software on it.

Sandra is a native 32bit Win32 application, although it can provide information on 16bit Windows and DOS, too. It comprises 50 information, benchmarking, listing & testing/diagnostic modules. It also features plug-and-play support, and can save, print, fax, email and upload a report it has created. It can also

export reports in various formats: XML, HTML, and SMS for the Microsoft SMS management system. The software runs on Windows 95 or 98.

AudioCD MP3 Studio 2000

This great audio CD shareware tool from Ashampoo allows you to create your own private audio CDs. You can extract tracks from audio CDs, store them, combine them and record your own CDs. Tracks can be read from audio CDs and stored in a space-saving compressed format (up to 1:4) on your hard disk or removable media. You can create playlists of your favourite tracks, including normal and compressed WAV files and MP3 files, and write them all to audio CDs you can play on your stereo.

Key features include:
- extracts tracks from audio CDs with all standard CD-ROM drives.
- supports almost all standard CD writers. Drivers for new CD writers are available free from www.ashampoo.com.
- supports MP3 music files and writes them directly to audio CD
- write speed selection for maximum recording quality
- automatic level adjustment (normalise) while recording
- compressed music file format (eg 1:4)
- management of tracks and artist lists
- all functions in real time.

This software requires a Pentium PC or faster and runs on Windows 95, 98, or NT.

LaserAge 1.9.1 (freeware)

An addictive arcade game with good graphics. Blast that aircraft and go to the next level!

LaserAge is a shoot-'em-up that combines powerups, detailed graphics and lots of action. There are four levels, 18 enemies to fight, nine powerups and full-screen mode. New features include a web-based highscore list.

Requires Windows 95 or later.

CDH Image Explorer Pro 4.4

View, edit and manage your image and video formats. Image Explorer Pro is shareware that enables you to read and write some 70 formats, and has more than 100 image manipulation and processing features. Apart from the standard features (crop, resize, rotate, flip and mirror) it has several advanced features, including:
- batch format conversion among all supported formats
- advanced image thumbnailing and thumbnail browser
- GIF animation creation
- video editing
- 2,000-plus special effects
- Adobe Photoshop-compatible plug-in support
- picture index creation
- slideshow capabilities
- 3D text and shaping.

It runs on Windows 95, 98, 2000, and NT, and requires a Pentium PC, with 16MB of RAM and at least 14MB of hard disk space.

Paint Shop Pro 6.02

Designed for users who want control, power and flexibility, Paint Shop Pro delivers the tools you need to easily capture, create, enhance and optimise your graphics projects. Version 6.01 adds new features such as editable text with character-level formatting, object manipulation and node editing, multiple colour gradients and a multi-level redo option. It also improves compatibility with Windows 2000. The latest version 6.02 includes minor improvement and bug fixes as well as Animation Shop 2.02. For a full list of changes visit Jasc Software's website www.jasc.com/psp602new.html.

Paint Shop Pro runs on Windows 95, 98, or NT, and requires 12MB of RAM and 10MB of free hard disk space. Please note this is a 32bit, time-limited demo.

WinOptimizer 99 Deluxe

WinOptimizer 99 Deluxe can find and safely delete redundant files, recovering space on your hard disk and optimising Windows performance. It includes a revolutionary screensaver that seeks out and deletes data garbage automatically.

This function-limited demo runs on Windows 95, 98 or NT and needs a Pentium 100 or faster with at least 32MB of RAM.

Paragamus SpeedNet

SpeedNet claims to increase your online download speed – with dialup connections seeing a speed increase of about 100-200 per cent, and higher speed connections such as cable modems, ISDN, 56K and DSL by 200-600 per cent.

SpeedNet optimises Windows to allow for the optimum packet size and provide the maximum download speeds.

Please note: This version is function limited. It only speeds up connections that have a 56K or less modem.

BeOS 5 Personal Edition

Thanks to this brand 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.

BeOS 5 is designed to unleash the processing power of modern PCs. Be has created this Personal Edition that fits inside a single compressed file on your Windows 95, 98, 2000, or NT4 computer. This file can be converted into a Windows application that boots and runs BeOS 5. You don't need any special hardware or a separate partition for your BeOS files. And it's free.

As you might expect, squeezing an entire operating system into a single file imposes some limitations. Although BeOS 5 Personal Edition is by no means a 'crippled' version of BeOS, it isn't as robust or as flexible as the real version, BeOS 5 Pro Edition. To purchase a copy of BeOS 5 Pro Edition, go to www.be.com/ products/freebeos/ distributors.html.

Installation

When uncompressed, BeOS 5 Personal Edition inflates to 512MB, so you need that amount of disk space available before you start the installation. (BeOS 5 Pro can be installed in a partition as small as 256MB or as large as your largest hard drive.)

To install, follow the on-screen instructions, then restart your computer.

Unlike most Window applications, BeOS 5 Personal Edition takes over your computer and shuts down Windows and launches BeOS 5. To get back to Windows, reboot your computer. Running BeOS 5 Personal Edition will not harm your Windows operating system – it doesn't delete any data or alter the Windows Registry. When you reboot into Windows after running BeOS 5, your computer will revert to normal.

Remember, Personal Edition lives inside a 512MB file. Some of the 512MB is taken up by the OS itself, and some is devoted to a variable-sized 'swap file' (or virtual memory). After all that is accounted for, you may not have much room left for writing and saving files. To get around this, you can mount other partitions. For example, you can mount your normal Windows partition and read, play and write files you have stored there (though not all files will be recognised by BeOS).

Note that BeOS 5 Personal Edition can only recognise one processor. If you have a multiprocessor system, you should purchase the BeOS 5 Pro Edition.

Cards and hardware

Your graphics card, sound card, network card, or other hardware device may not work with BeOS 5, whether you have the Personal or the Pro Edition. For a full list of compatible hardware, check the list at www.be.com/products/ freebeos/beosreadylist.html.

Before installing BeOS, you should read the notes in the Hands On section of the CD-ROM.

Blender (BeOS and Windows)

Blender is a powerful 3D modelling and rendering package available on several platforms. Featuring a versatile animation system, advanced rendering and deformation tools, inverse kinematics and an editor for post-production, Blender can create commercials and other broadcast quality content, as well as multimedia and 3D

Create broadcast-quality 3D animations using Blender

game content for PCs and game consoles.

We have included both Windows and BeOS versions. The latter can be found in the \software\blender\ folder on the CD,

Pinball's fun with RollemUp

and is supplied as a compressed TAR file. Uncompress this (using WinZIP, for example) and copy the files to a folder on your hard disk, then install from within BeOS. The Windows version can be copied and unzipped directly from the CD menu.

RollemUp

Another good example of what BeOS is capable of is a pinball game, and again we've supplied both Windows and BeOS versions (the BeOS version files can be found in \software\rollemup\ beos\rollemup 1.1\). To get you started quickly, there's also the Windows version you can install and run from the CD menu.

Uninstallation

BeOS comes with its own uninstaller. Ensure that the CD is inserted in its drive, then simply select Start > Programs > BeOS 5 Personal Edition> Uninstall BeOS 5 Personal Edition and follow the on-screen instructions.

HANDS ON

You'll find files mentioned in this month's Hands On workshops in the following folders on the CD: \hands on\databases\, \hands on\pda\, and \hands on\vis prog\. Please refer to the Hands On section in this issue for details of these files.

The CD also contains **RealProducer** and **CuteFTP** – both relevant to this month's Hands On. RealProducer 7.0 converts your audio and video files or live feeds into RealAudio and RealVideo for the Internet or your intranet. Check out the Real website at

www.realnetworks.com/products/producer/info.html for more information about this product and RealProducer Plus 7.0. (See Streaming Media workshop p152.)

CuteFTP 4.0 (30-day trial)

CuteFTP is an award-winning FTP client that transfers files via the Internet faster than any web browser. Its easy-to-use interface and robust features include Encrypted Site Manager, Smart Keep Alive and Quick Connect Bar and make CuteFTP a must-have for beginners and power users.

MessageASAP

MessageASAP is an innovative software package that allows you to access and manage all message types and multiple email accounts, providing total location and device independence.

How does it work?

MessageASAP consists of two major components: OfficeAgent® (which resides on the client PC) and software on the OfficeDomain portal. OfficeAgent, the heart of the system, receives all faxes and voicemail messages. It converts all inbound faxes and voicemail messages to file formats that are compatible with the industry leading browsers. So, it doesn't matter what browser is being used – Microsoft Internet Explorer or Netscape Communicator. And these files can be viewed without any additional plug-ins or software.

Plus, OfficeAgent instantly puts them all in the user's inbox as email attachments.

You can program OfficeAgent so you never miss an important message

OfficeAgent can also be programmed to send an alert to a pager or PCS cell phone when an incoming message arrives so an important email, fax or voice message never needs to be missed. Each message received has specific information attached to it (ie From, Date, Time) based on CallerID. All messages are then uploaded to your POP3 email account. Replies to messages can be done quickly. Every message from a known sender has the correct email address attached to it, allowing easy response via email. In addition, the user's personal address book of phone numbers and email addresses is

online on the same web page.

Work mate

You can use MessageASAP instead of an answering machine, fax machine or answering service. MessageASAP can receive your emails, faxes and voice messages and present them in an orderly fashion on your local machine or on your own web page.

Your personal web page can then be accessed via a browser on any computer that can access the Internet. This will allow you to access, view and manage all of your messages while travelling, no matter where you are as long as you can access the Internet.

SPECIAL READER OFFER

When installed, a code on the CD activates the software. You will receive an email to advise you of this and another at around 60 days alerting you to the end of the free promotional offer. The package also includes the following three products.

MessageASAP Upgrade allows you to retrieve voice and fax messages without having to enter the MessageASAP portal — so there's no need to change ISP, phone number or email address. It includes a further 20MB of disk space on the server, plus AdFreeASAP, which eliminates the banner ads when viewing the webmail account.

MessageASAP upgrade also entitles you to future upgrades and phone support.

AlertASAP is ideal for use when travelling. This premium product sends notification of all new email, fax and voice messages to your pager or PCS phone. It includes filtering capabilities so that you can choose which messages you want to be alerted about.

AutoResponder sends an automatic response to messages received at times when you are unavailable or unable to respond. You can filter AutoResponder and select which messages should receive a response.

DETAILS

PLATFORM Windows 95, 98, or NT4; Pentium 90 or higher; 16MB of hard disk space plus additional space for voice and fax storage; 32MB of RAM minimum; Netscape Navigator 3 or later, or MS Internet Explorer 3 or later; 14K or faster modem, voice/data, speakers and microphone. Caller ID recommended but not required

UNINSTALLING MessageASAP comes with its own uninstaller. Ensure that the CD is in its drive, then simply select Start > Programs > MessageASAP > UninstallMessageASAP and follow the on-screen instructions.

Technical information to help you use the CD

● **How to use the CD-ROMs**
Put the disc into your CD drive:
If you've got **Windows 9x**, the *PCW* interactive loader will appear on your screen. If your CD doesn't autoload, go to Start/Run and type in **<CD Drive>:\pcw.exe** Please note: the CD is designed to run on Windows 9x although some of the software may also run on other versions.

● **Technical support**
We cannot offer technical support on individual programs contained on the CD-ROM. You may find help in the SUPPORT section on the CD, or by visiting the SUPPORT WEBSITE at **www.pcw.vnunet.com/cd**. For general problems with the CD, the Technical Helpline is

open weekdays from 10:30am to 12:30pm and 1.30pm to 4:30pm on **01685 354726**.

● **Faulty discs**
If you have a faulty disc please return it with your name and address, clearly marked
'**PCW CD July 2000**' to:
TIB plc
HelpLine Returns
Unit 5 Triangle Business Park
Pentrebach
Merthyr Tydfill
Mid Glamorgan CF48 4YB
quoting ref '**PCW Vol 23 No 7**'. A replacement disc will be sent to you. NOTE: *These cannot be supplied direct from VNU.*

● **Getting software on to the CD**
Personal Computer World is keen to promote quality software and would like to hear from you if you are interested in having your product included on a future cover disc. For cover-mount enquiries only please telephone Mick Andon on 07968 330670 or email **mick@andon.co.uk**

IMPORTANT NOTICE

The publisher, VNU, has checked the *PCW* CD-ROM for known viruses at all stages of production, but cannot accept liability for damage caused either to your data or your computer system, which may occur while using either the disc or any software contained on it. If you do not agree with these conditions, you should not use the disc.

contents

Alarm sounds as broadband roll-out gathers speed

The roll-out of Britain's toll-free and broadband services began in earnest as the fastest-ever spreading virus (see below and p26) gave a timely warning of the Internet's security problems.

BT has split itself into four fancy new business units and announced charges for its ADSL services, starting at £39.99 a month for a single 512Kbits/sec line. A £150 start-up fee is waived if you register before 30 June.

These charges are likely to set a benchmark for other companies that, under the current system, are restricted to reselling BT capacity. They may undercut BT either by restricting bandwidth or

The Love Bug sparked more criticism of Microsoft (see below) as the company fought the threat of break-up with the offer of a deal under which it would change business practices that are said to include strong-arming rivals and forcing PC vendors to accept unfair deals.

Ironically, the anti-trust case looks increasingly dated, with Microsoft far from dominating emerging markets in web servers and handheld appliances. The launch of its new Pocket PC operating system, which is Windows CE version 3.0 in all but name, was low-key by Microsoft standards and the company could come up with only four licensees (see p27). Pictured above is Compaq's new slimline Aero 1550 handheld, one of two new Pocket PC models launched by the company.

increasing contention ratios (the number of people using a link) or both. But BT has admitted there is nothing to stop users sharing the bandwidth and cost of a nominally single-user line (see p39).

The company has agreed a deadline of July 2001 for unbundling the local loop – allowing other companies access to the final stretch of line from local exchanges, which would enable an open market in services like ADSL.

But BT is defying a call by the European Commission, and the threat of legal action from the US Government, to bring the date forward.

BT also launched an aggressive promotion of its new WAP services. The end of the £22.5b 3G cellular mobile auction presaged still more seismic changes to Britain's comms infrastructure (see p42).

Meanwhile, more companies have offered deals for toll-free 56K access, presenting a confusion of options for users (p34). **New comms special reports – pages 34, 37, 38, 39 and 42.**

Virus offspring renew Love Bug threat

Anti-virus experts warned of copycat variants of the Love Bug worm that swept the world on 5 May causing billions of pounds worth of damage – and said it could have been far worse.

According to Paul Ducklin, head of research at anti-virus specialist Sophos, the Visual Basic Script (.vbs) attached to the worm could have overwritten vital application or system files. 'Anything a program can, it could do,' he said.

One of its tricks was to overwrite any JPEG, VBS or MP3 file; another was to point the host browser at a program which stole passwords, though the server where it was held was quickly

swamped. It also spread itself via chat channels and Outlook's address book.

Microsoft quickly posted patches for all versions of Outlook, making it impossible to launch an attached executable file by clicking an icon on the email. Instead you have to save it to disk before launching. 'It's not completely safe but it stops you launching on impulse,' said Ducklin.

Microsoft came under fire for allowing, as a default setting, HTML files to launch automatically in Outlook. As *PCW* warned early this year (see news February) this can allow embedded Love Bug-type scripts to execute without so much as a click.

Eddie Bleasdale, of Net Project, claimed that the Love Bug would never have happened with Linux. He went on to predict a variant that would combine the spreading power of an email virus with the ability of the CIH virus to overwrite the flash BIOS on some machines. 'That will be able to knock out the hardware in every computer in a company,' he said.

But Ducklin said the problem is as much cultural as technical. He has posted a list of precautions at www.sophos.com. A basic rule to adhere to is: 'Don't open attachments unless you are sure of the source.'
My Love Bug affair – p26

Clive Akass tells how he caught the killer from Manila and learned to love Bill Gates.

Say boo to the killjoys

You can see the temptation. You spend your days doing boring things no-one appreciates with Visual Basic scripts. You think 'If I do this, I could do this, and then that' ... and before long you have a program that will really make them sit up. It is not difficult.

Now it is like having a rock in your hand, confronting a huge window. You have nothing against the window, but something in you wants to smash it. Except that the virus writer can take a shot not just at one window but at hundreds of millions of them across the world. What better chance is a poor kid from Manila ever going to get noticed?

The cleverest part was the marketing, which consisted only of a three-word email header: 'I love you'. A lot has been written about how this touched a basic yearning in computer users who are invariably loners with the social grace of a hedgehog with bad breath (this guff is written on computers but journalists get trapped in their own stereotypes).

In fact the message was hard to ignore, coming as it did from someone you knew. Can you be indifferent to the

Warning sign ... emails to nowhere

fact that your boss, your wife's sister, your husband's brother, the vicar, the milkman, or the man who fixed the drains, is suddenly declaring love for you? If nothing else, it spells trouble.

This is just what happened to millions of people across the world when the Love Bug struck. It was irresponsible, it

cost billions, and it was a pain in the backside, but you have to see the funny side.

I caught the LoveBug from a PR woman in Belgium after the briefest of encounters on a stand at CeBIT. With hindsight, the message sent in her name had 'virus' written all over it. I

should have spotted it, having written a story early this year warning of the danger.

But it was first thing in the morning and I get a lot of jokey email from PR people. Also, I had never seen a .vbs attachment and was curious to see what it could do. I was stupid, and we were very lucky not to have lost many vital files.

I knew straight away that I had a virus because I got a flood of messages from Outlook as it tried to email to everyone in my address book and found some lacked an address. I pressed ALT-CONTROL-DEL and stopped it before it got to the Cs; then I

used Notepad to view the .vbs file. It was bad news. I could see it had written to the Registry, registering my Home Page as a nasty-looking executable on a distant server.

I swapped this back to my own home page and decided to leave the machine as it was until I knew what the other registry entries did – otherwise

I might have had trouble when I rebooted. Then I switched to my backup machine and began to assess the damage. My first call was to Systems but they already knew about the virus: others in the building had been hit. So had the offices of

Click me, I love you... the LoveBug message

just about everyone who called that morning. This virus was a very fast traveller.

Still not grasping just how badly the web had been hit, and feeling like a disgraced lover confessing to having passed on an unspeakable disease, I decided to send warning emails to everyone in my address book.

One recipient replied to thank me for saving him just in time, but of course all those emails were adding to the congestion on the web.

The bug caused a lot of disruption but little hard damage at *PCW* Towers; it overwrote our JPEG image files, but we had copies of most of them in other formats and our systems are backed up – we do practise some of what we preach.

And I found myself getting irritated with people using this as another stick with which to hit Microsoft. Maybe it's the weather; maybe it's the hypocrisy of some of the sharks trying to drag it down; maybe it's the relentlessness of attacks on a company which, like the US itself,

can be seen as both good and bad. Okay, I'll talk to my doctor about it, but I'm even beginning to warm to Bill Gates.

Sure the Love Bug would not have happened with Unix or Linux; it would not happen with Windows either if, like them, it were nailed to the floor. The weaknesses in Windows stem paradoxically from its strengths: its ubiquity, which makes it a sitting target; its powerful, easy-to-use scripting languages; and the multimedia support than can turn emails into a performance art. Microsoft has made no secret of the fact that there is a trade-off between power and security: if you want secure email, refuse anything but plain text; if you want the fun, you have to take the risk of allowing powerful code into your machine.

Microsoft *should* do more sandbagging, but so should we. We are grown ups and can lock our own doors. We have to learn to live with the fact that the Internet will never be completely secure. We can do that without spoiling everything that makes computing a pleasure. What we should not do is to let the love bug turn into a killjoy.

He's feeling unwanted – no-one sent him the Love Bug

Uphill struggle begins

Microsoft has launched a new version of its Windows CE operating system in what could be its final bid to break into the handheld market.

Previous versions flopped so badly that Microsoft has dropping the name CE in favour of 'Pocket PC' for handhelds. The company is insisting that vendors inscribe their models with the words 'Windows-powered Pocket PC' – a phrase that could arguably contravene the Trade Descriptions Act by giving the impression that a device is runs Windows applications.

In fact, the bundled pocket Outlook, Word and Excel are only file compatible with their desktop equivalents, putting them on much the same footing as rival handheld software.

The result is that handhelds are one area where Microsoft has to compete on a level playing field. Company officials admit privately that there is a considerable 'anything but Microsoft' factor among both manufacturers and buyers.

Sony announced, almost simultaneously with the Pocket PC launch, that it was licensing Symbian's rival

Epoc-based platform for its mobiles. And Microsoft managed to line up only four vendors offering Pocket PC devices – HP, Casio, Compaq and Symbol (see the Handheld Rivals box opposite).

But Microsoft is famously good at learning from its mistakes – Windows itself only became successful in its third incarnation – and Pocket PC does seem to be a big improvement over CE.

Features include a Media Player (see screenshot above), which will play downloaded MP3 files and type-enhancing ClearType technology for reading electronic books. A pocket Internet Explorer allows you to view standard web pages either by zooming or scrolling.

Crucially, developers for the platform can use familiar

tools like Visual Basic and Visual C++, and Microsoft has made the development kit available free of charge at www.microsoft.com/ windows/embedded.

But the company faces an uphill struggle: Palm has an 80 per cent market share in the US and a 40 per cent one in Europe, while Psion's Epoc (now owned by Symbian) has 28 per cent in Europe to CE's 27 per cent.

Symbian, an alliance of Psion and cellphone makers, has yet to achieve a market presence. What it does have is an operating system built from scratch for next-generation connectivity, from Bluetooth to GPRS and UTMS. These features are to be added to Pocket PC later this year while models from Palm and its licensee Handspring will need add-on modules for these facilities.

But fast-changing cellular technology is set to transform the use and design of handhelds; with Bluetooth wireless hands-free sets they could largely supersede the mobile phone as we know it. So the market battle between the three rival mobile platforms may not begin in earnest until this technology begins to on-stream next year.

The Cassio-peia E115 comes with 32MB of RAM, a 131MHz NEC VR-4121 processor, 240 x 320 full-colour touch screen. Casio is also offering two ruggedised industrial versions, the EG-80 and the EG-800. Price: £499.99 inc VAT. www.casio.com

This iPAQ PocketPC is one of two models from Compaq – the second, the Aero 1550 is pictured on page 25. The iPAQ uses a 206MHz StrongARM processor, 32MB of RAM and 16MB of ROM and it uses the USB port for PC links. No UK price is available until it ships in June. US price is $499 (£312, or £366 inc VAT). www.compaq.com

Hewlett-Packard's £477 inc VAT Jornada 545 is reviewed on page 92. Its sibling, the 548, offers twice as much RAM with 32MB. Both have a 320 x 240 full-colour display and a Compact Flash 1 slot. www.hp.com/jornada

Symbol PPT 2700 is aimed at the industrial market and has a bar-code scanner and a wireless LAN module. It uses an NEC VR-4121 processor and 16MB of RAM, and can be adapted for wireless technologies like GSM. Price: £849 inc VAT. Symbol 0118 945 7000

Windows gets a Millennium make-over

The last-ever incarnation of Windows 9x is scheduled to ship to PC vendors on 9 June, ready for its launch later this year.

The aim is to install Windows Millennium Edition on PCs being sold for next Christmas, although it will be available as an upgrade to 9x users before then.

Features of the new operating system include rapid booting, better support for home networking and new imaging features.

The Millennium Edition will also include the Windows 2000 feature preventing the overwriting of key system files – an addition that will be welcomed by many users following the latest virus scare.

But the real change will come next year with the release of Whistler, which will see the generation that began with Windows 95 merge into Windows 2000.

Whistler will be compon-

entised, allowing cut-down versions to be installed on mobiles as task-specific devices – even very small ones that might be expected to use Windows CE.

The Millennium Edition will initially be released in four versions: for home users, office users, severs and data centres. But there will be a single set of drivers, helping both developers and users.

The first beta version of Whistler is expected to be available this summer.

Vendors hot on cool chips

National Semiconductor has announced an x86 chip with a claimed 'typical' power consumption of less than 1w, rivalling the Crusoe chips announced by Transmeta in January.

The Geode GX1, which uses NatSemi's 0.18micron process, is the latest sign that chipmakers are beginning to compete on power consumption as well as processing speed, as they focus on mobile applications.

The advantages of frugal chips extend beyond prolonging battery life. They run cooler at any given clock speed, easing device construction and avoiding the need for noisy fans.

The GX1's peak power consumption can be as high as 2.4w, still lower than mainstream notebook chips from Intel or AMD. The GX1 is aimed at webpad devices of a design NatSemi has licensed to several manufacturers. It has VGA and PCI controllers but partners the CS5530 I/O

chip (pictured), so it is not quite a system on a chip.

Transmeta's Crusoe chips, whose developers include Linux guru Linus Torvalds, are said to consume as little as 10milliwatts running an undemanding application; peak consumption is about 2w. However, they require more peripheral chips than NatSemi's and they have yet to appear on the market.

In April the company received £50m in funding from Compaq, Sony, Gateway and AOL.

Meanwhile Intel was preparing to launch a 700MHz mobile PIII using power-saving Speedstep technology which was said to be able to clock down to as low as 100MHz to preserve batteries.

AMD has also launched new mobile versions of its K6-2 and K6-3 chips running at 450MHz, 475MHz and 500MHz using its PowerNow battery-saving technology. These consume at least 3w but are faster than NatSemi's Geodes.

Gateway to free PCs?

Virgin Entertainment is to distribute Geode-based webpads to 10,000 US customers in a move which could herald the advent of free web-access appliances.

PC vendor Gateway, which is also a service provider, plans to be selling similar access appliances by the end of the year and hinted that these may eventually be free. Mike Maloney, vice-president of its consumer division, said: 'With prices falling as they are, the natural conclusion would be for them to be given away.'

Gateway has formed a couple of joint projects with BT. It is bundling BT Cellnet access and an Internet-enabled Nokia 7110 phone with its 550MHz

Performance WAP PC. And, in a recognition of the convergence between comms and computing, it is to install sales units in 85 of BT's high-street shops over the coming year. This will leave it well placed to bundle devices with web service provision.

The Virgin US scheme shows one possible business model. Customers there will be expected to provide personal information and agree to take targeted advertising; the giveaway machines will be primed for linking to sponsor sites.

Another US firm, EISA.com, plans to offer an Internet-enabled DVD player for just £62 to subscribers to its £15-a-month access service.
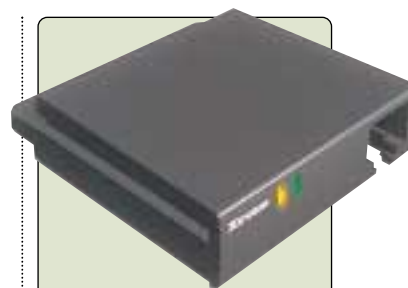
Xircom's SpringPort Ethernet module was one of several add-ons for Handspring's Palm-compatible Visor handheld which launched in Britain for £199 with a PC-synchronisation cradle or £144 without.

Other modules that fit the Visor's Springboard slot include a GPS positioner, a choice of modems, a keyboard and a digital camera.

The past month's activities have muddied the waters still further. Clive Akass investigates.

Unmetered confusion deepens

Confusion over unmetered access offers increased over the past month as more service providers got in on the act to offer deals. But AltaVista, which started the bandwagon rolling had yet to announce a launch date for its unmetered service as we went to press.

A spokesman said: 'It will be soon but, unlike some other service providers we want to make sure we get it exactly right first.'

Rival search portal Excite offered a very similar deal, with a £50 setup fee that it said would be refunded in gift vouchers for spending online.

Charlie Whelan, managing director of The Free Internet group that is partnering Excite in the venture, said the £50 deal worked out at 14p a day for the year – less than the cost of a newspaper. 'We believe that this is an absolutely unbeatable offer.'

World Online offered unlimited access for a £20 start-up for users prepared to switch to its telecom service. The offer extends, without the start-up fee, to Bun.com, Strayduck, Telinco and Screaming.net subscribers that are all now owned by World Online – as is their telco Localtel.

Tiny, which claims to be

Britain's largest PC vendor, offered two deals: £29.99 a month unlimited access, or £6.99 off-peak. Both are contingent on users signing up to Cable & Wireless for their phone line, and the cheaper option obliges you to spend £10 a month on voice calls.

Tiny will be bundling the offer with new machines and it is open to existing customers.

Virgin Net offered 10,000 subscribers unlimited access for £15 a month 'with no hidden costs', but you can sign up now at its website for a national rollout in July.

And NTL extended its

completely free (to its cable subscribers) unmetered service to TV viewers who lack a PC – though they will need to pay £10 a month rental on a modem-equipped set-top box

The best deal for you will depend on how much you use the net and how much you spend on voice calls. But other factors will be impossible to assess until the services get into full swing: will advertising levels be intrusive, and will service providers have enough modems and bandwidth for the increased demand? Even the service providers can only guess at the answers.

Provider	Charges (inc VAT)	Free time	Min voice spend/month	Telco	Available	Broadband
AltaVista www.altavista.co.uk	£30-£50 setup fee then £10 annually	Unlimited	None**	None**	Soon	Nothing announced
Breathe www.breathe.net	£50 startup	Unlimited	None	Any	April	
BT Internet www.btinternet.com	£9.99 a month	Evenings and weekends	None	BT	Now	£39.99 a month home ADSL, £99.99 multi-user business
BT SurfTime residential 1	15.25 a month*	Evenings and weekends	None	BT to any linked ISP	June	
BT SurfTime residential 2	£29.25 a month*	Unlimited	None	BT to any linked ISP	June	
BT SurfTime business	£29.74 a month*	Unlimited	None	BT to any linked ISP	June	
Callnet 0800 www.callnet.net	£19.99 for Callnet dialler, but £20 of free calls	Unlimited	None	Callnet Telecom for web; BT, Kingston or Localtel for voice	Now	
Demon www.demon.net	£11.75 a month	None**	N/A	Any	Now	Trialling ADSL
Excite www.excite.co.uk	£50 startup then £20 a year	Unlimited	None	Any	Now	
Freeserve www.freeserve.net	£6.99 a month for Energis users	Off peak None	None £10	BT Energis	June May	Trialling ADSL
Lineone/Quip www.lineone.net	£20 for Quip dialler	Unlimited	£5	Users keep existing telco and dialler routes calls via Quip	March	
NTL ntlworld www.ntl.co.uk	None in franchise area; £10 startup elsewhere	Unlimited	£10 outside franchise	NTL	Now	Cable modem £40 a month; trialling ADSL
Telewest Surfunlimited www.telewest.com	£10 a month	Unlimited	£10 Telewest's	Must switch to Cable Internet	Now	Cable modem £50 a month; trialling ADSL
Tiny www.tiny.co.uk	£6.99/ £25.99	Off-peak/ Unlimited	£10/ None	C&W	9 May	
Virgin www.virgin.net	£15 a month	Unlimited	None	Any	July ††	Has trialled ADSL
World Online †	£20 start-up, £14.99 monthly line rental	Unlimited	None	Localtel (calls 10 per cent less than BT)	Now	
X-stream www.x-stream.co.uk	None	Unlimited, but ad window permanent	None**	Any	Now	

* Plus approx £4 for backbone link ** BT SurfTime access possible. Deals vary with ISP †And others – see story above ††Now for current subscribers

Broadband for a tenner

Satellites could become the poor man's broadband under price deals being worked out as we went to press.

Eutelsat and Eurosky both plan £10-a-month services with download speeds of up to 2Mbits/sec – upstream rates depend on your local link. Combined with one of the new unmetered access offers, they could provide an always-on broadband link at less than half the price of ADSL or cable.

A previous service set up by Eutelsat (control room pictured) and service provider Easynet has hit trouble because of a dispute over terms.

But Eutelsat launched an independent multimedia service on the grounds that it was being held back by telco partners such as BT.

Eurosky uses the same Astra satellite as BSkyB and can be accessed by a standard analog satellite dish. Eutelsat, which has its own satellite, needs either one of these fitted with a dual-LNB, or a completely new dish. But next year Eutelsat will launch another satellite which will allow its services to be accessed by a dish designed for digital TV services.

Both services need a land link for upstream data, but downstream is beamed by satellite. The one snag of the system is its latency, which can disrupt fast interactivity.

For those who live outside the footprint of ADSL or cable it could offer the only broadband service for years. But in the longer term satellites could have a much bigger role in complementing land-line and mobile services because they remain the most efficient way to broadcast material.

Several developers are already working on gateways that distribute signals from a number of sources round the home like data mains. Web congestion could be eased by broadcasting widely-used information.

Current services require a PC Card or USB box. The one used by Eurosky costs £240 inc VAT, or £311 if you want to receive TV channels as well.

The biggest users of satellites to date have been companies that need to broadcast a lot of data to widely dispersed offices. But this could change rapidly if a critical mass of home users is achieved.
www.eurosky.net
www.eutelsat.com

Blue Jini

Sun's ad hoc networking technology, Jini, will be demonstrated working with Bluetooth at a Java developers' conference in July.

Bluetooth is designed for short-range connections and will need some form of networking to reach its full potential. Jini, which is still under development, allows devices to link into networks and share resources easily. George Paolini, vice-president of Sun's Java community development programme, told a recent analysts' conference that the two technologies are a perfect match.

Microsoft has a rival XML-based architecture called Universal Plug and Play (UP&P).

Weca winners

Fifteen 11Mbits/sec IEEE 802.11wireless networking products have been given a Wireless Ethernet Compatibility Alliance (Weca) seal of approval, designed to ensure compatibility between devices.

The products from seven companies, including 3Com, Cisco and Compaq will carry the alliance's Wi-Fi logo.
VNUNET.COM

Analysts whop WAP 'gold-rush'

Hype about mobile data services is creating false expectations, according to a group of UK analysts. They accuse the industry of promoting 'rather weak' second-generation (2G) services with a vision of what will become possible only with 3G.

The analysts warn that the bandwidth of so-called 2.5G services – packet-switched GPRS, which BT Cellnet is set to roll out in Britain this summer, and CDMAOne in the US – will in practice be more like 14.4Kbits/sec, the speed of a 1994 dialup modem, than the touted 64Kbits/sec. 'You will be able to buy theatre tickets and place bets over the Internet from a 2.5G cellular phone but a video-conference with your Aunt Mabel in Sydney [will be] impossible,' they say in an Ovum white paper entitled *Mobile IP*.

The paper questions the importance of Wireless Application Protocol (WAP), part of which they say will become 'virtually redundant' with fast 3G services. Critics who say WAP is potentially

little better than using the fixed web's TCP/IP stack are 'easy to believe'.

Mobile IP also calls for a higher priority to be given to setting IP standards that let people stay connected while roaming across Europe. The complex arrangements involved in this are dominated by two major consortia, iPass and GRIC, which have considerable market power. 'Roaming needs to be open to all [service providers] on fair terms,' the paper says.

Europe is also in danger of becoming smug about

Ericsson picture promoting mobile e-commerce ... will the reality live up to the hype?

beating the US in establishing a homogeneous cellular network, claim the analysts.

CDMA, widely deployed in the US, is far more easily upgraded to 3G, and Europe's 3G adoption will be patchy for some time. 'If it is not integrated with IP roaming technology then the overall mobility solution in Europe could be worse than in the US.'

A second Ovum paper, *Mobile ecommerce: market strategies*, questions whether

there is a big demand for mobile eshopping. Co-author Duncan Brown said suppliers are pushing the idea because they sense a chance to make money – though there is little, if any, to be made in the short term.

'Business users rather than the mass market will be the first serious adopters, but even they won't pay a premium for existing services that are easier and cheaper to access using the phone or PC.'

The WAP market has all the frenzy, uncertainty and lack of preparedness of a gold-rush, Brown said. He advises traders thinking of going mobile to capitalise on the strengths of mobiles: convenience, local relevance, and personalisation.

WAP hype had led many to believe that mobile shopping will be a reality within the year. But Brown said: 'The industry has not even agreed a framework for trusted and secure payments yet, let alone standardised its technology. It is just not going to happen until these big questions are answered.' Details at www.ovum.com.

Hemingway never had these problems!

Moving to Paris to become a freelance writer fills your head with romantic ideas of the Sartre, Hemingway, and Orwell. Unlike them, I needed to get online and obtain a proper email address. Hotmail has its uses but it also has many shortcomings, not the least of which is the inability to work offline.

France Telecom is still state-owned and, despite some deregulation, it dominates the French telecoms market and charges some of the highest rates in Europe, so you want to

spend as little time online as possible.

Toll-free surfing has yet to hit France but, as in Britain, there are plenty of fee-free service providers. So which one to choose? I opted for the curiously named Waika9, part of 9Telecom, one of France Telecom's few rivals, because it got most stars in a French IT magazine's review of the ISP.

France has embraced the new economy but, being more bureaucratic than Britain, not without the requisite paperwork. As far as I can tell no ISP in France

allows you to register online. You fill in a form online and two days later a letter arrives with a CD complete with a French version of IE 5.0, a user name and password – and then you have to go through the registration process again.

Even then, I could not raise a connection. *Zut alors*! A previous dialup configuration was preventing me getting through. So what could I do? Phone the technical support

line? Not with my French at the level of a three-year-old's. I spent five days trying to reconfigure my system before bowing to the inevitable and re-installing Windows and trying again with a clean system.

That worked like a dream. Now I can go back to my romantic dreams safe in the knowledge that my dialup connection can keep my freelance writing flowing when that great novel doesn't quite work out.

Paul Fisher   *gets online in Paris*

Share, share, even BT says it's fair

Users will be able to share a BT home ADSL connection to cut costs, even though multi-user business links cost twice as much.

Some BT Openworld executives appeared ambivalent when questioned about whether the company would, or could, stop a basic ADSL link being networked. Any block, technical or legal, they said, would be likely to infuriate both users and the industry.

It would prevent the use of web-pads, which allow untethered access via a wireless network. And it would dampen an expected boom in home networking, wired or unwired, as broadband links become widespread and users find they want to spread access around their homes.

BT Openworld's new retail broadband director Marc Deschamps said he believes BT could tell whether a line is being shared, but the company is only likely to take action if it felt the sharing was 'abused'.

The snag of line-sharing is that it can distort the 'contention ratio', in other words, the number of users sharing a channel or port,

which is about eight-to-one on the local link and about 50-to-one further upstream, he said. Service levels are worked out on the load statistics of one user per line.

But his technical manager, Bob Foster, said he would be happy to see people networking links. 'Of course they would have to share the bandwidth between them, and they would not have such a good service,' he said. 'But the more people who get to use the service the better.'

Four people sharing the cost of a £40-a-month

Foster: the more the merrier

512/256Kbits/sec line would, in theory, still have a far better

service than they would get if each paid £10 a month for an unmetered 56K link. Their maximum data rate would still be 512Kbits/sec, while their minimum data rate would be of the order of 56K, and they would not need to dial up.

Foster admitted there is nothing to stop blocks of flats, or even neighbours, sharing lines. But he pointed out that multi-user business lines, which start at £99 a month ex VAT, include service-level guarantees.

CLIVE AKASS

The choice is yours when it comes to firewalls

Security is set to become a growing concern with the new always-on links which can give intruders the run of your hard disk.

Trial ADSL systems that used Network Address Translation (NAT) – which meant they did not have a fixed Internet address and

could not be used as web servers – were tricky to hack.

But BT has dropped NAT for its commercial ADSL systems to enable your PC to act as a web server as well. You might think there is no point to this since BT will offer 20MB of space on its server, which would be faster and offer virtually unlimited access, but you would be far freer in what you could do on your home machine.

ADSL machines will be vulnerable to hackers and

BT is not bundling any form of firewall. 'It will be up to users to choose their own,' said Internet applications technical manager Bob Foster.

Several hardware and software firewall products aimed at home and small-office broadband users are available, *see Roger Gann's Hands On columns for May and June.* The WatchGuard Firebox Solo (pictured), designed for small offices, is sold by Wick Hill.
www.wickhill.com

Motorway madness

The earliest 72-mile stretch of the M1, opened in 1959, was the first arterial road in Britain built from scratch to cope with the modern motorised world. It transformed travel between London and Birmingham, but once you got to the cities you were back on the upgraded cart-tracks that passed for roads.

Forty years later we have an electronic equivalent: an information superhighway with off-ramps that put you on the local loop, the rutted dirt track home. The difference is that roads are seen as a communal responsibility whose primary purpose is to facilitate transport for the common good.

Imagine the outrage if the Government had said in 1959 to the few companies large enough to upgrade the rest of the road system that they should first bid for the privilege, in sums so large as to risk bankruptcy, and that none of the money raised would be pledged to the roads and that users would be charged at a level that recouped the cost of both the auction and the building.

People would have said the auction money constituted a hidden tax on road use, that the system was elitist in barring the poorest from the roads, that it could make transport so expensive as to cripple the economy and that there was a risk that so few people would use the roads that the builders could go bust.

This is pretty well what is being said about the auction for a major slice of Britain's electronic roads programme, set up by a government ostensibly pledged to provide Internet access for all. Five companies, including BT, will have to pay £22.5b between them – more than the gross domestic product of many

The early M1... like today's Internet backbone it led to traffic jams on byroads

PHOTO: P A NEWS

countries – for the right to build 3G wireless services which will probably cost at least as much again to put in place.

Meanwhile BT, once part of the publicly-owned Post Office, has split itself into four trendy business units, and priced its fixed ADSL broadband links beyond the reach of all but the most prosperous homes.

In two recent major BT launches, of ADSL and Cellnet's new WAP services, all the talk was about the money to be made. Fair enough, you might say, considering that the prospect of profit is what drives the rollouts, but there seems at least a possibility that things could go horribly wrong.

Losers in the auction are likely to boost bit-rates of rival GPRS technology to compete with the expensive new 3G systems. More spectrum may be allocated for cellular use, reducing the value of existing licences. And analysts at Ovum (see page 38) are not alone in suspecting that hype over WAP could turn people off cellular technology until it

becomes very much more mature.

Then there are the charges. BT's technical guru Bob Foster, talked blithely of a plumber in the near future using fixed broadband and 3G wireless links to order parts and download a video of installation instructions. What he did not say was how much it would cost.

Look at today's prices: £12 a month voice-phone standing charges, maybe an extra £20 for calls, £40 for the broadband link, say £40 for the 3G standing charge plus £20 for per-megabyte costs, around £20 for cable or satellite TV, roughly £10 for a TV licence. Rounding up those figures, that plumber could easily be paying £150 a month, which could buy a fair class of car.

Foster's colleagues cite market research showing that a lot of people will be willing to pay that kind of money. I doubt it, in the short term. We are still stuck with chicken-and-egg: you won't get a mass market until prices fall; and prices won't fall until you get a mass market.

Britain's national interest

lies, as with physical roads, not in how much can be squeezed from the user, but in how we can best provide an infrastructure people can afford to use. The market will find an answer eventually, when advertising and transaction revenues become significant, but the higher the threshold costs for users, the longer it will take.

If this were the only consideration, that £22.5b should certainly have gone on lowering the threshold. That would be hard to sell to an electorate with other proper priorities, and it may be right not to rush into what is going to be a cataclysmic change.

But if those profits are slow in coming people might start looking at another historical precedent. There was a time at the height of the Victorian railway boom when it seemed that you had only to lay down track to make money. Some investors discovered too late that you also needed passengers. We are still using the railways, but a lot of people went bust building them.

CLIVE AKASS

STORAGE

Zen boosts CD speeds

CD-ROM drives that are claimed to be as fast as many hard disks are on sale in the UK. Their multibeam technology is also being used to speed up DVD drives and CD writers.

Data transfer rates are boosted because seven tracks (or seven sections of the CD's single spiral track) are read at once. One track is overlapped with the next read section and data from the other six is error-corrected and collated by a custom parallel processor from developer Zen Research.

The technology can be used with either Constant Linear Velocity (CLV) drives, where the spin rate varies to give a constant read speed, or the more common Constant Angular Velocity (CAV) drives that have a constant spin rate.

CAV technology places less stress on the disc motor, which can therefore run faster, but data transfer rate falls off considerably as the head reaches the slower inner region. Vendors have come under considerable criticism for labelling drives by the outer transfer rate – a 32-speed CD drive will have an average speed of 14-17-speed.

Zen prefers its multibeam heads to be used on CLV drives where its fast read rates can compensate for the slower motor – and transfer

Multi-beam illumination
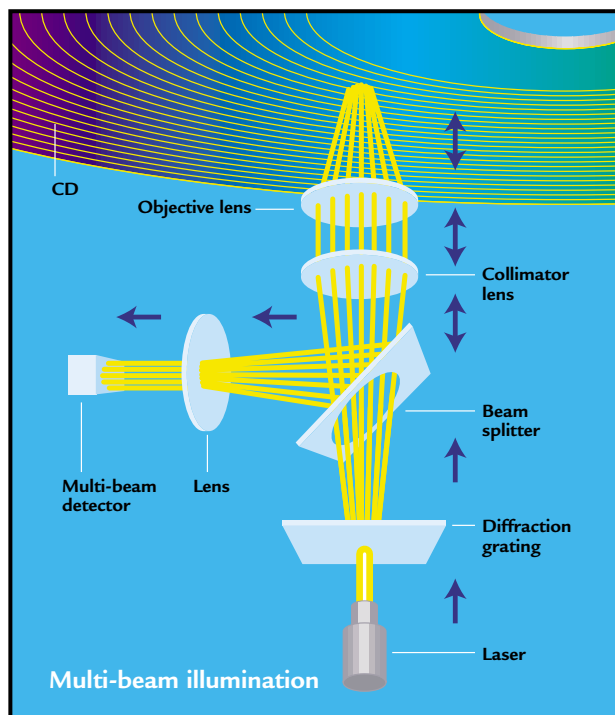
rates are similar right across the disc. For this reason it calls the technology TrueX.

Consumer electronics firm Kenwood, which set up a computer division two years ago, already sells TrueX drives in the US, and a retail version of its 72-speed TrueX drive is on sale now; Zen says at least two other manufacturers are licensing the technology.

TrueX drives can pump out data fast enough for high-quality video without the need for disc caching, said Zen president Emil Jachman.

He predicts the technology will confirm the CD as the standard form of removable storage for PCs.

The multibeam algorithms also help locate the head over the required data, reducing random access times. The current average 50ms is still slower than a hard disk.

The new Kenwood drive has a claimed transfer rate of 10.8MBytes/sec, which is faster in theory than hard disks in most PCs.
*AGP Distribution
01794 528000*

e-Space revisits policy-based compression

On-the-fly data compression to save hard-disk space could be making a comeback – even though storage costs are plummeting, a US company believes. SolutionSoft is launching e-Space, which it says can pack up to 70 per cent more data onto a hard disk.

Stac had a huge hit 10 years ago with Stacker, software that effectively doubled hard-disk space at a

time when capacities were low and prices were high. It later successfully sued Microsoft for subsuming similar technology into DOS.

e-Space differs in that compression is policy based, so it compresses only files that have not been used for a month, leaving recent files uncompressed. SolutionSoft president Paul Wang says this makes the process faster and more resilient as compression

is by file rather than by disk, so any data corruption will have limited effect.

However e-Space will cost around £190 per workstation – for which you can buy a sizeable hard disk. Wang claims e-Space is still cost-effective if you take into account the cost of installing and maintaining the disk – and e-Space bundles storage management features.
www.ideal.co.uk (distributor)

IE5.5 in standards row

Microsoft has been accused of pushing people to use the latest version of Internet Explorer in a replay of the kind of tactics that got it into deep trouble with anti-monopoly authorities.

The Web Standards Project, an international pressure group of developers, says the new IE 5.5 for Windows fails to support key web standards, such as Document Object Model 1 (DOM1) and parts of Cascading Style Sheets 1 (CSS1).

Some Explorer features will only work under Windows because they use proprietary Microsoft technology. The WSP says this 'may lure some developers deeper into functionality that is supported on only one browser and one operating system – Microsoft's'.

However, standards compliance is also an issue for Netscape 6.0, the latest version of the browser Microsoft was accused of bullying into the sidelines. Nearly a decade after the launch of the web there is still no single platform for developers to write to.

A Microsoft statement described IE 5.5 as 'the most standards-compliant' browser available and said 'assertions' made by its critics were wrong. The statement did not specify the assertions it was denying.

However, IE product unit manager, Mark Wallent, said the standards issue is not clear cut. Web authors who wanted their work accessible from every possible system were limited to HTML 3.2, with no CSS and limited scripting.

Equally, current browsers had to be backward compatible. 'We're not comfortable in making a trade-off in which we sacrifice compatibility for the sake of supporting a standard. When we can do both, we do. When we can't, it's a much harder choice,' said Wallent.

An example was CSS1's white-space property, which could cause problems 'with HTML compatibility and parsing rules'.

Wallent said designers for company intranets, which generally have standards of their own, are more concerned with getting innovative features. He admitted that Microsoft did not get off to an auspicious start with its CSS1 support in IE 3.2 but support had been boosted in IE 5.5 to 80 per cent. (see also Reviews p118).

It's show time

When you are put through PowerPoint purgatory as often as **PCW** *reporters, you appreciate a presenter with style. This new PC remote control uses radio, so you can walk around waving your arms as you navigate those gripping slides of sales in Outer Mongolia, untroubled by the need to find an infra-red line of sight. For further special effects, the £159 IntraLink RemoteRF has a built-in laser pointer. And, once you have persuaded the boss to buy one, you can even use it to play Doom from your bed. EmphTek 01258 840939*

Mstream hits

A new distributed denial of service (DDoS) tool could be more devastating than those that paralysed major US sites in February, a security expert has warned. The tools send a series of messages from infected hosts to overwhelm a target server.

The latest, Mstream, is believed to be in the early stages of development, but despite numerous bugs it is powerful enough to disable a website with only a handful of agents, said Dave Dittrich of the University of Washington.

A Canadian teenager, known as Mafiaboy, has been arrested in connection with an attack on CNN's website.
VNUNET.COM

FAST attacks

US software vendors could switch off vital software used by British firms they believe are contravening licence agreements, warned the anti-piracy Federation Against Software Theft (FAST).

The move, sanctioned by the US Uniform Computer Information Transactions Act, could affect any countries that receive US software.
VNUNET.COM

Intel is changing direction and looking beyond the PC for new markets, says Tim Bajarin

A future-perfect strategy

Intel is at an interesting crossroads at the moment. Although PC sales will continue to grow at an average 20 per cent a year, the market is changing dramatically due to the advent of a whole new range of mobile appliances. This explains the increased interest in Intel's twice-yearly conference for financial analysts.

Intel's chief executive Craig Barrett has made an important positioning statement. He pointed out that 'the Internet runs on silicon' and said the plan was to see it run on Intel products. In other words, Intel is no longer aiming its business at just PCs. It is setting its sights on networking components, information appliances and even online services.

In fact, Intel is setting up a major server farm in Oregon that will be able to host thousands of IT and ecommerce sites, including non-US ones. From the comments made by Barrett and other Intel executives, it is clear that Intel has to be looked at as more then a semiconductor company; it is preparing to apply its market clout to other areas.

One strategy for entering new markets will be chip integration. Intel is focusing R&D on various products that combine two or more chips. For example, rather than sell a microprocessor designed strictly for cell phones, Intel will push integrated packages that include a processor, flash memory and a digital signal processor.

It is also trying to extend use of its core chips by encouraging communications equipment makers to adopt Pentium III or Celeron chips rather than task-specific network chips. The company

Taking steps to the future... Intel is concentrating research on highly integrated chips with low power drain to take on NatSemi and Transmeta in the appliance market
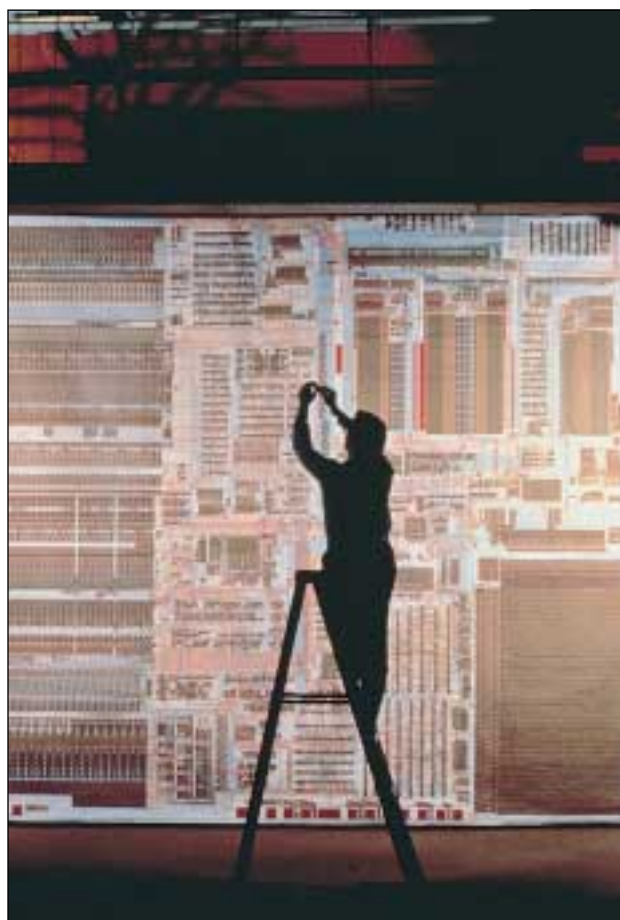
has actually been moving in this direction for some time. 'The more total building blocks a company has, the more it can integrate a total solution,' said Ron Smith, vice-president of the wireless communications computing group.

Intel has set up a £62m investment fund to build up companies, including those outside the US, that use its products.

Intel officials also spoke about their processor road map for the remainder of the year. Willamette, the upcoming successor to the Pentium III, will begin to ship in volume this year at speeds of 1.4 GHz or faster. The Pentium III, however, will not advance beyond 1GHz.

Timna, the codename for the newest Celeron with a

built-in graphics chip, will ship in volume by autumn and a mobile 600MHz Pentium III consuming less that 1w will ship this summer. This appears to be aimed at competing with the low-power Crusoe chip coming from Transmeta, which employs Linux creator Linus Torvalds.

Intel hopes its reputation for quality and support will persuade manufacturers of notebooks and mobile webpads to use the Pentium III instead of Crusoes.

The new Intel chips will also go up against National Semiconductor's Geodes, highly-integrated x86 chips that are used in about 70 per cent of webpad-style devices either on the market or in the works.

Another important chip

coming out later this year is the second-generation StrongARM processor, which will showcase the work of Intel's wireless group. These chips are designed to go into cell phones, pagers and other wireless devices.

In the area of new business products, Intel executives said they plan to build special-function server appliances that perform traffic management as well as voice-data servers. This new strategy clearly pits Intel against many of its current competitors, as well as new companies taking aim at information appliances and networking and communications systems.

With this dramatic shift in company direction well under way, the question is whether Intel can be successful with this new strategy. Trying to be all things to all people is always a risky proposal. And, in order to carry out these goals and still keep up its image as a company with world-class quality control and customer support, it will have to hire hundreds of new workers with new skill sets in a labour market that is already very tight.

But it is run by some of the smartest people I have ever known and if any company can make this transition well, it will probably be Intel. I expect Intel to continue to be one of the most profitable companies in our industry and would not be surprised if it ends up with the lion's share of these new markets.

3G puts vendors under pressure

The £22.5bn 3G auction is likely to put a rocket behind the rollout of new UMTS infrastructure as shareholders demand quick returns. It is also putting pressure on suppliers to come up with future-proof technology.

Graham Maile, director of comms specialist Plextek, speaks of a serious rethink as the high cost of 3G licences impacts industry strategy.

Maile, chairman of the 3G advisory group UKTAG, said first-wave vendors such as Ericsson, Motorola, Nokia and Lucent will be looking for serious orders in the next year or two – two to three years earlier than expected.

US and Japanese firms that had underestimated the significance of European 2G standards were part of a second wave. They had thought the Japanese market would take off first, but now see Britain and Germany as more of a focus for sales.

An alliance between Alcatel and Fujitsu to develop 3G systems, announced within days of the auction, illustrated the determination of such companies not to be marginalised.

'Apart from Motorola and

3G auction could speed up deployment of cellular infrastructure.

PICTURE: NOKIA

Nortel, and to some extent Lucent, North American companies have missed out on the GSM market and are determined to be part of the 3G action,' said Maile.

Unsuccessful high-street bidders, such as Virgin, EMI and Tesco, will become virtual mobile operators by buying airtime wholesale, said Maile. 'Companies such as Tesco or Virgin could create services geared around their brand.'

So whither WAP, GPRS and Enhanced Data rates for GSM (EDGE), the GSM upgrade? The roadmap was GPRS this year, EDGE in 2001 and UMTS starting in 2002; Maile said the rollout may be limited by a shortage of handsets, which can be difficult to produce in high volumes, and UMTS licensees

are no longer under the same pressure to provide GPRS services. He said the dual-mode terminals will allow some operators in Europe to use GPRS in large-cell, low-density areas and 3G in high-demand urban areas.

'Telcos are not going to sit on their licences. The pressure is on suppliers to provide technology that is totally flexible and perhaps reprogrammable.'

Plextek's own spin-off, Radiant, is trialling its broadband wireless systems operating at up to 28GHz. It uses a mesh architecture with relay nodes instead of conventional base stations, providing a greater coverage at lower cost, said Maile.

Ali Pourtaheri, chief executive of cellular specialist UbiNetics, also believes the auction will speed up deployment, and that other European countries will hold a similar sell-off. Germany's forthcoming UMTS auction is expected to raise £31.2bn.

But he warned: 'There is a risk that higher roaming costs could endanger the take-up of subscriptions.'

Caroline Swift *reports from Silicon Fen*

Gordon Laing likes the look of the new Pocket PCs and he doesn't care who knows it.

Mine's better than yours

I recently had a childhood flashback. I'd just started describing my fondness for Windows CE to various colleagues, when I was suddenly met with complete and utter disapproval. 'Oh no!' they cried, 'you can't really be serious can you?' What followed went along the familiar lines of the Psion 5 being the superior-keyboarded PDA, and the Palm V being the preferred choice for discerning pockets everywhere.

In an instant I was transported back to the school playground with me defending my Sinclair Spectrum against the richer Commodore kids. To be honest I don't really mind which PDA (or indeed classic home computer) people prefer, but what I'd really missed in recent years was the passionate defending of your chosen machine.

I used to be a die-hard Psion 5 supporter you know. However, after experiencing problems with decreased

Previous Microsoft Palm CEs promised the world but delivered it IN SUCH A SLUGGISH AND CLUNKY FASHION that you'd get fed up

battery life, and going through several replacements with similar issues, I decided to give Windows CE a shot. While we could argue about operating system pros and cons, it was the sheer convenience of a modem fitted as standard to almost every keyboarded CE device that really sold me. It's hardly rocket science, but clearly a step that has eluded Psion so far.

Today I use a discontinued US IBM Z50 Windows CE device, spotted at a knock-down price of £250 by fellow columnist David Fearon – the *PCW* editorial team cleaned the shop out of this one. Built inside a ThinkPad case, it boasts a superb keyboard and, indeed, this very column was written on it.

But note the discontinued part. That's right, no-one bought the Z50, or indeed Windows CE in general. It got so bad that about half the device manufacturers have abandoned the platform, with IBM, Philips, Everex and Sharp moving on to pastures new. Microsoft too has had a rethink and in April launched the new version,

which is pretty much make or break for the platform.

It may be Windows CE v3 underneath, but Microsoft has dropped all negative branding associations and simply called the new devices Windows Powered Pocket PCs. The Windows-powered badge may be a little misleading for anyone expecting to find anything resembling what they have on their desktop PC or notebook, but note the pocket bit: that's right, no v3 OS for the keyboard-based devices, at least for the near future. No, Microsoft is going after Palm, and this time it looks like it's not going to take any prisoners.

I'll go out on a limb right now and say something that will probably get me lynched at the next Symbian conference: I've seen several of the new Pocket PCs, and you know what? I really like them. While the Windows 95 styling of CE v2.11 may have worked on the larger 'HPC' devices, it was far too cramped on the palm form factor. Microsoft has done the right thing by completely redesigning the UI from the ground up for new pocket devices, dumping unnecessary details like 3D buttons which slowed the whole thing down.

Versions of Word and Excel have finally made an appearance and, supporting Office 2000 formats, they're great for opening attached files. The unforgivable lack of a web browser in Palm CE 2.11 has been addressed, although it remains to be seen how effective its scaling will be on the relatively low-resolution display. The Transcriber which lets you hand-write anywhere on the screen, and have it recognised and turned into real text is very impressive, and the whole system also feels much quicker too. Best of all, though, Pocket PC boasts a proper audio media player with big friendly buttons and a headphone jack, allowing the devices to double as portable stereos.

Previous Microsoft Palm CEs promised the world, but delivered it in such a sluggish and clunky fashion, that you'd get fed up and reach for the pen and paper instead. These new Pocket PCs are a different kettle of fish though. However much Palm and Symbian defenders believe Microsoft has no part to play in the handheld world, the fact is, Pocket PC looks like a winner. If the device manufacturers get it out sooner rather than later, and at a competitive price to the Palms, then it may be time to discard those anti-Microsoft prejudices, and maybe even your old PDA.

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Barry Fox is fed up with BT and suggests if you've got a complaint, get on the hotline to Oftel.

Pity poor, I mean inept, BT

The words may sound dull, but their importance is colossal. Telecoms watchdog Oftel is pushing through 'local loop unbundling'. Trials will begin in January, with a full service on offer by July 2001 at the latest.

BT owns the copper wires into at least 20 million UK homes. So, unless those residents have signed up for any one of the cable services, all phone calls into and out of those homes must rely on BT's wires. To use alternative services, such Eurobell or Mercury, the subscriber must enter key codes before a call (either from the phone's memory or a plug-in adaptor), which routes calls out of the BT network at the nearest exchange.

Oftel's unbundling gives BT's rivals direct access to the company's copper wires: they can install their own equipment in BT's exchanges. This is possible because replacement of the enormous old analog Strowger equipment with compact computer switch racks left the exchange buildings nine-tenths empty. Now, over a dozen companies, including NTL, Energis, Colt, Easynet and MCI WorldCom, are filling that empty floor space with ADSL modems that will talk direct to matching modems in consumers' homes and offer always-on net access at several Mbits/sec at the same time as plain old telephony speech.

Kicked into gear by this first real level-ground competition, BT is offering its own ADSL service. So, at last, UK consumers have access to affordable, high-speed data.

But spare no sympathy for BT. It has messed up on new technology, and got away with it, for much too long. And exciting new developments are still being mishandled through poor management.

ISDN, for example, has been so over-priced and badly sold that it will be killed by ADSL before it ever breaks through. And when hackers demonstrated that Prestel viewdata security was hardly secure by going into Prince Philip's mailbox, BT vindictively prosecuted.

BT's defunct Telecom Gold email system was horribly unfriendly and could not be modified to take an @ symbol. Online directory service PhoneBase was then built on the same technology as dead Prestel; it needed the old 'accept' key found on dumb terminals but missing from PC keyboards. The first Electronic Yellow Pages was also based on Prestel and an obstacle course to use.

Unfortunately, the EYP Help Line was nothing more than an answering machine.

Phone Disc, the CD-ROM version of BT's paper telephone directories, was launched at £2,200 ex VAT for a one-year disc. After years of pitifully slow sales, the price was dropped to £200 and BT tried to sue cut-price rivals. It has now been at least a year since BT dropped the price to £40, yet it never even issued a press release.

The first launch of BT Internet was a fiasco, with buggy software and helpline staff who admitted that they could not help.

Link stores claim it is easy to use a Cellnet SIM in a new WAP phone. But it isn't. Step one is to get the SIM card enabled for fax and data; step two is to set up the services option which involves saving an SMS file that contains the settings. The Cellnet Help Line (08705 772255) charges a national rate (8p a minute peak) to play recorded options before referring callers to the Genie helpline (0906 3020220), which charges 50p a minute. Genie promised to send me an SMS settings message but never did. When I called back, it referred me to Cellnet.

Now MMail promises WAP-like services with an ordinary cellphone. Enter the destination email address (with ! if there is no @), leave a space, write a message and send it to 212. Mail came through to my PC, but replies

If you need help call BT Customer Services, says the company's MMail literature, WITHOUT GIVING OUT A NUMBER to call

did not go back. If you need help call BT Customer Services, says the company's MMail literature, without giving out a number to call. The usual number, (0870 5772255), wasted my time at national rates before admitting, 'We're not properly trained, try data and fax services on (0345 196000)'. They couldn't help either. MMail shouldn't even work at all until enabled by keying 'on' and 'sending' to 212. Cellnet is still trying to work out why MMail can be sent before this is done. Cellnet group product manager for text messaging Sam Whitely says the missing phone number is nothing to do with her and all Cellnet's helpline staff are fully trained.

Enough of this! I have asked Oftel to investigate. If you have suffered similar problems, tell Oftel too.

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Brian Clegg pushes paper aside and extols the virtues of working with electronic documents.

Paper chase, lost the race

I was fascinated by a throwaway line I came across recently in a report on application service providers (ASPs) – the companies that rent software. The report noted that desktop productivity packages (word processors and the like) were ideal candidates as 'they require an inordinate amount of IT time and resources to maintain... despite the fact that they are not core applications'.

I'll be coming back to ASPs in another column. But for now, just think about those words, 'not core applications'. Could the report have got things back to front? Certainly traditional computer programs such as payroll and invoicing are needed for a company to function, but all they do is enable things to stay the same. With these systems alone, a company would be doomed. To thrive there has to be communication and change, and that means a flow of documents. And what produces documents? Those non-core applications.

In the early days, documents meant paper. It's easy to

> **It's easy to mock paper-pushing, but it kept the MACHINERY OF BUSINESS flowing. At first computers did little to change that.**

mock paper-pushing, but it kept the machinery of business flowing. At first computers did little to change this. Mainframes don't work like people. They aren't document-driven. But the arrival of the PC did more than put computing power into the hands of individuals, it brought the document into the electronic world. Two further developments have reinforced this move: networking and formatting.

Document networking began with sneakernets, shifting files from place to place on floppy disks without ever producing paper, but it was the LAN that launched the edocument revolution. LANs made it simple to dump a document onto a shared drive to be picked up by someone else, like pinning it on a noticeboard. This technique was soon enhanced by email, a technology that evolved on the Internet's ancestor ARPANET. With software to aid collaboration, from bulletin boards like Lotus Notes to sophisticated

team functions in word processors, edocuments have become practical tools.

Some would say that the second development, the ability to format documents, is a major contributor to wasted business time. When you had a single font and no fancy layouts, you just wrote a document. Now you design it, and redesign it. Once the initial thrill of being able to lay out a table 500 different ways has been overcome, users settle down to produce documents just as fast as they ever did – only they look a whole lot better. And illogical though it seems, that means they are more likely to be valued.

At their most sophisticated, electronic documents can rival and better print. In my office I don't have a stack of *PCW* magazines; instead, a couple of neat CD-ROMs hold more than four years worth of issues. This is possible because the document is formatted using Adobe Acrobat. This sophisticated electronic document software can reproduce every nuance of the page layout. Unlike the paper edition, I can search the whole CD. In the latest version, Acrobat 4, it is also possible to reproduce other facets of the conventional document. For example, an Acrobat file can be distributed and signed digitally, just as a real document can be passed around for signature. It seems to me that document-oriented desktop productivity packages are about as core as you get.

The subject of unmetered phone calls for web access has cropped up in this column before. And right about now, BT should be launching its unmetered service, Surftime. This was announced in the same week as AltaVista, Telewest and NTL's unmetered offers, though BT claims the timing was just a coincidence.

Surftime seems good for companies. Unlike its competitors, it is available for business use. And, BT stresses that Surftime can be used with any ISP supporting 0844 numbers, while its competitors tie you into one source. But there is a teeny catch. At the time of writing, few ISPs have taken the plunge. They are, no doubt, nervous of the impact of longer connection times on their servers. The service provider my company uses, Mistral, is 'studying BT proposals' and 'as such no decision has been made'. By the time you read this, things might be different and there may be a host of industrial-strength ISPs lined up behind Surftime.

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Sometimes, the only thing that separates a popular site from an unpopular one is perception.

A lumpy playing field

After writing last month's Retro column on the BBC Micro, I found myself drifting into that saddest of all geek realms – the vintage computer collector.

In my subsequent web wanderings, attempting to find the computers of my youth (anyone got a ZX80 or Acorn Atom they don't want?) I stumbled on a new and fascinating way to make myself poor: online auction sites. Don't worry, I'm not going on a nostalgia trip: check out Niall Magennis' account of the Amstrad CPC series of machines in this month's Retro for that.

It's just that auction sites illustrate one of the features of web commerce that eager businesspeople tend to overlook. That feature is the flip-side of the web's levelling effect: the popular Utopian view being that small companies can set up shop on the web free of conventional overheads and have a perceived presence as impressive as a multinational company.

> **Things may start out level, but ONCE A SITE HAS A SMALL LEAD the web accentuates the idea of branding rather than levelling things out**

True enough, but a conventional shop or business has to compete with perhaps half a dozen others in its area: there's plenty of custom to go around. A website has to compete with every virtual retailer on the planet involved in selling that line of goods or services: there's no sense of location and no captive customer base.

Website success is like a weather system; unpredictable, unstable and, in some senses, independent of quality. The ease with which millions of surfers can hop over to another site when they're looking for a particular product or service leads to an interesting effect. When there's no money involved, the effect is stalled: I can open 20 different browser windows on the subject of canine distemper or the mating habits of the Tuscan mountain goat, and pick the best one based on what I see. There's no risk, so I can trust my own judgement. Non-commercial sites also link to others in the same field, generating cross-traffic.

When I'm in consumer mode, however, things are different. Where our own money is involved, we tend to be cautious: if site A only has a few hundred hits per day and we've not heard of it before, the chances are we'll hop over to site B, because it looks more reputable, professional, safe or whatever. It only takes a tiny difference in the quality of one site, or a national ad campaign or random luck, for it to get marginally more visitors. Once that happens, a positive feedback loop takes hold, driven by the subtle workings of the FUD (fear, uncertainty and doubt) factor.

The safer a site appears to be relative to the competition, the more hits it generates. And the more hits it generates, the safer it appears to be. That tiny difference in initial conditions generates an avalanche of hits further down the road. It's the virtual equivalent of the butterfly effect, where the air disturbed by the wings of a butterfly in India can, in theory, precipitate a typhoon in South America.

Things may start out level, but once a site has a small lead, the web accentuates those boring classical retail ideas of branding and market presence rather than levelling things out. Think of an online bookstore, any online bookstore. Did you think of Amazon? I'd be really impressed if you didn't.

I conformed exactly to the model I've just described while looking for a site on which to bid for 20-year-old computers, opening a dozen-odd browser windows containing different auction sites and immediately closing all but the two that seemed to have by far the most bidders and sellers: QXL and eBay.

At the moment, there are thousands of commercial web start-ups, and venture capital isn't exactly hard to come by these days. But the less successful are going to fall by the wayside very rapidly and be swallowed up by the leaders in a familiar echo of current conditions in the real world.

And while we're on the subject, auction sites are good for a bit of entertainment too: check out the domain name auctions. Anyone fancy owning daylight-robbery.com for a minimum bid of £15,000? No? How about double-glazed-windows.co.uk, starting at £795? Perhaps not. But who can pass up the chance of owning charliedimmock.org.uk when bidding starts at a mere £100? Believe it or not, those were some of the better ones available on QXL the day I had a look.

davidf@pcw.co.uk

letters

LETTER OF THE MONTH

TELEMARKETERS HIT BY DISHONESTY VIRUS?

As a home worker I get many phone calls from canvassers, usually hard-pressed students earning a crust in a call centre. I recently filled in an online form for regular updates on information from a certain company. Not wanting to have a mailbox crammed with junk I left the email field blank.

A few weeks later I got a call from a nice man purporting to be from said company explaining that its database had been hit by a virus, eradicating all the email addresses from their records. I suggested to the caller that this was a pretty odd virus, beautifully crafted to hit such a specific area of a database. He agreed that it must be a 'most remarkable' bit of code. His answer had incredulity written all over it and he clearly knew that the virus story was nonsense.

On further questioning he told me that he was only using the words on the 'script' supplied by the management. He was studying statistics, clearly knew a fair bit about computing and conceded that the story was a cover being used to fill in any empty fields on the database. Is this a new virus spreading through the world of telephone marketing, not a computer virus but just another of those little germs of dishonesty which slowly and inexorably causes you to lose faith in humanity?

DYLAN WINTER

DENY RESPONSIBILITY AND LET THE USERS SUFFER

For a long, long time now I have been bombarded by CD after CD offering the best and cheapest Internet access, with AOL and CompuServe fighting for the right to be my newest drinks mat.

But that is not my concern. One day, for the first time ever, I decided to read the small print on one of the CDs from my amassed collection – just for kicks. AOL was top of the pile and what I read surprised me greatly but worried me more. The legal disclaimer stated: 'AOL and its affiliates cannot accept responsibility for any disruption, damage and/or loss to your data or computer system that may occur while using this CD, the programs or data on it.'

Now, I know that legal disclaimers are all fine and dandy and absolve even the devil himself of guilt if God signs along the dotted line, but should computer companies really be allowed to make these cover-all declarations?

What they are saying is 'our program could well cripple your system but if you're fool enough to use it then that's your problem'. Why don't they go a step further and say something like 'just looking at this CD makes every program that we have ever written free from any legal prosecution by you even if they are specifically designed to do nasty things'?

I don't think it's fair for a company to say it's not responsible for any damage that it expressly causes. What if I installed some software and then because of that some system files or the Registry got corrupted? They are saying that they are not responsible even though it's clear that the error originated from using that program.

This is quite a far reaching situation and, with the advent of the Internet, a global problem. I think the computing world needs to set some standards whereby companies can't just print a disclaimer and escape blame. Just think how much better the software produced would be if companies were responsible for any damage their programs caused.

Isn't it about time governments or the courts passed a law that made each company responsible for the damage that it may cause so they are no longer able to hide behind a shield of legal red tape? Unfortunately, because of the international nature of the manufacture of programs the passing of a law such as this would be a problem.

I never realised just how much of a grasp the software market has over society – it's pretty much what they say goes. If you try to stop or regulate them, they just exclude you from their business and it is you who must suffer that loss, while the company continues elsewhere.

In the June issue of *PCW* (p26) Tim Bajarin gave a good example of these tactics in action. Microsoft has a problem with the US Government but, because of its international status, it can just move production to another country and the good old USA doesn't have a leg to stand on. Software companies choose to hide within the legal complexities rather than to produce faultless quality goods knowing full well that, unless your country is willing to pay millions to prosecute them through a long legal battle, they are going to get away with it.

Absolve the devil of guilt if God signs along the dotted line

If such a law as described above was passed, we would see an end to shoddily manufactured programs because companies would be investing more time into making stable and reliable programs due to the fear of prosecution. I realise the speed of production would go down but I am willing to wait for quality which has had proper testing – though I doubt it will ever happen.
RICHARD LEE

IN SUPPORT OF PENGUINS
With respect to Peter Henderson's letter in the June issue, entitled: 'What do you get if you cross a penguin...? I have been running SuSE Linux for 14 months and haven't had a 'major' problem with its operation. I am a hardware engineer and am well practised the art of installing Windows 95 and 98. I was shown Linux by a colleague who was running Red Hat 4.2 and I thought I would give it a try. I obtained my first copy of SuSE Linux at version 5.2 from a magazine cover disc. I will admit that I didn't get along with it, but decided to purchase a copy of SuSE 6.1 when it became available.

I ran this copy quite happily and upgraded to version 6.2. I did encounter a problem accessing the DNS server information for my ISP, but I found out a file had been omitted from the distribution by SuSE. A quick visit to its FTP site to obtain this file corrected the problem within a minute.

Now I am up to the 6.3 release and have obtained some more hardware. I have a Sound Blaster card. I discovered

that the Open Sound System software didn't support this card and thought it would be a problem. However, a quick read through the Linux Documentation Project that comes with SuSE distributions advised me what to do. Once the modifications had been implemented the card worked fine and as well as it does under Microsoft OSs.

I also have an Allied Telesyn UTP/fibre-optic network and have successfully configured my system to run as a server between myself and my other half's system. Once connected up, I configured the IP Masquerading and firewall software to allow my other half to surf the net at the same time as I do.

Setting up SAMBA, Apache and other software was made a lot easier by the purchase of Sybex' Linux Complete book. I have now got to the point of dual-booting Linux and 95. But 95 is there mainly for Windows applications. However, Microsoft Office documents can mainly be read through Sun StarOffice, so I don't worry too much about Windows.

In his letter, Peter Henderson said that 'As a serious alternative to MS Windows, for the average user, I think not.' It may not be ready for the big screen, but (a) it is only nine years old, Windows is 17 years old and (b) Linux has certainly started to make inroads over Windows in the past 12 months.
STEWART SMEDLEY

REGISTRATION HAS A ROLE
In response to Irfan Shaffi's letter in June's issue, about registering software, I work for a company that produces software and we encourage customers to register their purchases. Not, as Mr Shaffi implies, so we can sell their details to the highest bidder. Nor is it because we love to spend our time deciphering the scrawl that appears on the cards so we can enter them in our database – just for fun. No, it's so we can inform our customers about new versions and patches for the software they have

bought, because they prefer to be told by us than have to check every few months.

We have also found that customers have a nasty habit of throwing away the packaging – and with it all the serial numbers for our software. When they next come to install the software, oops, no serial number. They call us up and the first question we ask is 'Did you register the product?' If yes then after a quick look in the database we can give them their serial number. If no then it's proof of purchase or no go.

Of course, this is all our fault and we're being totally unreasonable, but I can't tell if you've genuinely lost your serial number or if you've bought a copy from the bloke in Charing Cross Station for a tenner (and yes this has happened). So while I admit sometimes there seems little point in registering, one day you may find it's actually worth your while.
DAVID PHILPOTTS

GROW UP – GIVE US SECURITY
The recent outbreak of the LoveLetter virus prompted me to write a letter. Industry commentators frequently urge users never to open email attachments, or at least to open only those sent by prior arrangement. However, this is not always feasible.

Technology becomes valuable once it has found a role in mainstream economic life. Email has done, but the IT industry that created it must support the way users wish to operate it, not how the creators originally conceived it.

As a finance consultant, I routinely exchange work with my clients and associates in Word and Excel formats using email attachments and that has become a way of life for many businesses. To protect myself, I buy the best anti-virus software I can find and keep it up to date, but that protection is not wholly sufficient. The advice of 'Don't' is about as helpful as that given to my sister by my maiden aunt ('Just say no'). It doesn't fit with the aim of making the technology work for the user rather than vice-versa.

What is needed is for the industry to develop a methodology to make email safe in the same way as safety is accepted as paramount in other technologies (eg engineering). That is why I find ideas such as Digital Immune System and Artificial Immune System so promising.

It is time for the IT industry to grow up and provide users with the security they need.
CHRIS BUNTON

REVIEWS

contents

Beware your Colvin OSR2

Nik Rawlinson
DEPUTY EDITOR

RSI, eye strain and carpal tunnel syndrome have had more than their fair share of press in recent years. Employers are quickly realising that they are the cause of several thousand lost (wo)man hours each year, but there is something potentially more disruptive in every large office in the UK and beyond – a Colvin. If you work in an organisation with 50 or more PCs there is a good chance that you are running a Colvin OSR2 or above.

If you didn't install Colvin yourself there's a good chance your employer set it up as a shared resource. It's a hardware device most likely sited in the vicinity of your servers, soothed by the

IT strategy. End users have neither the time nor, in many instances, the ability to maintain their own machines. The trouble starts when systems departments impose draconian rules company-wide with little apparent comprehension that users, whether on an individual or a departmental basis, have differing needs.

Rolling out NT across 1,000 desktops is a sensible move as far as stability and security are concerned, but if Colvin's aim is to use it as a way of restricting users' ability to tailor their machines to work in a way with which they are happy, then clearly something is wrong. He is doing little more than encouraging them to format the drive in favour of an unauthorised copy of Windows 9x.

If you didn't install a Colvin there's a chance your employer set it up as a shared resource

strains of Jean Michel Jarre. It has the ability to invoke automated relocation routines to undertake autonomous 'audits' or 'installation base authorisation routines' on your notebook or desktop PC. Often, though, these seem to do little more than hamper your workflow for 10, 20, 30 minutes and give little in the form of useful feedback. Colvin OSR2 has been known to delete or move files and data without first obtaining user confirmation and is often criticised for its unfriendly user interface.

Sound familiar? Perhaps I should explain: Colvin OSR2 is not something you can actually buy. Installation is free, but your organisation will have signed a service contract, usually with a one- or three-month notice period. If you've not yet worked it out for yourself, Colvin is an IT support department employee. Of course, your particular installation might not be a Colvin – that's just a name I picked at random – but it's likely the effects will be much the same.

Don't get me wrong – systems engineers have a vital part to play in the smooth running of any large corporate's

The systems department has a fairly tough job here at VNU, maintaining a network of 500 or so desktop machines, of which around a quarter will be subjected to the installation of anything up to half a dozen or so new applications each week for 'testing'. We work in the heart of Soho's media district, yet I can think of few other organisations that would have such demanding requirements on the stability and flexibility of its network hardware and support staff. Yet even those departments that support far less demanding users often fail to see the importance of a flexible corporate IT strategy.

Preventing users from rearranging the Start menu may make life easier for the small number of people working in the systems department, but if it made life easier and more productive for the end users then is that policy not back to front? Surely the needs of the many outweigh those of the few and Colvin ought to realise that an indication of a job well done is not necessarily that the support department has very little left to do in the way of a job.

VNU European Labs

VNU Labs tests all kinds of hardware and software, from PCs and modems to databases. All our tests simulate real-world use and for the most part are based on industry-standard applications such as Word, Excel, PageMaker and Paradox. Our current PC tests for Windows 98, NT and 2000 are the SYSmark tests from BAPCo. In all our performance graphs, larger bars mean better scores.

ratings

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

Mesh Matrix 900 GT Live

A 900MHz Athlon machine that is not quite cutting edge, but a real winner all the same.

Mesh is no stranger the the cutting edge of computing, as last month's 1GHz Athlon proved. This month, however, Mesh has decided to take a small step back from the cutting edge and produce a great high-spec machine at a reasonable price.

It's common knowledge that dropping the processor spec a generation or two will save a lot of money without sacrificing a huge amount of performance. In testament to this Mesh has equipped this PC with a 900MHz AMD Athlon CPU and backed it up with 128MB of PC100 SDRAM. This specification produced a SYSmark score of 158, which is very reasonable when you consider that last month's 1GHz Mesh machine scored 171.

As far as 3D performance goes, the Matrix managed to beat its 1GHz sibling turning in a score of 5,514 compared to 4,653, although there is a very good reason for this. Sitting in the AGP slot is a graphics card sporting the new GeForce 2 chipset from nVidia. We've had a good look at this new chipset (see page 96) and it's a very fast graphics solution. As well as sporting 32MB of DDR memory running at 333MHz, it also has the ability to apply multiple textures to a single pixel. There's also the second-generation transform and lighting engine on board, ensuring that you're well and truly future-proofed.

Making the most of the graphics card is a Mitsubishi Diamond Plus 91 monitor. This is a great display with a 19in natural flat aperture-grille tube producing a sharp and vibrant image. You shouldn't have any trouble spending hours sitting in front of this screen, without the slightest hint of eye strain. Even running a resolution of 1,280 x 1,024 results in a clear, well-focused and easy-to-read image.

All three of the 5.25in drive bays are occupied, but with this array of peripherals you're unlikely to want to install anything else. In the top bay is the Creative Live! Drive II that provides digital and analog input and output ports for

out, MIDI ports and headphone and microphone sockets. This is one of the best sound cards you can buy and the Labtec speakers do a good job of amplifying its output.

The other two bays are filled with optical devices. The Pioneer DVD-ROM drive provides 10-speed DVD performance and 40-speed CD performance. The other optical unit is a Panasonic CD-RW drive which provides eight-speed CD-R, four-speed CD-RW and 32-speed CD-ROM performance. The internal storage is taken care of by a 34GB IBM hard disk, which should be more than ample for quite some time.

Input devices are also first rate with a Microsoft Internet keyboard married to a Microsoft IntelliMouse Explorer. The latter is a great device and sports Microsoft's new optical mouse design, so you never have to worry about the mechanics getting clogged up. It also has five buttons as well as the scroll wheel.

The inside of the case is up to Mesh's usual high standards with all the major components unobstructed. The only sore point is the digital DIN cable that stretches from the Live! Drive II to a

the SoundBlaster Live! Platinum hiding within the case. To cater for all your devices you get optical digital in and out, co-axial digital in and out, analog in and

backing plate at the bottom of the case. Obviously Mesh was limited in its options for keeping this cable tidy since it's not very long, but it's a shame to spoil an otherwise faultless interior.

On the whole this is a stunning machine with just about every base covered well. Mesh is shooting for the high-tech enthusiast with the Matrix, and it's got the balance just about perfect.

Even though the CPU is a step down from cutting edge it's still more than fast enough for almost anything you're likely to throw at it. Add to this the incredible price of only £1,599 ex VAT and you've got a real winner.

RIYAD EMERAN

DETAILS
★★★★★

PRICE £1,878.82 (£1,599 ex VAT)
CONTACT Mesh 020 8208 4706
www.meshplc.co.uk
PROS Fast, feature-packed, great value
CONS None
OVERALL A great PC at an amazing price. If you're looking for a high-spec system this should be top of your list

PERFORMANCE RESULTS

0	100	200	300

158
SYSmark 2000

0	1,000	2,000	3,000	4,000	5,000	6,000

5,514
3DMark 2000
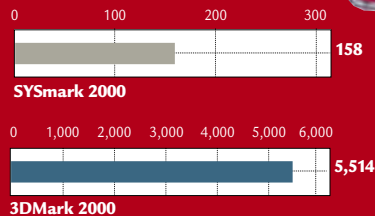
Carrera Cygnus M933 S

This 933MHz PC offers lightning-fast speed, lots of power and great graphics.

Like Mesh, Carrera has seen the benefit of stepping the CPU down from the 1GHz cutting edge (see previous page). However, Carrera has gone for an Intel solution rather than an AMD one. Strangely, though, this 933MHz Pentium III chip is brand new, newer in fact than the 1GHz we saw last month. Basically the race to release the 1GHz chip meant that Intel made the faster chip available first.

Unlike the 1GHz Dell we saw last month, this Carrera uses a Flip Chip incarnation of the Pentium III. The CPU resides in a Supermicro FC-PGA motherboard with two DIMM sockets. Even though the motherboard sports the Intel 820 chipset, Supermicro has not included support for RAMBUS memory due to the high price premium that RIMMs carry. One of the DIMM sockets is filled with 128MB of PC100 memory. This will slow the system down somewhat since the memory translator will have to be employed to allow the system to talk to the SDRAM. That said, the Cygnus is anything but slow.

Also like the Mesh, the Cygnus sports the cutting edge of graphics card technology. Filling the AGP slot is a 3D Power graphics card that incorporates the nVidia GeForce 2 chipset. This is the ultimate 3D card of the moment and it helped the Cygnus score an amazing 5,916 in the 3DMark benchmark. It also managed a very impressive 87.9fps in Quake III at 1,024 x 768 and 77.3 at 1,280 x 1,024, both in 16bit colour, making this a fantastic machine for games. As well as lightning-fast performance, the GeForce 2 has the richest feature set that you'll find in a graphics card.

Obviously a good graphics card needs an equally good monitor to make the most of it. Carrera has gone for a 19in Iiyama Vision Master 451. Although this doesn't sport the NF aperture grille tube of the Vision Master Pro version, it's still a great display and a fine example of shadow mask technology. With a screen this size you can easily work at a resolution of 1,280 x 1,024 without hurting your eyes. It also makes the most of the high-resolution 3D performance of the GeForce 2. You could even try playing Quake III at 1,600 x 1,200 – we got a score of 55.5fps at this resolution.

Two of the five PCI slots are occupied, one with a sound card and the other with a V.90 modem. The sound card is a Creative SoundBlaster Live! 1024, a decent card that will be more than adequate for playing the games this machine is so good at. A set of Altec Lansing surround speakers continues the entertainment feel. The combination complements the high-tech graphics well.

Another very impressive aspect of the Cygnus is the storage solution. Residing on the primary EIDE channel is the latest hard disk from IBM sporting a massive capacity of 45GB. It's fast, too, with a 7,200rpm spindle speed and a 2MB data buffer. The eight-speed DVD-ROM drive shouldn't take long to install your applications to the hard disk. It also reads CD-ROM media at a very respectable 40-speed.

There's loads of expansion room in the case, with three 5.25in bays free and one free external 3.5in bay.

The Key Tronic keyboard and Microsoft mouse are standard Carrera fare. Both are quality items although we would have preferred a wheel mouse. There is also a two-year on-site warranty.

Carrera has built a very fast system, as fast as the 1GHz Athlon machine we saw last month. Had there not been the performance hit caused by the memory translator on the 820 chipset it would have been even faster. With a price of £1,799 you're getting a lot of power for your money and you're only a small step away from the 1,000MHz mark.

RIYAD EMERAN

DETAILS
★★★★

PRICE £2,113.82 (£1,799 ex VAT)
CONTACT Carrera 020 8307 2800
www.carrera.co.uk
PROS Very fast, cutting-edge components, ideal for the hard-core gamer
CONS No removable storage, a little pricey
OVERALL Carrera has proved once again that it's at the cutting edge of PC technology. If you want a lightning-fast machine, especially for games, this should be right up your street

PERFORMANCE RESULTS

0	100	200	300
			170

SYSmark 2000

0	1,000	2,000	3,000	4,000	5,000	6,000
						5,916

3DMark 2000
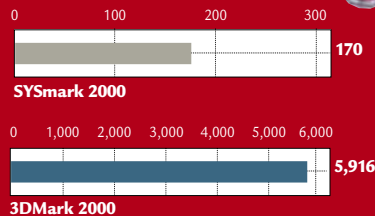
Hi-Grade UltiNote L8400

A fast and well-specced portable that can really claim to be a desktop replacement.

Hi-Grade managed to ship us the first mobile Pentium III notebook for review back in our December 1999 issue. Now the company has held onto its cutting-edge position by supplying the first 700MHz mobile Pentium III incorporating SpeedStep technology, coupled with an impressive 192MB of RAM. Although we looked at a 750MHz notebook a couple of months ago, that model from AJP used a full-size Flip Chip, which had none of the power management features of the true mobile CPUs. The beauty of the SpeedStep chip is that it detects if the notebook is running on mains or battery power. When on the mains it runs at full voltage and full performance, but when running on battery power the voltage is dropped, which results in a significant reduction in battery drain but only marginal performance loss. In our opinion the mobile Pentium III SpeedStep is one of the best CPUs that Intel has produced in a long time.

The design is the same as the AS8400 we reviewed in our April issue. This is no bad thing since the chassis is solid and you're given a sense of confidence in the longevity of the product. Another advantage to this chassis is that everything is resident inside it, so you don't have to swap peripherals when you want to load an application or save a file. Talking of peripherals, this is an impressively specced machine. Taking care of software installs and movie playback is an eight-speed DVD-ROM drive. This is a fast unit for a notebook computer and it validates the L8400's aspirations as a desktop replacement. Next to the DVD-ROM drive is the floppy drive, so getting files off the machine should be as easy as putting them on.

On the opposite side of the case you'll find two stacked PC Card slots that will accept one Type III or two Type II PC Cards. Also there's an IR port and the power socket.

At the rear is a very impressive complement of ports. There are two USB, two PS/2, D-SUB monitor out, parallel, serial, network/modem and audio ports. This makes it a very well connected machine, although a FireWire port would have been a welcome addition, especially since the 12GB hard disk makes it possible to dabble in digital video editing.
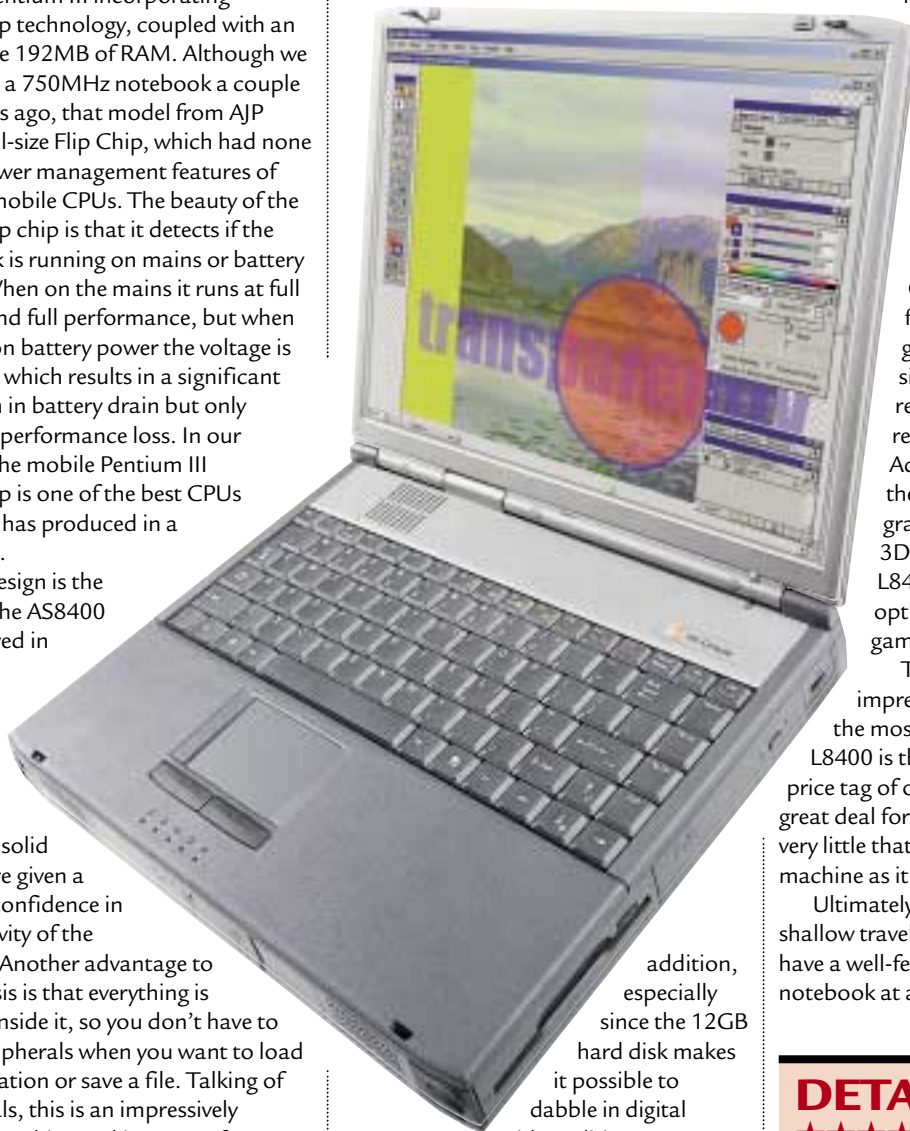
With a notebook computer, ergonomics are very important, and the two main areas of concern are the screen and the keyboard. The screen is a 14.1in affair with a native resolution of 1,024 x 768. As far as TFT notebook displays go, this is a fine example and the lighting is even across the surface with no dead pixels present. We found the display fine to work at for extended periods of time, which is good for a desktop replacement unit like this.

Unfortunately, the keyboard isn't quite up to the standard of the screen.

The overall feel is light and it rattles during use. Also, the return key is a little too small and is easily missed. The touchpad is superb and pointer manipulation is simple. Unfortunately, the utility to disable touchpad tapping hasn't been loaded, although the touchpad is positioned far enough away from the space bar to avoid too much inadvertent activation.

As far as performance goes this is a very fast notebook, turning in a SYSmark score of 142. Considering that the fastest PC in this month's group test produced a similar score, the L8400 really does offer desktop replacement performance. Add to this the fact that the 8MB S3 Savage/MX graphics chipset offers full 3D acceleration, and the L8400 will even give you the option of playing the odd game as well.

The performance may be impressive, but without doubt the most impressive aspect of the L8400 is the price. With an ex VAT price tag of only £1,775, you're getting a great deal for your money and there's very little that won't run as well on this machine as it will on a desktop.

Ultimately, if you can get used to the shallow travel of the keyboard, you'll have a well-featured and very fast notebook at a great price.

RIYAD EMERAN

DETAILS

★★★★★

RECOMMENDED
Personal
COMPUTER
WORLD

PRICE £2,085.62 (£1,775 ex VAT)
CONTACT Hi-Grade 020 8532 6100
www.higrade.com
PROS Very fast, well featured, great price
CONS Disappointing keyboard
OVERALL This is an incredibly fast notebook at a great price. The keyboard could be better, but that's not enough to take away its shine

PERFORMANCE RESULTS

	0	100	200	300
SYSmark 2000			142	
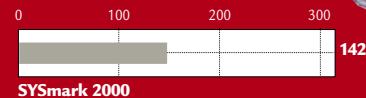
Gateway Select 1000

A lacklustre mid-range PC despite its 1GHz processor and respectable components.

With AMD and Intel locked in their spiralling dogfight, each instantly matching the other with processor clock rates, new processor speeds are pouring out of their factories almost before PC vendors have had a chance to sell the old lot. And so, we have another machine with a 1GHz processor, in this case an AMD Athlon, for under £2,000 ex VAT.

Along with the 1GHz Athlon, the core components of the Select consist of 128MB of SDRAM and a 20GB Western Digital Caviar EIDE hard drive. The Caviar's latest incarnation keeps pace with the competition by spinning at 7,200rpm and providing a 2MB data buffer. But while its capacity is plenty to keep most people happy, it is at the lower end of the scale relative to the drives other manufacturers are shipping in new systems. The single SDRAM DIMM sits in one of three sockets on the system's motherboard, Gateway's own Kodoko, which unusually sports three USB ports on the rear connector array.

We were appalled by the monitor included with the Select. The 17in shadow mask EV700, with its less than pin-sharp image and poor power regulation, would be an acceptable if unexciting choice for a £1,200 system. But for one costing £2,231 inc VAT, it's unacceptable. With the price of flat-screen aperture grille monitors plummeting, there's no excuse for this kind of tired technology in a new system that supposedly represents the state of the art.

If the quality of the monitor was an unpleasant surprise, however, we were positively stunned by the graphics card to which it was attached. The Select 1000 uses an anonymous card based on the standard nVidia TNT2 chipset, with 32MB of on-board RAM. Nothing wrong with that in a 466MHz Celeron system, but if you're a gamer who's just shelled out for the Select, a good portion of those one thousand million CPU clock cycles per second that you've paid for will go to waste as the Athlon sits around waiting for the graphics card to redraw the frame.

Open the Select and the bad news continues. Unlike most other big manufacturers, Gateway didn't neatly route the power supply, EIDE and audio cables around the case, so they're left hanging limply across the insides, restricting access to the CPU and DIMM sockets and making the prospect of upgrading anything an unpleasant one. Even the good points of the machine's construction are tempered by poor forethought. The tower case has stacks of potential for expansion, with an almost unprecedented total of eight free device bays: three front panel 5.25 areas, plus three internal 3.5in bays beneath those, and another two in a cage attached to the floor of the case. But to power all these devices, Gateway gives you a total of two power connectors. You do the sums.

On the positive side, supporting components are pretty reasonable, starting with Toshiba's newest DVD-ROM drive, a 12-speed unit. There's no CD-RW in the Select, which some would justifiably view as an essential part of a new mid-range system, but you do get an LS120 floppy drive, which will take 120MB Superdisks as well as standard floppies. Not as good as a CD-RW, but considerably better than nothing. A Creative SoundBlaster Live! Value sound card provides audio to a set of Boston BA735 speakers, with two satellites and a small subwoofer. Add the 56K PCI modem and you're left with three spare PCI slots, but the Kodoko is a legacy-free and thus ISA-free motherboard. A standard Microsoft three-button IntelliMouse and a responsive Gateway-badged keyboard complete the peripheral picture.

In the SYSmark 2000 application benchmarks, the Select falls significantly below the level of the 1GHz machines from Dell and Mesh that we looked at last month, with a score of 160. Its 3DMark graphics score – half that of Dell's B1000SE from last month and easily bettered by systems costing £500 less – reflects the questionable wisdom of partnering a cutting-edge processor with yesterday's graphics hardware.

The Select 1000's software bundle, Microsoft's Works Suite 2000, does at least provide you with a decent array of applications to get you going, including Word 2000.

Gateway is a big company with a big reputation, but the Select does little to solidify Gateway's standing in the market. It may include the fastest processor on the planet, but that's only a part of the equation, and the rest of the machine just doesn't measure up.

DAVID FEARON

DETAILS
★★

PRICE £2,231 (£1,899 ex VAT)
CONTACT Gateway
0800 973132
www.gateway.com/uk
PROS Cheap for a 1GHz system
CONS Poor monitor, dated graphics card and disappointing build quality
OVERALL There's no point in having a 1,000MHz processor if the rest of the machine can't cut the mustard

PERFORMANCE RESULTS

0	100	200	300	
				160

SYSmark 2000

0	1,000	2,000	3,000	4,000	5,000	6,000	
							2,477

3DMark 2000
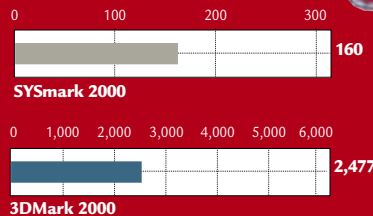
HP e-Vectra

A good-looking and powerful machine that should keep the business user happy.

The lifecycle of a business PC – in addition to being the subject matter for a very dull book – is completely different to that of your average home user PC. Typically, a computer will come into a company and sit on a desk for a couple of years before being retired to either an employee's house, or the computer scrap heap.

With this in mind HP has come up with the e-Vectra. Fortunately, it's not an old product re-badged to signal its readiness for e-business, but a fully fledged PC in a small form factor. Perhaps the best way to describe it would be as a hybrid somewhere between a conventional desktop and a laptop. It measures just 89 x 240 x 272mm (w x h x d), and unlike the recent wash of ultra-slimline computers to have hit the market, the e-Vectra is designed for the office not the home. This doesn't mean, however, that functionality has replaced style as HP has put a lot of effort into how the machine works. As well as being able to sit on the desk like a standard desktop PC, the machine can sit upright using a bundled stand in a fashion similar to the Playstation 2. A second plastic clip keeps the cables tidy at the rear of the machine. Unfortunately the small case size means that an external power supply is needed. This takes the 'figure of eight' style two-pronged plug not the standard kettle lead.

Our review model was kitted out with an Intel Pentium III 600MHz Flip Chip processor – Celeron processors are also available – 128MB of RAM, an 8.4GB hard drive, and a 24-speed CD-ROM drive. Two USB ports make sure that the latest peripherals can be used without problem. Less emphasis has been placed on the graphics processors – an integrated 4MB Intel i810 chipset that's no good for the latest games, but is more than enough for business applications, email and surfing the web. The e-Vectra also sports on-board sound which, if nothing else, will please users wanting to listen to music. For the business environment an on-board 3Com Fast
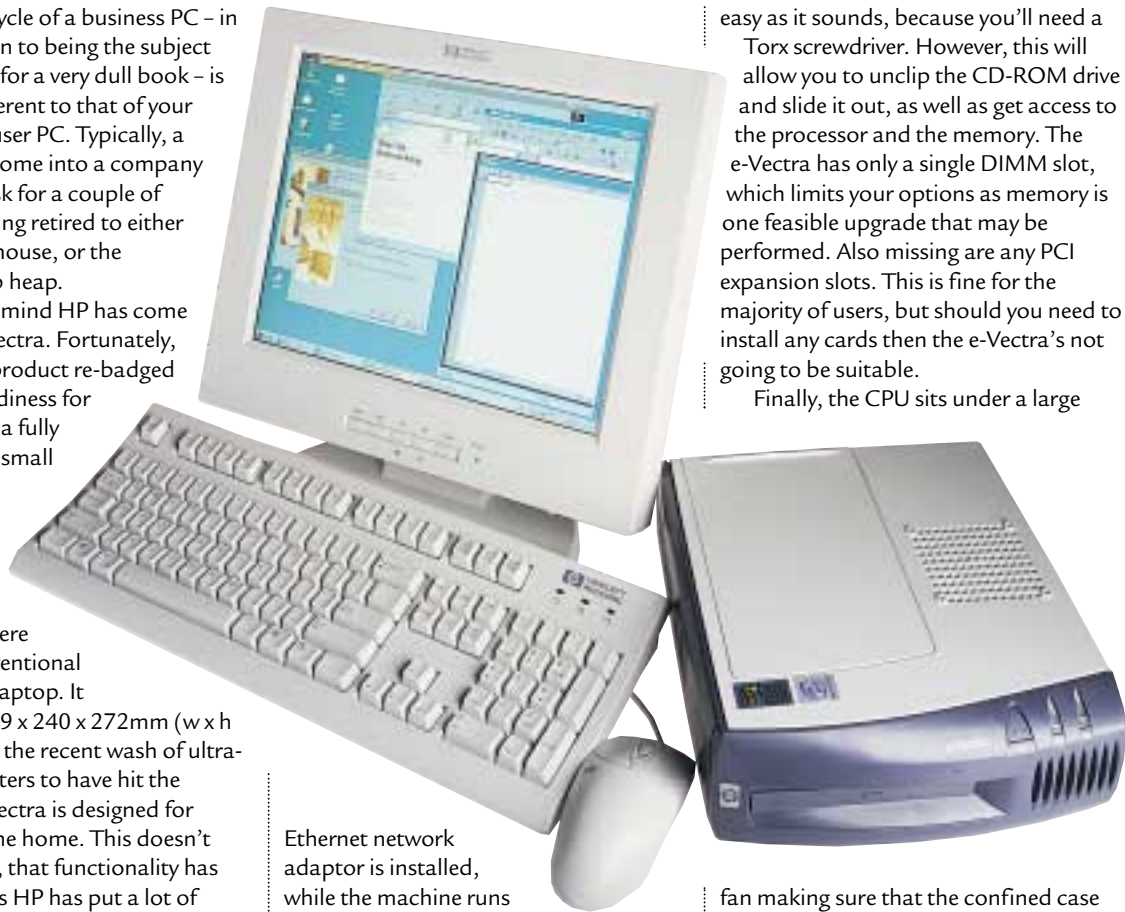
Ethernet network adaptor is installed, while the machine runs Windows 2000. We ran the SYSmark 2000 benchmark on the machine, which gave us the rather impressive score of 127. This puts it just a couple of marks back from a 600MHz desktop HP Vectra. Clearly this is more than a good-looking machine, it's got the power as well.

Despite the fact that this PC isn't meant to be upgraded, HP hasn't ignored the fact that maintenance sometimes means you'll have to get inside the machine. A flap on the top allows access to the hard drive which pulls out on a caddy. HP recommends in the documentation that the hard drive should be removed in the event that the machine develops a fault, and just the base unit sent back for repair. This also means that the hard drive can be replaced easily should the need arise. Access to the drive is controlled through a key, which is handy as apart from the theft aspect you also need to consider that the CMOS password clear switch is located directly beneath the drive.

The other components require that the case be removed entirely. This isn't as easy as it sounds, because you'll need a Torx screwdriver. However, this will allow you to unclip the CD-ROM drive and slide it out, as well as get access to the processor and the memory. The e-Vectra has only a single DIMM slot, which limits your options as memory is one feasible upgrade that may be performed. Also missing are any PCI expansion slots. This is fine for the majority of users, but should you need to install any cards then the e-Vectra's not going to be suitable.

Finally, the CPU sits under a large fan making sure that the confined case space doesn't cause overheating. As with everything else in the machine, the fan can simply unclip allowing access to the processor. In all, with the e-Vectra HP has done well. It's a simple machine that will serve the needs of those who rarely do more than send emails or word processing.

DAVID LUDLOW

DETAILS
★★★★

PRICE £775.50 (£660 ex VAT) for system only, £813.10 (£692 ex VAT) for 15in panel
CONTACT Hewlett-Packard 0990 47 47 47
www.hp.com/uk
PROS Powerful, small and cheap
CONS Only a single memory slot, external power supply
OVERALL This is definitely a business PC, and for that use it's perfect for the email-sending, word-processing employee

PERFORMANCE RESULTS

0	100	200	300

127
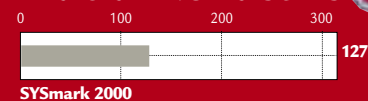
SYSmark 2000

Viglen Incepta

An easy-to-use PC that will appeal to the novice user, but lacks expansion potential.

Intel's 'Easy PC' guidelines should have given computer manufacturers the impetus to ignore the design rule book and banish traditional beige boxes forever. Instead, with a few notable exceptions, all we've seen are a few otherwise average PCs gain curvy edges and iMac-style plastic cases. It's hardly the revolution we were promised.

Enter Viglen's Incepta, a prime example of this new breed of plug-and-play 'throwaway' PC. This one's very much in the mould of AST's Century City as it comes in a compact white box and all you have to do is attach the supplied USB keyboard and IntelliMouse, hook up the VGA monitor and switch on the power. It may sound very much like a normal tower-case PC so far but if you believe the hyperbole, the machine is innovative, easy to use and even lowers the total cost of ownership.

As you'd expect from an 'Easy PC', set-up is straightforward, but we were surprised that Viglen didn't think a set-up poster was necessary for the uninitiated. The USB and VGA connections were fairly easy to fathom, but the RJ-45 network port and modem connection could prove trickier for novice users, especially as they were only identified by symbols. However, this was a minor complaint as we were up and running within two minutes.

Viglen supplies the Incepta with processors up to an 800MHz Pentium III. The unit we looked at came with a 650MHz Pentium III processor backed by 64MB of SDRAM and when subjected to SYSmark 2000 turned in a respectable score of 119. Although it's more than able to cope with the latest office suites, running several programs at once slowed the system significantly.

Graphics are taken care of by an on-board Intel 810 chipset and although our 3DMark 2000 test refused to run, with just 1MB of dedicated RAM (although the chipset can access the main system memory) it's definitely not the best PC if you want to play the latest 3D games. Sound is also handled by an on-board chipset – this time from Soundmax. It proved an average performer, but the speakers from Altec Lansing were capable of delivering good quality sound.

The Incepta comes with a 17in monitor from ADi that can handle resolutions of 1,280 x 1,024 but only at a flickery 60Hz and again this proved a reasonable performer at a more reasonable resolution. As it's the one component you could take with you when you buy another system it could be worth opting for a better flat-screen CRT model. Elsewhere, there's a 56K modem to get you on the Internet, this time an AMR device from 3Com. There's even an on-board network adaptor and, although home users will probably have no need for it, schools and small businesses will be well served by this addition.

The Incepta boasts a reasonable specification by today's standards, but that won't always be the case and this PC is definitely not designed with upgrading in mind. For a start there's no PS/2 connection or parallel port, so it's USB or nothing when it comes to adding extra peripherals. Two ports are located at the front of the unit, with a further two at the back. The front ports are a good idea as they're ideal for attaching peripherals such as digital cameras, which are frequently 'hot-swapped', but on a system that relies so much on USB for expansion, four ports seems a little mean.

Getting inside the unit is a Herculean task and even after we'd removed all the obvious screws we had great difficulty. Once inside, only the RAM could be easily upgraded with two free DIMM slots. There are no free drive bays so you can't add a CD-RW drive and you're stuck with the eight-speed DVD-ROM drive that comes with the machine.

The Incepta isn't a bad machine and by today's standards it's quite well equipped, but the fact remains you can get a more expandable system for much the same price. While the plug-and-play credentials of this PC could appeal to novices, more experienced users or those with non-USB peripherals will probably be better off looking elsewhere. This said, with specifications changing all the time if you plan to upgrade your PC every few years, the Incepta is definitely worth considering, but please forgive us if we don't share Viglen's view that the machine is 'a milestone in PC design'.
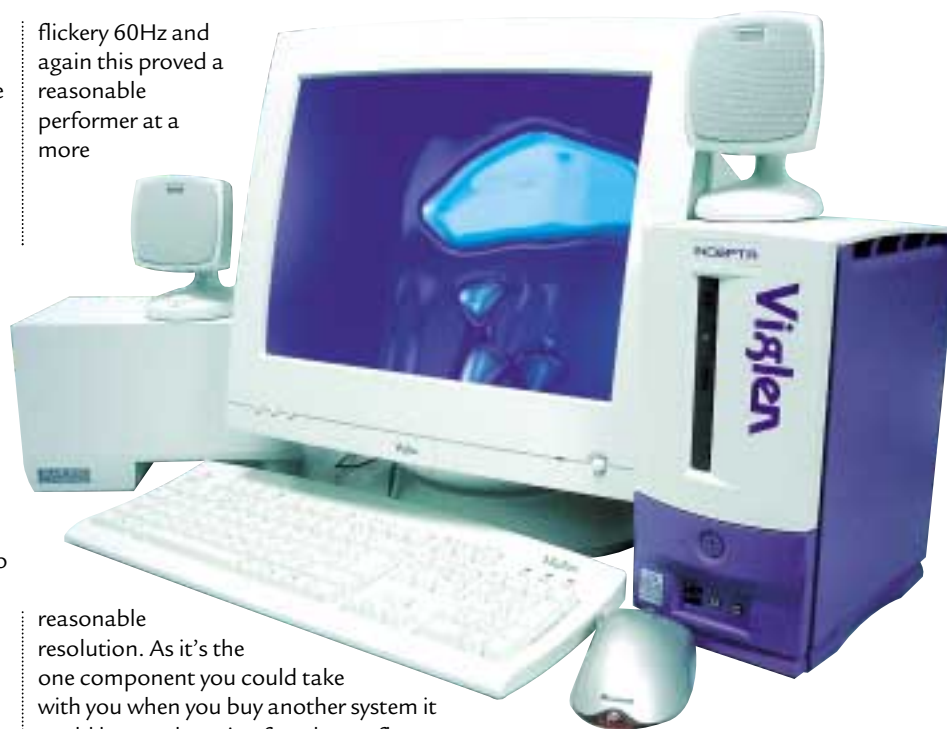
RICHARD MCPARTLAND

DETAILS
★★★

PRICE £999 (£850 ex VAT)
CONTACT Viglen 020 8758 7000
www.viglen.co.uk
PROS Easy to set up and use, ideal for computer novices, design
CONS Integrated sound and graphic capabilities, very limited expansion potential, difficult to get into, price
OVERALL A plug-and-play 'throwaway' PC, with the emphasis on ease of use but your money will get you a more expandable PC with a better specification elsewhere

PERFORMANCE RESULTS

	0	100	200	300
SYSmark 2000			119	
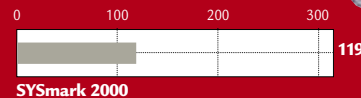
Amstrad e-m@iler

A pay-per-use email solution that doesn't quite hit the mark.

The Amstrad e-m@iler is set to change the online world as we know it. No longer do you have to buy an expensive computer or pay a monthly subscription charge to an ISP to get connected to email. You may have noticed the first problem with this proposal – subscription-free ISPs have been popping up all over the place for the past couple of years, with Freeserve probably the most notorious in the UK. Internet access is becoming increasingly important and the ISPs have realised this. Soon we'll be seeing flat-rate access either in the form of fast always-on connections like ADSL and cable, or from the traditional dial-up providers. So while charging structures are moving away from the per use model, Amstrad has decided to head in the other direction. Not only do you have to pay for your online time, there's also a standing charge each time you connect to Amserve.

Looking at the other side of the equation there's the cost of the unit. At £80, it may seem like a good deal at first, Amstrad even claims to be making a loss on the unit itself, but it's got to make this money back somehow. Amstrad has two sources of revenue from the e-m@iler. First, there's a 12p service charge for sending or receiving email, added invisibly to your phone bill. This means that every email you send will cost 12p plus the associated phone call charges. Each time you dial up to collect your email there's also a 12p charge. It may cost over twice as much to send a letter, but in the Internet society email is virtually free and should remain so. The second source of income for Amserve is targeted advertising. In the middle of the night when you're tucked up in bed your e-m@iler is furiously downloading the next batch of adverts. Of course you don't pay for this privilege, but you still have to look at them.

Just to make sure you don't forget it's there, it has the annoying habit of flashing its screen to and from inverse video. After having the unit on the desk for three days we had to cover the screen with Post-It notes, as the constant attention seeking was getting increasingly annoying.

The e-m@iler also has another trick up its sleeve; it can receive messages from the mother ship via CLI (Caller Line Identification), the system used to send the telephone numbers to caller display units. This means when a new email arrives the unit can automatically collect it for you (and put another 12p on its tab). If you're not lucky enough to have CLI then the unit is quite happy to check with the servers regularly to see if it can earn another 12p for the pot.

In the pack you'll also find the 'Pocket Dock-it' organiser, which allows you to keep a mobile copy of all the contact details you've carefully entered into the e-m@iler's memory. A word of caution though – if you don't send enough emails per week ('approximately five' the manual states) then your advanced features privileges will be revoked and the e-m@iler will pretend it's just a normal phone. According to the manual, Address Book, Voicemail, Fax and Calculator are classed as advanced features. As we went to press we were informed by Amstrad that this restriction has now been removed from the service.

Bearing in mind you can get a Sega Dreamcast, with email capability, for £159 if you hunt around, then it's hard to recommend the e-m@iler on price grounds. Add to this Digital TV providers that have either released, or are about to release, email services and the e-m@iler doesn't seem like such a good deal. If the unit had been launched a couple of years ago then it may have been a viable proposal, but given the current climate and the advances that broadband and digital television will bring, it's a case of too little too late.

WILL HEAD

HP Jornada 545

A huge improvement over the old Jornada, users will find that the 545 performs numerous tasks.

Hewlett-Packard is the only hardware manufacturer to have new hardware ready for the launch of Microsoft's Windows Powered Pocket PCs, and it is certainly a huge improvement over the old Jornada. The Jornada 545 uses Microsoft's new operating system, Windows CE 3.0, which was reviewed in last month's issue. HP has customised this slightly and has solved the few problems contained in Microsoft's version. For example, it is much easier to manage the available memory with the HP task switcher, giving the user the opportunity to switch between open applications and close those that are open if the program does not have this facility itself.

HP has shunned Microsoft's Today screen in favour of its own Home Menu (although the Today screen is there if you want to use it). The Home Menu consists of a series of program shortcut icons to stop you having to go through the Start Menu.

The hardware is not perfect, but it is a huge improvement on what went before. A 133MHz Hitachi SH3 processor packs a big enough punch to keep all of the applications moving at a useable pace. 16MB of RAM is provided, which we found to be sufficient. A 32MB version, the Jornada 548 is also available for an extra £70 inc VAT. The colour display is excellent. The 16-bit 240 x 320 touch-sensitive LCD display is easy to read and even does a fairly acceptable job in sunlight. The cover, when open, acts as the screen's shield and helps keep the display bright outside. To extend the battery life, the backlight dims after a user-defined period.

On the side is an action wheel that rocks up and down to scroll through the current window or menu, and you can press it inwards to select the current option. A button for recording memos is situated below. This is more difficult to press accidentally than the previous Jornada and it is recessed. An IrDA port has been placed at the top left of the device, and next to this is a Type I Compact Flash slot. We would have preferred a Type II slot. It is difficult to

see how HP could have achieved this while maintaining the Jornada's thin form, though – the device is only 2cm thick. A headphone jack is located next to this. Four hot keys are positioned on the front of the device, that open frequently used applications.

It is easy to connect the device to your PC. Both serial and USB cables are supplied as standard. These can either be plugged into the bottom of the Jornada or into the supplied cradle. If the cradle is plugged into the mains it will recharge the batteries at the same time. This method of connection is excellent – if you leave the cradle plugged in at your desk, all you have to do is insert and remove the device as needed and information such as your contacts is automatically synchronised with your PC.

It is not all good, however. The lid will not fold flush with the rear of the unit – it

sticks up like the lid on the Palm III. This is useful if you intend using the Jornada outdoors a lot, but a bit irritating if you don't. The stylus feels cheap, thin, plastic and lightweight – about the same weight as the average coffee shop disposable spoon. It is stored inside the lid, in a well created in the centre. We thought this was a terrible idea and makes the stylus fiddly to remove and store. What makes this doubly disappointing is the fact that the main unit's alloy casing works so well. You can remove the lid completely, though, and we recommend doing just that and buying a heavy-duty leather case and decent stylus.

HP has provided a massive amount of software that covers most conceivable uses of this device. In addition to the standard Pocket PC software, such as Outlook, Word, Excel, Internet Explorer and Media Player, HP has thrown in programs such as MusicMatch Jukebox, Peacemaker and ZIO Golf.

The decision to buy this as opposed to another handheld really depends on what you plan to use it for. If you are simply after a device with a good PIM, then a Palm-based device probably has the edge, and a monochrome version would certainly be lighter and cheaper than the Jornada. But if you are after a pocket-sized machine that can do a lot more, then this would be a good choice as, despite the problems with the lid and stylus, the Jornada 545 can perform so many more tasks. It is a true Jack-of-all-trades.

JASON JENKINS

DETAILS
★★★★

PRICE £369 (£314.04 ex VAT)
CONTACT HP 0990 47 47 47
www.hp.com/uk
PROS Good screen, responsive, easy to connect to your desktop, lots of software
CONS The lid and stylus are annoying
OVERALL It does have its problems, but the Jornada 545 can do so much that for such a good price it is easy to overlook the down side

nVidia GeForce 2

This company is at the cutting edge of graphics chip technology and GeForce 2 is proof of that.
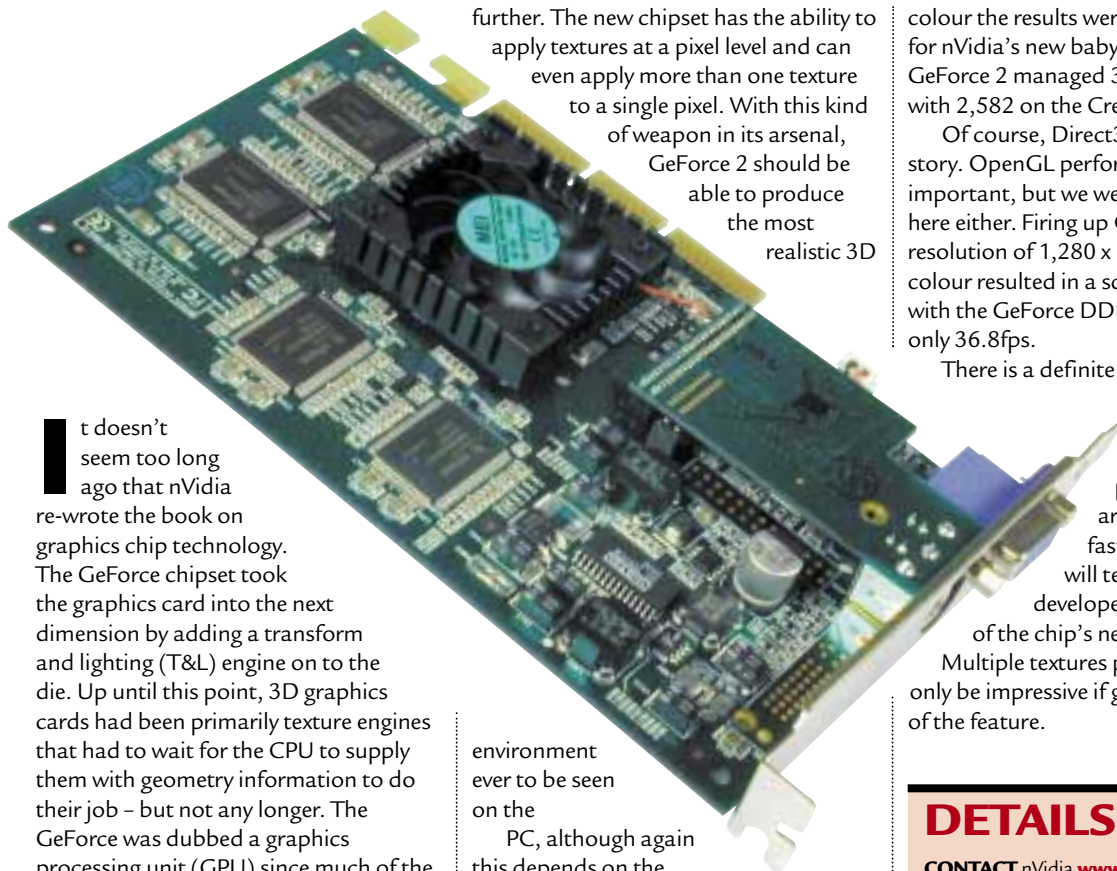
It doesn't seem too long ago that nVidia re-wrote the book on graphics chip technology. The GeForce chipset took the graphics card into the next dimension by adding a transform and lighting (T&L) engine on to the die. Up until this point, 3D graphics cards had been primarily texture engines that had to wait for the CPU to supply them with geometry information to do their job – but not any longer. The GeForce was dubbed a graphics processing unit (GPU) since much of the calculations that were previously left up to the CPU were now done by the graphics chipset. The upshot of this scenario is that the CPU is left free to work on other tasks such as improved artificial intelligence in the non-player characters within a game.

Of course, any hardware feature is only as good as the software that makes use of it, and as yet we haven't seen many games that really exploit the T&L capabilities of the GeForce chipset. That said, the software support will undoubtedly come since taking the graphics load from the CPU can only be a good thing. It did, after all, take a while for software to fully utilise any hardware 3D acceleration at all.

Even though the GeForce chipset is ahead of the competition in terms of performance and features, nVidia hasn't sat back on its laurels. Instead, while the competition is still playing catch-up, nVidia has already produced the follow-up to its award-winning chipset, imaginatively named the GeForce 2.

This incorporates all the features of its predecessor, but the second-generation transform and lighting engines push the 3D performance even further. The new chipset has the ability to apply textures at a pixel level and can even apply more than one texture to a single pixel. With this kind of weapon in its arsenal, GeForce 2 should be able to produce the most realistic 3D environment ever to be seen on the PC, although again this depends on the software taking advantage of the features.

One thing that doesn't have to wait for software advancement is the raw power of the chipset. The GeForce 2 reference card we received from nVidia has been beefed up considerably in the performance department and the CPU runs at a core clock speed of 200MHz, while the memory speeds along at 333MHz. Unlike the original GeForce, this chipset uses DDR memory as standard, providing two data transfers per clock cycle instead of one. This is quite an improvement on the previous GeForce DDR chipset that sported a CPU clock speed of 120MHz and memory speed of 300MHz.

We tested the GeForce 2 using an Intel Pentium III 733MHz machine with an 820 motherboard and 128MB of RDRAM. The results were impressive. As a comparison, we ran the same tests on a Creative Annihilator Pro incorporating the GeForce DDR chipset. Running 3DMark at 1,024 × 768 with 16bit colour resulted in a score of 6,132 on the GeForce 2, compared with 4,976 on the standard DDR GeForce card. Pushing the settings up to 1,280 × 1,024 in 32bit colour the results were equally impressive for nVidia's new baby. This time, the GeForce 2 managed 3,087, compared with 2,582 on the Creative GeForce card.

Of course, Direct3D is only half the story. OpenGL performance is just as important, but we weren't disappointed here either. Firing up Quake III at a resolution of 1,280 x 1,024 with 32bit colour resulted in a score of 44.6fps, with the GeForce DDR card managing only 36.8fps.

There is a definite increase in performance with the GeForce 2 chip, and the production boards are likely to be even faster. But only time will tell if the games developers will make use of the chip's new features. Multiple textures per pixel will only be impressive if games make use of the feature.

RIYAD EMERAN

DETAILS

CONTACT nVidia **www.nvidia.com**
PROS Very fast, feature packed, cutting edge
CONS Remains to be seen whether the industry will use the new features
OVERALL While the competition is catching up with the original GeForce chip, nVidia has already produced the next one. The 3D card market is starting to look like a one-horse race

PERFORMANCE RESULTS

Quake III 1,280 x 1,024 32bit colour & textures

0	100	200	300	
				44.6

GeForce 2

0	100	200	300	
				36.8

GeForce 1
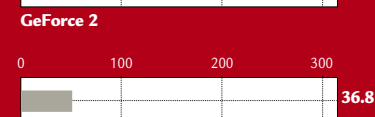
3DMark 1,280 x 1,024 32bit colour

0	1,000	2,000	3,000	4,000	5,000	6,000	
							3,087

GeForce 2

0	1,000	2,000	3,000	4,000	5,000	6,000	
							2,582

GeForce 1
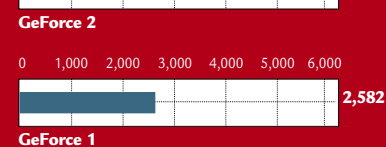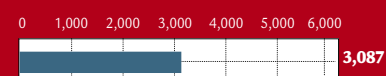
Ericsson R320 and Mitsubishi Trium Geo

These two stylish WAP phones prove you don't always get what you pay for.

IT buzzwords come and go, but one of the most prevalent of the moment seems to be WAP, or Wireless Application Protocol in its expanded form. WAP allows certain Internet content to be accessed via an equipped GSM mobile phone but, as with so many things, you shouldn't believe the hype.

Cellnet is pushing its WAP service in a big way right now, including a high-profile television advertising campaign. However, branding WAP phones as Internet phones is not entirely accurate, and the TV image of a guy on a surfboard navigating the Internet is far from the reality. As it stands, WAP has some useful features, but it's far from a mature technology, so don't expect the functionality from your phone to match that of your PC.

The first WAP phone to gain exposure was the Nokia 7110 (reviewed March 2000 p73). This stylish model boasted Nokia's famous menus as well as a spring-loaded key cover for those users who wanted to pretend they were in *The Matrix*. As is always the case, it hasn't taken too long for the competition to catch up. Consequently we're looking at two new WAP phones, the Ericsson R320 and the Trium Geo Phone, manufactured by Mitsubishi. These two phones are at the opposite end of the marketing spectrum. The Ericsson is a top of the range product aimed at the high-end, style-conscious user, while

the Trium is Cellnet's new 'Pay as You Go' pre-pay phone.

The first thing that strikes you about the Ericsson is how slim it is. The body thickness of the R320 is only 1cm. Our review model shipped with a lithium-ion battery that protruded slightly, but lithium-polymer batteries are available and they lie flush with the phone itself. However, the aesthetics of the thin

design did not appeal to all. Some of the *PCW* team felt that the R320 looked as though it had been sliced in half. Another issue with the design of the phone is the large aerial. Aerials are no longer necessary on mobile phones, as Nokia has shown with many of its models, and the one on the R320 adds considerably to its size as well as spoiling its looks.

In its favour, the R320 has a large and clear screen, with an attractive Indiglow-type backlight to it. Ericsson has decided not to copy Nokia's scroll wheel design for navigating and instead

The R320 has a large clear screen, with an attractive Indiglow-type backlight to it

has positioned four navigation buttons below the screen, allowing up, down, left and right movements. This system works well enough and allows simple navigation through the phone's menus. What is bizarre, however, is the scroll slider at the top left-hand side of the phone. This device is almost impossible to use if the unit is in your right hand so, although it is a great bonus to left-handed users, it's of little help to the majority of the population.

The phone itself is feature-packed, allowing both 900GSM and 1800GSM compatibility. It's blessed with a large array of ring tones and a couple of

games to while away long train journeys or meetings. You can also add voice tags to 10 of the numbers in your phone book. You then simply press a button, say the name of the person you want to call and the phone dials them for you.

We used Cellnet's Genie service to test the WAP capabilities of the phones. The R320 took a bit of fiddling to set up, but it was fine once we got the configuration right. This won't be a problem for anyone buying the R320, as it should be configured at the time of purchase. Accessing the Genie WAP service seemed quite slow via the Ericsson, and navigation was also made difficult due to the way the information was displayed. When connected to a WAP service such as Genie, the R320 wraps the list of active options across each line so the up, down, left and right buttons all have to be used to navigate. This is particularly annoying since the large screen lends itself to each option being given a separate line, thus making navigation a far simpler operation.

Like the Nokia 7110, the Ericsson R320 has a built-in infra-red GSM modem. This means that the phone can be connected to a PDA or notebook without the need for cables or external devices. This is great for the travelling business person who wants to keep in touch with the office wherever they are. Ultimately, this is still the preferable way to access the Internet on the move and a suitably equipped PDA will make email far easier than using either of these WAP phones. The IR modem has to be activated before use. This is a neat feature since the battery would not last long if the modem was constantly polling for devices to connect to. You also get PDA functionality with an in-built diary with

alarm reminders, although the infra-red modem would indicate that the phone is aimed at someone who already has a personal digital assistant.

If there's one thing missing from the R320, it's GSM1900 support. Without this the phone is useless if you visit the US, and many potential business users will be looking for this functionality in their next mobile purchase.

Mitsubishi Trium Geo

The Trium is not a phone for the style conscious. It's far from attractive and is not slim in any dimension. That said, it's not too heavy and should fit in most pockets. Considering that the Trium sells for £99 inc VAT as a pre-pay mobile phone package its uninspired design can be easily forgiven. When we first saw the Trium, we were concerned by the small dimensions of the screen, but we soon found that our worries were

answer the phone, since the basic controls are not covered. Where the Trium scores highly is in its usability. Navigation is so simple that you'd think you were using a far more expensive unit. The two buttons beneath the display take you directly to either Internet or SMS functionality, while the four-way rocker switch gives you access to all the phone's features. The other two exposed buttons are the call and hang-up controls. The beauty of this design is that you rarely have to open the flip. If you want to use the WAP features you can control everything from the exposed controls, and this phone handles WAP very well. When we accessed Genie we were happy to see that each of the possible selections was given its own line, making selection very easy. It also responded far

issue in a budget phone like this. It does, however, support both 900GSM and 1800GSM standards.

It has been a few months since we looked at the Nokia 7110, and WAP services have come on a long way since then, but we're still not in a position where it's worth buying a phone purely on the strength of WAP. That said, if you're looking to buy a phone anyway, WAP capability is definitely a bonus.

We expected more from the Ericsson R320. It's not as small and stylish as it could be, especially when you consider how well-designed the Ericsson T28 is. It is, however, a feature-packed phone that will appeal to the business market.

The Trium, on the other hand, surprised us completely. We were not expecting much from a £99 pre-pay phone, but were forced to reassess

our opinion, especially as it has a superb feature set. If you're considering a pre-pay mobile phone, consider the Trium, it could be the best deal around.

RIYAD EMERAN

unfounded. The display is indeed small, but the resolution of the screen is so good that you hardly notice its size. The high resolution of the display has been exploited to its full potential as well with the whole menu system dripping with impressive graphic representations. Even when the phone is in standby you're presented with a picture of a butterfly that flaps its wings when a button is activated. You also get a constant display

quicker than the Ericsson. We found that performing operations such as checking cinema times were simple and quick, making the WAP capability a useful feature rather than a gimmick.

As far as the features go, you get everything you would expect from a more expensive unit, including several annoying musical ring tones. You even have the option of a vibrating alert instead of a ring tone, if you like that kind of thing. Of course, some of the more advanced phone features are missing, like a scheduler or some games,

The Trium is far from attractive and not slim in any dimension, but it should fit in most pockets

of the time of day and the date, something that's very useful if your watch is being repaired.

The Trium has a flip cover that hides the numeric pad, although this isn't an active flip, so don't just open it and start talking when the phone rings unless you want to look silly. That said, you don't actually have to open the flip cover to

but all the important stuff is here. The only disappointing aspect of the Trium is the Ni-MH battery. We would have preferred a lithium-ion one which would suffer less from memory effect, but considering the price of the phone it's a fair compromise.

Like the Ericsson, the Trium lacks GSM1900 support, but it's less of an

DETAILS
★★★★

ERICSSON R320
PRICE £150 with a contract (£127.66 ex VAT)
CONTACT Ericsson 08705 237237
www.ericsson.se
PROS Slim, feature-packed
CONS Slow WAP access, clumsy navigation
OVERALL The R320 is a good mobile solution, but its WAP performance is slow and difficult to navigate. It's also larger than it should be

★★★★★

MITSUBISHI TRIUM GEO
PRICE £99 (£84.25 ex VAT)
CONTACT BT Cellnet 0990 214000
www.genie.co.uk
PROS Great value, easy to navigate, fast WAP performance
CONS Not the prettiest phone around
OVERALL A great little phone with all the features most users will need. If you're thinking of getting a pre-pay phone, the Trium is definitely worth checking out

Quantum Atlas V

With a data buffer that is double the size it used to be, Atlas V is streets ahead of its predecessor.

Most new products claim to be faster and better than those that went before but, in the case of the Quantum Atlas V, it's really true. The Atlas V is, of course, the successor to the Atlas IV, and like its predecessor it is a SCSI 7,200rpm drive. That is about as far as the comparisons go, as the Atlas V is streets ahead.

To begin with, Quantum has worked on the areal density, getting it up to a massive 9.1GB per platter. In real terms, this means that all drives up to 36GB in size come in a 1in high form factor. Increased density also means that drive heads have to be moved less to write the same amount of data. More impressive is the non-operating shock the drive can withstand, as this has been upped to a massive 300Gs. Basically, the drive can take quite a shock, although we wouldn't recommend testing it.

Performance-wise the data buffer has been doubled from 2MB to 4MB, and the seek time has dropped to a rather impressive 6.3ms. Of course, all the specs in the world mean nothing if the drive performs badly, so we did some tests of our own on the 18GB drive that Quantum supplied for our review. First we used a RAID-based server with four processors to copy 1GB of data to the drive in order to test sequential write speed. We then used Intel's Iometer version 1998.10.1 to run a random read/write test. The results were impressive, with the data write being completed in just 46 seconds, and the Iometer result showing 1.02Mbytes/sec.

In our recent hard drive group test this result would have put the Atlas V near the top of the range, and certainly within spitting distance of some of the 10,000rpm drives on offer.

DAVID LUDLOW

DETAILS
★★★★★

PRICE £399.50 (£340 ex VAT)
CONTACT Quantum 01344 353 500
www.quantum.com
PROS Fast, good value
CONS It still falls slightly behind the 10,000rpm drives
OVERALL A top-notch drive that performs well and is reasonably priced. No other 7,200rpm drive can touch it

Microtek X12USL

This scanner's performance and good colour quality will certainly make a splash in the high end.

Not only is the X12 one of the first 42bit scanners we have seen, it also boasts a staggering optical resolution of 1,200dpi. It's larger than your average unit, capable of handling legal-sized documents of 14in. It supports both Mac and PC connections and has USB and SCSI ports and cables. Microtek even bundles a SCSI card. Bear in mind, though, that if you don't want to go for SCSI and have an older PC, this might not be the scanner for you as it offers no parallel connection.

There are two X12s to choose from – standard or professional. The standard, as tested here, is suited to home and SME users, while the professional includes a light lid for scanning slides and transparencies and a more high-end software package. That said, though, even the home edition comes with a generous bundle of OCR and document management software and a copy of Adobe Photoshop 5.0 LE.

In our tests it performed well. The driver was easy to use with a series of buttons running down the right-hand side allowing you to set your preferences. You can set the resolution manually or use more descriptive specifications for output use such as on-screen, inkjet printing or fax. Scanning at the highest optical resolution, it achieved fair colour recognition. Yellow was particularly pure, but magenta and cyan recognition was less so, with a fair share of other shades evident across the test square. Composite colours such as red, green and blue were slightly dappled. However, it detected 20 out of a possible 20 distinct greyscale shades ranging from black to white and could differentiate between a series of narrow black lines as closely placed as 180 per inch.
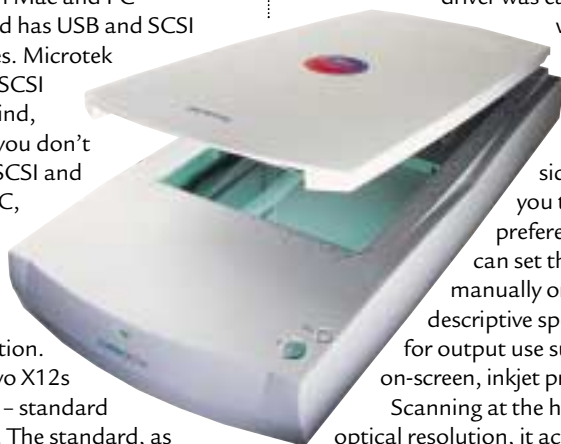
Overall, the X12USL performed well. Its software bundle is second to none and its top resolution is impressive.

NIK RAWLINSON

DETAILS
★★★

PRICE £233.83 (£199 ex VAT)
CONTACT Microtek 01908 317 797
www.microtek.nl
PROS High resolution, good greyscale recognition
CONS Colour performance a little patchy, high price for home users
OVERALL Good for high-end users, but if you primarily want to scan for the Internet or an inkjet printer, there are cheaper options

Agfa ePhoto CL30 Clik!

It's not without its flaws but this feature-rich and well-priced camera is good value for money.

Aimed squarely at the budget market, the CL30 Clik! is the first hand-held device using Iomega's new Clik! disks as a storage medium, rather than the CompactFlash or SmartMedia found in other cameras. Not only does it offer a 40MB capacity, it is also a cheap medium – two disks will set you back just under £22. Housed at one end of the camera, the supplied 40MB disk is capable of storing up to 60, 120, 160 or 360 images, depending on the level of compression selected. There is also a monochrome text-recording mode for use with OCR software. Sporting a 1megapixel CCD, the CL30 can capture a true 1,152 x 864 image but, as with other Agfa cameras, this can be upped through interpolation to 1,440 x 1,080 using Agfa's PhotoGenie technology.

When it comes to styling, the CL30's oblong form fails to inspire, but the layout is clear. On the back, an LCD displays the battery status, resolution setting and the number of images you still have room to take. Below this is a 1.8in colour TFT protected by a beefy Perspex cover. Using the screen indoors is fine except in low light conditions when it reverted to a delayed and jerky refresh, demonstrating the step-down in shutter speed. At the other end of the scale, we found the screen difficult to read in bright sunlight, even when it was set to its highest contrast level.

The CL30 is power-hungry, too, and if you use the screen to frame and review your images the four AA batteries will die after about 40 minutes, cutting short the fun of those who enjoy outdoor photography. That said, Agfa does give you the choice of switching off the TFT and using the in-built optical viewfinder to save on battery life, or using the bundled AC adaptor.

Lens-wise the f2.8 lens has a fixed focal length equivalent to 43mm, making the field of view narrower than what you might expect from a standard compact. No optical zoom is present, although there is a 2x digital zoom facility, but we would always recommend that such editing is done on the PC after the shots have been taken.

Operating the CL30 Clik! is made easy thanks to Agfa's EasyPilot button that works in much the same way as the wheel on a scroll mouse. Using this to navigate the menus, you will notice a wide range of options, depending on whether you are in record or play mode. Among the usual settings for resolution and flash, record mode carries an autofocus macro setting for close-ups. Four fixed-focus settings also exist, and you can manually set the white point to calibrate the RGB balance. We liked the way you can organise your images into albums on the disk, and even connect the camera to a TV for those exciting family slide shows.

On the downside, shutter or aperture priority is not available where you would expect to see these on a more expensive camera. Nevertheless, you can manually adjust the exposure from +4 to -4 using 0.5 f-stop increments. The shutter speeds range from 1/30 to 1/700 of a second, while the aperture opens to f2.8 and stops down to f8.0. In play mode, you can preview the stored images singularly or nine at a time in a thumbnail spread, deleting any unwanted pictures.

Image transfer is quick, thanks to the USB connection. And with the supplied Iomegaware software you can see the camera as a drive, allowing you to open and save images in any application. To fully take advantage of the PhotoGenie interpolation you will have to use the supplied Photowise software to output prints of 8 x 10in.

Picture quality is reasonable, but compression artefacts, even in high-resolution mode, are apparent where sharp edges have become blurry. Colour reproduction is acceptable, but we could notice a faint blue cast similar to that seen with the Clikless CL30 (see *PCW* January 2000, p164). The CCD also had difficulty in very sunny conditions, where steep gradients in contrast resulted in unsightly noise. However, we did push the camera and, for all-round general use, the results are adequate.

Overall, you get a good value, feature-packed camera that doubles up as a Clik! drive. Along with the Clik! disk, AC adaptor and software the ePhoto CL30 Clik! ships with cables (USB and video), alkaline batteries and a case. A range of optional lenses and filters will screw on to the 37mm thread. If you don't want a Clik! drive there are better cameras around.

JALAL WERFALLI

DETAILS
★★★

PRICE £375 (£319.15 ex VAT)
CONTACT Agfa 020 8231 4903
www.agfa.co.uk
PROS 40MB Clik! drive, USB port, optical viewfinder, good range of features for price
CONS Bland looks, poor battery life, no rechargeable batteries
OVERALL A keenly priced, entry-level digital camera that has broken the solid state memory mould, but falls short of the competition

Camedia C-2020Zoom

Olympus' new model has no USB interface and is a bit sluggish, but don't write it off just yet.

Following the heady excitement of the first 3.3megapixel digital cameras reviewed last month, Olympus has just released a new model – the Camedia C-2020Zoom. It's only a 2.1megapixel model and it uses a slow old serial interface, but don't turn this page; the 2020 has more than a few neat tricks up its sleeve that make it well worth considering.

Measuring 107 x 74 x 66mm and weighing 305g without card or batteries, the 2020 may not be as small as Canon's S20, but it's still fairly compact. Olympus throws in a set of four AA alkalines to get you started, but you'll have to shell out for a set of rechargeables. We think these are much more important for day-to-day use than, say, the IR remote control that Olympus includes in the standard package.

The 2020 sports an 8MB SmartMedia card and is compatible with those up to 64MB. At 1,600 x 1,200 top resolution, you will get around five or 16 shots in 8MB, using SHQ and HQ compression respectively. An uncompressed TIFF mode is offered for those who demand the best quality, but the files are around 5.5MB each. Lower resolution 1,024 x 768 and 640 x 480 modes are also offered at two levels of compression.

It's good to see some digital camera manufacturers taking care over their choice of lenses, and Olympus is up there with the best. The 2020 features a precisely controllable 3x optical zoom,

equivalent in coverage to 35-105mm on a 35mm camera. The macro mode focuses down to 20cm and a virtually stepless manual focus mode indicates its position using an on-screen bar. Optional lens attachments widen or shorten the coverage.

Pictures are composed using either the optical viewfinder or the 1.8in TFT display. Aperture, shutter speed and exposure compensation (+/- 2EV in 1/3 steps) are clearly indicated at the top of the screen.

Unlike many cameras that either don't let you change exposure settings, or only give you a couple to choose from, we salute Olympus for offering proper aperture and shutter priority modes, along with a totally manual option. There are no fewer than 36 different shutter speeds from which to choose, ranging between 1/800 and four seconds; manual mode lets you further extend exposures up to 16 seconds, which allowed us to capture trailing car headlights, and even stars in the night sky! There are also 16 aperture settings from f2.0 to f11, for proper control over depth of field.

The flash can be forced on or off, but more impressive are the slow synchro functions, with front and rear curtain settings; the latter is perfect when photographing moving objects in long exposures as the flash freezes the action at the end, leaving a satisfying trail of lights or blurred

motion behind it. You can even synchronise with an external flash gun.

New for the 2020 is a video recording mode that captures good-quality MJPEG QuickTime movies in either 320 x 240 at 15fps, or 160 x 120 at 60fps – you'll get around 28 seconds of either on the 8MB card, but no sound. The composite PAL video output displays full-screen pictures or video clips on your TV.

In our optical tests, the 2020's lens performed excellently, with square geometry and sharp details right into the corners, unlike many digital cameras that often slightly barrel at the edges. The fine manual control is also welcome, but the 2020 is let down by overall speed. Best quality JPEGs take around seven seconds to record and over two minutes to download, while video clips must first buffer for several seconds before playing.

It would be easy to dismiss the 2020 because of its lack of USB interface and higher resolution models now on the market. However, it does offer great control for the photographic enthusiast and boasts decent optical quality too. This all bodes well for the similarly designed 3.3megapixel/USB 3030 model from Olympus, due out this summer for about £900.

In the meantime, the 2020 delivers decent pictures with superb control, although impatient users may want to invest in a USB card reader, and a set of rechargeable batteries while they're at it. Fortunately, you should be able to find the 2020 on the high street for nearer £550 all-in.

GORDON LAING

DETAILS
★★★★

PRICE £649.99 (£552.34 ex VAT)
CONTACT Olympus 0800 072 0070
www.olympus.co.uk
PROS Excellent manual control, QuickTime video capture
CONS No USB, slightly slow, overshadowed by new 3.3megapixel models
OVERALL Great all-round facilities make up for lack of speed

Roland U-8 Digital Studio

Even though the price is a bit steep, this sound package can turn anyone into a professional mixer.

Musicians are getting a little spoiled by the falling price of semi-pro sound cards, MIDI and audio sequencers. Whereas once musos with bedroom studios dreamed of the power and sound quality of pro studios, now many simply shrug their shoulders and question why anyone would want to pay the exorbitant rental fees of pro studios, when great sounding recordings can be done on a midrange PC.

Well, one of the problems is that you don't get the same hands-on control with software as you would with real hardware recorders and rack units. Also, controlling the transport and virtual faders of midi and audio sequencers with a mouse is less than ideal, especially when working on complex mixes.

Well, Roland has tried to solve all these problems in one fell swoop with the U-8 Digital Studio. The U-8 is actually a software and hardware hybrid. Roland has basically taken the guts of its VS series of hard disk recorders, removed the user interface and hard disk, and added a USB cable to link the unit to a PC.

You get a 16-channel mixer and the ability to record two tracks at a time. You can also replay 16 tracks (arranged as eight stereo pairs).

The first thing you notice about the U-8 is that it's fairly well specified when it comes to inputs. It has inputs at mic, line and instrument level, and also offers optical S/P DIF digital in and out for mastering to DAT or CD-R. The main output is via two RCA phono plugs. You will also find MIDI in and out around the back of the unit, meaning that there is no need for an additional MIDI interface.

Installation was extremely simple, thanks to the unit's USB interface. You simply install the drivers, load up the software and plug the unit into the back of the PC. The drivers are ASIO-compatible, so you get low latency recording when using the bundled Cubasis VST software.

If you're a guitarist, the first thing you'll want to try before recording is the guitar tuner application. It works in much the same way as a standard digital guitar tuner, but the screen updates seemed to lag a little bit behind the actual playing of a note. Nevertheless, the end results were very good.

Recording with the unit really is a piece of cake. All you have to do is load the U-8 controller application, launch Cubasis VST and hit one of the four EZ Recording buttons on the U-8 hardware marked start, guitar/inst, mic and mixdown.

For example, if you press the guitar/inst button, a four-step wizard will pop up and guide you, step by step, through the process of setting the right input level, choosing an insert effect (such as distortion) and adjusting the EQ and mixer settings. It really does make it very easy to record tracks.

Also, you can step through the wizard using the hardware controls on the U-8 so you don't have to reach for your mouse. In fact, most elements of the U-8 software application can be controlled from the hardware unit. The transport controls and jog wheel allow you to completely control recording and playback from Cubasis

VST. You can even adjust the loop setting from the unit's function buttons and any movement of the hardware mixer controls are immediately reflected in the mixer window of Cubasis VST.

The overall audio quality is excellent – right up there with professional gear. It also helps a lot to have dedicated mic and guitar inputs.

The unit is no slouch when it comes to effects, either. They are excellent, which should come as no surprise; they are, after all, lifted from Roland's professional VS-series recorders.

All the effects can be edited with the software that has been supplied by Roland and the company has sensibly offered two modes of editing: easy mode, which allows slight tweaking of the most important parameters; and complex mode, which offers total control over all the editing options.

All in all, the U-8 is a breath of fresh air when it comes to using computers to record multitrack audio. It's so simple that anyone can use it, yet the end results are surprisingly professional. It's just such a shame that the U-8's ease of use comes at such as high price. If you've got the money, though, you won't be disappointed.

NIALL MAGENNIS

DETAILS
★★★★

PRICE £499 (£424.68 ex VAT)
CONTACT Edirol 0845 117 2001
www.edirol.com/europe
PROS The hardware offers great control over the software. Mic and guitar inputs are a big improvement on the usual sound card inputs. Great audio quality and effects
CONS Expensive
OVERALL The U-8 really is a great piece of hardware that works extremely well with the bundled Cubasis VST software. It's just a shame that it's a bit over-priced

LaCie PocketDrive

Need extra storage on the move, why not try LaCie's PocketDrive? Just be careful not to drop it.

LaCie has used its expertise in repackaging existing drives to come up with the PocketDrive. This external 6GB hard drive has both FireWire and USB connectors. It is intended for anyone needing extra storage on the move, especially if they need to edit video away from their desks, or transport video to different locations. Inside the attractive case is a standard notebook hard drive – the drive manufacturer will differ depending on capacity. There are currently 6GB, 12GB and 18GB versions available – we tested the 6GB incarnation.

It is not intended to be drop-proof: the drive is only protected by the plastic case and a rubber surround. We were somewhat disappointed that LaCie has not taken greater steps to protect the inside of the drive, but it does help to keep the unit small. It measures a tiny 85 x 142 x 27mm and weighs in at just 360g. LaCie has really hedged its bets when it comes to connectivity: there are two FireWire ports and a single USB port at the rear, in addition to a power connector. If you have four-pin FireWire on your PC or notebook, or you want to use USB, you will need to use the power connector to make the drive function. But if you are lucky enough to have six-pin FireWire, it will be able to draw sufficient power from the device to function.

The inclusion of two FireWire ports means you can daisy chain the device to other FireWire peripherals. Silverlining 98 ships with the drive, allowing you to manage the device with ease, creating partitions and formatting them as necessary. We tested the PocketDrive's compatibility with a notebook and a DV iMac and found no problems. The benefits of the FireWire interface can be seen in our tests: copying a 495MB file to the PocketDrive using USB took 12 minutes, 12 seconds. The same file through FireWire took only one minute, 53 seconds. All in all, it's an excellent product and, should you have the need for it, a good buy.

JASON JENKINS

DETAILS
★★★★★

PRICE £351.33 (£299 ex VAT)
CONTACT LaCie 020 7872 8000
www.lacie.com
PROS Two FireWire ports, one USB, very fast via FireWire
CONS You will have to be careful not to drop it
OVERALL LaCie has covered all the bases and has come up with a great product

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Abit Athlon KA7

This Athlon board is not only reliable, but also easy to set up.

The Athlon is undeniably a good chip and excellent value for money; it is significantly cheaper than a similarly clocked Pentium chip. However, processor alone does not a good machine make. While the processor may provide the oomph, it is the motherboard that provides the electronic glue to make all the components talk to each other. Without a stable board, you can't expect a stable system and, until recently, this has been the bane of the Athlon builder. So, with trepidation, we set about building another Athlon system but this time we were pleasantly surprised.

Installation was a simple matter of plugging in the chip, connecting the relevant parts and throwing the power switch. Using the same components as in the March motherboards group test (750MHz Athlon, 128MB of PC100 RAM, 32MB nVidia TNT2 Ultra-based graphics card) and a fresh install of Windows 98 SE resulted in a SYSmark 2000 score of 139. We also ran SYSmark 98 and here the board scored 286.

The KA7 uses VIA's Apollo KX133 chipset with the capability to run the memory at 133MHz plus support for AGP 4x. There are two Ultra DMA 66 channels plus the standard floppy connector and four DIMM banks providing good upgradability. Five PCI slots are on offer, plus one shared at the bottom of the board with the standard complement of two PS/2, two USB, two serial and one parallel port.

In terms of setup, the default method is the usual Abit affair, with everything left to SoftMenu in the BIOS. Those who prefer to tinker with dipswitches can also specify the bus speed using a bank of switches in a similar manner to the BE6-II. There are advantages and disadvantages to both approaches but, given that modifying multiplier and bus speeds is not an everyday occurrence, there is little to distinguish either method.

Abit has produced a reliable board that is simple to set up, addressing the main problems experienced by the Athlon in its early days. With any luck, we will see more boards like this in future.
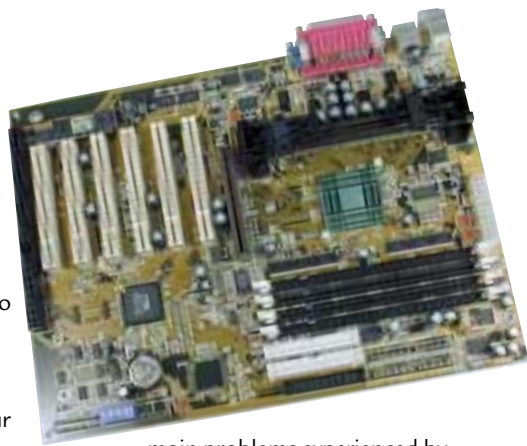
WILL HEAD

DETAILS
★★★★★

PRICE £129.25 (£110 ex VAT)
CONTACT Dabs Direct 0800 138 5240
www.dabs.com
PROS Extremely easy to set up. Reliable performance
CONS None
OVERALL A reliable, easy to set up board with a good complement of features. If only all Athlon boards were this simple

Pagis Pro Millennium

Basic OCR and image manipulation is offered by this a useful software bundle.

This package seems good value at first sight, bundling Kai Photo Soap2 image-manipulation software and Textbridge Pro Millennium optical character recognition (OCR) with Pagis Pro 3.0 document-management facilities – all for less than the price of any two of them. Publisher Scansoft claims Copier and Forms Fill-in are extra bundled 'products' but they're really single features: one sends a scan straight to the printer and the other helps you

complete scanned forms electronically.

Even basic OCR and graphics software is now seriously useful, so packages like this stand or fall on how well they help you manage your scans. A common problem is that they force you to cope with two filing systems – their own and native Windows. This can also stop you hyperlinking a document to relevant scans. Pagis Pro 3.0 looks promising because it installs itself within Windows Explorer. When you click on the Pagis Inbox folder, two extra toolbars pop up: one gives you scanning options and the other linked applications. Sadly, the implementation is clumsy. Explorer slows down markedly when you click on the Pagis Inbox and there are subtle changes in the menus – different hot keys to create a new folder, for instance (we found the Pagis hotkey by trial and error as it wasn't marked on the menu). And Pagis crashed twice when we created subfolders.

We tested Pagis with a Visioneer 6100C scanner that comes with the latest PaperPort Version 6.0, a similar and apparently more stable product that now supports hyperlinking even though it remains separate from Explorer. So for just £20 more than the Pagis suite you can get comparable document management and basic OCR with a scanner thrown in.

CLIVE AKASS
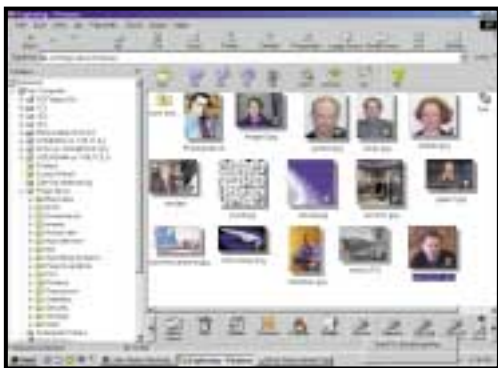
Pagis Pro – integrated with Windows Explorer

WordPerfect Office 2000

Corel confirms its support for Linux with a full office suite that should keep most users happy.

Corel is diving headfirst into the Linux market. WordPerfect 7 and 8 for Linux were quickly followed by Corel's own Linux distribution. Both honoured the Linux attitude that software for personal use should be freely available and as a result they could be downloaded for no charge from Corel's dedicated Linux site http://linux.corel.com.

Corel has confirmed its dedication to Linux with the release of WordPerfect Office 2000, a full office suite. The main components in the package are WordPerfect 9 word processor, Quattro Pro 9 spreadsheet, Corel Presentations 9 presentation package, CorelCENTRAL 9 PIM and contact manager, Paradox 9 database plus a download version of Corel Linux OS.

Although previous releases have been available for free download, WordPerfect Office 2000 for Linux is a retail product, so users will have to pay for it. This may

annoy some hardened free software supporters, but at £130 ex VAT it's not exorbitant. Corel is also hardly exploiting the Linux community as WordPerfect 8 is still available for download and its Linux distribution adds many useful and intuitive features to the standard Linux system. On the whole Corel's decision to make some money on a product that has

had extensive development is a fair one. In an ideal world all software would be free, but given that this isn't going to happen, then Corel deserves to recoup some of its investment in Linux. While £130 may seem a lot to those who are used to paying nothing, when you compare it to other fully functional office suites on the market it's reasonably priced.

The release of WordPerfect Office 2000 for Linux has been a fast one, mainly due to Corel's decision to use Wine (a Windows emulator) to allow the bulk of the Windows version to be used with just a few tweaks here and there. This means less code has to be rewritten and modified, and the visual aspects and file formats across the two systems can be kept more or less consistent. The downside of this approach

WordPerfect 9 has all the features you need
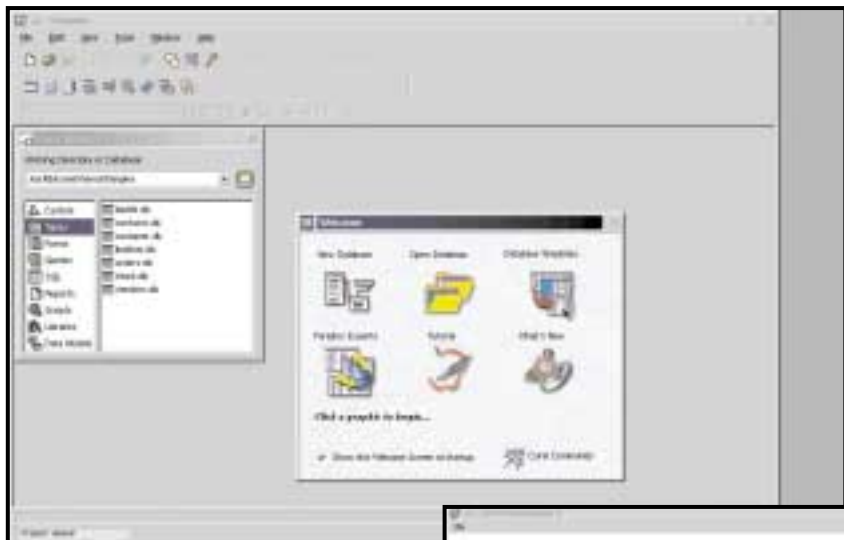
Paradox 9 gives you all the database functionality you need (top)
Create anything from birthday banners to corporate presentations. There's even a range of templates to guide you if your not artistically gifted (below)

is the runtime overhead introduced by invoking Wine. Also, the fact that the code hasn't been optimised for Linux makes it a little sluggish.

WordPerfect 9 has all the features you expect to find in a professional word-processing package. Styles can be easily set up and modified, with a Quick Style option to get you going quickly. Font previews are available so you don't have to remember what all the cryptic names are and there's full control over elements such as paragraph and tab spacing. There's full spelling and grammar checkers, including as you type spelling checks. If you're used to using a professional word-processing package, you'll find that most of the familiar features are available within an easy to navigate menu structure. One particularly useful function is the 'Publish to PDF' option, which allows you to create Adobe Acrobat PDF documents straight from the application. There's also support for Word and Lotus document formats so you can transfer files between environments, plus the ability to read both Windows and Linux versions of WordPerfect 6.1, 7 and 8.

Quattro Pro, formerly a Borland product, provides all the spreadsheet functionality found in most of the big packages. You can have multiple worksheets within each file and format the cells to your heart's content. The standard array of formulas that you expect to find are present, along with graphing and sorting functions. Even for the most hardened of spreadsheet users, most of the functionality of a professional package is there. Again there's file support for both the

Microsoft and Lotus camps plus earlier versions of Quattro Pro.

CorelCENTRAL plays the part of the PIM that users expect in a full Office Suite. Corel has chosen the approach of splitting the functionality into a number of distinct programs, in much the same way that Outlook is split into separate applications on Pocket PC (formerly Windows CE). The set comprises Address Book, Memos and Calendar. Calendar incorporates both an 'at a glance' view of things that must be done today, along with a traditional diary view allowing those all important future meetings, birthdays and reminders to be recorded. The Memos utility is useful for those moments of inspiration that must be noted, with the ability to file and organise the notes at a later date. Topping off the set is the requisite address book with the ability to store all the contact details you could ever need. The only obviously lacking component is an email client, although

there are one or two available for Linux.

Bringing up the rear are Paradox 9 and Presentations 9. Paradox, again originally a Borland product, offers all the relation database functionality you could want in a simple and easy to use manner. When you start it you're presented with the option of either following the tutorial, opening an existing database or diving straight in on your own. If you find yourself stuck there's help at hand in the form of 'Experts', the equivalent of Windows' Wizards, to walk you through the operations step by step.

Presentations is a PowerPoint equivalent for creating anything from a frivolous 'happy birthday' banner to a high-powered corporate presentation. There's a range of templates available if you're not particularly artistic and the package is very easy to use.

WordPerfect Office 2000 is a mature and competent Office Suite; the fact it runs on Linux is a bonus. If you're used to using a professional package then it's unlikely you'll be disappointed. Some may quibble that you actually have to pay for it, but for those in the real world, the price justifies the features and functionality on offer. If you want a professional solution running in a Linux environment then WordPerfect Office 2000 does exactly what it says on the box.

WILL HEAD

DETAILS
★★★★

PRICE £152.75 (£130 ex VAT)
CONTACT Corel 0800 581 028
http://linux.corel.com
SYSTEM REQUIREMENTS Linux Kernel Release 2.2, X Windows, Pentium 166, 32MB of RAM, 450MB of disk space
PROS Stable, competent office suite with a comprehensive feature set
CONS Performance overhead due to Windows-based components
OVERALL WordPerfect Office 2000 provides a stable and feature rich office suite for the Linux generation. It may cost money, but then most things in life do

BeOS 5 Personal Edition

This super-fast, super-sleek operating system gives a taste of how computing can be.

BeOS is astounding. It's a glimpse of how PC computing ought to be: lightning-fast, colourful, easy and stylish – what it would be like if we weren't fettered by layers of backward compatibility and accumulated detritus. For the first time you'll feel the raw power of your PC, and it's a refreshing experience. It boots in 10 to 15 seconds, and entire applications open faster than documents under Windows, transforming even moderately-powerful machines into snappy, responsive powerhouses, and on recent hardware it screams along. It's a slap in the face for big, cumbersome, hard-to-install OSs like Windows, OS/2 and Linux, free of bloat and the burden of backwards compatibility. It's also nearly free of device drivers and applications compared to Windows, which is its only drawback.

BeOS started on its own hardware platform, the twin-PowerPC-based BeBox, in 1996. A year later it was ported to the Power Macintosh, and a year after that, version 3.0 was released for both PowerPC and Intel systems. Be intended to produce a modern legacy-free system, built cleanly from the ground up to be fast, multi-processor-capable, multitasking and graphical. Not based on anything else, not compatible with anything else, but learning from the errors of other systems – for example, TCP/IP networking was built in from the start. It's fully buzzword-compliant: microkernel-based; has object-oriented design; full graphical operation; and 64bit journalling filesystem.

It started to mature with release 4, which switched from MetroWerks to GNU C++ for the Intel version, making it faster but binary-incompatible with previous versions. Release 4.5 improved hardware support and fixed many bugs. The current version 5 is if anything a smaller step, improving device support and adding modest refinements. More than anything, the version number change is a marketing feature, reflecting a business change rather than a technical one. Be is changing its focus from desktop PC OSs to embedded systems for Internet appliances. It has developed a
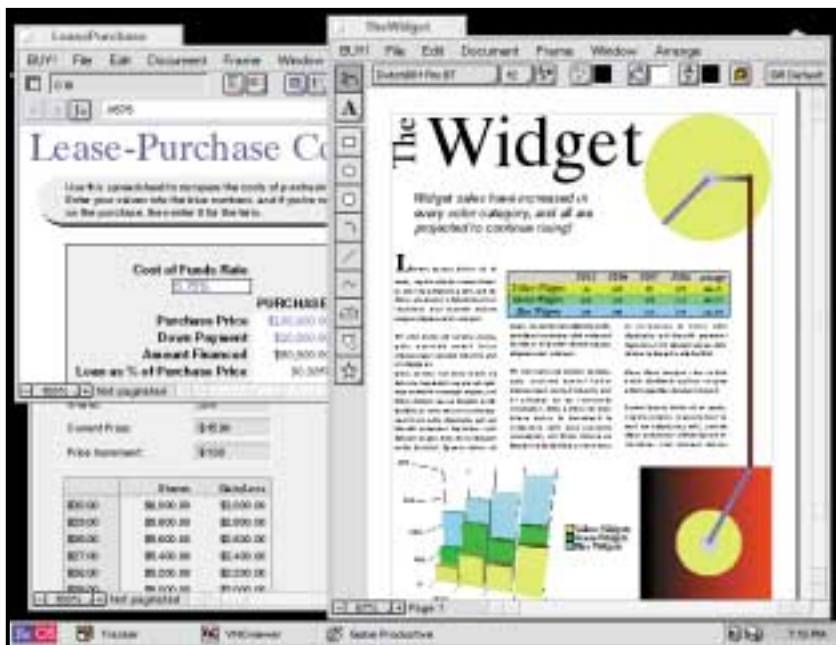
Entire applications open faster than documents under Windows and the GUI looks similar to that on the Mac

free version of BeOS 5, the Personal Edition, and handed over marketing of the full Professional version to application developers such as GoBe, developers of the only BeOS office suite, GoBe Productive.

There have been free demo versions of BeOS before: both 4 and 4.5 have appeared as bootable demo CDs which can't be installed onto a hard disk. These weren't as impressive as they could have been though. As CD drives are slow and read-only, the system performed badly and, without virtual memory, was extremely RAM-hungry.

BeOS 5 Personal Edition gets round this. The 44MB download is a Windows executable and installs under Windows 95, 98 or NT; a Linux version is also available. It creates a directory called \BEOS on

any hard drive with at least 500MB free. This contains a couple of programs and a 500MB 'image.be' file containing a complete installed copy of the OS. The process only takes a few minutes and worked on every system we tried.

BeOS can be started from an icon in Windows 9x, from DOS mode, or from a boot disk for users of NT or Linux. Contrary to some reports, it doesn't run as a Windows program. Windows is shut down and the PC goes into DOS mode before booting BeOS.

After the graphical loading screen, the desktop appears. This is normally a colourful sight – unless your graphics card isn't supported, as we found with a Tseng ET6100-based card. BeOS device drivers are tiny, and most are written by Be and come with the OS, so no configuration is required. If the system can identify your card, it loads the driver, if it can't, there may not be much you can do, although some additional drivers can be found on websites such as the Be Depot (www.bedepot.com). As such, there's no installation process involved: you start with a fully-functional system. BeOS can mount drives from most other operating systems: FAT, FAT32, HPFS, NTFS, Linux Ext2 and even MacOS HFS volumes. You can't readily expand the BeOS boot volume but you can keep applications and documents on other drives, so space isn't a major constraint.

Hardware support is a problem though. BeOS 5 supports many types of

devices, but comparatively few specific models. For example, only a handful of SCSI adaptors and printers are supported. Network cards are restricted to 3Com models, PCI, ISA and PCMCIA NE2000 compatibles, and a few others. FireWire and USB are new additions, as are CD writers and a good cross-section of recent sound cards.

The system looks superficially Mac-like, with elements from other systems. If you've used any GUI, it will be familiar. There's a Start-menu analog and the Deskbar, which lets you start and switch between programs, shut down the system and so on. It even has a 'system tray' containing a clock, volume control, mail notification utility and so on. By default, it's a rectangular stack of buttons at the top right of the screen, but it can be repositioned in any corner or along one edge, just like Windows' Taskbar. It's complemented by the Tracker, which resembles MacOS' Finder. There are neat touches everywhere, and it all feels a lot smoother and better-integrated than Windows.

The journalling filesystem should be resistant to corruption and supports customisable attributes, so you can use a directory of files as a simple database. Rather than just searching, multi-variable queries can be applied. The system uses MIME types for tracking file formats and includes built-in translators for most common sound, image and video formats. It can display almost anything, including animated OpenGL objects using moving video as textures.

BeOS is a complete operating system and can perform most of the tasks that Windows can. Preinstalled components include the NetPositive Web browser, an email client, a dialup networking stack, a media player, file translators, a 3D audio mixer that lets you graphically move parts of a track around in space, and even a few demo programs. More components are available from the website, such as tools for working on a
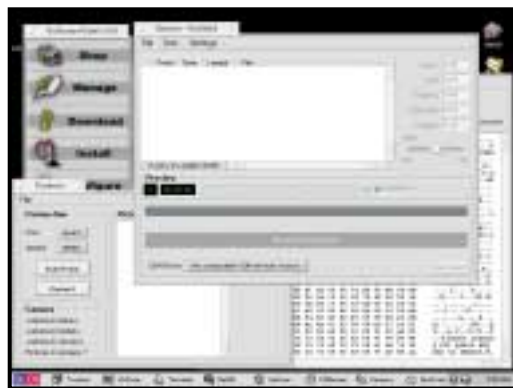
Hardware detection can be patchy with the system failing to find supported devices

Windows network. Many demonstration and free programs are available, including a demo version of the GoBe Productive office suite, graphics programs such as ArtPaint, BeCasso and Easel, audio packages including Aural Illusion and ObjektSynth, and more. Some of the multimedia packages are best-of-breed: adamation's personalStudio non-linear video editor lets you apply complex effects live in real time in a way that is impossible on Windows or MacOS. This perfectly complements BeOS 5's native facilities for capturing DVD-resolution video from a camcorder via FireWire and sending the edited results back to tape.

Be claims about a thousand shipping applications, with more arriving all the time. As parts of the underpinning of BeOS use Unix-style technologies, such as the network stack, porting Unix software is relatively easy. The GIMP photo-manipulation program is currently being ported, as are the Mozilla and Opera web browsers.

There are about a dozen very professional BeOS-oriented websites offering information, hints and tips, downloads and more, all linked from within the HTML-based documentation provided with the Personal Edition.

This edition is cut down from the Professional version in some areas. You don't get commercial components such as RealPlayer and Macromedia Flash, nor the CodeWarrior-based development system, and it's missing many of the demo programs, images, movies and sound clips from the CD version, along with all the third-party freeware and demonstration versions. If you can track down a v4.x demonstration CD, you can use the slightly older versions on there, and many can be downloaded anyway.

We found that hardware detection was patchy. Graphics cards are handled well, but the system failed to find supported devices on two machines, including NICs and a SoundBlaster 16. As in the early days of NT, for serious use, you should get a machine built specifically for BeOS using only components from the hardware compatibility list.

Finally, the Personal Edition can't be installed in a hard disk partition in its own right; only the CD version supports this. A skilled BeOS user could get round this, but doing so violates the principle of the freely-downloadable version. This isn't a demo or a crippled version, it's the real deal, just without some non-essential components and running from a DOS partition – something that caused no noticeable performance drop.

The BeOS is a remarkable piece of work. Compared to a behemoth such as Windows 2000, it's low on features, but it does everything most users will need, and does so far better than Windows. It's smaller, faster, runs more smoothly, multitasks better and feels vastly more responsive. Perhaps the Personal Edition will bring BeOS to a wide enough audience to win it the critical mass in the PC market that it needs – and certainly deserves. Over 100,000 people pre-registered their interest in the free version and the official download sites recorded over half a million downloads in the first two weeks after its release.

If you have reasonably high-spec PC you owe it to your computer to let it show you what it's capable of.

LIAM PROVEN
This month's cover disc includes a copy of BeOS and check out the workshop in Hands-on p240.

There are many demo and free programs available for BeOS including some graphics programs

DETAILS
★★★★

PRICE Free

CONTACT Be **www.be.com**

SYSTEM REQUIREMENTS 32MB of RAM, Pentium CPU, 0.5GB of hard disk space

PROS Sleek, fast, stable, excellent multimedia support

CONS Poor device support, limited software range

OVERALL BeOS is the smoothest and most polished OS around, as long as your hardware supports it and you can find the applications you need – and the free version lets you try it out easily and safely.

BETA

Adobe Illustrator 9

This impressive upgrade promises to make Adobe top choice once again for vector illustration.

This new release of Adobe Illustrator is astoundingly brilliant. With Illustrator 8, Adobe pulled back lost ground and put the package back in the running as the world's best vector illustration software. Version 9 goes far beyond that.

Over the past couple of years Macromedia has steadily captured the market in tools for creating and delivering web content. Adobe clearly wants that market and much of what's new in Illustrator 9 is aimed at breaking the growing domination of Flash as the delivery format for vector-based high-quality web animation.

A glance at Illustrator 9's new features must make worrying viewing for the people at Macromedia. Output to Flash (SWF) or scalable vector graphics (SVG) format, optimised output to GIF, JPEG and PNG, a pixel preview mode to show how vector art will look when rasterised, live drop shadows and glows, feathering, editable outlined text, object and layer effects, export of layered images to Photoshop and text that remains editable when exported to Photoshop – that's just for starters.

Adobe has finally addressed the transparency issue and, though rather belatedly, makes vastly superior use of transparency features than either Freehand or CorelDraw.

Other significant new features include live shapes that cope intelligently with edits, new lasso tools, graphic styles, web-safe RGB colour workflow, live Photoshop filters, release to layers for animation, and integrated PDF support.

Until now, there's only been one way to produce dynamic and exciting web visuals and that's using Macromedia's Flash application to create shockwave Flash format (SWF) animations. With the advent of Flash-enabled browsers the popularity of the format has exploded. Illustrator 9 provides pretty much the same kind

Apply transparency to pictures, object, text or layers using the new transparency palette

of Flash export options as Freehand 9, and more besides. You can export graphics to a single SWF file, export layers to separate SWF files and build layer-based Flash animations.

Adobe is promoting the SVG format as a superior alternative to Flash. SVG is an open standard that uses XML and CSS. Like Flash, it's vector based and therefore scalable, is interactive, and produces small files. Unlike Flash it has no installed user base and isn't supported by the current generation of browsers – Adobe provides an SVG viewer with Illustrator 9 and you can download it from www.adobe.com/svg.

For raster-based web graphics Illustrator has adopted Photoshop's save for web window to provide optimisation tools and multiple preview
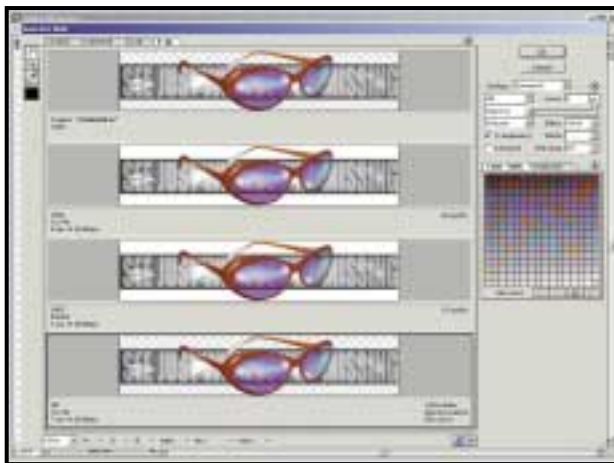
Illustrator 9's save for web option works just like Photoshop 5.5's, allowing you to compare quality and performance of different file format settings

windows for quality comparisons. You can save in GIF, JPEG, PNG-8 and PNG-24 formats, view four-up side by side comparisons with full control over compression settings, colour palettes and transparency. There's also a lossy GIF option.

One of the problems of producing vector graphics that will be viewed in a rasterised format in a web browser is that the conversion can lead to unpredictable results. Illustrator 9's new pixel preview mode saves having to export files, view them in a browser, then go back to Illustrator to edit. You can leave pixel preview mode on where it has the advantage of snapping objects to a pixel grid and avoiding anti-aliased edges.

Transparency is a feature that's been available in Freehand and CorelDraw for some time. One reason Illustrator has lacked it is that transparency isn't supported in PostScript and so applications have to 'fake' it – usually by defining overlapping areas as new objects and creating appropriate fills to create the effect of transparency.

Adobe has implemented transparency-based features that leave the competition standing. You can apply transparency settings to any layer, group, or object, including raster images, type and spot colours so that underlying objects show through. This is done the same way as in Photoshop – by selecting the object and adjusting an opacity slider in the new transparency palette.

You can apply transparency solely to an object's fill or stroke and the topmost object in a group can be made to knock out objects beneath it in the group to reveal what's below the grouped object.

Transparency can be applied to individual characters, words, or paragraphs in a text block and, as with virtually all other text transformations, the text remains fully editable. You can even create cumulative effects by applying transparency to individual

words and then overall to a text block.

The beta version demonstrated a few display glitches when applying transparency effects to type, hopefully these will be have been sorted by the time the product ships.

Also available from the transparency palette and another crossover from Photoshop are the blend modes, which control how an object's colours interact with the colours of underlying objects. An isolate blend option restricts the blend mode to objects within a group – objects underneath the group remain unaffected.

Opacity masks work like Photoshop alpha channels. You create an opacity mask by placing one object on top of another and selecting the mask option on the transparency palette. Visible areas of the underlying object are determined by the greyscale values of the top object. For example, a circle with a black to white gradient fill could be used to create a vignette of an object below it. Any object can be turned into an opacity mask. Used in combination with the gradient mesh tool, images and text, it has huge potential.

One of the big advantages of raster graphics is that you can create soft-feathered edges. With live feathering you can now achieve the same effects in Illustrator 9. According to Adobe the degree of feathering is specified, as in Photoshop, by a feather radius and can be previewed in the editing window. Even after applying feathering you can still edit the underlying object. We were, however, unable to test this feature, as it wasn't available in the beta review supplied.

Feathering is one of a number of features collectively known as object and layer effects (or 'live' effects), which change the appearance of an object, group or layer without affecting the underlying artwork. The obvious advantage of this is that you can edit the underlying object, be it text, a bitmap image or vector object, without having to start from scratch. Live effects can also be edited themselves to produce variations, or simply if you decide at a later stage that it's not right.

For example, text that has had a drop shadow or glow applied remains editable – you can even change the font or perform a spelling check. Photoshop and third-party plug-in filters applied as live effects are likewise editable. You can apply gaussian blur to text and then edit it. You can even use a live effect to convert text to outlines, so it can be opened without the font, yet it remains editable to anyone who has the font installed.

Object and layer effects are put to

further productive use with graphic styles – a sort of graphic style sheet. The starting point for graphic styles is appearance. Any combination of live effects, fills, strokes and transparency settings can make up an appearance. Once applied to an object, they're listed in the new appearances palette where they can be re-ordered, deleted and edited. Appearances can then be defined as graphic styles in the new styles palette. Like the object and layer effects from which they're built, graphic styles change only an object's appearance, not the

Stroke and fill settings, transparency and live object effects can be defined as graphic styles and dragged from the styles palette onto any object to quickly change its appearance

object itself, which remains editable.

Object and layer effects, like many of Illustrator 9's new features, will save much of the effort involved in repetitious reworking of raster effects applied to vector artwork when edits need to be made at the vector level – typically copy changes.

Another time saver comes in the form of live shapes – objects that automatically resize in relation to text and other objects. Typically you might use a live shape as a web button incorporating text. The usual approach is to design your button to accommodate the longest word or phrase, then adjust the width of the button to fit other circumstances. A live shape automatically shrinks or grows in proportion to the text it contains.

Other new features have been added either in response to the competition or to tighten integration with other Adobe products. The new lasso tools and simplify path command emulate those of Freehand 9. If you place native Illustrator files in GoLive it calls Illustrator to export the files in the appropriate format and if the file is subsequently edited in Illustrator, GoLive prompts you to

update it. Transparency is maintained between Illustrator and Photoshop 5.5 in both directions.

Illustrator's native file format is now PDF, making creation of PDFs from within Illustrator little more than a basic save operation though you still, of course, exercise complete control over compression and other PDF options, The Illustrator file extension remains .ai and version 9 can open previous version files. To ensure your files remain editable you simply check the 'preserve Illustrator editing capabilities' box to preserve file features such as links, swatches, brushes and graphic styles.

Whichever way you look at it, this version of Illustrator is the most comprehensive upgrade in its history. The implementation of transparency and all that flows from it, layer and object effects and the new web authoring features between them push the boundaries of vector illustration into a new dimension. Issues that will have to wait for the full release before we can judge include stability, the reliability of transparency and live effects on display and in print, and performance of export filters in terms of file size and fidelity to the original.On the basis of what we've seen here though, there's only one word for it – awesome.

KEN MCMAHON

DETAILS
★★★★★

PRICE £292.58 (£249 ex VAT)
CONTACT Adobe 020 8606 4001
www.adobe.co.uk
SYSTEM REQUIREMENTS Windows 98/NT4/2000, Pentium processor, 64MB of RAM, 105MB of free disk space, PostScript Level 2 printer
PROS Comprehensive web tools, exciting new object and layer effects, versatile transparency features
CONS As with any beta, performance and stability yet to be determined
OVERALL The most exciting development in vector illustration for years

Netscape 6.0

A promising and compact update which offers great integration of net tools and faster browsing.

Netscape's latest browser has endured a very long gestation – so long that many people have simply given up waiting for it. What's finally been released is a preview version, rather than a complete, polished product. Nevertheless, it does give a fair impression of what to expect when the final product ships later this year.

Netscape is presently at version 4.7. Version 5 never saw the light of day and this new release is based on the Mozilla open source project – specifically a new browser engine called Gecko.

Gecko is, so Netscape says, a completely standards-compliant browser engine – something that's long overdue, especially for those developers fed up with programs that aren't even the same across Mac and Windows versions. It's really Gecko that's the point of the preview release, with some solid features wrapped around it to give a taster of the final product. Gecko itself will be used in browser-type products from a range of other companies too, including IBM and AOL.

One of the main claims made for Netscape 6.0 is that it's smaller. It certainly is more compact than Internet Explorer, but it's still a fairly large program, taking up a reasonable chunk of disk space. Don't expect a return to browsers that fit on floppies any time soon. It does, however, run rather more speedily on older systems than version 4.7, though the Mac version appears to take rather a long time to start up. That's especially true the first time, when it spent so long fiddling around that we were convinced the system had hung.

When Netscape starts, the first thing that strikes you is the interface. There's not such a clear demarcation between the buttons, tool bars and the actual window as in earlier versions. The effect is closer to something clever done with frames, which is because most of the interface can be customised using XML. Skins are promised for the final version, so you can completely change how everything looks. For the time being, you'll probably either love or hate the way this looks.

The new version allows you to customise Netscape's interface to your liking

The next thing you'll notice is the sidebar, like a persistent left-hand frame (though you can hide it from the menus) which contains a number of tabs. These give quick access to a number of facilities, like a search system, an Instant Messenger Buddy List, and news headlines. You can customise it with other options, or develop a sidebar for your own site.

The input box at the top of the window lets you search the web, with results appearing in detailed form in the main window, and a list of sites in the sidebar's search tab. That allows you to follow links from the main window, and still go back to search results, without fiddling around – a little like the search option introduced in IE 4.5 for the Macintosh.

At the top and bottom of the screen are links to channels for shopping, information, and tools such as email, web page composer, instant messaging and web mail, making everything you want always close at hand.

The browsing itself appears to work very well. It's faster than the previous version and seems quicker than Internet

Explorer, but it's hard to make a completely objective assessment. Certainly, pages like the BBC News were rendered very quickly, and sensibly too, with the layout and text appearing before any pictures, making it much simpler to follow links without waiting for everything to download.

There are other handy things, like a central master password that gives access to all the other ones, and Netscape's Smart Update to ensure you have the latest version. If you make extensive use of tools like instant messaging, or want to keep the news in view, then the browser really does give you a handy one-stop tool that doesn't clutter your screen unnecessarily.

There are rough edges in this preview. You can't set up helper applications properly, and the mail and news facilities are unfinished, but the core browser itself appears to work well, even on a system with limited resources. Oddly, the Mac version appeared less responsive, on a system that's usually nippier than the PC – unless you have a new Mac, you may be better off waiting.

If you want a complete, polished solution, wait for the final release. On the evidence of the preview, it looks like it will be well worth the wait. If you don't mind a few rough edges, and can't wait to get your hands on something that integrates buddy lists, email, news headlines and standards-based browsing, then it's certainly worth experimenting with the preview. You're likely to be pleasantly surprised.

NIGEL WHITFIELD

DETAILS
★★★

PRICE Free
CONTACT Netscape
http://home.netscape.com/
PROS Fast and standards-based, integrates well with instant messaging and other net tools
CONS Sidebar performance is a little sluggish, some areas still need polishing
OVERALL A good-looking browser that shows a lot of promise, but with a few rough edges at the moment. Great integration of common net tools and tasks

BETA

Internet Explorer 5.5

A familiar look and feel for Microsoft's latest browser with a few useful features for web designers.

Nobody likes change, so it's perhaps good news that IE 5.5 looks and feels exactly like version 5. There are no interface tweaks like those found in Netscape 6.0 and end users will probably wonder why they bothered to download. One feature you'll probably welcome, though, is the print preview. This is long overdue and means you'll no longer have to use the hit-and-miss method to guess which page that one important paragraph falls on when you don't want to output a lengthy page.

Installation is painless – download a small installer from Microsoft's site and it will take care of grabbing the rest and writing it to your drive. It simultaneously installs version 2.1 of the MSN Messenger, Microsoft's rival to AOL's Instant Messenger. You may remember a well publicised falling out last year that saw AOL blocking users of the MSN Messenger from chatting with their users so it's worth checking what your friends use before getting too attached to one or the other. The AOL messenger is bundled with Netscape's browser, but there's nothing to stop you using that with IE 5.5. It's a shame Microsoft chose to install version 2.1, which has already been outdated by a new version offering parental controls and, recognising this fact, pops up a message asking you to upgrade every time it starts.

There are many changes targeted at the web designer. Perhaps the most exciting is the new HTML+TIME 2.0 feature that allows for synchronisation of streamed media, timing of HTML elements, animation and so forth and, being largely XML based, conforms to standards ratified by the W3C (World Wide Web Consortium). Further, support for enhanced style sheets cater for vertical text. This may seem frivolous to us, but will be greatly welcomed by Chinese and Japanese developers.

The concept of Element Behaviours has been introduced, allowing development teams to split workloads. In this way, scripting experts can write their work into a separate file that's referenced by the HTML author and eliminates the need to define how every element on a page should behave on an individual basis. The new ViewLink feature also simplifies the incorporation of DHTML components. This is closely tied to the Element Behaviours feature outlined above and
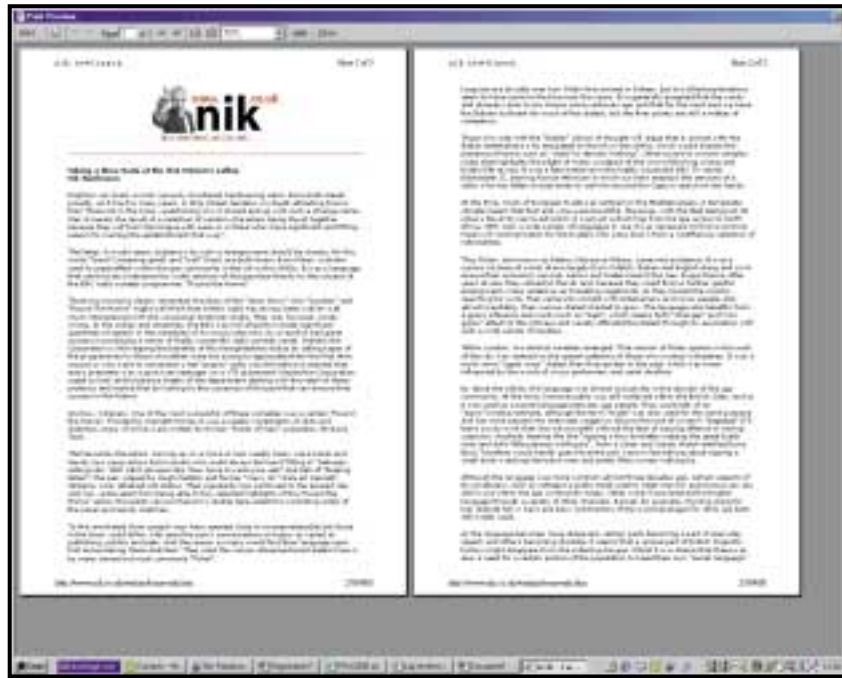
Internet Explorer 5.5 includes a long-awaited print preview mode

allows code written in an external file to be incorporated within a larger HTML document, even if that coding previously would have required installation on the client machine before it would properly render.

IE 5.5 should run more quickly and efficiently than its version 5 predecessor as the core architecture has been tweaked to change the way it handles frames. Previously IE had initiated a fresh instance of the browser core to handle each frame, even if it was contained within a pre-existing browser window. Saving on resources, the ViewLink technology built into this latest incarnation allows it to render the new frame within the existing HTML page. The end user will see no difference, but the performance of frames-based pages will be much enhanced and Microsoft promises it will allow designers to create some visually interesting effects such as transparent frames that take on the background image of the HTML document from within which they're addressed.

IE 5.5 has a few smart new graphics filters that will auto-render fades and blends client-side rather than relying on the author generating them first and then saving as a GIF or JPEG. Previously, when you wanted to use a fade as the backdrop to, say, a table cell, you would have to first generate the pattern in a graphics package and refer to it in your code. This version of Explorer lets you describe the fade and even any required transparency directly within your code and let the browser handle it at the user end, cutting down on download time.

In all, Internet Explorer incorporates many enhancements that should work toward cutting download times and enriching your online experience, but until HTML authors are satisfied that there's a sufficiently large installed base to warrant putting them to use in their pages you're unlikely to see any real benefit in the near future. It's still worth upgrading if only to keep your system up to date, but we'd recommend opting for the mix and match approach and supplementing the download with an install of AOL Instant Messenger.

NIK RAWLINSON

DETAILS
★★★★

PRICE Free download
CONTACT Microsoft
www.microsoft.com/windows/ie/
PROS Should cut download times, will be familiar to existing IE users
CONS Outdated version of MSN Messenger bundled with the beta we tested
OVERALL Worth the download but you may have to wait to feel the full effect

Compaq NeoServer 150

A simple package that offers small businesses a network solution and great storage potential.

Small businesses looking to network a number of PCs, printers and laptops could do a lot worse than the Compaq NeoServer 150. Designed to operate as an out-of-the-box server, it offers Internet access and an abundance of storage at a reasonable price.

Also included is a Compaq eight-port 10BaseT Ethernet hub that can be used to link up to seven other devices – more if you daisy-chain hubs together. We have to admit to being a little surprised by Compaq's decision to ship a 10BaseT hub, rather than a switch. After all, the price incentive for doing this has all but disappeared, and the far inferior performance offered by hubs could become an issue over time.

The server itself is built around a 566MHz Intel Celeron processor with 64MB of SDRAM memory. Storage is also well covered with an internal 13GB EIDE hard drive, and two external and removable hard drive slots that support a 17GB and a 13GB EIDE hard drive respectively.

Configuration was slightly flawed. In theory all we had to do was insert the CD-ROM, press play and wait for our new and shiny network to come to life. We tried to do this on a Windows 2000 machine, and were told that the network settings hadn't been configured correctly, which we tried to do manually.

On Windows 2000 this involved configuring our network settings to work with both DHCP (Dynamic Host Configuration Protocol) and DNS (Domain Name Structure). The idea is that the NeoServer acts as the DHCP server, while our Windows 2000 machine would be assigned an IP address each time we logged on. This is a fine idea, as it removes the need to manually configure each device that you want to connect to the network.

Once done, we performed a search from Network Neighborhood for computers called NeoServer and, sure enough, it appeared without a hitch. The next job was to map a network drive so that we could begin to write files to our new server. It then appeared just like a local hard drive in Explorer. It's administered through a standard web browser, and by typing 'neoserver' into the address line we were taken to the main configuration page. Configuration is well thought out, simple and intuitive. As well as setting up the mundane time and date information, we were also able to set up the more interesting details such as ISP information, user accounts, access permissions and more advanced network settings. Again, we were impressed with its simplicity.

As well as offering the standard file sharing and shared Internet access, the NeoServer also doubles as a backup solution. Through the management console you're able to schedule backups of any work, and then save them to a private file with no write privileges, for example.

Another NeoServer function is to act as a primitive web server. It allows you to set up an internal intranet site with the address http://intranet.neoserver, which is also protected by a built-in firewall.

We found it strange that no HTML editing tools were included however, with only the advice that we should modify our homepage, by editing the contents of the \\disk1\www folder, with FrontPage.

It also allowed us to set up a simple internal email system, so if we wanted to mail a colleague in our new office, it wouldn't involve logging on to the Internet. When you do happen to log on, however, security is offered by way of an integrated firewall. Although a decent addition, we found it a little perturbing that there was no way to configure this.

Overall, the NeoServer is a comprehensive piece of kit aimed at a specific market. Although there are other ways of setting up a network – namely buying a cheap network starter pack (which can cost less than £100 and consist of a switch, cables and NICs) and simply linking your machines together, this method is preferable.

The reason for this is that it's a far cleaner solution, which for less than a grand provides you with a central server as well as shared Internet access and a firewall. If you're looking to expand into a flexible networked environment, and have £1,000 to spend then look no further.

DAVID RAE

DETELS
★★★★

PRICE £985 (£839 ex VAT)
CONTACT Compaq 0845 270 4222
www.compaq.co.uk
PROS A simple answer to what can be a complex undertaking, well-priced, comes with everything you need to set up a small network
CONS Why provide a hub when a switch would barely have increased the price? No way to configure the firewall, experienced a few problems with the automatic network configuration offered by the software
OVERALL If you want to network a small office, then there are many ways you can go. However, no other method offers this kind of functionality, build quality and simplicity and at such a good price

HP Kayak XM600

A fast entry-level workstation helped along by dual-Pentium III processors, at a reasonable price.

HP's new workstation range is being sold as powerful machines at PC prices, and it looks like the company may have come up with a winner in the shape of the Kayak XM600.

There are two Pentium III 733EB processors inside this machine. These feature both faster on-die cache and support for a 133MHz FSB and are mounted using an Intel-approved solution. The motherboard is a custom-built version from Asus and uses Intel's 820 chipset. Unusually, it has three RIMM slots (most 820 boards only support two). One of the slots is filled with 128MB of 700MHz RAMBUS memory. The other two are fitted with the appropriate RIMM spacers, but we feel that an 840 solution would be more appropriate if multiprocessor performance is important to you. That chipset's dual-RDRAM memory channels and 64bit PCI bus would have given the system the opportunity to make better use of the dual processors. This would have pushed up system price though, and as it stands the 820 manages to attain a good compromise between performance and value.

Sitting in the AGP slot is an Elsa Synergy II card. This has 32MB of SDRAM on board, and uses a standard TNT2 chip. Although this doesn't allow it to break the speed barrier as far as 3D performance is concerned, this isn't a system intended for gamers. NT4 is the operating system of choice, but as this comes pre-loaded we were unable to run our DirectX 7-based 3DMark 2000 benchmark. In Quake III it managed 31.2fps (frames per second) and 33.6fps with SMP enabled. Much more important are the custom Elsa drivers – this is what you're paying a premium for.

The dual processors really helped this machine fly when we ran our test 3D render using 3D Studio. It managed to complete the test scene in 18 minutes 15 seconds. We ran the same scene on the 1GHz machines we reviewed last month – the 1GHz Pentium III took 26 minutes nine seconds, proving that if you're using software that implements multi-threading properly, two processors really are better than one.

In keeping with its workstation status, HP has mounted a 10/100 network interface card in the bottom PCI slot. No modem is present, but then the customers HP is aiming this system at won't need one. This leaves four PCI slots free.

A 15.3GB Maxtor hard disk is mounted in a 3.5in bay. This faces sideways at the bottom of the case, making it very easy to add and remove drives as required. An HP CD-RW is included for backup. There are no other optical drives, leaving two 3.5in and 5.25in bays free for expansion.

The case is an excellent choice and if you need to upgrade, it should be fairly painless. Instead of using screws to secure each of the drives, this case has a series of plastic strips through which metal bars hold everything in place. This makes them much easier to remove – you can simply rip out the rods when you need to work on the bays. A diagnostic panel is located on the front of the case. This monochrome LCD shows information such as the name of the machine, BIOS version and serial number. The diagnostic functions are fairly limited – it displays a smiley face to indicate the status of various conditions.

Build quality is good – a funnel directs air toward the processor, and there's an extra fan at the base to help keep the system cool.

HP supplies machines and monitors separately, so the choice is up to you. As far as this system is concerned, the company recommends its P96, although as this wasn't the monitor sent in for review we can't tell you how good it is.

Overall, this system is very well put together. It's very easy to use, and the RAMBUS memory combined with the dual processors and the graphics card make it a fast machine. It isn't the best value system you could buy and other manufacturers can sell you a similarly specified machine for less. If you like the idea of the support that comes from such a top-quality name though, then it would be an excellent choice.

JASON JENKINS
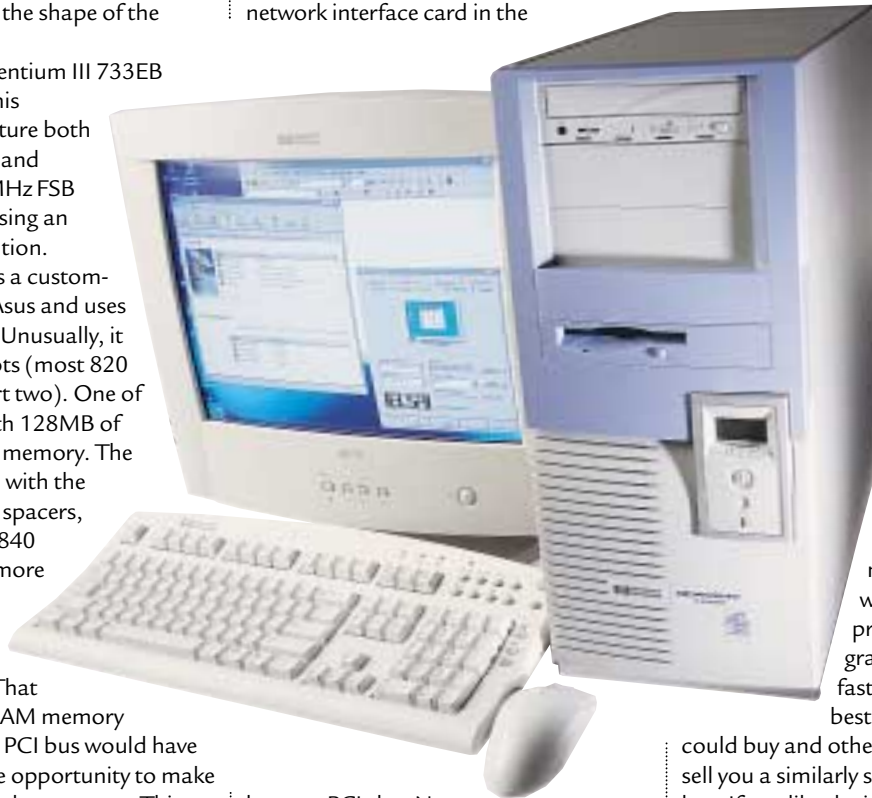
DETAILS
★★★★★

PRICE PC £2,811.78 (£2,393 ex VAT), HP75 17in monitor £270.25 (£230 ex VAT), HP P96 19in monitor £493.50 (£420 ex VAT)
CONTACT HP 0990 47 47 47
www.hp.com/uk
PROS Dual processors, excellent build quality and case
CONS Could be cheaper
OVERALL A very good entry-level workstation that combines quality and speed

PERFORMANCE RESULTS

0	100	200	300

171

SYSmark 2000

0	10	20	30	40	50	60

31.2
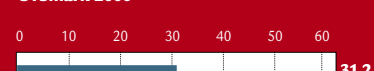
Quake III (fps)

PERSONAL COMPUTER WORLD
BESTBUYS

YOUR GUIDE TO TODAY'S TOP PRODUCTS ▶▶▶▶▶

ENTRY-LEVEL PC

Carrera
Lynx W600

Sporting Intel's 600MHz Celeron CPU, this is perfect for home users not mad about games. It comes stocked with 128MB of RAM, a 13GB hard drive and an eight-speed Panasonic DVD-ROM drive. Graphics are handled by the onboard 810e graphics chipset, which isn't ideal for games, but there's also a modem and a copy of Lotus SmartSuite Millennium.

Review *June 2000, p78* **Price** *£821.33 (£699 ex VAT)*
Contact *Carrera 020 8307 2800 www.carrera.co.uk*

MID-RANGE PC

Mesh
Matrix 900 GT Live

new

This is a great high-specification machine at a reasonable price. It has a 900MHz AMD Athlon CPU backed up with 128MB of PC100 SDRAM. You also get a super fast GeForce 2 graphics card driving a 19in Mitsubishi monitor. Mesh is shooting for the high-tech enthusiast with the Matrix, and it's got the balance just about perfect.

Review *July 2000, p77* **Price** *£1,878.82 (£1,599 ex VAT)*
Contact *Mesh 020 8208 4706 www.meshplc.com*

HIGH-END PC

Dell **Dimension XPS B1000 Special Edition**

The first in the new wave of 1GHz Pentium III-equipped systems, the B1000 Special Edition, partners the power of the 1GHz PIII with 128MB of RAMBUS RDRAM and Dell's custom GeForce 256 graphics card with 64MB of DDR memory. You also get a spacious 30GB EIDE hard drive that can be backed up using the eight-speed CD-RW. A scorcher.

Review *June 2000, p75* **Price** *£3,136 (£2,669 ex VAT)*
Contact *Dell 0870 152 4850 www.dell.co.uk*

FULLY-FEATURED NOTEBOOK

Gateway
Solo 9300 LS

Making use of Intel's 600MHz 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** *£2,243.08 (£1,909 ex VAT)*
Contact *Gateway 0800 55 2000 www.gateway.com/uk*

ULTRA-PORTABLE NOTEBOOK

Sony
Vaio PCG-Z600RE

Sony has taken the ultra-portable genre a step further with this slim, sexy, Pentium III, 500MHz machine with 128MB of RAM and a 12GB hard disk. You also get a 56K PC Card modem and a built-in Ethernet adaptor. With a 12.1in TFT screen sporting a 1,024 x 768 resolution and a Memory Stick slot for Sony's own solid state media, this is the coolest notebook around.

Review *June 2000, p76* **Price** *£2,301.82 (£1,959 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*

Canon
PowerShot S20

The S20 is almost the same as the S10 with a champagne gold finish. The 3.3 megapixel model gives you 2,048 x 1,536 pixels. The S20's card slot is CF-II-compliant and can swallow an IBM MicroDrive hard disk.

Review *June 2000, p104* **Price** *£699 (£594.89 ex VAT)*
Contact *Canon 0121 666 6262* *www.canon.co.uk*

Philips
Vesta Pro

This is a very well designed unit with built-in USB microphone. The 640 x 480 pixel CCD can deliver up to 15fps at VGA resolution or smooth 30fps at lower resolutions down to 128 x 96. An excellent package at a remarkably cheap price.

Review *July 2000, p224* **Price** *£52.87 (£45 ex VAT)*
Contact *Microtronica 01189 633 733* *www.pcstuff.philips.com*

Creative Labs
SB Live! Platinum
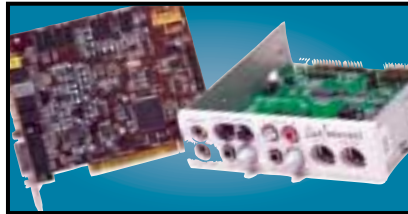
This is exactly what gamers and budding PC musicians have been asking for – great sound quality and excellent bundled software make it a winner. We think it's the best sound product ever.

Review *February 2000, p83* **Price** *£179 (£152 ex VAT)*
Contact *Creative Labs 0800 973 069* *www.soundblaster.com*

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** *£130.43 (£111 ex VAT)*
Contact *Watford 0870 729 5600* *www.watford.co.uk*

Brother
HL-1250

This compact machine has everything you could reasonably ask for at the price, but Brother has gone one step further with the inclusion of both parallel and USB ports.

Review *February 2000, p165* **Price** *£245.58 (£209 ex VAT)*
Contact *Simply 08707 297 366* *www.brother.com*

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*

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*

Hewlett-Packard
Office Jet R45

A 600dpi colour inkjet printer, colour scanner and photocopier all in one. Colour output is rich and vibrant. The 30bit scanner supports a maximum optical resolution of 600dpi.

Review *November 1999, p96* **Price** *£364.25 (£310 ex VAT)*
Contact *Hewlett-Packard 0990 474747* *www.europe.hp.com*

Creative Labs
Annihilator Pro

Based on the DDR version of the GeForce 256 chipset from nVidia, this card offloads transform and lighting effects processing from your CPU to give outstanding results.

Review *March 2000, p80* **Price** *£218 (£186 ex VAT)*
Contact *Creative Labs 0800 973 069* *www.europe.creative.com*

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*

Seagate
Barracuda ATA 28GB

This 28GB beast's spin speed of 7,200rpm helped it achieve 0.89Mbytes/sec in our random read and write test. It's a breeze to install and the £5.10 cost per GB makes it a bargain.

Review *April 2000, p197* **Price** *£160.97 (£137 ex VAT)*
Contact *SMCdirect 01753 550333* *www.seagate.com*

Seagate
Barracuda ST150176LW

The Barracuda may no longer be at the cutting edge of SCSI performance, but with its 7,200rpm spin speed and 50GB storage space its value for money is outstanding.

Review *April 2000, p202* **Price** *£692.08 (£589 ex VAT)*
Contact *SMCdirect 01753 550333* *www.seagate.com*

Abit
KA7

This uses VIA's Apollo KX133 chipset with the capability to run the memory at 133MHz plus support for AGP 4x. There are two Ultra DMA 66 channels plus the standard floppy connector and four DIMM banks.

Review *July 2000, p108* **Price** *£129.25 (£110 ex VAT)*
Contact *Dabs Direct 0800 138 5240 www.dabs.com*

Gigabyte
GA-6BX7
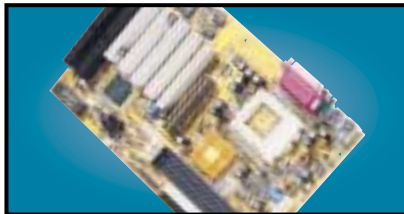
If you are going to use one of the latest Pentium IIIs you're going to need a FC-PGA (Flip Chip Pin Grid Array) compatible board. The GA-6BX7 uses the 440BX chipset and has one AGP, four PCI and one ISA slot. It also uses cheap SDRAM.

Review *June 2000, p98* **Price** *£99 (£84.26 ex VAT)*
Contact *Gigabyte 01908 362 700 www.gbt-tech.co.uk*

Abit
BP6
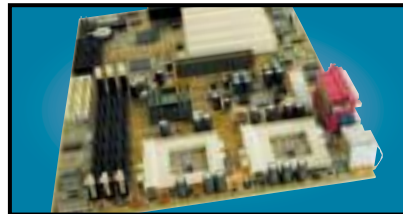
The BP6 allows you to use Intel's socket 370 Celerons in a dual-processor configuration. Even if you only use the board for a single processor, the BP6 still shines because it is one of the few Socket 370 boards to use the BX chipset.

Review *March 2000, p195* **Price** *£116.33 (£99 ex VAT)*
Contact *Top PC 0113 2422 416 www.abit.com.tw*

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** *£233.82 (£199 ex VAT)*
Contact *Dabs Direct 0800 138 5124 www.ctxeurope.com*

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** *£363 (£309 ex VAT)*
Contact *CTX 01923 810 800 www.ctxmonitors.com*

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*

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*

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*

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** *£193.87 (£165 ex VAT)*
Contact *Dabs Direct 0800 138 5114 www.europe.creative.com*

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** *£99 (£84.35 ex VAT)*
Contact *Eicon Technology 020 8967 8000 www.eicon.com*

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** *£233.82 (£199 ex VAT).*
Contact *OnStream 0800 328 1204 www.onstream.com*

Panasonic
LF-D103 U

This unit not only reads CD-ROM and DVD-ROM discs, but it also writes to PD and DVD-RAM discs, offering safe and affordable high-capacity backup.

Review *October 1998, p98* **Price** *£364.23 (£309.99 ex VAT)*
Contact *Insight 0800 073 7570 www.panasonic.co.uk*

gadgets

compiled by Niall Magennis & Claire Morley

MP3?
Got it taped

At a price of about £200, the romeMP3 player crams everything you need to listen to MP3 tunes into a standard-sized cassette tape shell. What's more, you can actually put the romeMP3 into a cassette deck and play it like an audio tape! Even the cassette deck's fast-forward and rewind buttons will function with the device.

Contact: www.romemp3.com

Lost and found

You'll never get lost if you've got this mobile phone in your pocket. The Esc! from Benefon is not just a dual-band GSM phone, but also a GPS device. You can even track and find another Esc! phone, so now there's no excuse for not being able to find your mates at that obscure pub you've never heard of.

Contact: www.benefon.com

Four into one shot

Who says gadgets have to be expensive? For just £24.95, the Lomo Action Sampler is no ordinary camera. When you take a shot, all four lenses are exposed over the period of one second. The pictures are split into four when developed, making each one a mini-action sequence. And best of all, the pictures are developed in the normal way. The camera works with any 35mm film.

Contact: www.firebox.com
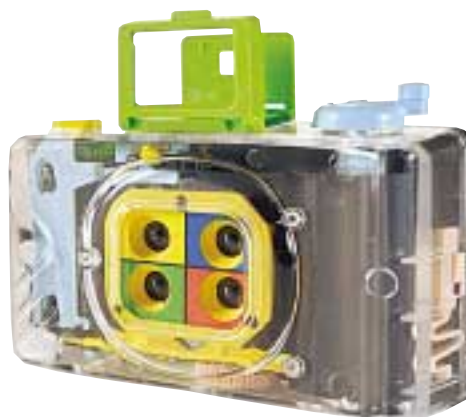
WAP's the story

Siemens is claiming the Unifier is the smallest mobile data device on the market to have a keyboard and large screen display, but what is really impressive about the unit is the built-in WAP 1.1 browser. When combined with a mobile phone, the Unifier can be used for email and short messaging services (SMS), as well as WAP browsing. Priced at about £50, the unit also comes with a docking station to allow it to synchronise with Microsoft Outlook or Lotus Organiser.

Contact: www.siemens.com

Radio stars on the Internet

It may look like a conventional radio, but it's actually the world's first Internet radio from Kerbango. You simply connect it to your phone line and press the 'On' button. The device then connects to the Internet and displays the available Internet radio stations by category. The radio has a USB port, a built-in modem and Ethernet connector. It'll even play back MP3 files stored on your PC when both are on the same LAN.

Contact: www.kerbango.com

Style in the fast lane

The analog modem maybe on its last legs, but the cable modem is now set for prime time. With its Home Connect Cable Modem, 3Com isn't just going for speed but also for style. The device is only currently available in the US, but cable modem services are now starting to hit the UK so we should see it over here soon. It supports 3Mbits/sec for downloads and up to 1Mbits/sec for uploads.

Contact: www.3com.com

ILLUSTRATION ADRIAN JOHNSON

Patently absurd

If you are a programmer or create ecommerce websites you could unwittingly be infringing someone's patent. Guy Matthews looks at the winners and losers in the murky world of patenting laws.

On the face of it, the ability to patent an invention, so that you can charge a small commission for its subsequent commercial use by others, is perfectly fair. If you put in the hard work, why should another party freely be able to copy your innovation? In the high-tech world at least, this simple principle has become considerably muddied, thanks to a combination of sinister and self-interested motives and muddle-headed bureaucracy. And if writing software code of any kind is your business, then you could easily suffer dire consequences.

The principle of patenting an invention is surprisingly old, dating back to 1790. The basic right to patent your invention is enshrined in the US Constitution, the idea being to give a little guy with a big idea a chance of exploiting the fruits of his labour. The principle's usage blossomed in the increasingly industrialised US of the late nineteenth and early twentieth centuries, the era of the Wild West and the American Dream.

In the hundred-odd intervening years, these worthy original ideals have been turned on their head and, effectively, perverted. In the digital age, the owner and

enforcer of a patent is more likely to be a big-time software corporation coming down hard on a small-time programmer who happens, probably inadvertently, to have strayed onto their patch, sometimes with financially lethal consequences. The world of patenting, particularly the patenting of software code, has become a badly-policed jungle where might is right and lawmakers are out of their depth. Not unlike the Wild West of patenting's first heyday.

At the heart of the problem is the spiralling number of patents being filed with the Patent and Trademark Office (PTO), the US Government body that grants patents. Until a few years ago, most developers of software, corporate or otherwise, were generally content to allow the far less rigorous law of copyright to protect their intellectual property. For years, it was widely thought that software, as an 'idea' rather than a physical object, was unpatentable anyway.

Now, thanks to new thinking on software's definition and status, everybody wants to patent it. In 1992, there were a manageable 1,600 or so software patents issued by the PTO. By 1997 this had grown to over 13,000, and the figure for last year is estimated at around 22,500. The PTO, operating on the same resources today as a decade ago, is scarcely able to cope. Patents are being approved, it is alleged by the body's critics, that had no business being filed in the first place.

This approval, say critics, is being granted by poorly paid and poorly trained civil servants who have little idea of what software innovation really is, and no time or inclination to learn. In a climate where high-paying, high-flying software companies are short of the bodies they need for the work they're doing, what chance does a dusty governmental outpost like the PTO have of competing for talent to better itself?

So who does this problem affect? The majority of the above mentioned flood of patents are sought by powerful technology manufacturers and software developers – IBM, Sun, AT&T to name three prime examples. What they're seeking to do, say critics, is to use patenting laws not to protect their property from rogues, but to crush others attempting to establish any sort of foothold in their markets. This means you could be a start-up developer, or even a small-time enthusiast, and blamelessly stray onto turf that has already been claimed. Unlike in the world of copyright, your lack of awareness of infringement is absolutely no defence.

See you in court

What happens next is sometimes salutary stuff. Gregory Aharonian is a US patent lawyer who has made a name for himself as a prominent critic of current software patent policy. He said that there are two principal types of attack made by the owners of patents: 'If you are a successful

The crazy world of patenting

1 Software company Geoworks has a patent that covers 'flexible user interface technology' used on 'all devices, including mobile phones, which are based on the WAP specification'. This translates as just about any wireless device connected to the Internet. Phone.com, which produces software for WAP phones, has filed a suit in the US District Court to challenge the validity of Geoworks' patent claims. Others such as Toshiba have stumped up for the licence fee.

2 Although we can now look back on the Y2K threat and see it as a storm in a teacup, the threat seemed serious enough in December of last year. A long-running dispute about the validity of Dickens2000, a bug fix, went right to the wire. As late as 23 December the PTO was still dithering about whether inventor Bruce Dickens has the right to collect fees and royalties from thousands of firms which had used the fix or something similar.

3 Knowing that it has one arm tied behind its back by its open-source status, Microsoft is trying to use patent law in a devious attempt to throttle Linux. As applications based on Linux proliferate, unprotected by patents, as is the wish of the Linux community, so Microsoft is looking hard for patents that Linux apps appear to stray onto. Another Bill Gates dirty trick, say outraged open-source fans.

Microsoft knows all about how costly patent infringement can be. It ended up paying out £75m in compensatory damages when it was found guilty of violating STAC Electronics' patent on data compression in February 1994.

4 Linux isn't the only victim of openness on record. When Compuserve released the Graphical Interchange Format (GIF) as an open specification in 1987, it didn't realise that it contained compression technology owned by Unisys. Unisys didn't get around to acting on the matter until 1994, but, no matter that the patent had gone undefended for so long, developers in their thousands were forced to fork out a royalty to Unisys for use of the by then hugely popular image format.

5 The newer the technology, the more apparently prone it is to patent problems. Small-time MP3 programmer Tord Jansson has been forced, temporarily at least, to shut up shop while large companies threaten to take him to court.

and established software company, then you are bound to get lots of people after you with patent claims on your technology. Most of these are invalid and nothing to worry about, and companies will often see it as a badge of honour to be sued in this way. It means they've arrived.'

It's a different matter if it's a small start-up that gets hit, said Aharonian. 'If you are a small company, and you get a letter in the mail that begins "Dear Sir, We hold a patent…" you are in immediate trouble. The first thing you need is a validity opinion from your lawyer, which could cost you between £12,500 and £25,000. You can't really do without this, just in case it is a valid claim. If you get two or three of these a year, will it kill you? Maybe not, but it certainly uses up slim resources.' Few cases, he said, end up in court, but the expense of settling behind the scenes can be horrifying.

It's rare, but not unknown, said Aharonian, for independent or even amateur programmers to get hit. 'Patent holders are usually after people they think have money,' he advised. But in essence, any shareware programmer, any ecommerce entrepreneur, any small software operation could potentially be caught out by a minefield that's growing more dense year by year.

This wouldn't matter too much if so many of the patents being granted weren't so dubious. If the only patents being permitted were rock solid, and based on proper research, both on the part of the applicant and the examiner, then there would be far fewer to contend with. But it's widely acknowledged that most software patents aren't worth the paper they're printed on. Most are taken out as an intimidatory device by corporations that can well afford the small fortune it costs to establish the patent. The currency of the patent has been devalued by applications, made by these companies, that are backed by inadequate research into prior art (see glossary). The law that guards them, however, remains the same.

So, who's doing something about this mess? The PTO, and other patenting bodies around the world, aren't oblivious to the growing problem. The PTO, in particular, has announced new patenting laws to better define how software patents differ from hardware patents. It also plans to implement a secondary examination procedure for software, and has put out new guidelines for computer patents, including a promise that examiners will pay more attention to prior art.

So much puff, say critics. Aharonian said: 'I'm cynical about government promises. The quality of patents has not improved for 15 years, and it has become an assembly line process. The Government says it is on the case, but when did you ever

Glossary of patent terms and bodies

European Patent Office (EPO)
The continental equivalent of the PTO (see below), with similar powers but working to subtly differing laws.

Obvious/non-obvious
The degree to which a patent claims ownership to something that is novel, or alternatively commonly used and in the public domain.

Patent and Trademark Office (PTO)
The US Government body responsible for granting patents.

Processes and ideas
An idea or a process may not be patented, only a usable invention that accomplishes a task. But software is no longer regarded as an idea, thanks to important legal test cases.

Prior art
Examples of similar existing innovations, potentially evidence that an 'invention' has been thought of before. Non-patent prior art is previous inventions that, because unpatented, do not stand in the way of an application.

Software Patent Institute
Maintains a database of US and non-US software patents.

UK Patent Office
Thanks to EU harmonisation, the UK Patent Office is increasingly in line with the EPO, and can virtually be regarded as a division thereof.

know a government, British or American, that told the truth? And unlike in business, civil servants don't get fired for doing nothing.' There's also the whiff of suspicion, said Aharonian, that various governments are glad of the extra revenue that the growing patenting industry brings them.

Global concern
The patent problem might look like a strictly US affair, and with most patents only enforceable on products made or sold in their country of origin, you could be mistaken for thinking so. Not so, said Bruce Dearling, a European patent lawyer with UK-based partnership Hepworth Lawrence Bryer & Bizley. Dearling said that fewer patents are issued by European patenting bodies, partly a function of the longer period it takes to register one and the additional layers of examination that need to be gone through. This may, however, be about to change. 'The volume of patents in the US has been largely brought about by the proliferation of Internet and

Closing the doors to competition

The huge potential of Internet-based patents to rake in massive amounts of money in licensing deals is proving too much for many web companies that are falling over themselves to register patents – many of them ideas in widespread use outside the web.

The two most famous offenders are ecommerce software supplier Open Market, which is encouraging anything but open competition with its raft of ecommerce patent applications, and online retailer Amazon which has registered a number of patents for shopping online.

Open Market has been granted a number of obvious patents including one on the concept of an online shopping basket. It is currently causing breath to be held all over the global Internet community as it bids to patent card payment technology which is already in widespread use.

However, Amazon has stirred up the most antagonism among net users over the leveraging of its patents against competitors.

The company came very close to shooting itself in the foot when activists called for a boycott of its site. Leading the protests was Tim O'Reilly, the founder of technical books publisher O'Reilly & Associates. O'Reilly wrote a strongly worded open letter to Amazon's chief executive Jeff Bezos and organised a 10,000-signature petition.

The controversy was over Amazon's patented one-click system that allows repeat online customers to place orders without having to re-enter their credit card and address information. The patent also covers how Amazon stores the billing and shipping information.

Amazon then went on to get a preliminary injunction against competitor Barnesandnoble.com that prevented the company from using the one-click system.

However, although still defending both Amazon's right to the patent and the company's lawsuit against Barnesandnoble.com, Bezos did state in an open letter posted on Amazon's website: 'I now believe it's possible that the current rules governing business method and software patents could

Amazon.com was threatened with a boycott over its one-click

end up harming all of us — including Amazon.com and its many shareholders, the folks to whom I have a strong responsibility, not only ethical, but legal and fiduciary as well.'

Bezos also said he was prepared to lobby the US Congress to try to have the patent rules modified and that he had agreed to help fund a prior art database.

Priceline.com is another company that is causing controversy over dubious patents. The web retailer has patented an Internet version of a reverse auction where a customer can propose a price for a product or service and then sellers can decide whether they want to accept that price. The company is suing Microsoft and its Expedia travel services site for infringing its patent because Expedia allows customers to propose their own prices for flights and hotel rooms.

Perhaps Tim Berners-Lee, inventor of HTML, best summed up the problems with online patents at the Eighth International World Wide Web Conference in Toronto last year: 'You are able to take an existing social practice and write software to do it and get a patent.'

ecommerce technologies. The jury is out, but there are those who believe there will be a corresponding increase in Internet-related patents in the UK and Europe,' said Dearing

He also points to a rise in multi-jurisdictional patents, and to the increase in European patents being sought by US corporations. He added: 'With the borderless nature of the Internet, it is getting harder to pinpoint where a patent infringement has taken place. There hasn't been a test case yet, but there might well be soon enough. Thanks to the Internet, the globalisation of intellectual property

rights might be around the corner.'

There are good reasons that the software patenting problem has got so serious with so little being done about it. It is not the sort of issue that provokes public uproar. No government would countenance such equivocation and muddle if it applied to an issue such as public health. Consequently, drug patent applications are sifted with a fine tooth comb, and granted only after lengthy deliberation.

But as the Internet and ecommerce bring high tech out of the laboratory and processing centre and into the home, this prevailing attitude is clearly nearing its sell-by date. It's really all a question of who gets hurt in the meantime. Until laws and procedures change, the life of the programmer will continue to be a tightrope.

Home comforts

THE PC IS MAKING A COMEBACK INTO YOUR LIVING ROOM SAYS LIAM PROVEN, AND THIS TIME IT'S HERE TO STAY.

THE **WINTEL PARTNERSHIP** somehow seems to be able to drink from the elixir of digital PC life like no other computer platform. Despite its often unwieldy interface and aesthetically-challenged looks, the PC still reigns supreme over the computing world and has outlived numerous predictions of its demise. But now a new breed of device is rapidly making its way onto the scene, and this time it's not being hyped as a challenger, but rather as a complementary device. It is the home appliance computer. A device that will be more easy to use than a PC, and integrate more effectively with existing home entertainment products or even kitchen appliances.

Ironically, the first PCs occupied the same type of space in our homes as these new appliances are expected to occupy. Let's take a bit of a history lesson. The earliest home computers appeared in the 1980s with milestone products such as the Apple II, the first complete microcomputer for under $1,000, and the Sinclair ZX-81 and ZX-Spectrum, which squeezed in at under £100. These early eight-bit machines didn't really do much, and despite advertising claims that they could be used for home economics, balancing your bank account, writing letters and indexing your record collection, the main use was soon established: games. Although dedicated consoles could sometimes do better, the fact that these home computers could be programmed by their owners led to an explosion in creativity. Amateur programmers turned professional, new companies appeared, and the breadth of software available multiplied.

Unfortunately, keeping prices low and retaining compatibility stifled technical progress. Eight-bit machines gave way to 16-bit devices such as the Atari ST and Commodore Amiga, but ultimately, the technological initiative moved on. A new generation of 32-bit games consoles took over the home market, providing near-arcade quality audio-visuals and gameplay to a predominantly teenage audience (see 'Rise of the superconsole' box later in this feature). The PC became not only the standard business PC, running suites such as Microsoft Office, but also the most common home computer, used for letter-writing, Internet access, multimedia and games.

ILLUSTRATION SHONAGH RAE

Higher-resolution graphics meant the new breed of PCs needed their own high-spec monitors, and so the PC moved away from the living room where the early computers were used with an RF output plugging into the TV, and into the bedroom or spare room.

Naturally, the PC's great strength is that it's modular and expandable. Kit it out with a high-performance 3D accelerator and decent monitor, a high-quality sound system and lots of fast local storage, and a modern PC can provide a very impressive gameplaying experience.

However, all this makes for an expensive machine and a considerable amount of tweaking

The Icebox may not keep your food cold, but it will give you Internet access, email, and DVD playback

to get it all working together. For a fraction of the price, a dedicated console performs well, especially at lower TV resolutions. Machines such as the Sony Playstation, Nintendo 64 or Sega Dreamcast are cheap and powerful, and their simplicity lends them robustness. There's no bootup or shutdown sequence, and with few moving parts, there's little to go wrong. Even with their basic specifications, they're sold at a loss to make them a more attractive purchase: manufacturers recoup the money on sales of the games. No wonder that in most homes the games console replaced the home computer under the TV.

However, PCs and games consoles both have drawbacks. PCs are complicated, comparatively hard to use, failure-prone and require a high specification to run Windows. Consoles are cheap, easy and reliable, but specialised – typically, they can play games and perhaps audio CDs and nothing else.

The new breed

This is where the new range of home computer appliances fit in. They must have the ease of use of a console, yet much of the flexibility of a PC.

This is how a new wave of manufacturers believe the computer will find its way back into the front room beside the TV set. They want to create a simple, dedicated plug-in-and-go machine that allows users to access the main Internet services – email and web-browsing – and perhaps also provide entertainment such as games and MP3 or DVD playback.

One of the first, Netpliance's iOpener (www.netpliance.com/iopener), has already been highly successful in the US, although not in the way the company planned.

The iOpener is a sleek desktop unit, consisting of little more than a 10in 800 x 600 resolution LCD and a keyboard. Hidden behind the display is a notebook-PC-type motherboard based on a 200MHz IDT WinChip, with PS/2, USB and parallel ports. It has 32MB of RAM and a 16MB Flash disk containing the QNX operating system. (A demonstration version is available from www.qnx.com that fits the OS, a dialup TCP/IP stack and web browser onto a single floppy.)

Netpliance plans to sell the iOpener at a loss-making $99 and make its money from the associated Internet service the machine requires: a $21.95-a-month subscription plus a usage charge of $5.95 per hour. Initially, it was possible to buy the machine and cancel the Internet service. A Linux hacker, Ken Segler, took apart his iOpener and discovered that the machine has an EIDE hard-disk interface, so you could fit a 2.5in hard disk and an external network adaptor, converting the machine into a sleek PC. To protect its revenues, Netpliance has modified the design to make this more difficult, and the Internet account is now mandatory, but the device remains an elegant and easy way onto the Internet.

Another company designing home computer appliances is Vestel (www.vestel-usa.com). This is a new company established by a large Turkish electronics manufacturer. Its Internet appliances are also x86-based, but run Windows CE. There are four versions: two integrated into conventional home appliances, the Internet.TV and Internet.Phone, and the standalone Internet.Terminal, which is available in LCD and CRT versions. Like the iOpener, all have integrated 56K modems.

One of the most exciting processor designs for this new breed of home devices is National Semiconductor's Geode chip. Originally designed by Cyrix, which sold it as the MediaGX, it integrates a 6x86 CPU core, graphics, sound and I/O controllers into a single device: a 'PC on a chip'. As little else other than memory need be added to make a complete system, the Geode is ideal for compact devices.

NatSemi has already produced a few exciting prototype units that use the processor. Perhaps the most minimal of these is the WebPad (www.national.com/appinfo/solutions/index.html). This is an A4-sized colour touch-screen which runs on batteries and uses a wireless

Rise of the superconsole

PC technology isn't a prerequisite; it's equally viable to go the other way and enhance a games console for Internet use.

The first such device to ship was Sega's Dreamcast, the coin-op company's attempt to leap ahead of the Playstation and Nintendo 64 after disastrous sales of its 32-bit Saturn console. Based on a 200MHz Hitachi SH4 CPU, partnered with NEC PowerVR2 3D graphics and ARM7-based sound controllers, it's almost an enhanced games-playing PDA. It even runs a cut-down version of Windows CE, tailored for the console hardware and with the Windows GUI removed. Together with DirectX 5 support, this enables games to be developed on PC hardware using Visual C++ or other tools and easily cross-compiled, or even ported from the PC.

The machine ships with a 33.6K modem as standard and can be used to send and receive email and browse the web as well as multiplayer online games, although Sega has yet to truly deliver any games which fully harness the power of online gaming.

Although more proprietary internally, Sony's Playstation 2 has USB, FireWire and a Type 3 PC Card slot. Sony claims that Internet access isn't a primary function and there's no modem, but a PC Card Ethernet adaptor will allow connection to broadband Internet services such as cable modems or ADSL.

The PS2 can be used as a DVD player, too. The unit is expected to hit European shelves in September.

network connection to offer web and email access. The Webpad uses Be's BeIA operating system (www.be.com/products/beappliance). This is a desktop OS and as such is a lot more memory-hungry (it needs 32MB of RAM) than systems like QNX or Windows CE which were designed for embedded use. This means it offers rich support for media such as MP3 audio, AVI, Indeo and QuickTime video as will as OpenGL 3D graphics.

The WebPad is something of a specialist tool, but the Geode chip is also used in Merinta's iBrow (www.merinta.com). Merinta is the Internet-appliance division of thin client manufacturer Boundless Technologies (www.boundless.com). The unit is a small desktop device with an LCD and a separate keyboard with a built-in trackball. It's currently being bundled with an Internet service and resold in the US by VirginConnect as the Webplayer (www.virginconnectme.com). There's also a set-top box version for use with a TV, marketed by WebSurfer as the Innovator Net Top Box (www.websurfer.com).

The WebPad concept isn't new. British manufacturer Acorn demonstrated a similar device, the NewsPad, based on the StrongARM processor and RISC-OS (www.riscos.com). It also produced a range of thin clients based on the same technology, which is still in active development even though Acorn is no more.

The biggest battle may not be fought over hardware, but rather over the territory of the OS. QNX, Windows CE, BeOS and RISC-OS are all contenders for the OS of choice for this new wave of home appliances. Because they're complete operating systems in their own right (see 'Lightweight operating systems' box), they all have the potential to support additional software – everything from viewers for Internet content such as Macromedia's Shockwave or Adobe Acrobat's PDF right up to simple productivity applications and games. Some even offer Java support.

Although most of these new home appliances lack permanent local storage such as a hard disk, this isn't insurmountable – for example, PDAs typically keep their small applications in RAM disks. Several companies are working on tiny lightweight versions of Linux too.

Specialist uses

However, if the device is intended for more specialist functions than general Internet use, flexibility isn't a problem, and even the modest requirements of these systems can be dramatically reduced by using specially-developed proprietary software.

An example of this is CMI's Icebox (www.cmiworldwide.com/iceHome.html), an information appliance for the kitchen. The designers previously worked on products such as breadmakers and juice extractors, and this shows in the Icebox's design. As well as a wireless keyboard, it has a remote control, and both of these are waterproof and even washable. The 'Ice' in the name stands for Information, Communications and Entertainment. As well as web access and email, the Icebox is a TV set and cable receiver and a CD and DVD player. Using an optional video camera, it can even function as a closed-circuit TV system. Web access is provided through a special portal site that also offers related services such as cookery advice and online shopping. There are two versions on offer – an inexpensive CRT-based standalone unit for the retail market and a more expensive slimline variant with a flip-down LCD flat screen which is intended to be built into a fitted kitchen.

Not all home appliances will be as complex as the Ice box. Web access places fairly high demands on a device. It must have a large screen offering at least VGA resolution and colour for most web pages to be usable, together with a moderately powerful processor and a megabyte or so of memory to be able to render pages and their embedded graphics. A pointing device is also essential.

However, a device intended solely for sending

Lightweight operating systems

It's easier to buy in the operating system for an information appliance than to build your own. Designing an operating system isn't as complex as it sounds, but providing it with device drivers, GUI, Internet connectivity and a web browser is a much bigger job.

Two of the systems used in current appliances, QNX and Wind River's VxWorks, come from the world of Real Time software: control systems which must respond to external signals as they occur. For example, VxWorks was the operating system used in the Mars Pathfinder probe. Guaranteeing response times means keeping the software small and tightly-coded. These 'embedded' systems often have no user interface, but QNX was designed to be Unix-like, including a 'microGUI', Photon and a user interface, Neutrino.

Designed for communications devices, Symbian's EPOC32 is also RT capable, although it's better known as an end-user system for PDAs. In contrast, its closest rival, Microsoft's Windows CE, isn't real-time capable, instead focusing on resembling desktop Windows to both users and programmers. GEOS, used in Nokia's Communicator cellphones, was developed on the Commodore 64, showing how small these systems can get.

Very simple low-specification devices such as email-only terminals use custom-written mini-OSs such as AppForge, but at a cost in flexibility – for example, only simple image attachments can be viewed.

and receiving email needs none of these. A small text display is sufficient, and while a graphical display will be more attractive, colour isn't necessary. This also allows for simpler software, meaning a less powerful processor and memory.

Several companies offer products for this market, comprising little more than a modem, a keyboard and a small LCD. Cidco's MailStation (www.mymailstation.com), which costs around £60, runs for three to six weeks on three AA batteries, handles five separate email accounts and can store around 400 messages in its 512KB of Flash RAM, but you must use Cidco's dialup service (around £60 a year). It has an address book and calculator and can output messages to a serial printer. VTech's Email Postbox (www.unbound communications.com/products) at around £60 is similar, but it adds email filtering and can accept proprietary memory cards to store more messages. The £50 Email Express is a pocket-sized version, minus printer port and card slot, and smallest of all is the yet to be released Email Traveler – a handheld PDA that comes with a combined keyboard and docking station.

A larger and more elegant desktop alternative is Simpliance's eMailBox. The unit has yet to hit the market, but when it does it will be a freestanding box with a wireless keyboard and the same half VGA-size mono screen as the Psion 5. It will offer automatic scheduled mail collection and a simple GUI with online help.

Amstrad's e-m@iler (www.amstrad.com) is about as sophisticated as email devices get. As well as a hands-free speakerphone and digital answerphone, it can send and receive email, send faxes and drive a printer or send emails to a fax

The sleek iOpener offers an elegant and easy way onto the Internet

machine for printout. It has a 700-entry address book which can be synchronised with a pocket databank with its own miniature screen and keyboard, although this device can't store postal addresses, limiting its usefulness. The price is subsidised by the mandatory Amserve dialup service as well as on-screen advertising. The dialup service is expensive though (see reviews p91).

Microsoft isn't blind to the potential of the home appliance market, and is now readying its response: a PC-based games console codenamed X-Box. The specs of this unit are still a bit vague. It will be based on an x86-compatible CPU, which was originally rumoured to be an AMD Athlon but Microsoft now says will be a custom-built 600MHz Intel Pentium III or derivative. It will have high-performance graphics provided by a custom nVidia chip, possibly based on the GeForce 256. Figures of over 300 million polygons per second have been mentioned, easily outperforming the Playstation 2's 75 million. There'll also be 64MB of unified RAM, for both program and graphics storage, an 8GB hard disk and a quad-speed DVD-ROM drive. It will run a modified Windows OS, probably based on a heavily cut-down version of Windows 2000, support DirectX, USB and 100Mbits Ethernet, and probably a 56K modem.

Several major PC companies were reportedly shown the design but weren't interested, so Microsoft will be producing the device itself. It has said that, although the device will support multiplayer Internet gaming, it's a pure games machine and is unlikely to offer full Internet access, although it will play DVD movies.

If the X-Box happens in this form, it will be the final blurring of the boundaries between home computers, business computers and games consoles.

There's something for everyone here, from light email users, through occasional non-technically-minded surfers, PC-based workers with a secondary device, to hardcore gamers who want to go online as well. And, of course, the full-spec PC, or Mac, for those who want it all.

WITH FASTER MODEM LINKS
AND IMPROVED COMPRESSION
TECHNOLOGY NOW AVAILABLE,
NIGEL WHITFIELD SHOWS
YOU HOW TO MAKE THE MOST
OF STREAMING MEDIA.

Live sound

T he days of streaming media sounding like the wrong end of a call to an underwater phone box, and looking like a series of slides from an impressionist cartoon are, thankfully, long gone. Streaming media – audio and video that starts to play back as soon as you click to download it – has greatly improved from the early attempts of pioneers such as RealNetworks.

Nowadays, of course, modems are generally faster, and more people have digital links thanks to ISDN, cable modems and even ADSL. Compression technology has improved greatly too, as has processor speed, which means modern CPUs can handle more complex decompression routines. Best of all is the fact that you can now add streaming media files to your own website very easily, especially as many of the streaming tools suppliers offer cut-down free software aimed at consumers.

What's out there?

At the moment, there are three main companies offering competing streaming media formats: Apple, Microsoft and RealNetworks. Microsoft is a latecomer to the market, and it's tempting to write off its contribution if you're committed to providing a website that works on more than just Windows. But that would be unfair because,

streaming media

and vision

despite its lack of cross-platform compatibility, there are other advantages to its system.

RealNetworks is the longest established player in the field and the first name that comes to mind when people consider streaming media. Some Internet Service Providers, such as Demon Internet, provide free Real Audio services for pages hosted on their servers. This makes it easy to get started with streaming media because you won't have the worry of configuring servers or hosting your own content.

Apple's QuickTime is one of the most flexible systems, with a player that will decode just about any format, streaming or not. For viewers on Windows and Macintosh systems,

there's a wealth of content available via fast Internet links.

All these formats are steadily becoming fairly standards-based, but that doesn't mean you can use any player to play back any type of streaming file. What it does mean, however, is that they all use Real Time Streaming Protocol (RTSP) to access information over the Internet.

Like http, it defines a method for a client to request the transfer of a file, and will work over a number of networks. You'll also hear about Real Time Protocol (RTP), which is a lower-level protocol designed to make it easier to deliver continuous streams of information over the net.

When streaming MP3 requires a download to stream

With the Internet virtually awash with files in the MP3 format, it would seem a pretty logical choice for streaming. There are plenty of free downloadable tools you can use to create and serve streaming MP3, such as ShoutCast and Xing's StreamCast servers. There are also a couple of servers for Linux systems that will do the job.

The name of the streaming MPEG 3 format is m3u, and you can play streaming files in this format by configuring your web browser to recognise that extension – it will work with most of the popular media players.

With the ShoutCast network, you can become what the company terms a DJ, broadcasting your own radio station on the Internet, with a listing on the Shoutcast pages.

While all this is handy, there are some problems. First, different systems use different ways of serving and requesting the content. If you want to use a selection of different services, you might find yourself with a collection of different programs to listen to them as well. Widespread adoption of RTSP should fix that, however, allowing you to use just about any program to listen to m3u files. Until then, some services, like ShoutCast, will need you to use their own specific software.

The other big problem with MP3, in terms of streaming, is that it wasn't originally designed as a streaming format. If you record a file with a reasonable bit rate, it will still be quite large, and when you stream it, you'll end up using lots of your bandwidth.

For example, one of the sample files that we used in writing this article was an MP3 file with a bit rate of 6.8Kbytes/sec. The whole file was around 900Kb, and playing it over the Internet would use practically all the bandwidth available over the 64K line that linked the test server to the Internet.

Converting the file to a QuickTime streaming format reduced the size to about a third, and resulted in a much lower bit rate of about 12-13Kbits/sec at most.

Of course, one of the benefits of MPEG 3 is that you can choose a different bit rate to make a file smaller. If you're encoding one for people to listen to live, rather than by downloading, it's important to make it as small as possible.

For the time being, however, we would recommend that you stick to other formats, and certainly steer clear of anything that requires visitors to your pages to download yet another piece of software before they can listen to your audio.

In theory, using RTSP means you can play common formats using any media player you like. In practice, things are more difficult. If you're streaming MPEG, for instance, then most systems can play that. But try using QuickTime video format, or one of RealNetworks' file types, and you'll find that you're restricted to clients that understand those formats. This will cause some problems with web browsers.

For the technically minded, RTP sits on top of the UDP layer of the Internet Protocol, much like DNS. In other words, delivery of data isn't guaranteed. For really high-quality streaming media, you'll have to wait for IPv6 – the next generation of the Internet Protocol – which provides real options for specifying quality of service.

In the meantime, the way that systems such as Apple's QuickTime TV network operate is by having a network of servers mirroring content on a high-bandwidth network, such as the one operated by Akamai. By bringing the content as close as possible to the end user, the company hopes to reduce the number of hops in the route and minimise the effect of Internet congestion. But for the time being, unless you have a lot of money to spend, you'll have to live with that congestion if you want to serve your own media.

Simply multimedia

There's one more acronym you're likely to come across when you dip a toe into the waters of streaming media – SMIL. This is a mark-up language, or more correctly an XML scheme, for controlling streaming media. You can specify, for example, an area within a browser window in which first one and then another media clip will play.

There are plenty of other neat tricks that SMIL can do, helping to provide a degree of interactivity within the world of streaming media. You can use SMIL to control the behaviour of clips with QuickTime and Real players, but for the time being, there's no need to worry about it. You can do streaming media without SMIL, it just gives web authors more control so they can do fancier things with streaming content. There's not enough space in this feature to fully cover SMIL, but we'll elaborate on it in a later issue.

For now, we'll assume you want to do something fairly simple, like adding streaming media to an existing website. You could use it to

Creating Real Audio content

Real Audio is a popular format, and some ISPs let you stream content from their free web space. RealProducer can convert a number of files into the format necessary for uploading to a web server. You'll find RealProducer Basic on the cover disc.

Installation is simple. Click on the Setup program and supply your email address. The first time you run the program, you'll have to choose whether you want people to be able to record your files as they watch them.

1 You'll now find yourself in the Recording Wizard, which is the simplest way of converting your file. You can start the Wizard from the File menu if it doesn't appear automatically. All you need to do is choose the type of information you want to process. In this example, we're electing to convert a file. Click OK to arrive at the next screen, where you can browse to find the file on your hard drive, then click Next to carry on.

2 The information screen allows you to specify copyright and other information, which can be displayed to people as they listen to your file. Supply the information that you want to make available, then click Next. You can specify whether you want to create a multi-rate file on the next screen, or a single-rate file. Choose the second option, of course, unless you know that your file will be on a Real System G2 server.

3 From this list of rates, you can choose the most appropriate; for the widest possible audience, choose one of the modem options, but remember that you'll lose some quality. On the next screen, you can specify the type of sound file – whether it's speech, music, and so on, which optimises the encoding. There's a similar screen for video too. The following screen lets you specify a file name for the results.

4 Here are all the statistics for the file. Check that all the settings are OK, then click Finish. You'll be returned to the main screen of RealProducer, where you have to click on the Start button to perform the conversion – the Wizard merely sets up the options for you.

5 When the conversion is finished, you will be asked if you want to submit information about your clip so that it can be indexed on RealNetworks' website. For the moment, just dismiss that dialog box. This screen shows the main RealProducer window, as you will see it when you're processing a video file. The window on the right shows the results of the processing, so you can see how much the quality is being affected, and change the settings if you like.

play a welcome message to people on your website or to allow visitors to see your latest TV advert. You might have sound files that you want people to be able to listen to, or a holiday video you want friends to be able to watch without having to first download the entire file.

Making choices

When you want to stream media, the first thing you need to do is choose which format you're going to use. There are some formats around that don't use RSTP – but they're strictly minority systems – and many of them will migrate to the standards-based system in time. If you want to be sure of reaching a reasonable audience, the choice is really between Apple, Microsoft and RealNetworks.

With three different formats, you need to pick the most appropriate for both your audience and the server that will be hosting your media clips, which needn't be the same one that hosts your web pages.

Adding Real Media files to your web space

Adding Real Media files to your web space is simple; for this example, we're using the Demon homepages service, which provides two streams – so two people can be listening to your file simultaneously. Here we're just covering the basics of uploading a file. You can also embed Real Audio files in web pages, using the EMBED tag, which allows them to be played as background files. There's more information on some of the streaming media websites listed in the quick tips.

1 Once you've created your files, you'll need to upload them to your web space. Here we're using CuteFTP, which you'll find on the cover disc. Skip the wizard that appears when you start the program, and choose Quick Connect from the menu. For the Demon server, enter homepages.demon.co.uk as the host, and your node name as the login name. For other ISPs, follow the instructions you've been given, then click the Connect button.

2 When the connection to the server has been made, you may see a message like this one, displaying status and other information. You can usually just click OK to dismiss it, and carry on. It's a good idea to create a folder for all your streaming media, to keep it in one place, so do that and then change to it.

6 If you visit your web site without an index.html file, this is what you'll see. It's a listing showing the sizes of all the files in the folder you created earlier. Double-clicking on a .rm file should download it to your hard drive and play it from there, while choosing the .ram file instead will download that, then launch RealPlayer to access the streaming server.

7 Here's RealPlayer, running one of the clips directly from the website. If you find that you can't hear it clearly yourself, it's probably a good idea to go back to RealProducer and re-encode the file, choosing a slower type of connection as the target for playback. If all is well, then your clip has been successfully uploaded, and you can go on to link it into your web pages.
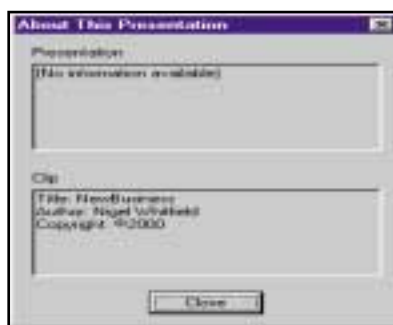
8 This is the clip info, which contains the details you supplied when you created the clip using RealProducer. To show it, choose Clip Info from the View menu, which will display a line at a time scrolling just below the tool bar. To see all the info like this, click on the button to the right of the scrolling info window.

QUICK TIP

Netscape doesn't support URLs beginning with RTSP, so make sure your browser is configured to recognise the appropriate extension and MIME type. It should also be configured to launch the player at the appropriate time.

So just how do you choose the right format? There are a number of things to consider: quality of the media when it's viewed; amount of space taken up on your server; the ease of creating or converting files; the type of server you have access to; and whom you're expecting to view your files, and on which platform.

Choosing between the formats on the basis of quality is hard to do as they're all capable of producing good results. With a choice of multiple Codecs (Coder-Decoders) in QuickTime, for example, you can tweak file size, bit rate and quality to suit your needs. The same can be done with other formats.

Making an objective assessment of the quality of the three systems isn't easy and, for many people, other considerations may take precedence, especially if you're financially restricted or the choice of platforms is constrained.

Creating media files is simple – our first workshop shows how to use RealProducer, which you'll find on the cover disc, to create files that

3 This is the display you'll see in CuteFTP, with our empty directory on the web server on the right and all the media files we've created on the left. Before you upload a file to the server, make sure you select binary mode, if your FTP program doesn't do it automatically for you. To copy a file over, just drag and drop it. Make sure you save your files with the extension .rm, otherwise you won't be able to play them as streaming media.

4 When you've uploaded the files to the Demon homepages server, and the directory listing refreshes, you'll see something like this. For each Real Media file that you've uploaded, with the extension .rm, a corresponding file with the extension .ram has been created automatically. It's these files that provide the streaming capability, rather than just allowing files to be downloaded and then played.

5 If you're using a server that doesn't create the RAM files automatically, create them by hand. As this one shows, it specifies the protocol pnm: followed by the complete path to the server holding your files. It's a neat trick, avoiding the problems where some web browsers can't be taught to understand methods like rtsp:// or pass them to other programs. The short RAM file is all that needs to be downloaded for RealPlayer to interpret the .rm file as streaming media.

9 Here's a simple bit of HTML. You refer to your streaming media file just like any other file on your website, with a standard <A HREF="filename.ram"> type of link. If you use the .rm file instead, then the web browsers will download the entire file to the hard drive and play it rather than accessing the streaming information via the RealNetworks server.

10 Here's the end result – a web page with a simple link to start the file playing. If you have unique content you'd like to promote, you can make use of the Submit option that appears in RealProducer when you've finished processing your file. Remember, although you can use the program to create streaming files from CDs and other material, you should always make sure you have the permission of the copyright holders before streaming files over the web.

11 Finally, if you have problems with streaming media not working properly, remember to check the options in your browser. This is the settings screen in the Mac version of Internet Explorer. You need to make sure that .ram files are set to View with Application and that the application is set to RealPlayer.

can be served using the free streams available on Demon websites. Mac or PC users who have QuickTime Pro (Mac users just need to fill in a registration form) can simply open a file and save it in a streaming format.

There are commercial tools available as well, including Media Cleaner from Terran, which can convert a wide range of formats and save the results ready for streaming on any of the three servers, but it isn't a cheap program. If you want to create lots of media files, it's a worthwhile investment and gives you control over the results. Alternatively, if you're a business you can contract out the work to specialists, but that won't come cheap.

Which platform?

Perhaps the most important consideration will be platform choices. While all three major systems are available for both Windows and Macintosh, there are other considerations. At the time of writing, Microsoft's media player for the Mac was

QUICK TIP

Registering QuickTime 4 gives you the ability to save streaming files for both Audio and Video. Simply choose Export from the File menu, and then select the speed and format that you want.

Setting up your own streaming server

If you want to set up your own streaming server, it's very simple to get started with Apple's QuickTime. You don't have to pay any fees to use the server, and you can download the open source version, known as Darwin Streaming Server for a variety of platforms. Information and binaries for Linux on Intel or Solaris 7 on Sparc can be found at www.apple.com/quicktime. We downloaded the LinuxPPC binary, running on a PowerMac system with MkLinux.

1 Start at www.streamingserver.org, where you'll find binaries based on Apple's server in the PRISS section. There are also links to Apple's site, for which you'll have to register before downloading. The binaries differ slightly, with some file names changing, but all provide essentially the same functionality – just choose the one that's suitable for your own platform. Apple's binary packages provide some additional utilities, including a streaming proxy.

2 Most packages are downloaded as a gzipped tar file, like ss102.ppc.tar.gz. Unzip with gunzip, and then extract files from the archive with tar xvf filename. The version we used provided just two files – QTSS.conf, which has to go in the /etc directory, and a binary called QuickTimeStreamingServer, which you should put in the appropriate directory on your system. In Apple packages, there's an Install shell script, which copies files to the appropriate locations for you.

6 It may be worth downloading one of the Apple packages simply for the short sample.mov file that comes with them. Otherwise, you'll need to create a file to stream. Here we're using QuickTime Player on the Mac, registered to give the facility to Export. Choose Export, select QuickTime movie, and choose a streaming speed from the menu beneath the file formats. The options button gives these choices, allowing you to add 'hints' for Internet streaming.

7 When you've copied a movie file into the directory you specified in the configuration file, you're ready to check that it's playing. Start QuickTime Player, and choose Open URL from the File menu. For a file called sample.mov on a server called media.mycompany.com, the URL would be rtsp://media.mycompany.com/sample.mov. If all is well, the file will start playing in a few seconds – Apple's sample.mov file is an iMac advert.

8 If all the people who'll be accessing your server are using Internet Explorer, that's about all you need to do. You can configure the browser to allow access to RTSP URLs directly, so a web page like this, with code such as Vision On will work fine. Unfortunately, that's not enough for Netscape. You'll need to do more work to make pages that work with any browser.

QUICK TIP

RTSP uses port 554 by default. If you're behind a firewall, you'll need to ensure that it allows both TCP and UDP traffic to pass through on that port, or use a streaming proxy server. Port 7070 is also used by some clients.

only a beta, so many Mac users will be reluctant to download it. QuickTime and RealPlayer are full releases for both platforms, and the RealPlayer is also available in beta form for Solaris on Sparc and Linux on Intel systems.

If reaching the widest possible audience is important to you, then RealPlayer looks like the sound choice at the moment, with QuickTime running a good second. On the server side, you may be constrained by what your ISP offers – if it has free streaming for a particular format, then

you're better off using that if you want to get a feel for it.

On the other hand, if you need many streams, then the choice may simply be one of cost. RealNetworks' charges are based on the number of streams, which usually filter down to the pricing models of ISPs offering the service.

Microsoft's streaming server only runs on Microsoft operating systems so, if you want to use it, you'll need to hunt around for an ISP that has Microsoft servers, or run it on a system in-house.

3 This is the configuration file, called streaminserver.conf in the Apple packages, or QTSS.conf in some others. Make sure the server is listening on port 554, which is the default for RTSP, and set the maximum number of streams, via maximum_connections, so that your link isn't overloaded. The movie_folder item lets you specify where all your streaming files are stored. We've chosen /usr/local/movies.

4 Further down in the file, you can select options for logging. We've chosen to put files in /var/streaming/logs/ – make sure the path ends with a / and that the directory you name does exist. You also need to give names for the log and error files. Other options in the file allow the server to restart if there are problems, and control what happens when links appear to be congested, but for now, you don't need to change the defaults.

5 After editing the configuration file, change to the directory where you installed the server, and start it running. The command here is simple:./QuickTimeStreamingServer; with the Apple Binaries, the file to run is DarwinStreamingServer. The command prompt will reappear almost immediately, as the server runs itself in the background.

9 First, you'll need to configure your web server to give the right MIME type for files ending with specific extensions. In the mime.types file add a line: application/x-rtsp rts rtsp Save the file. You'll need to restart the web server for it to take notice of the changes you've made, and ensure that web browsers are configured to use the QuickTime plug-in to play this type of content.

10 Now, on your web server, you use a similar trick to the one employed by RealNetworks. Create a small file, with the extension .rts, for each media clip that you want to use. The file should include the full RTSP URL of the clip, and needn't necessarily point to the same server. You can create the file in notepad or simply on the Unix terminal by typing cat > filename.rts followed by the URL, as in step 7, then press enter and Ctrl-D to close the file.

11 And here are the results – a link automatically starts playing the streaming clip using the QuickTime plug-in, on both Netscape and Internet Explorer, regardless of whether it's a PC or a Macintosh system. So with just a few steps, you can start streaming information in-house, using completely free software.

Apple's QuickTime Streaming Server is part of Mac OS X server. It's also a key technology in the company's Open Source initiative, so you can download it as Darwin Streaming Server and compile it on your own systems.

There are no costs, and it serves an unlimited number of streams. Add to that the fact that you can find binaries on the Internet for Solaris, BSD and Linux on a variety of architectures, and it becomes a very attractive proposition for anyone who wants to start streaming on their own network or using their own hardware.

Streaming media may seem like a black art at first, and it's certainly not the most straightforward web technology available, with competing standards and quality suffering on congested links. However, it can be surprisingly simple to get good results.

Follow the workshops, and you will see just how quickly you can start to stream over the Internet or your own LAN.

QUICK TIP

Good tutorials and information on streaming media can be found at www.streamingserver.org, webdevelopersjournal.com, and streamingmediaworld. com. The first site also has QuickTime server binaries for a variety of systems.

THE MINUTE MANUFACTURING PROCESSES OF PHOTOSYNTHESIS COULD POWER PCS.

Popeye computers

THIS MAY BE HARD TO SWALLOW, but researchers have found a new use for spinach – building computers. No, it's not April Fool's Day. Elias Greenbaum, of the Energy and Environmental Biotechnology Research Group at Oak Ridge National Laboratory in Tennessee (www.ornl.gov), leads a team researching photosynthesis. They've recently found a way to isolate the microscopic chemical factories, with which plants convert light to chemical energy, and make the process work in the lab.

Photosynthesis is the conversion of carbon dioxide and water into oxygen and carbohydrates and it's a hugely complicated series of chemical reactions fuelled by sunlight. Boiled down to its overall effect, it is a two-stage process (for a detailed explanation see mint.biol.andrews.edu/fb/fall/ch10.htm). First the light energy converts water into an oxygen molecule, a positively-charged hydrogen ion and a free electron. Next, the electron, hydrogen ion and carbon dioxide combine to make glucose.

Each of these reactions takes place in a 'reaction centre' – a tiny molecular structure about five nanometres across, embedded in the plant membrane. It's the first reaction centre – known as photosystem-1, in which the electron is liberated – that's of particular interest to Greenbaum's group.

In photosystem-1, two chlorophyll molecules are held inside a protein scaffold. When an incoming photon excites the system, a single electron is ejected from the chlorophyll molecules. The electron is then passed along by several other molecules, which ensure it can't immediately fall back into the now positively-

charged chlorophyll. Finally, it exits the reaction centre, en route to take part in the second phase of the photosynthesis.

What Greenbaum has done is to find a way to isolate the photosystem-1 reaction centres from a plant. He uses spinach because it's so commonplace and has a long history of use in photosynthesis research. Getting the reaction centres out is no mean feat – the raw spinach is washed and liquidised, then rinsed with detergent and the reaction centres are separated using a centrifuge. Then they're deposited in a thin layer on a gold-plated substrate.

As for using photosystem-1 as a computer component, the key realisation was that each reaction centre behaves like a diode – it passes current in one direction, but not in the other. What makes these 'diodes' attractive for researchers is that they're 25 times smaller than conventional silicon diodes and operate faster.

And once you have a diode, you have the basics for constructing logic gates, the building blocks of computer processors. Greenbaum hopes that his group's research will lead to logic-packing densities as great as 1,000 times that of a Pentium chip. The biggest challenge is going to be connecting up reaction-centre diodes into functioning circuits. One possibility is to use carbon nanotubes – thin hollow carbon cylinders, just a few atoms in circumference – as connecting wires.

Greenbaum's work also raises the possibility of making a new kind of 'clean' fuel cell. He has developed a patented process for precipitating metallic platinum onto a sheet of deposited reaction centres. The metal catalyses the splitting of water into hydrogen and oxygen molecules. Shine a light on the device and it produces free hydrogen and oxygen, which you can subsequently allow to react and collect the heat. The only waste product is water. At the moment, Greenbaum's work is fundamental research, but he expects practical technology to appear in about five years' time.

Strangely enough, spinach has also recently been in the technology news for something quite different – its ability to neutralise dynamite. It turns out that some of the enzymes in spinach can digest TNT and turn it into carbon dioxide, water and nitrogen.

Oh, and it's good for you too.

TOBY HOWARD

IBM's latest supercomputer will be 500 times faster than its closest rival.

Blue Gene genie

THE LAST TIME *FUTURES* looked at supercomputers, a then top-of-the-range home PC had a 200MHz processor with 32MB of memory and a 2GB hard disk. Three years later, PCs have moved on a bit and so has the supercomputer world.

It's a bit like trying to measure a piece of string, but, according to a list of the world's top 500 fastest computers (www.top500.org), the current fastest machine is a monster called ASCI Red. Part of the US Department of Energy's Accelerated Strategic Computing Initiative at the Sandia National Laboratories in Albuquerque, New Mexico, (www.sandia.gov/ASCI), Red is an Intel machine with more than 9,000 processors. It performs at two teraflops – two million-million arithmetic operations per second – and runs simulations of nuclear weapons.

Number two on the top 500 list is ASCI Blue, an IBM machine at the Lawrence Livermore National Laboratory, with nearly 6,000 processors. But IBM won't be in second place for long, with the announcement of its new supercomputing project, Blue Gene, which is set to be the most powerful computer ever – 500 times faster than ASCI Red.

IBM has a track record of building impressive machines. A couple of years ago, its Deep Blue machine famously beat world chess champion Garry Kasparov (www.research.ibm.com/deepblue). Blue Gene will be 1,000 times as powerful as Deep Blue, making it two million times the power of today's top-spec PC.

To build such a revolutionary machine, IBM researchers have devised a computer architecture called Simple, Many and Self-Healing, or SMASH for short. SMASH relies on an established processor design used in the RS/6000 series of machines (www.rs6000.ibm.com), with a very small Risc instruction set – there are only 57 instructions that the processor can run. Each Blue Gene chip will have 32 RS/6000 processors on board and there will be 64 chips on each of the machine's two-foot square motherboards. There will be a stack of eight motherboards in a vertical tower and a total of 64 towers. The figures are amazing – each motherboard hosts 2,048 processors, making a total of over a million.

The operating system will be a flavour of Unix and the machine will be able to support over eight million simultaneously parallel 'threads' of computation. The $100m machine will occupy 160 square feet of floor space at IBM's Watson Laboratories in Yorktown Heights, New York. It should be ready by 2005.

But what's all the computing power for? Unlike many of the world's supercomputers, Blue Gene won't be used for military or intelligence purposes. Its first application will be molecular biology.

One of the Holy Grails of contemporary

Unlike ASCI Red, which is used to run detailed simulations of nuclear weapons, Blue Gene will be used for molecular research

scientific research is to understand how the proteins in our cells fold up into complex 3D shapes. A protein is a long, linked chain of amino acid molecules and the links allow the protein to adopt a shape which determines its function in the cell. A number of diseases, such as cystic fibrosis and Alzheimers, have their origins in anomalously folded proteins. Improved knowledge of how proteins fold could lead to the development of new drugs and a better understanding of how diseases attack cells.

Dr Paul Horn, senior vice-president of IBM Research, has a grand vision of the ultimate application of Blue Gene's protein-folding simulations. 'One day, you'll walk into a doctor's office and have a computer analyse a tissue sample,' he says, 'and the machine will instantly prescribe a treatment best suited to your specific illness and genetic make-up.'

Didn't Doctor McCoy have one of those?

TOBY HOWARD

Bundles

Some of us don't want to pay the price premium of cutting-edge technology and would rather have a more rounded package that doesn't break the bank. With this in mind, the *PCW* group test pays homage to the family PC.

As processors get faster and memory and drive capacities rise, it's important to remember that not everyone necessarily needs this amount of computing power. For some, a good package that covers all bases and is easier on the pocket may be more suitable. For the family, bundled peripherals and a wide range of functionality are more important than an extra 10fps in Quake III or five minutes saved balancing the books.

The family PC has the difficult task of keeping up with the latest games as well as offering a comprehensive feature set. Bundled peripherals are important for those who want a one-stop-shop solution, but others may prefer to shop for extras separately. Office tasks must be catered for and Internet connectivity is essential.

Another major area of importance is that of price. Too high and it will put off the family user, too low and the system will be too cut down to be of any realistic use. Juggling these points and still staying ahead of the game is no easy task.

We invited 14 manufacturers to take up the challenge of putting together an affordable yet functional family PC and set the following guides: at least 128MB of RAM, a 12GB hard drive, 16MB dedicated graphics card, a minimum 17in monitor, modem and sound included, Windows 98 Second Edition with an optional office software suite and a one-year, parts and labour warranty (either on-site or collect and return). The price to squeeze this all into? £999 ex VAT was the challenge. Read on to find out how it all panned out.

contents

• *PCs reviewed by Riyad Emeran, Will Head and Jason Jenkins*
• *Tested by Lars-Goran Nilsson*

PHOTOGRAPH DAVID WHYTE

# of joy

Carrera **Octan M700**

THE BEST THING that can be said about Carrera's entry into this group test is that it's fast. Like evesham.com, Carrera has opted for an Athlon processor, clocked at 700MHz. This has been combined with the fastest possible graphics card, a Hercules 3D Prophet DDR-DVI with 32MB of DDR memory, which helps to make the Carrera one of the fastest machines for 3D performance.

However, it looks as though the Athlon's off-die cache has hampered it slightly compared with some of the Intel machines, as the Pentium III-based machines hold the top spot in terms of both 2D and 3D performance.

The card also has room for a DVI port. This is not really necessary, as there is no digital flat panel to connect it to, but at least it's there should you choose to upgrade at some point in the future.

A good sound card sits in a PCI slot – a generic Aureal Vortex 2 card with optical digital out. The modem sitting below this has an extra port for your phone line, so you won't have to buy a telephone socket splitter in order to use your modem. There is also a USB card that provides an extra two ports. However, if you want to add an ISA card, you'll have to remove this first as it obscures the shared slot.

A Panasonic DVD-ROM drive is present, together with a 20.5GB IBM hard drive. Unfortunately, there is no removable storage device, which is a bit of a shame considering the machine's target market.

The LG Studioworks 775N monitor is frankly below par here. The display is simply not as clear as others, and the focus is a little blurred in its current configuration.

As far as input devices go, we found the two-button mouse a little disappointing and would have liked to have seen a wheel mouse. However, the keyboard is up to Carrera's usual high standard and should please most users.

Overall, we would have happily settled for a slower machine in exchange for some form of removable storage and a better monitor.

DETAILS
PRICE £1,173.83 (£999 ex VAT)
CONTACT Carrera 020 8307 2800
www.carrera.co.uk
PROS A fast system, an extra two USB ports at the rear
CONS Monitor, no removable storage
OVERALL You get speed for your money but not enough else for it to win here

BUILD QUALITY	★★★★
PERFORMANCE	★★★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★★

Dell **Dimension XPS T700**

DELL IS A MAJOR international player in the PC market and its position and buying power usually allow it to produce feature-packed PCs at a good price.

The Dimension XPS T700 is a fast machine, but Dell has cut back on some features to enhance performance. That said, this is by no means a disappointing PC, it just doesn't cover as many bases as some of the other models on test.

Driving the Dimension is a 700MHz Intel Pentium III CPU backed up by 128MB of PC100 SDRAM. Avoiding the poor SDRAM performance offered by the 820 chipset, Dell has installed a motherboard with a BX chipset, which is fine since the PIII 700 runs with a 100MHz bus.

A 20.4GB Western Digital hard disk sits on the primary EIDE channel, providing a commendable amount of storage. Connected to the secondary EIDE channel is an NEC DVD-ROM drive. Unfortunately, there's no form of removable storage, which appears to be a remarkable oversight.

Filling the single AGP slot is a Dell-branded graphics card equipped with the nVidia GeForce 256 chipset. Connected to the graphics card is a Dell-branded monitor with a flat-screen, aperture-grille tube. Whether it's a Mitsubishi NF or a Sony FD tube is hard to say, but Dell has been known to use Sony tubes in the past. The display is clear and bright, but the three-button OSD control isn't very intuitive.

Sound is well catered for with a SoundBlaster Live! 1024 connected to a set of Altec Lansing ACS340 speakers. Input devices are high quality with a Dell-branded keyboard married to a Microsoft Intellimouse.

Bundled software includes Microsoft Works Suite with Word 2000, plus Norton Anti Virus, which walked away with an Editor's Choice award in last month's group test.

The Dell is a good machine and a strong performer. The disappointment is the lack of removable storage.

DETAILS
PRICE £1,116.25 (£950 ex VAT)
CONTACT Dell 0870 152 4699
www.dell.co.uk
PROS Fast Pentium III CPU, impressive performance
CONS No removable storage or extra peripherals
OVERALL A solid Intel-based machine for the price. If you're looking for an Intel foundation to build on, the Dell is worth a look

BUILD QUALITY	★★★★
PERFORMANCE	★★★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★★

Elonex **WebRider Pro**

ELONEX HAS OPTED for a Celeron processor for its WebRider Pro. This is one of the new breed of FC-PGA Celerons clocked at 600MHz and mounted on a Slocket in a Slot 1 board. Like the FC-PGA Pentium IIIs, this processor is similar to its big brother, although it only runs on a 66MHz bus and comes with 128KB of full-speed Level 2 cache as opposed to 256KB. 128MB of PC100 SDRAM backs up the processor although, unfortunately, the RAM clock on our review unit had been set to Host Clock minus 33MHz, which would result in the RAM running at 33MHz. As the chip is new, this could just have been an oversight.

Graphics duty is handled by ATi's All in Wonder 128. However, while this provides a wonderful array of multimedia features, it can't really compete in the 3D stakes. The card is hooked up to an Elonex-branded 19in monitor. On the whole, the Elonex fared badly in our tests, taking last place in everything with SYSmark, 3DMark and Quake III scores of 98, 1,683 and 21.6fps respectively.

Although the main focus of the group test isn't performance, we did specify games playing as a factor and in this arena it couldn't really keep up. However, if you would rather have a larger monitor, TV tuner and great DVD play back, then the Elonex has it covered.

The main board offers three vacant DIMM slots, four PCI slots, one ISA and one shared. One PCI slot is occupied by the 3Com modem, with sound coming from an onboard SoundBlaster PCI 128 solution piped through a set of PC Works speakers. An Acer DVD-ROM drive occupies the top 5.25in bay with two left for expansion. There's also a Zip 100 drive thrown in for data transport and backup. The bottom 3.5in bay is taken up by the 13.6GB Fujitsu hard drive, which leaves one vacant. Also bundled is an Epson Stylus Color 660 printer and Acer Prisa 320U scanner.

If you don't want to play games, the Elonex may be for you, but the Viglen offers a better all-round package.

DETAILS
PRICE £1,173.83 (£999 ex VAT)
CONTACT Elonex 0800 037 4466
www.elonex.co.uk
PROS TV tuner, 19in monitor
CONS Not really up to state-of-the-art gaming, very slow
OVERALL If you're not that bothered about games and would rather have the TV tuner and 19in monitor, consider the Elonex

BUILD QUALITY	★★★★★
PERFORMANCE	★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

evesham.com **Athlon GeForce 700**

AS USUAL, EVESHAM.COM has presented us with an exceptionally well-built machine that would be a good buy for any family. Again, however, the company has lost out to other manufacturers on value for money. A 700MHz Athlon beats at the heart of this system, mounted on an MSI K7 Pro motherboard. This uses AMD's own chipset, the 750, with three PCI slots and one shared slot free. This fast processor has been married with an equally fast graphics card. It uses nVidia's GeForce chip and this, together with its 32MB of memory, helps this machine score highly on both our 3DMark and Quake III tests. A V.90 modem is mounted directly below the graphics card, with a basic sound card, the SoundBlaster 128, below this.

Diamond provides the PCI modem. A Memorex CD-RW/DVD combo drive sits in the uppermost 5.25in bay. As always, we would have preferred to have seen a separate CD drive as well, so that you can copy on the fly, but you will still be able to create CDs and read the latest DVD software. A massive 30GB Maxtor drive is included.

After the expansion cards and peripherals are taken into account, there are three PCI slots free and two 5.25in bays for future expansion.

One disappointing aspect concerns the monitor. The Taxan Valuevision isn't the best here. The screen is fairly reflective and visibly curved, as you would expect from a budget shadow-mask model. This would not be a problem if there were a lot of extras thrown into the bundle, but as it stands the screen makes this system a little lacking on the value-for-money front.

In terms of the bundled software, you get Lotus SmartSuite Millennium edition. This is a fully-functional office suite that suits its intended task. There's also Adaptec's Easy CD Creator pre-loaded and a game, Mechwarrior 3. It's not a bad buy, but other vendors have put in better family bundles this month.

DETAILS
PRICE £1,173.83 (£999 ex VAT)
CONTACT evesham.com 0800 038 0800
www.evesham.com
PROS Speedy performer, DVD/CD-RW combo drive
CONS Monitor, would have preferred a separate CD drive
OVERALL A good all-rounder that just loses out in this test

BUILD QUALITY	★★★★
PERFORMANCE	★★★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★★

Maxdata **Artist Future PIII 700**

THIS IS THE first time we have reviewed a Maxdata system and from this entry it looks as though the German company has a few things to learn about the UK PC market. Inside the case there's a Pentium III 700E mounted on an MSI 6199VA board, which uses VIA's latest chipset.

This can support a 133MHz FSB, and Maxdata has put 128MB of PC133 SDRAM into a single memory slot. The 700E processor cannot take full advantage of this, however, as it can't support a 133MHz FSB. In SYSmark, this machine falls towards the bottom of the table, although you'll still be able to perform most 2D tasks fairly easily.

There is an Elsa Erazor III graphics card in the AGP slot. This uses the revamped TNT2 Pro chip which incorporates faster memory, more memory bandwidth and a higher fill rate. It's not up to the standards of the TNT2 Ultra or the GeForce, but it still packs quite a punch in our 3D bench tests, putting it mid-table despite its lack of T&L capability.

One of the PCI slots contains a Creative SoundBlaster 128 sound card – a fairly basic card, but functional enough, and one that has made a frequent appearance in this group test. Below that is a Conexant modem that supports the V.90 standard. A Toshiba DVD-ROM drive is provided along with a 20.5GB hard disk, but there is no removable storage solution.

The 17in Belinea monitor is not up to the same standard as other monitors in this test. We found the OSD fairly tricky to use, and the display does not look as clear as others here. In terms of build quality our review system was good, with the various cables secured out of the way to make upgrading easy.

Maxdata bundles Works Suite 2000 with its machine and this includes Microsoft Word as well as the latest version of the more basic Works Suite, so you'll be able to create and edit documents and spreadsheets from day one.

Overall, the Artist Future shows some promise, but it's eclipsed by the competition.

DETAILS

PRICE £1,172.65 (£998 ex VAT)
CONTACT Maxdata 01344 788 900
www.maxdata.co.uk
PROS 700MHz processor
CONS Monitor, no storage device
OVERALL Value for money kills this one dead

BUILD QUALITY	★★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★
OVERALL RATING	★★★

Mesh **Matrix 700GDR**

MESH KNOWS HOW to make a high-spec PC and has won many *PCW* awards in the past. This time we were looking for a good balance of performance and features to suit a family environment. With the Matrix 700GDR, Mesh has proved that it isn't only capable of producing high-end machines, since most families would be happy with this spec.

Beating at the heart of the machine is a 700MHz Athlon backed up by 128MB of PC100 SDRAM. This is quite generous and provides decent performance for a machine of this price. You also get a 20.5GB IBM hard disk, which will keep most users happy.

Connected to the secondary EIDE channel is a Pioneer DVD-114 DVD-ROM drive which provides 10-speed DVD and 40-speed CD performance. Sitting above this is a Philips CD-RW drive, which is great for archiving data. Unfortunately, the Philips drive is black and gold and sticks out like the proverbial sore thumb.

The video setup is first rate and the gamers in the family should be happy. Sitting in the AGP slot is a Guillemot 3D Prophet graphics adaptor which sports the nVidia GeForce 256 chipset and has a healthy 32MB of memory onboard. Coupled with the Prophet is a Mitsubishi Diamond Pro 710s monitor. This 17in unit sports a Natural Flat tube, giving the screen almost no reflectivity.

Sound is a complete Creative Labs solution with a SoundBlaster Live! 1024 coupled with Four Point Surround speakers. You'd be hard pushed to find a better sound setup at this price.

The final expansion card is a Diamond SupraExpress 56K modem to get you online straight away.

Input devices are high quality, with a Microsoft Internet keyboard coupled with an Intellimouse and the Microsoft Works Suite rounds things off.

On the whole Mesh has put together a great package. If a bundled printer or scanner aren't your main requirements, the Matrix 700GDR should be top of your list.

DETAILS

PRICE £1,173.83 (£999 ex VAT)
CONTACT Mesh Computers
020 8208 4706 **www.meshplc.co.uk**
PROS Top notch components for the price
CONS If you want a printer or scanner you'll have to look elsewhere
OVERALL If you want a great specification and are happy to choose your own printer and scanner, this is a superb package

BUILD QUALITY	★★★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★★

Panrix **Magnum 700**

128MB of SDRAM, which is ample for this purpose.

Demonstrating modern design, this motherboard has no ISA slots. What you get is five PCI slots and single AGP and AMR slots. There's nothing in the AMR slot and Panrix has used the backing plate to mount two extra USB ports instead.

The graphics solution is top notch and comes in the form of a Hercules GeForce 256 DDR-DVI. This is a great card as, not only does it marry the GeForce chipset with fast DDR memory, but it also gives you the added flexibility of a DVI connector, in case you prefer a digital flat-panel screen. The screen is the Mitsubishi Diamond Plus 73, which incorporates a 17in Diamondtron NF tube. It's not quite as good as the Mitsubishi model supplied by Mesh, but it's still a flat-screen, aperture-grille display.

PANRIX IS NO STRANGER to the winner's podium, and last month the Leeds-based integrator walked away with the Editor's Choice award. This month, however, things are a little different and although Panrix has produced a good machine, it doesn't quite fit the criteria as well as some of the competition.

Processing speed is well taken care of with a 700MHz Athlon filling the Slot A on the Asus K7V motherboard. One of the three DIMM sockets is filled with

Storage is very well taken care of with a 30.7GB Maxtor Diamond Max hard disk. The optical storage is equally impressive, taking the form of the Ricoh MP9060 DVD-ROM/CD-RW combo drive. This unit gives you the best of both worlds, although you can't copy a CD directly, you'll have to use the hard disk as an intermediary instead.

Sound comes courtesy of the onboard VIA AC'97 sound chipset which pumps its signal to a set of Labtec LCS 1030 speakers. Finally, a Diamond SupraSST 56K modem will get you online.

The Panrix is a fairly good machine with some great features, but other manufacturers have produced more well-rounded specifications this month.

DETAILS

PRICE £1,173.83 (£999 ex VAT)
CONTACT Panrix 0113 244 4958
www.panrix.com
PROS Fast processor, huge hard disk
CONS Short on features
OVERALL Panrix has produced a decent machine, but there are better family PCs on offer this month

BUILD QUALITY	★★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★★

Polar **Professional PIII 600**

trails the Watford machine slightly.

The graphics card is a Matrox G400 with 32MB of SDRAM onboard. It is a shame this isn't the dual-head version, but it does display a good image, even if it can't compete with the GeForce cards in 3D.

The supplied monitor cannot take full advantage of the quality image the Matrox card is pumping out, though. On the positive side, it is a 19in model but, given its quality, we would have preferred to see a higher standard 17in model. The display is below par, as the focus is not as sharp as others on test. Unfortunately, the poor focus means that the higher resolutions offered by this 19in tube are unpleasant to use.

One PCI slot is filled with an OEM version of Creative's SoundBlaster Live! 1024. This one has the welcome inclusion of a CD SPDIF connector, and

POLAR HAS PRODUCED a PC that is fine as far as it goes, but one that doesn't quite fit the family PC spec. Polar has opted for an Intel system – a Pentium III 600EB. A good motherboard – the Supermicro PIII SCA – has been chosen to complement the CPU. This can take either SDRAM or RDRAM and so it is a good choice if you are thinking of upgrading in the future.

The memory translator hub required to run the SDRAM slows the system down slightly, which explains why the Polar

the three-piece speakers will produce a fair quality sound reproduction.

A Panasonic SR-8585 DVD-ROM drive is provided, along with a 25GB IBM hard drive. Although there is space for it at the front of the case, Polar has chosen to mount this in a standard 3.5in drive bay. A network card and modem are also installed. Removable storage comes in the form of a Zip 100. This isn't the best, especially considering the CD-RW drives seen elsewhere, but it is better than nothing.

This is a fair effort from Polar and the bundled Lotus SmartSuite means that you can be productive from day one, but there are better all-rounders on test here.

DETAILS

PRICE £1,173.83 (£999 ex VAT)
CONTACT Polar 0800 138 1238
www.polartechnology.com
PROS Large hard disk, good connectivity
CONS Monitor could be better, poor SDRAM performance from the 820 chipset
OVERALL Good, but not enough of a family focus to win here

BUILD QUALITY	★★★★
PERFORMANCE	★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

Quantex Microsystems **GX600S**

QUANTEX'S ENTRY is built around a Pentium III clocked to 600MHz. The chip is running on a 100MHz system bus and is backed up by 128MB of PC100 SDRAM. In terms of SYSmark performance, the Quantex was a little lacking, beating only the Elonex with its new FC-PGA Celeron clocked to the same 600MHz frequency.

Moving into 3D performance, the Quantex picked up a bit, mainly due to the nVidia GeForce-based Creative Annihilator graphics adaptor, although

the card uses SDR, not DDR memory. A look at the back also revealed that the Annihilator was equipped with an S-Video port and a DVI connector for digital flat-panel capability, adding some future proofing.

Inside the case the system was neat, but the design was not the best we've seen. Access to the processor was obscured by the power supply and the plastic moulding on the front of the case balloons out at the bottom, increasing the size of the chassis.

The MSI motherboard offers four PCI slots, one ISA and one shared slot with an Aureal Vortex 2 sound card occupying one and a Lucent LT Winmodem sitting in the shared slot. Two DIMM slots are vacant and there was space for one more 5.25in device – the other two play host to the Toshiba DVD-ROM drive and Sony CD-RW

drive. Only one of the four available 3.5in bays allows external access and will only hold a humble floppy drive. Sitting in the bottom 3.5in bay is a 20GB Seagate Barracuda hard disk.

A Quantex-badged Delta Electronics 17in monitor is hooked up to the graphics card. Unfortunately the display on our review model gave the impression of a U-shaped shadow dropping across the screen. Bundled peripherals include a set of Altec Lansing ACS 45.1 speakers and a Microsoft Sidewinder Pro joystick.

Despite the good graphics card and CD-RW drive, the poor monitor and generally disappointing performance makes the Quantex hard to recommend.

DETAILS

PRICE £1,173.83 (£999 ex VAT)
CONTACT Quantex 01438 224 444
www.qtx.co.uk
PROS Good graphics card, DVI output
CONS The rest of the spec isn't on the same par
OVERALL The true benefit of the graphics card can't be seen, due to less suitable components elsewhere

BUILD QUALITY	★★★
PERFORMANCE	★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

Simply **Systemax A700A-DPRW-R**

A WELL-ROUNED system is preferable to a power PC in this marketplace and so Simply has sensibly specced a 650MHz Athlon for processor duty. The BioStar motherboard has three DIMM slots, one of which is filled with a 128MB PC100 SDRAM module. The board layout is fairly tidy and there's plenty of working room should you want to upgrade later.

Graphics are taken care of by a Matrox Millennium G400, which may not be as fast as the latest GeForce

cards, but it will handle the latest crop of games. Connected to the G400 is an Iiyama S700JT1 monitor. This is Iiyama's budget, 17in, shadow-mask model and the quality difference between this and the Vision Master range is notable. That said, it's not a terrible monitor, the focus is good and the colours are rich, but it does pale in comparison to the super-flat, aperture-grille models on test.

The EIDE channels are well used on this machine. On the primary channel there's a 15.3GB Maxtor Diamond Max hard disk. This might not be huge by today's standards, but it's still large enough to suit most home users' needs. The secondary channel sports a Ricoh MP9060 DVD-ROM/CD-RW combo drive. This great unit walked away with a Highly Commended award in last month's CD-RW group test. The

only problem with a combo drive is that you can't make a direct copy of a CD. However, Simply has considered this and thoughtfully included a 52-speed CD-ROM drive as well.

Sound comes courtesy of a SoundBlaster PCI 128 card married to a set of PC Works speakers with two satellites and a subwoofer. A 56K modem is included for Internet access while a Hauppauge TV tuner will mean you won't have to miss your favourite programmes while you're working.

An Epson Stylus Color 460 inkjet printer may not be the best quality or fastest inkjet around, but it adds value to an already impressive spec.

If you want a good all-round home PC, the Simply has a lot to offer.

DETAILS

PRICE £1,173.82 (£999 ex VAT)
CONTACT Simply 08707 297 366
www.simply.co.uk
PROS Great spec, great value
CONS Not the fastest on test
OVERALL The Simply offers a lot. It's a great all-round package and worth considering

BUILD QUALITY	★★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★★★
OVERALL RATING	★★★★

Time **800-7 VQ Professional**

TIME HAS SUPPLIED the fastest clocked processor in this month's group test, a whopping 800MHz Athlon backed up by the now *de facto* 128MB of RAM. However, to pay for the processor other components have been sacrificed, so the true potential of this CPU has not been realised. In terms of SYSmark performance there was little to separate the Dell, with its 700MHz Pentium III, from the Time, with both machines notching up 146 overall.

Although the machine is housed in a standard sized ATX tower, Time has used a Micro-ATX board, so you have the expansion disadvantages of Micro-ATX without the space-saving advantage. Since the board is Micro-ATX, the number of PCI slots is limited to three, with two available, plus one empty DIMM slot.

Occupying the top two 5.25in bays are a Panasonic DVD-ROM drive and an LG CD-RW drive, thoughtfully loaded with Play and Stop buttons for easy CD music control. An commendable 20GB of storage space is provided by the Fujitsu hard drive. Sound comes from an onboard solution utilising the SoundBlaster PCI 128 chipset piped out to a set of Labtec LCS-2632 speakers.

Connected to the 17in Time-badged monitor is a disappointing graphics card. The TNT M64-based card more or less crippled performance in the 3D department. We would rather have seen a few less clock cycles on the CPU and a more competent graphics card for the money. Consequently the Time floated near the bottom of the group in our Quake III and 3DMark tests, scoring 28.1fps and 2,061 3DMarks respectively.

Time has been quite generous with bundled peripherals. There is a Mustek 1200 USB scanner and an Epson Color 660 printer. These may not be top of their class, but they are more than adequate, considering the price point.

Time has put too much emphasis on the CPU, resulting in an unbalanced machine and the use of the Micro-ATX motherboard is disappointing.

DETAILS

PRICE £1,173.83 (£999 ex VAT)
CONTACT Time 01282 777 555
wwwtimecomputers.com
PROS Fast processor, scanner, printer
CONS Poor graphics card, Micro-ATX motherboard
OVERALL While the processor has the highest clock value, this has not been exploited and other machines offer better value

BUILD QUALITY	★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

Tiny **Home Performance Plus**

DESPITE THE OBVIOUS pun, Tiny submitted the smallest machine in the group test, so if space is a premium, the Performance Plus may appear an attractive prospect. At its heart beats a 700MHz Pentium III processor, backed up by 128MB of PC100 SDRAM. Given the diminutive dimensions of the case, the motherboard utilises the Micro-ATX form factor incorporating the VIA chipset.

Two PCI and one shared slot are on offer, although one PCI holds the modem and only one of the two DIMM slots is empty. Given the size of the case, everything is sensibly located, and there's even space for one 5.25in and one 3.5in device.

However, at the front, the aesthetic benefit (if there is one) of the curvy fascia is soon outweighed by the awkwardness it imposes. Ejecting the Panasonic DVD-ROM drive is no easy feat and inserting disks into the floppy drive soon becomes annoying.

Graphics come from a TNT M64-based card, so the performance is nothing staggering. It only managed fourth from the bottom in our SYSmark 2000 test, with a score of 120, along with the Polar. When it came to 3D performance, the Tiny only managed to outrank the Elonex notching up 27.5fps and 1,960 3DMarks in Quake III and 3DMark respectively.

Acting as the window to the Performance Plus is a 17in Panasonic Panasync monitor. While it may only be a 17in model, the display produced is excellent. Sound comes from an onboard Creative SoundBlaster chipset coupled with a set of fairly small Tiny-branded speakers. The keyboard features the increasingly common quick launch, sleep and volume buttons, but they are set well away from the usual layout to avoid accidental use.

On the whole, the Tiny didn't really excel in this group test, with its only defining feature being the monitor. As we went to press Tiny told us that this machine should have shipped with a Lexmark printer, which adds some value. If you want a small system, then it may be the one for you, but otherwise there are better systems on show in the group.

DETAILS

PRICE £1,173.83 (£999 ex VAT)
CONTACT Tiny 01293 821 555
www.tiny.com
PROS Fantastic monitor
CONS Everything else is a bit lacking
OVERALL If you need a small system, the Tiny may be for you, but there are better PCs here

BUILD QUALITY	★★★★
PERFORMANCE	★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

Viglen **HomePro P3-650LWr**

UNSURPRISINGLY, the Viglen HomePro 650 features a 650MHz Pentium III running on a 100MHz bus and supported by 128MB of PC100 SDRAM. The MSI motherboard is based on Intel's tried and tested BX chipset, but there's definitely life in the old dog and BX isn't ready to roll over just yet.

Performance saw Viglen firmly adopting a middle of the road stance; a SYSmark score of 130 may not be astronomical, but it's more than enough to keep you going for a fair while.

Likewise, in the 3D stakes the ATi Rage Fury Pro may not be cutting edge, but it's more than capable of keeping up with the pack, with a Quake III score of 30.6fps and 2,165 3DMarks. As the focus of the machine was that of a family PC, you'll find a full set of multimedia capabilities thanks to the ATi graphics chipset. Video in and out is also included, although the 17GB Fujitsu hard drive will fill up quite quickly if you're into serious video editing.

Delving inside revealed no nasty surprises. The system was well laid out with all major components thoughtfully located. Of the three available DIMM slots, two are free for upgrading and, should you have any old ISA cards lying around, you'll find two vacant slots plus one shared. One PCI slot holds the 3Com modem with the other taking the SoundBlaster PCI 128, leaving two free.

A Pioneer DVD-ROM drive sits in the top 5.25in bay, leaving the one below free. A Panasonic LS-120 takes care of removable storage plus floppy disk requirements, which leaves two free bays.

Visual duties are provided by a Viglen-branded 17in ADI monitor providing an adequate, if a little uninspiring display. In terms of bundled peripherals Viglen has pulled out the stops, packing in an HP Scanjet 3300C scanner and Deskjet 610C printer that significantly add to the value and are good family items.

On the whole, Viglen has played the best hand in balancing between price and performance and gets a truly well-deserved Editor's Choice award.

DETAILS

PRICE £1,173.83 (£999 ex VAT)
CONTACT Viglen 020 8758 7000
www.viglen.co.uk
PROS Good performance, bundle and price
CONS No groundbreaking components
OVERALL Viglen has sensibly chosen components that work well together and, given the price, nothing has been noticeably sacrificed

BUILD QUALITY	★★★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★★★
OVERALL RATING	★★★★★

Watford Electronics **Aries Pro 7200**

THIS SYSTEM IS AN interesting combination of old and new technology and makes it the fastest machine for games here. Despite this, it doesn't win any awards, although there are some good components on show. The most interesting feature is the way in which a new processor has been combined with old technology. The processor, a Pentium III 600EB, has both on-die cache and supports a 133MHz FSB.

Instead of opting for an 820 motherboard with fast RAMBUS or crippled SDRAM, Watford has gone down the BX route. The Gigabyte motherboard can over-clock the BX chipset to support a 133MHz FSB, and Watford has made sure that the 128MB of SDRAM is PC133. Although this is not an Intel-approved method of configuring the latest generation of Pentiums, it proved stable, and gives the machine an overall speed boost compared to 820 SDRAM solutions.

The motherboard has a Promise chip onboard that supports UltraDMA66, although the benefit of this has yet to make itself evident. In the AGP slot is a Creative Annihilator Pro. This GeForce card has 32MB of DDR memory, and has been configured well to push it to the top of the 3D performance graphs, beating other machines with higher clocked processors. There is a Creative SoundBlaster 128 in a PCI slot, a fairly basic sound card by today's standards, but adequate for the machine's intended use. A Diamond modem lies below this.

A Pioneer DVD-ROM drive takes care of optical duties and sports a slot-loading mechanism. Unfortunately, the Seagate 28.5GB hard drive is the only storage device – a removable solution really should be a prerequisite on a PC.

On the plus side, the CTX monitor is a fantastic, 17in aperture-grille display. The FD Trinitron tube displays an excellent image, even better than the Mitsubishi supplied by Mesh.

However, even the superb monitor can't make up for the lack of features seen elsewhere. That said, if you want the best graphics card and monitor combination, this is the one.

DETAILS

PRICE £1,173.83 (£999 ex VAT)
CONTACT Watford 0870 729 5555
www.watford.co.uk
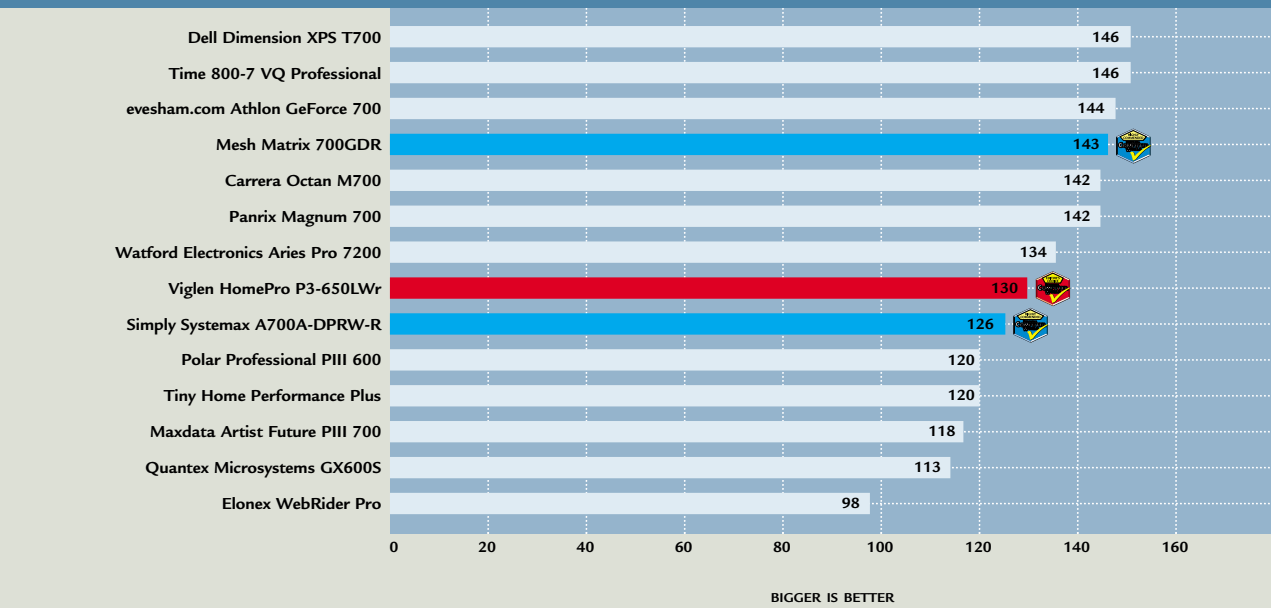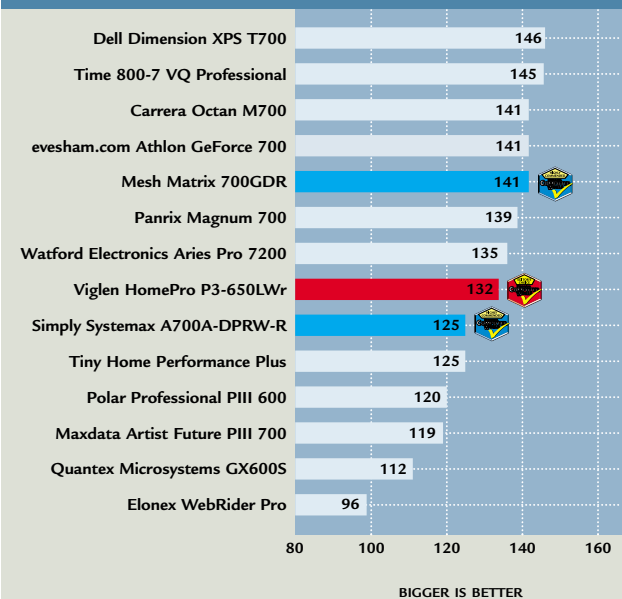**PROS** Excellent monitor, speedy in our tests
CONS No removable storage
OVERALL Worth a look for the monitor and fast performance

BUILD QUALITY	★★★★
PERFORMANCE	★★★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★★

SYSmark 2000 overall

Dell Dimension XPS T700	146
Time 800-7 VQ Professional	146
evesham.com Athlon GeForce 700	144
Mesh Matrix 700GDR	143
Carrera Octan M700	142
Panrix Magnum 700	142
Watford Electronics Aries Pro 7200	134
Viglen HomePro P3-650LWr	130
Simply Systemax A700A-DPRW-R	126
Polar Professional PIII 600	120
Tiny Home Performance Plus	120
Maxdata Artist Future PIII 700	118
Quantex Microsystems GX600S	113
Elonex WebRider Pro	98

0   20   40   60   80   100   120   140   160

BIGGER IS BETTER

SYSmark 2000 Internet content creation

Dell Dimension XPS T700	146
Time 800-7 VQ Professional	145
Carrera Octan M700	141
evesham.com Athlon GeForce 700	141
Mesh Matrix 700GDR	141
Panrix Magnum 700	139
Watford Electronics Aries Pro 7200	135
Viglen HomePro P3-650LWr	132
Simply Systemax A700A-DPRW-R	125
Tiny Home Performance Plus	125
Polar Professional PIII 600	120
Maxdata Artist Future PIII 700	119
Quantex Microsystems GX600S	112
Elonex WebRider Pro	96

80   100   120   140   160

BIGGER IS BETTER

SYSmark 2000 office productivity

Time 800-7 VQ Professional	147
Dell Dimension XPS T700	146
evesham.com Athlon GeForce 700	146
Mesh Matrix 700GDR	144
Panrix Magnum 700	144
Carrera Octan M700	143
Watford Electronics Aries Pro 7200	134
Viglen HomePro P3-650LWr	128
Simply Systemax A700A-DPRW-R	127
Polar Professional PIII 600	120
Maxdata Artist Future PIII 700	118
Tiny Home Performance Plus	117
Quantex Microsystems GX600S	114
Elonex WebRider Pro	99

80   100   120   140   160

BIGGER IS BETTER

3DMark 2000

Watford Electronics Aries Pro 7200	4613
Panrix Magnum 700	4529
Carrera Octan M700	4378
evesham.com Athlon GeForce 700	4096
Dell Dimension XPS T700	4050
Mesh Matrix 700GDR	3620
Quantex Microsystems GX600S	3346
Simply Systemax A700A-DPRW-R	2452
Maxdata Artist Future PIII 700	2361
Viglen HomePro P3-650LWr	2165
Time 800-7 VQ Professional	2061
Polar Professional PIII 600	2009
Tiny Home Performance Plus	1960
Elonex WebRider Pro	1683

1000   2000   3000   4000   5000

BIGGER IS BETTER

Quake III (fps)

Watford Electronics Aries Pro 7200	80.9
Carrera Octan M700	75.8
evesham.com Athlon GeForce 700	69.3
Dell Dimension XPS T700	68.8
Panrix Magnum 700	63.3
Mesh Matrix 700GDR	60.3
Maxdata Artist Future PIII 700	42.4
Simply Systemax A700A-DPRW-R	37.6
Polar Professional PIII 600	34.5
Viglen HomePro P3-650LWr	30.6
Quantex Microsystems GX600S	28.9
Time 800-7 VQ Professional	28.1
Tiny Home Performance Plus	27.5
Elonex WebRider Pro	21.6

0   20   40   60   80

BIGGER IS BETTER

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
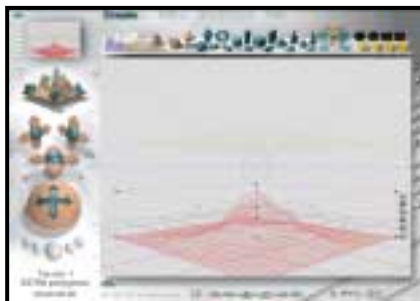
Bryce 4 script manipulates a wire frame scene and renders it

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 (below)

charts, applying graphics and sound effects, and adding movie files.

Dragon NaturallySpeaking Preferred 4.0

The script plays a pre-recorded wav file into Naturally-Speaking, which then converts the wav file to text.

Netscape Communicator 4.61

This opens a website of plays by Shakespeare and selects and loads the texts several times. Then it loads a page consisting of large tables, thumbnails and images and cycles through viewing the images.

Internet content creation

Adobe Premiere 5.1

This creates an animation of about 16 BMP files and other AVI clips and puts transitions between them. It superimposes two audio tracks and runs the audio through filters.

Adobe Photoshop 5.5

The script loads, resizes, zooms out of images, applies filters to the images, changes mode and colour settings, adjusts image brightness and contrast and saves the image to a JPEG file.

Avid Elastic Reality 3.1

The workload sets up and renders a morph between two MPEG2-sized images (720 x 480 pixels, roughly 750KB).

MetaCreations Bryce 4

This script opens an assembled wire frame scene and renders it to the final image. Then a new image is opened and saved in Metastream format. Another image is opened and saved in an HTML-compatible format.

Microsoft Windows Media Encoder 4.0

The input file is an AVI clip that is encoded using the MPEG-4 Video Codec.

3DMark 2000

It uses Remedy Entertainment's MAX-FX 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 × 768, colour depth – 16bit, full screen, highest texture detail, texture quality – 16bit, texture filter – bilinear, lighting and lightmap. At command prompt we typed:
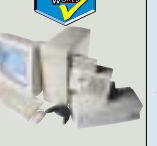
```
timedemo 1
demo demo001
```

This runs demo 1 and records the frames per second.

Table of features

MANUFACTURER	CARRERA	DELL	ELONEX	evesham.com	MAXDATA	MESH
MODEL NAME	OCTAN M700	DIMENSION XPS T700	WEBRIDER PRO	ATHLON GEFORCE 700	ARTIST FUTURE PIII 700	MATRIX 700GDR
Price inc VAT (ex VAT)	£1,173.83 (£999)	£1,116.25 (£950)	£1,173.83 (£999)	£1,173.83 (£999)	£1,172.65 (£998)	£1,173.83 (£999)
Telephone	020 8307 2800	0870 152 4699	0800 037 4466	0800 038 0800	01344 788 900	020 8208 4706
HARDWARE SPECS						
Processor	Athlon 700	PIII 700E	Celeron 600	Athlon 700	PIII 700E	Athlon 700
RAM/type	128MB/PC100	128MB/PC100	128MB/PC100	128MB/PC100	128MB/PC133	128MB/PC100
Occupied RAM slots/spare RAM slots	1/2	1/2	1/3	1/2	1/2	1/2
Max memory in this configuration	640MB	640MB	896MB	640MB	640MB	640MB
Maximum memory supported by motherboard	768MB	768MB	1GB	768MB	768MB	768MB
Hard disk (manufacturer & model)	IBM Deskstar	Western Digital	Fujitsu MPE3136AH	Maxtor 53073U6	Maxtor 92041U4	IBM Deskstar
HD size/interface	20.5GB/EIDE	20.4GB/EIDE	13.6GB/EIDE	30GB/EIDE	20.5GB/EIDE	20.5GB/EIDE
Storage drive model and manufacturer	None	None	Iomega Zip 100	None	None	Philips CD-RW 404
Size of storage drive media/drive interface	N/A	N/A	100MB/EIDE	N/A	N/A	650MB/EIDE
MOTHERBOARD COMPONENTS						
Motherboard manufacturer	Asus	Dell	Fic	MSI	MSI	MSI
Model/chipset	K7M/AMD 750	E139761/BX	KA11/VIA 694X	K7 Pro/AMD 750	MS6199VA/VIA693A	K7 Pro/AMD 750
EXPANSION AND I/O						
No of 3.5/5.25in bays	3/4	5/2	4/3	2/3	4/2	4/3
No of free 3.5/5.25in bays	1/3	3/1	1/2	0/2	2/2	2/1
No of PCI/ISA/shared slots	4/0/1	4/0/1	4/1/1	5/0/1	4/1/1	5/0/1
No of free PCI/ISA/shared slots	2/0/0	2/0/1	3/1/1	3/0/1	2/1/1	3/0/1
No of USB/serial/parallel/PS2	4/2/1/2	2/1/1/2	2/2/1/2	2/2/1/2	2/2/1/2	2/2/1/2
MULTIMEDIA						
DVD manufacturer/model	Panasonic SR-8585	NEC DV-5700A	Acer DVP 1040A	Memorex CD-RW/DVD 6424-4	Toshiba SD-M1302	Pioneer DVD-114
Sound card manufacturer & model	Aureal Vortex 2 Superquad	Creative SB Live! 1024 OEM	Creative SB PCI 128 onboard	Creative SB PCI 128	Creative SB PCI 128	Creative SB Live! 1024 OEM
Speakers (manufacturer & model)	Altec Lansing ACS54	Altec Lansing ACS340	PC Works CSW 100E	Cambridge Soundworks SBS52	Wave Master 120	Cambridge Four Point Surround
Graphics card manufacturer and model	Hercules 3D Prophet DDR-DVI	Dell GeForce 256	ATi All in Wonder 128	Generic nVidia GeForce 256	Elsa Erazor III Pro	Guillemot 3D Prophet
Chipset	nVidia GeForce 256	nVidia GeForce 256	ATi Rage 128	nVidia GeForce 256	nVidia TNT2 Pro	nVidia GeForce 256
RAM/max RAM and type	32MB/32MB/DDR SGRAM	32MB/32MB SDRAM	32MB/32MB SDRAM	32MB/32MB SDRAM	32MB/32MB SGRAM	32MB/32MB SDRAM
Graphics card interface	AGP	AGP	AGP	AGP	AGP	AGP
Monitor manufacturer/model	LG Studioworks 775N	Dell D-790	Elonex V999	Taxan Valuevision 1710 TCO 99	Belinea 10 30 40	Mitsubishi Diamond Pro 710s
Monitor size/max viewable diagonal	17in/15.9in	17in/16in	19in/18in	17in/16in	17in/16in	17in/16in
Maximum resolution/refresh	1,280 x 1,024/60Hz	1,600 x 1,200/70Hz	1,600 x 1,200/75Hz	1,280 x 1,024/60Hz	1,600 x 1,200/69Hz	1,600 x 1,200/60Hz
OTHER INFORMATION						
Modem manufacturer and model	V.90 Winmodem	V.90 Winmodem	3Com V.90 Winmodem	Diamond 56i Pro	Conexant HCF RTAD	Diamond 56i V Pro
Misc hardware	None	None	Epson Stylus Color 660 printer, AcerScan Prisa 320U USB	None	None	None
Bundled software	Lotus SmartSuite Family Pack	MS Works Suite 2000	MS Works Suite 2000	Lotus SmartSuite Millennium, Go Back disaster recovery	MS Works Suite 2000	MS Works Suite 2000 Nero Burning ROM
Standard warranty	2 yrs on-site	1 yr on-site, 2 yrs C&R	1 yr on-site	2 yrs on-site	1yr on-site, 2 yrs RTB	1 yr on-site, 2 yrs RTB

	PANRIX	POLAR	QUANTEX	SIMPLY	TIME	TINY	VIGLEN	WATFORD
	MAGNUM 700	PROFESSIONAL PIII 600	GX600S	SYSTEMAX A700A-DPRW-R	800-7 VQ PROFESSIONAL	HOME PERFORMANCE PLUS	HOMEPRO P3-650LWr	ARIES PRO 7200
	£1,173.83 (£999)	£1,173.83 (£999)	£1,173.83 (£999)	£1,173.83 (£999)	£1,173.83 (£999)	£1,173.83 (£999)	£1,173.83 (£999)	£1,173.83 (£999)
	0113 244 4958	0800 138 1238	01438 224 444	08707 297 366	01282 777 555	01293 821 555	020 8758 7000	0870 729 5555
	Athlon 700	PIII 600EB	PIII 600E	Athlon 650	Athlon 800	PIII 700E	PIII 650E	PIII 600EB
	128MB/PC100	128MB/PC133	128MB/PC100	128MB/PC100	128MB/PC100	128MB/PC100	128MB/PC100	128MB/PC133
	1/2	1/1 or 2 RIMMS	1/2	1/2	1/1	1/1	1/2	1/3
	640MB	640MB	640MB	640MB	384MB	384MB	640MB	768MB
	768MB	768MB	768MB	768MB	512MB	512MB	768MB	1GB
	Maxtor 53073U6	IBM Deskstar	Seagate Barracuda ATA	Maxtor 91531U3	Fujitsu MPF3204AH	Fujitsu MPE3204AT	Fujitsu MPE3170AT	Seagate Barracuda
	30.7GB/EIDE	25GB/EIDE	20.4GB/EIDE	15.3GB/EIDE	20GB/EIDE	20.5GB/EIDE	17GB/EIDE	28.5GB/EIDE
	None	Iomega Zip 100	Sony CRX-100E	Ricoh MP9060	LG CED-8042B	None	Panasonic LS-120	None
	N/A	100MB/EIDE	650MB/EIDE	650MB/EIDE	650MB/EIDE	N/A	120MB/EIDE	N/A
	Asus	Supermicro	MSI	Biostar	MSI	MSI	MSI	Gigabyte
	K7V/VIA KX133	PIII SCA/820	MS6199VA/VIA693A	M7MKA/AMD 750	MS6191/AMD 750	MS6156 BX7/VIA 693A	MS6119/BX	GA-BX2000+/BX
	4/2	5/2	4/3	3/3	4/3	3/2	4/2	3/3
	2/ 2	2/1	2/ 1	1/ 1	2/ 1	1/1	2/ 1	1/2
	5/0/0	5/0/0	4/1/1	4/1/1	3/0/0	2/0/1	3/1/2	5/0/1
	4/0/0	2/0/0	3/1/0	1/1/1	2/0/0	1/0/1	1/1/2	4/0/0
	4/2/1/2	2/2/1/2	2/2/1/2	2/2/1/2	2/2/1/2	2/2/1/2	2/2/1/2	2/2/1/2
	Ricoh MP9060	Panasonic SR-8585	Toshiba SD-M1302	Ricoh MP9060	Panasonic SR-8585	Panasonic SR-8503	Pioneer DVD-114	Pioneer DVD-104
	VIA AC'97 Onboard	Creative SB Live! 1024 OEM	Aureal Vortex 2	Creative SB PCI 128	Creative SB PCI 128 Onboard	Creative SB PCI 64 Onboard	Creative SB PCI 128	Creative SB PCI 128
	Labtec LCS 1030	Labtec LCS 2414	Altec Lansing ACS 45	Cambridge - PC Works	Labtec LCS-2632	Tiny OEM	Altec Lansing ACS 33	Maxxtro SPK41Q
	Hercules 3D Prophet DDR-DVI	Matrox G400 single head	Creative Annihilator	Matrox G400 single head	MSI 3D Phantom MS-8808	MSI 3D Phantom MS-8808	ATi Rage Fury Pro	Creative Annihilator Pro
	nVidia GeForce 256	Matrox G400	nVidia GeForce 256	Matrox G400	nVidia TNT2 M64	nVidia TNT2 M64	ATi Rage 128 Pro	nVidia GeForce 256
	32MB/32MB/DDR SGRAM	32MB/32MB SDRAM	32MB/32MB SDRAM	32MB/32MB SDRAM	32MB/32MB SDRAM	32MB/32MB SDRAM	32MB/32MB SDRAM	32MB/32MB/DDR SGRAM
	AGP	AGP	AGP	AGP	AGP	AGP	AGP	AGP
	Mitsubishi Diamond Plus 73	Frank & Walter Gmbh 996	Delta Electronics DE-770	Iiyama S700JT1	Time 17S	Panasonic Panasync SL75	ADI Provista E55	CTX PR705F
	17in/15.9in	19in/18in	17in/15.8in	17in/16in	17in/15.9in	17in/15.9in	17in/15.9in	17in/16in
	1,280 x 1,024/60Hz	2,048 x 1,536/60Hz	1,280 x 1,024/60Hz	1,280 x 1,024/60Hz	1,280 x 1,024/60Hz	1,280 x 1,024/60Hz	1,280 x 1,024/60Hz	1,600 x 1,200/60Hz
	Diamond 56i Pro	Diamond 56i Pro	Lucent LT Winmodem	Conexant SoftK56	MicroModem HSP56	MicroModem HSP56	3Com V.90 Winmodem	Diamond 56i Pro V
	None	RPTI PCI 10Mbytes/sec Network Adaptor	MS Sidewinder Precision Pro	Epson Stylus Color 460, Hauppauge WinTV GO, MS Sidewinder GamePad	Mustek Scanexpress 1200 USB, Epson Stylus Color 600, Joystick, Gamepad and Webcam	Lexmark 3200	HP Scanjet 3300C HP Deskjet 610C MS Sidewinder Joystick	Onboard UDMA 66
	Ultra Pack	Lotus SmartSuite Millennium	Corel Office Suite 8 Software Essentials and Activision games bundle	MS Works 2000, educational and games bundle	Lotus SmartSuite Millennium, Exec software pack, CD games pack	MS Works Suite Home Compilation pack	MS Works Suite 2000, MS Encarta 2000, family/entertainment/education packs	None
	1 yr on-site, 2 yrs RTB	3 yrs RTB	1 yr on-site	1 yr on-site	1 yr RTB	1 yr C&R	1 yr on-site	1 yr C&R

Editor's **Choice**

Many demands are placed on the family PC. It has to function as a home office, a gaming station for the latest releases, Internet terminal for communication and many other roles. Add to this an extremely price-sensitive market and it is no easy task to produce an all singing all dancing solution that won't disappoint. In general we were pleased with the standard of submissions and most machines would do well at the tasks outlined for them.

We were looking at how well the price/performance/features equation had been balanced. A fairly powerful processor and graphics card are required for the odd bit of gaming, but there are other factors. Bundled peripherals are good for some families but some prefer to buy a printer and scanner separately. We wanted a PC that was adequate in all areas without skimping on others.

The winners

With this in mind, the **Editor's Choice** award goes to Viglen's HomePro 650. The 650MHz Pentium III processor at its core may not be blistering by today's ever increasing standards, but it is more than capable of keeping you going for a fair amount of time. Likewise, ATi may not have the fastest chipset around compared to the likes of nVidia, but it can still keep up. You also get the added bonus of video in and out plus great DVD playback. The 17in ADI monitor again would not win any prizes in a dedicated group test but it is more than adequate for day to day use. 120MB of removable storage, courtesy of an LS-120 drive, may seem small compared to 650MB offered by CD-R, but if you're only backing up data files it is sufficient. Topping off the package are top notch peripherals, in this case an HP ScanJet 3300C scanner and DeskJet 610C printer. If you have a use for these items then you certainly won't go home disappointed. On the whole, Viglen has produced a well-rounded package that fits the criteria perfectly

Next up on the blocks comes Mesh with its Matrix 700GDR taking the first **Highly Commended** award. For those who like to choose their own peripherals the Matrix is ideal. The saving has been ploughed into other areas of the system, most noticeably the Mitsubishi Diamond Pro 710s monitor. Again, this is not the best 17in model around but is still a great unit and is unlikely to disappoint anyone. The 700MHz Athlon will keep you going well into the future with a GeForce 256-based graphics card to keep the gamers happy. Add to this a Philips CD-RW, Creative SoundBlaster Live! 1024, Pioneer DVD-ROM and 128MB of SDRAM and you've got a quality system that is more than adequate for the task at hand.

Finally, rounding off the awards is the Simply Systemax Power A700A-DPORW taking the last **Highly Commended** award. Hot on the heals of the Viglen, the Simply also sports a 650MHz chip, although this time an Athlon, and 128MB of SDRAM. Graphics come from Matrox's G400 (although only a single head unit) and the 17in monitor stems from Iiyama's budget range. There's a DVD/CD-RW combo courtesy of Ricoh plus a 52-speed CD-ROM for on the fly copying. A Hauppauge TV card is a good bonus for the family and the Epson Stylus 460 printer adds value. On the whole a fair contender, but just pipped at the post by the Viglen.

Choose your own peripherals with the Mesh

Simply's Systemax includes a TV card

Viglen's HomePro 650 took the top prize for its well-rounded family PC package

Top dog inkjets

After the PC itself, the inkjet printer has become an essential and increasingly affordable piece of equipment. So, if you need to produce professional-quality photos, or just want to print that important word-processing document, then we've got eight of the best to help you on your way.

The Internet has changed the way a lot of documents are published – traditionally it was print and distribute. Now it's distribute and print as companies and individuals put their information online and we, the users, print it, so it's not surprising that after the PC itself, the relatively inexpensive inkjet printer is perhaps the most common IT purchase. There are just four key players – Canon, Epson, Lexmark and Hewlett-Packard, and our brief was simple. We asked each to submit two printers – one for home users and another for higher-end colour professionals.

We wanted to be able to print photos, plain text and a range of content in between, including vector images and a university dissertation. For the full document rundown and what we were hoping to see, take a look at 'How we did the tests' on p210. Some models did better than others, as is always the case, but remember that quality is not the be all and end all. While you need professional results you certainly don't want to end up waiting all night for a job to complete. We also looked at how the printers performed on both proprietary inkjet paper and standard photocopier paper. After all, you don't want to be shelling out for inkjet paper when all you want to print is a word-processed document.

If you had preconceptions about who is top dog in the printer arena, you may find yourself thinking again because, as our exhaustive tests showed, advances in technology have brought the four contenders closer together than ever before.

contents

*• Printers reviewed and tested by
Nik Rawlinson and Jalal Werfalli.*

ratings

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

PHOTOGRAPH DAVID WHYTE

Canon **BJC-3000**

Connection is by USB or parallel. Data cables are not included. You can extend its functionality with an optional scanner cartridge. It boasts the same resolution of 1,440 x 720 as Epson's Stylus Colour 760.

The driver is well organised, but can only tell you when your ink is low using text – the ink display is static. There is also a growing bar to indicate progress.

It caters for nine media types, five output quality options and eight media sizes supplemented by a custom setting. Other options cover scaling, banner printing, poster printing across multiple sheets, changing the print order and watermarking output.

Plain text on photocopy paper was well reproduced but, in our mixed text and graphics output, the greyscales had been rendered as a composite grey and took on a pinkish hue.

The 3000 made a fair stab at photo. Colours were generally realistic,

THE FIRST THING you will notice about Canon's BJC-3000 is the amount of packaging it comes in. It couldn't possibly get damaged in transit, but we were concerned at the amount of tape, foam and plastic we ended up with.

Inkwells are individually dropped into the head, which should cut down on replacement costs, but they are not keyed so it is possible to drop the wrong colour into the wrong place, which would have disastrous results.

although the black resembled a dark charcoal grey and the output was grainy in parts. It also lacked definition in shaded areas, particularly on darker skin tones. The photo's graininess carried through into the vector image, although colours were bright and vibrant.

Sadly, it let itself down somewhat when printing the PowerPoint slides. Even on inkjet paper, these were badly banded and vertical lines that should have been straight were kinked in places.

It will not break any speed records, but it managed to shave 17 per cent off the Lexmark Z31's time for printing the photo and half the Z31's time to complete the 50-page Acrobat PDF document. Overall, it performed well, producing good output for home use.

DETAILS

PRICE £108.10 (£92 ex VAT)
CONTACT Dabs 0800 558 866
www.dabs.com
PROS Small, good photo quality
CONS Fairly slow
OVERALL Outperformed by some of the other printers seen here

TEXT QUALITY	★★★★
IMAGE QUALITY	★★
SPEED	★★★
OVERALL	★★★

Epson **Stylus Color 760**

The printer holds two cartridges, one black and one CMY, and installing them is a simple case of pressing a button to move the holsters to the centre of the carriage and then snapping them in. The Piezo technology used by Epson's inkjets still requires a certain amount of priming. There's a generous software bundle thrown in – Epson Print Adventure for making stickers and cards, Adobe PhotoDeluxe 3.1 Home Edition, stock photos and a media sample pack.

THE 760 BENEFITS from an excellent driver layout. A constantly updated on-screen monitor shows the progress and the amount of ink remaining, and an indicator tells you the number of minutes left to completion, saving you the trouble of waiting for a long job and ensuring you will not run out of ink midstream.

It has parallel and USB ports for PC or Mac connection, yet the only cable in the box is the power lead. A foldout setup sheet supplements the user manual.

The print driver dialog has a slider, allowing you to set the balance between quality and speed. If you would rather not fiddle, you can set it to automatic and let the driver decide for itself. It caters for seven media types and 25 paper sizes, supplemented by a custom option.

Other options take care of rotation, two or four pages on a single sheet and poster printing, as well as the option to reverse the print order if this is not built into your application.

The 760 was fairly speedy, beating Hewlett-Packard's Deskjet 930C in all categories. In the past, Epson printers have trailed behind in many tests but, in this instance, the photo was particularly quick, completing in just two minutes 10 seconds. However, the result was grainy and there was slight stepping in places where there should have been smooth fades. That said, there was no bleed from darker colours into lighter areas.

On photocopy paper text was less feathered than that produced by the 870 and our PowerPoint presentation was less saturated on inkjet paper. The colours were also noticeably brighter than those produced by the 870.

DETAILS

PRICE £121.03 (£103 ex VAT)
CONTACT Dabs 0800 558 866
www.dabs.com
PROS Excellent vector art output, fairly fast
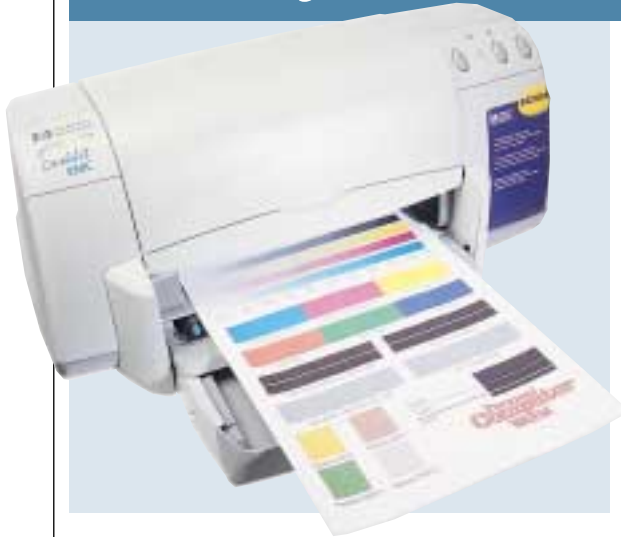**CONS** Some graininess creeping into photo output
OVERALL A good all-round printer for general use

TEXT QUALITY	★★
IMAGE QUALITY	★★★★
SPEED	★★★★★
OVERALL	★★★★

HP **DeskJet 930C**

HOME USER

THE DESKJET 930C employs the same engine as the higher spec P1100 but, without some of the enhancements, it's aimed more at the home user.

Installation was easy. Once we had installed the cartridges it ran through a head alignment process and was then ready to use. Connection is by parallel or USB interface, but there were no bundled data cables. The instruction manual is supplemented by three foldout, quick-start sheets for parallel,

USB or Mac connection. The in-box bundle comes with a small media sample pack, but the only discs included were the drivers.

Problems can be easily diagnosed. The printer uses an arrow on top of the cartridge cradle to point at a series of icons at the back of the body, indicating where the problem lies.

The driver was easy to navigate. A series of tabs running along the top of each section guides you through the functions, which even included settings to optimise the output for photocopying and faxing.

Brightness and saturation were set on a series of sliders. In common with its big brother the P1100, it lets you adjust the printed page drying time. There are no facilities to monitor print progress, the level of ink remaining in the cartridge or how much time remained for completion.

The 930C's photo was impressive – less grainy than that produced by the Epson Stylus Color 760. Skin tones were

realistic and transitional fades between light and dark tones were smooth. Darker colours did not bleed into light areas along lines of high contrast. Similarly, the PowerPoint output was well rendered, with vibrant colours on HP's inkjet paper and small inverse fonts very clearly presented. But while this was more appealing than the 760's output, its vector image was dull. Text on photocopy paper could not be faulted, with dark blacks and sharp, crisp edges.

When it came to printing images, the DeskJet 930C was beaten every time by Epson's 760C, but it streaked ahead of Lexmark's Z31. Text speed performance was good. HP has a reputation to live up to and the 930C will do it no harm.

DETAILS

PRICE £130.43 (£111 ex VAT)
CONTACT Watford 0870 7295600
www.watford.co.uk
PROS Excellent text and photo output
CONS Outclassed when it came to printing vector art
OVERALL A competent printer worthy of Hewlett-Packard's good name

TEXT QUALITY	★★★★★
IMAGE QUALITY	★★★★
SPEED	★★★
OVERALL	★★★★

Lexmark **Color Jetprinter Z31**

HOME USER

THE Z31 IS LEXMARK'S midrange printer. It takes up very little desk space and its paper output tray slides away when not in use. It's unable to receive many completed pages, topping out at 25 sheets. As a result, we ended up with pages all over the floor.

Installation was simple enough and included the option of creating a set of installation floppies that could come in handy if you also want to use this printer on a notebook that doesn't have a

CD-ROM drive. It connects to the PC via parallel port only, which is not a problem, but we didn't like the way that the installation CDs have been tucked into pockets in the front of the owner kit wallet. By the time the package had arrived, they had fallen out and were badly scuffed.

The maximum resolution of 1,200 x 1,200 is higher than the 1,440 x 720 offered by either of the Epson printers tested here, but this did not help when it came to photo printing.

Using Lexmark's own photo paper, the output was dark, grainy and slightly banded. That said, there was no bleeding from darker into lighter colours and transitions between different tones were smooth, with no discernable steps.

Banding was again evident in the solid grey areas of our Acrobat PDF, but text was rendered well. Edges were sharp and unfeathered, and characters

were dark and solid, even on standard photocopy paper. Unfortunately, the Z31 performed poorly when printing the vector image and was beaten by its competitors.

In terms of speed, the Z31 didn't shine. At over 24 minutes it was around half the speed of Epson's Stylus Color 760, but not too far behind Hewlett-Packard's Deskjet 930C when it came to printing 50 pages of solid text. This difference was accentuated when it came to printing the photograph. In the time it took the Z31 to complete the test, the Epson 760 could have printed four full A4 pictures.

Overall, the Z31 had some impressive stats, but in the final analysis it failed to impress.

DETAILS

PRICE £93.99 (£79.99 ex VAT)
CONTACT Simply 020 8523 4020
www.simply.co.uk
PROS Very good text quality
CONS Fairly slow, poor photo reproduction
OVERALL Worthy of consideration only if your main use will be text printing

TEXT QUALITY	★★★★
IMAGE QUALITY	★★
SPEED	★★
OVERALL	★★★

The technology of colour

Look closely at this page. If you have good eyesight, you'll notice that every picture, logo and letter is made up of just four colours – cyan, magenta, yellow and black (CMYK). By placing tiny dots of these colours very closely together, the eye is fooled into believing it can see every colour of the spectrum.

Inkjets work in a similar way, either placing dots very close to each other or making them smaller and dropping several dots on to exactly the same spot. Because the inks used are transparent, unlike paint which will obliterate any colour already in place when the next coat is applied, light shines through and what you see is a composite tone.

The ideal situation, of course, would be to mix the colours in the chamber before they are ejected, giving the printer more control over the colour laid down. But the technology is not yet in place to make this happen on a commercial scale.

No magazine is printed at a resolution that comes anywhere close to that offered by even inexpensive inkjets. *PCW*, for example, is printed at 300dpi (dots per inch), and many experts believe that the naked eye can't detect the individual dots on anything printed above 130dpi, so they instead appear to merge into a single shade. And even if a printer is able to boast the highest resolution it doesn't necessarily produce the best photo, as is the case with some of the photos printed in *PCW*'s tests.

Every inkjet print head, no matter which company manufactured the printer, is built around either thermal or Piezo technology. Basically, if you're not using an Epson printer, you're a member of the thermal gang. So how do they work?

Thermal inkjet
Thermal printing came about by chance. Back in the 1970s, a scientist had carelessly left a hypodermic needle sitting above the flame of a Bunsen burner. This caused the liquid within the needle to rapidly expand and eject from the open end. Thinking laterally, he wondered how he could put this to good use, and thus the thermal print head was born.
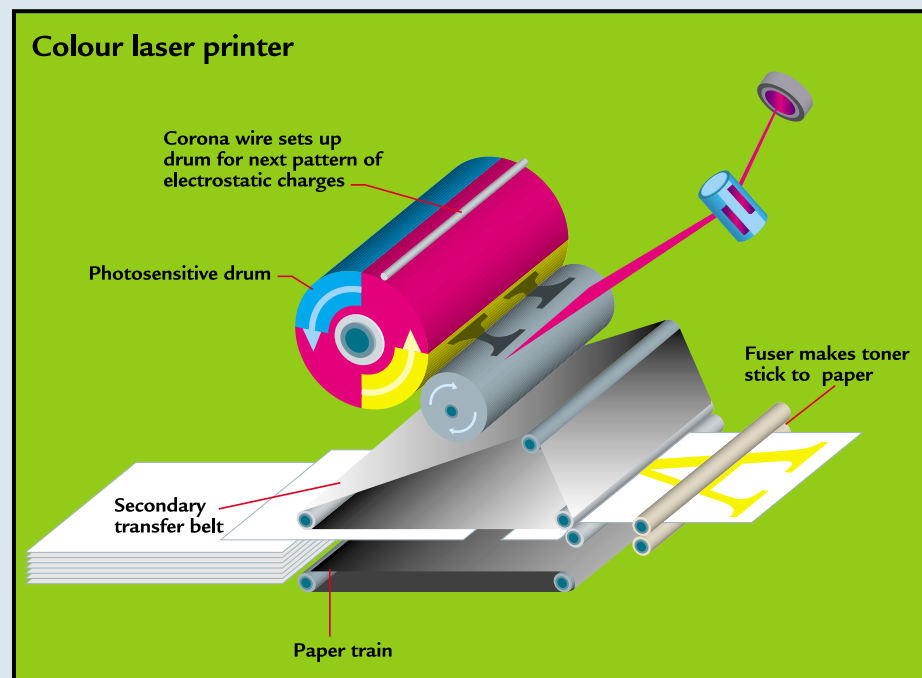
Of course, it all happens on a smaller and quicker scale these days. Ink fills a tiny chamber, at the bottom of which is a small resistor that heats to almost 500 degrees Celsius for just a few millionths of a second. This causes the ink to expand through the open nozzle. When the drop is large enough – about a millionth the volume of a drop of water from an eyedropper – its weight becomes too much for the natural tension of the liquid's surface to hold back and so breaks free, flying toward the page. Thermal inkjet manufacturers claim their technology is more tolerant and can easily overcome obstacles such as air bubbles in the chamber.

Piezo electric
Epson is the only manufacturer to use Piezo electric print heads and claims that because it doesn't need to engineer its inks to withstand high temperatures it can concentrate on the ink's reaction to paper and the way this affects the colours produced.

Instead of a heating element, the floor of a Piezo electric chamber is made up of a thin strip of metal and Piezo crystals. When a current is passed through the crystals they oscillate, physically changing the size of the chamber which, in turn, pushes ink out through the nozzle and towards the page. By adjusting the voltage, the head is able to eject droplets of different sizes, thereby varying the density of the coverage and the tone of the colour laid down.

Alternative technologies
As prices continue to fall, so alternative technologies become more affordable. Even colour laser printers have dropped in price. Tally's T8004, for example, can be yours for a little over £800, and boasts a print speed of up to eight colour pages a minute – faster than an inkjet.

Colour laser printers work in a similar way to their monochrome counterparts, but this is rather different to inkjet technology, and the image is not placed directly on to the page from the outset. There are two common methods in use, but the first employs a series of mirrors or a pyramid. The printer first directs a single laser beam on to the surface of a drum, which causes a static charge that matches the pattern of output. It does this four times – once for each CMYK colour. Next, the drum passes over toner cartridges of the same colours, and the static charge drags toner from the appropriate cartridge on to the drum. The drum continues to turn, eventually coming into contact with a moving belt that takes the toner off the drum. The image has now effectively been mirrored, and it is pressed on to a sheet of paper. If that were the end of the process, the charge would soon be lost and the toner would fall from the page, so a second set of heated rollers fuses it on to the paper, creating a permanent print.

Colour laser printer

Corona wire sets up drum for next pattern of electrostatic charges

Photosensitive drum

Fuser makes toner stick to paper

Secondary transfer belt

Paper train

Colour laser printers burn an image onto the drum before placing toner onto the page

The technology of colour (cont)

The second method is similar to the first, except that it uses four separate lasers, drums and toner cartridges to transfer the four colours onto the moving belt. The advantage of this is obvious: split the work four ways and cut down on the time to completion. But it often works out more expensive because of the duplication of components inside the machine.

Two other technologies are worth mentioning. The first is solid ink printing. The two great advantages here are that it is fast and the ink is easy to store because it looks and feels like a wax crayon at room temperature. The disadvantages, though, are that it takes some time to warm up each morning and moving it while the ink is still liquid can cause potentially damaging spills.

Once the inks have been loaded into the top of the printer they are heated until a portion of each block melts. This is fed through the printer to four rows of nozzles that stretch across the full width of the page. Each nozzle is the opening on the front of a chamber, at the back of which is a Piezo arrangement similar to that found in an Epson print head. This is used to push ink out of the chamber and onto the page which is then fed through a series of rollers to first press the ink on to the page and then cool it before it has a chance to run.

The final technology is that employed by Alps Electric, called MicroDry. Alps Electric has developed a range of printers that use a series of coloured tape, much like old-fashioned typewriter ribbons. Four of these are loaded into the printer at once and, as the paper passes through the body of the unit, the colours are pressed on to the page. The paper needs to pass through once for each colour, but this takes no longer than a single page on the average colour inkjet.

The unique selling point for this sort of technology is that you're not restricted to the traditional CMYK colours so, by using white, fluorescent or metallic, tapes can produce impressive results on even dark media.

What next?

The future of printing is by no means set in stone and you would be hard pressed to find anyone willing to make a prediction. What is obvious, though, is that the shift from print and distribute, to distribute and print, is gathering momentum every day.
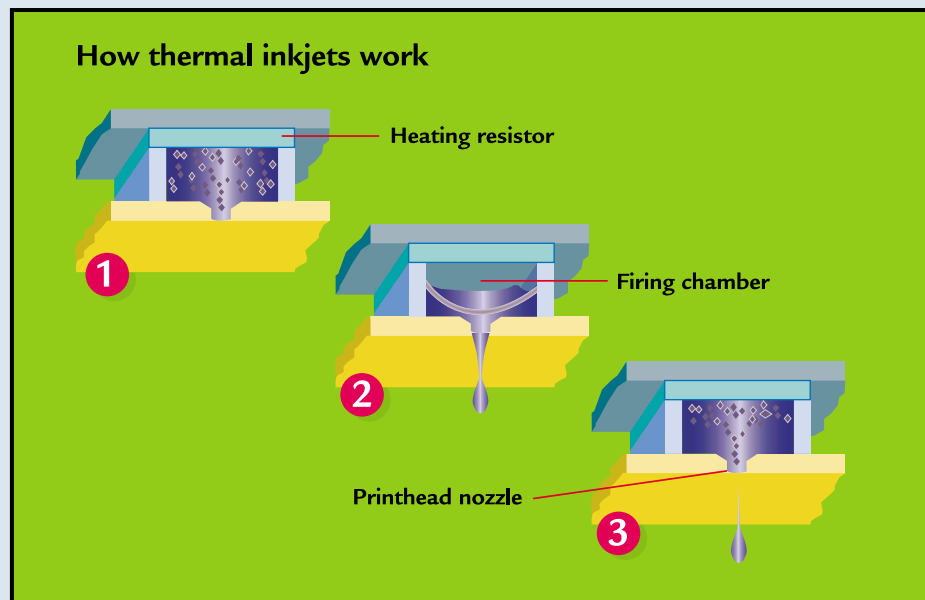
Greater adoption of the Internet and related technologies will, with luck, lead to a reduction in the amount of wasted print. As more companies put their catalogues and publications online, we will print out only those parts that are of interest or relevant to us.

Even book publishers are now toying with the idea of electronic distribution. Stephen King, just a few months ago, became the first mainstream author to release his work in a purely electronic format. Of course, the majority of those who paid to download it will have undoubtedly printed it before settling down to read it, and so inexpensive methods of achieving high-quality output are still likely to be as important in the future as they are today – at least until the e-book truly takes off.

NIK RAWLINSON

Piezo-electric technology

Charge

Piezo disk
(Piezo Electric)

Droplet

Cavity
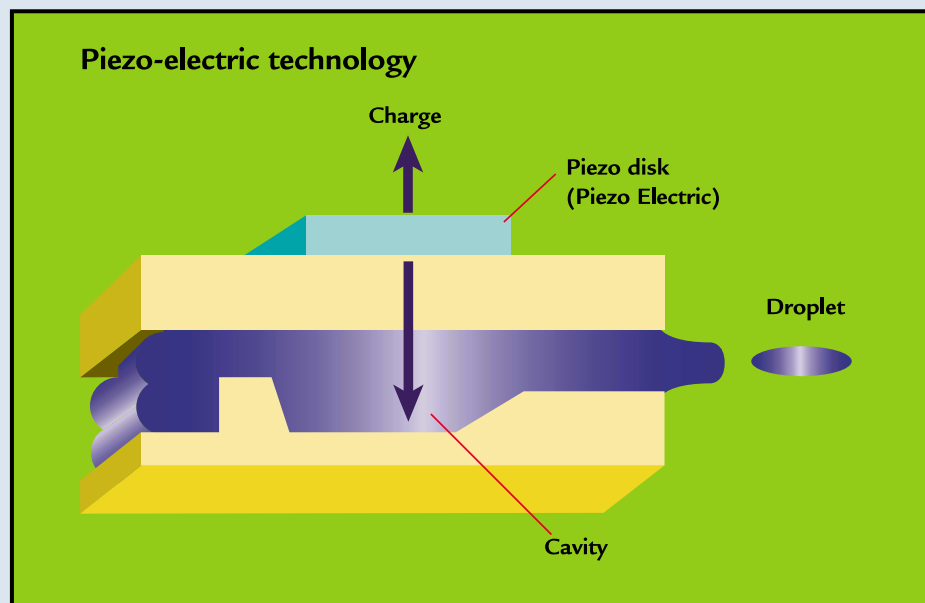
Piezo-electric print heads vibrate a disk of crystals to eject the ink onto the next page

How thermal inkjets work

Heating resistor

1

Firing chamber

2

Printhead nozzle

3

Thermal inkjet print heads use a heated resistor to expand the ink until it bursts onto the page

Canon **BJC-8200 Photo**

COLOUR PROFESSIONALS

THE BJC-8200 PHOTO is Canon's latest top-of-the-range bubblejet printer. Designed with the imaging professional in mind, it comes with six cartridges. These can all be replaced individually, eliminating the need to dump a single CMY unit when only one colour has run dry.

Installing these took a little longer, partly because there are six, and partly because they are heavily packaged. We were also concerned that you could fit the cartridges into the separate print head in any order. As with the 3000, there is a choice of parallel or USB connection, but no leads. A small media pack, together with a colourful setup booklet and user guide, were included.

The driver is one of the best we've seen, with five print mode options, including one for DTP and a setting for digital camera shots. Print quality can be similarly adjusted, affecting print speed. In addition, you have a choice of 10 media types and can cut printer power from the driver. There is no graphical ink level monitor, but it will warn you when reserves are low.

The 8200 is a quiet printer. It was still louder than HP's P1100, but low enough for use in an office. Text quality printing fell short of that by HP's P1100 and Lexmark's Z51 – characters were paler and feathered around the edges. However, this is a printer designed for photo output, so we were eager to look at how the true 1,200 x 1,200 resolution handled our test photo. Overall, colour balance was good, with no obvious stepping, while skin tones were realistic. Unfortunately, this was somewhat spoilt by underlying blotches covering the entire photo. That said, we were impressed by the print quality on Canon's own inkjet paper. Both the PowerPoint and vector image results were vibrant and sharp.

The BJC-8200 was the slowest in all but the single page of text test, lagging behind at 65 minutes 18 seconds for the mixed text dissertation and 56 minutes 36 seconds for the Acrobat PDF document.

Overall, it is a capable bubblejet, albeit slow, and even doubles as scanner if you install the optional cartridge.

DETAILS

PRICE £270.25 (£230 ex VAT)
CONTACT Dabs 0800 558 866
www.dabs.com
PROS Excellent vector art quality
CONS Very slow, poor photo performance
OVERALL Versatile, but much too slow

TEXT QUALITY	★★
IMAGE QUALITY	★★★★
SPEED	★
OVERALL	★★★★

Epson **Stylus Photo 870**

COLOUR PROFESSIONALS

LARGER THAN THE 760, the 870 is aimed at the more professional imaging user. It is just as easy to set up, and goes through the same priming process. The driver looks and works the same way too, with familiar ink reservoir gauges and time-to-completion countdowns. In this instance, however, the in-box bundle is more generous.

As well as the media sample pack, you'll find Epson Photo Reproduction Lab software, a disc of sample images and MGI LivePix 2.1 deluxe for Windows (version 1.5 for Mac). The interesting thing, though, is a toilet paper-sized eight metre roll of photo paper and an attachment for fixing it to the back of the unit. This allows you to print 10cm high photo banners. As with the 760, there is a choice of USB or parallel connection, but no data cables for either. It holds two cartridges – one black and one CMY.

The 870 was slower than its sibling when it came to printing text. At 30 minutes 51 seconds, our 50-page Word file took twice as long, as did the mixed text and graphics document.

The difference when it came to the Acrobat PDF was less obvious. In only two tests did it take less time: vector art printing and the PowerPoint slides. It was, however, faster than HP's high-end machine in all but text printing. Speed is less important where the 870 is concerned; its primary focus is on printing photo-quality output, and here it excels. Our test photo was beautifully rendered, with sharp, pure colours and no bleed from darker into lighter tones. There was no evidence of undesirable banding and skin tones were accurately reproduced. Light to dark transitional fades were smooth and we could see no stepping. It had no problem printing one of our PowerPoint slides on a transparency, but the colours in our vector art image were not as bright as those from some of the other printers.

We were a bit disappointed that the output from the PowerPoint slides test was somewhat saturated, even though we were using inkjet paper. On standard photocopy paper, text output was slightly feathered and we preferred that produced by the Hewlett-Packards.

DETAILS

PRICE £207.98 (£177 ex VAT)
CONTACT Simply 020 8523 4020
www.simply.co.uk
PROS Excellent photo output
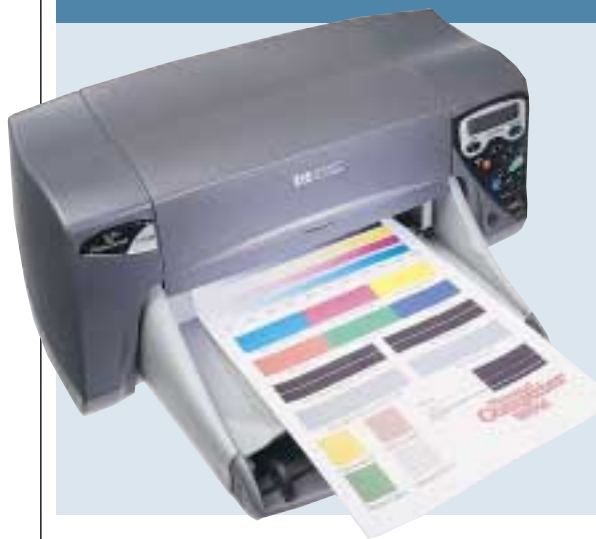**CONS** Disappointing text performance
OVERALL If photo printing is the be all and end all, look this way

TEXT QUALITY	★★
IMAGE QUALITY	★★★★
SPEED	★★★★
OVERALL	★★★★

HP **Photosmart P1100**

COLOUR PROFESSIONALS

AIMED AT THE imaging enthusiast, this printer has integrated SmartMedia and Compact Flash slots. Hardware options allow you to adjust paper and photo size or print a thumbnail preview. Connecting the printer to the PC turns the cards into mini hard drives.

The driver was less informative than those bundled with the other high-end printers in this test as, while it had more paper options, it lacked any indication of progress. What we did like was the way you can use it to vary the amount of ink that hits the paper and how long the printer will keep hold of your printout to allow for drying.

In use, the P1100 is whisper quiet. It's quick, too, ahead of the others in this test in the plain text and mixed content tests. Quality was exceptional, with good dark characters and sharp, unfeathered edges that put even Epson's Stylus Photo 870 in the shade.

In terms of graphics output, results were something of a mixed bag. On photocopy paper, the icons in our Acrobat PDF file looked slightly washed out when compared to those produced by the Epson Stylus Photo 870. We were also unable to print our vector art image at the highest quality setting. It worked fine when we dropped the quality to 'normal' and put this error down to memory problems.

It didn't set any speed records in the photo test, being beaten into third place by both the Epson 870 and Lexmark Z51, but we felt the wait was worth it when we saw the output. Colours were vibrant and skin tones were accurately reproduced. Small details were clear and tonal gradients were smooth, with no visible stepping.

That the P1100 is a high-end printer is reflected in the price but, for the extra money, you get a bundled duplexing unit, a separate 4 x 6in sheet feeder and an IR port that makes good use of HP's JetSend technology to communicate with similarly equipped cameras and scanners. If you have a digital camera and want a printer that will do your photos justice, then this one's for you.

DETAILS

PRICE £289.05 (£246 ex VAT)
CONTACT Watford 0870 729 5600
www.watford.co.uk
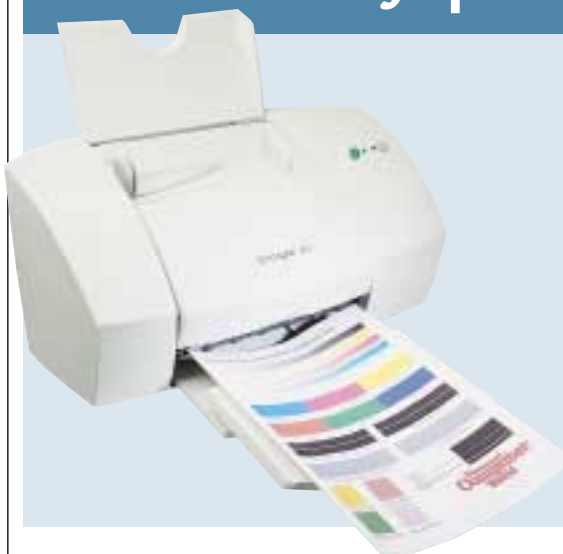**PROS** Integrated CF and SmartMedia slots, duplexing option, excellent text
CONS Poor vector art performance, competing products had more informative drivers
OVERALL Versatile contender

TEXT QUALITY	★★★★
IMAGE QUALITY	★★★
SPEED	★★★★
OVERALL	★★★★

Lexmark **Color Jetprinter Z51**

COLOUR PROFESSIONALS

AS FAR AS LEXMARK goes, the Z51 sits on the top branches of the inkjet tree. It is larger than its siblings and has a more impressive output paper tray that, in our tests, didn't throw paper on the floor in the same way that the Z31 did.

The Z51 had the same installation disc storage problem though. It was tucked into a pocket in the front of the owner's kit and had fallen out during transit. In the process, it had become so scratched that our test machine was unable to read the data. As a result, we resorted to making a series of installation floppies on a PC with a more forgiving CD-ROM drive. Although realistically, for most users, this would not be an option.

Although it shares a top resolution of 1,200 x 1,200 with the Z31, the difference in print quality was immediately apparent. Even though the image was still somewhat grainy, and the colours were not as pure as those produced by the Epson Stylus Photo 870, the banding had gone and skin tones were more realistic.

The test photo was still a little gloomy and there was a step between blue and green where there should have been a smooth transition, but we were glad to see that dark and light colours had not run into one another.

The vector image printed well. Detail was sharp and fades were smooth but the colours were just a little too bright, giving the whole image a slightly cartoonish feel.

Using standard photocopy paper, text output was excellent. Characters were dark and solid, with crisp, sharp edges. Even very small fonts were well rendered. Unfortunately, the banding reappeared in the solid grey areas of our Acrobat PDF.

If you definitely have your heart set on buying a Lexmark, then it's probably worth paying that bit extra to upgrade to this from the Z31. But if all you are looking for is a high-end printer, then there are several better options on test here.

DETAILS

PRICE £136.29 (£115.99 ex VAT)
CONTACT Simply 020 8523 4020
www.simply.co.uk
PROS Good-quality text output, inexpensive
CONS Poor photo quality
OVERALL A good high-end printer for those less interested in photo printing

TEXT QUALITY	★★★★★
IMAGE QUALITY	★★★
SPEED	★★★
OVERALL	★★★★

How we did the tests

Testing inkjets is a lengthy process involving mountains of paper, buckets of spent ink and days spent with a set of bright lights and a magnifying glass. We tested not only the speed and usability but also the quality of the printers and what they print. In testing these eight units we designed a range of tests that would push each printer to its limits and quickly show up any areas in which they fell down. These were split into three key areas – text printing, image printing and mixed output printing.

Text printing

Many people who buy printers have one use in mind: printing letters and documents produced by their word processor or spreadsheet. They want good-looking results quickly and, perhaps more important, cheaply. With this in mind, we printed 50 pages of what in the *PCW* office constitutes fairly typical output – old group tests. The time it took each printer to complete these entirely text-based documents was recorded for comparison.

Next came the examination. Because most people want to print using standard office paper rather than the more expensive coated inkjet paper, we used packs of photocopier paper to simulate everyday use. We wanted to see, therefore, whether the printers could cope with this more fibrous, lower quality paper and still produce solid dark characters with sharp edges. Some printers did well while others feathered the output and produced the sort of pages we would not be happy using in a business environment.

Image printing

Scanners and even digital cameras are now becoming so affordable that they are among the most frequently purchased computer peripherals for home users, and are even more prevalent in the business market. Estate agents are putting cameras to good use, eliminating developing costs when putting together house specs, and scanners are becoming almost as common as the ubiquitous photocopier as a cheap means of copying and archiving research and important documents in universities, libraries and offices.

But it's no good restricting your images to your hard drive or website – once in a while you'll want to print them, and with many printers now boasting 'photo quality' output we wanted to see what this meant in use.

For this test, we opted to use real photo paper, and to be totally fair we made sure that we were using each manufacturer's own brand of paper, because many tailor the chemicals in their inks to react in a particular way to certain paper types.

We used PaintShop Pro to print a copy of our standard test photo, the veteran of
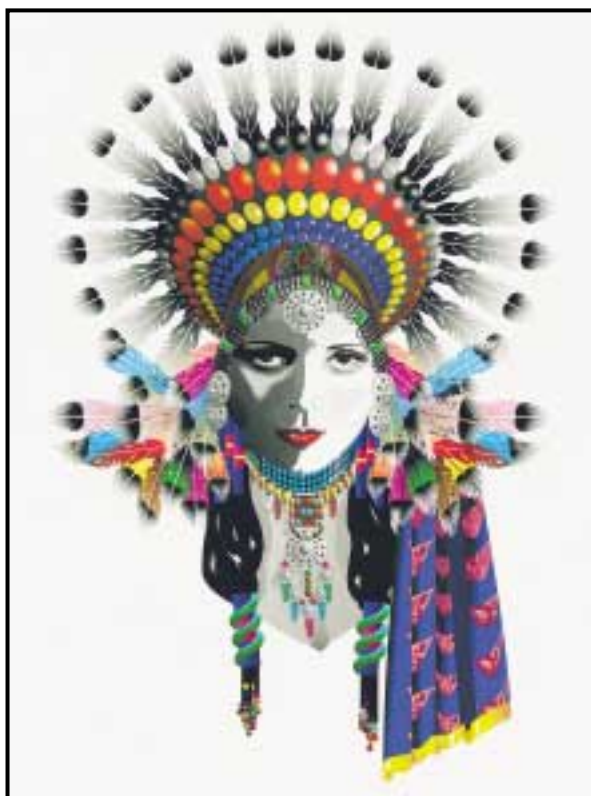
*Smooth fills with no undesirable jaggies scored highly*

many inkjet group tests, which tests each of the four main composite colours individually. These are red, green, blue and composite black since inkjets use cyan, magenta and yellow to make up these tones. To ensure a solid black, many also use their black cartridge or the black chamber of a photo cartridge to supplement the composite black shades.

Here we were looking for realistic skin tones, which are traditionally difficult for an inkjet to reproduce and smooth shading between varying tones of a similar colour. A good quality printer will make the transition from dark to light without any detectable edges.

We also didn't want to see any horizontal banding. This is where you get darker stripes running across the image as the top row of nozzles overlaps the area printed by the lowest set of nozzles on the previous pass. A good printer will never show banding like this. Another equally undesirable form of banding is that caused by a blocked nozzle or a tiny gap between each pass of the print head. Rather than a dark band this will cause a thin white stripe, and again it was something we were looking out for in our tests.

If you look closely at a traditionally produced silver halide print you should not be able to see any individual spots or dots making up the picture. We call this continuous tone and as far as inkjet manufacturers are concerned it is as close to the Holy Grail as you can get. We therefore marked down printers that produced grainy images where the individual drops of ink were easy to spot. Finally, we looked at the image as a whole to judge how well balanced it was in terms of brightness, saturation and
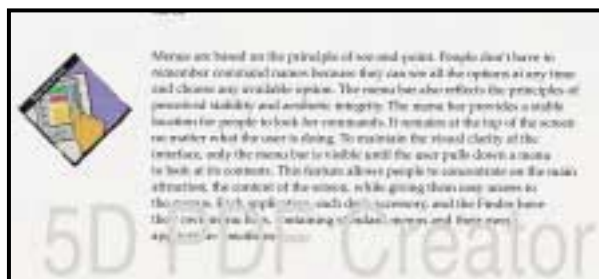
Text should be clear and sharp even on lower quality paper

Continuous tone has always been a stumbling block for inkjet printers

contrast. Everybody has an idea of what makes a good picture but it is easy to spot a saturated or washed-out image or one where particularly harsh contrast screams at you from the page.

Next, we printed a vector image in Corel Draw. If you want to recreate this test yourself we used the Huntress sample included on the Corel Draw installation disc and resized it so that it would fit onto a single A4 page. We printed this on each manufacturer's own inkjet paper so that we could see how the printers coped with the colours, vector fills and curves that had been resized to fit on the page.

Being a vector image in which lines and edges are defined by mathematical points, this picture worked differently to the test photo, which is a TIFF format bitmap with only spot colour information. We wanted to see whether the printers and drivers could successfully render smooth fills and sharp, smooth edges with no undesirable jaggies even after the slight resizing necessary.

Finally, and sticking with the inkjet paper, we produced a fairly typical 10-page presentation in PowerPoint using the package's wizard function and adding a few graphics of our own. We printed this as a handout, with three slides to a page and room to take notes alongside each one. This tested each printer's colour reproduction abilities, whether or not it saturated the paper, and how well it coped with images that had been dramatically reduced in size. Then we printed slide seven of our sequence on a transparency, again using the media produced by each inkjet manufacturer, to see how well the ink adhered when not using paper.

Mixed output

The chances are that your printing will not always be restricted to either text or graphics, but instead encompass both on a single page. Our last two tests addressed this issue, mixing word-processed text and a range of images.

For both tests we switched back to using photocopier paper to more realistically simulate everyday conditions, and printed a 95-page university dissertation followed by a 50-page Acrobat format PDF.

The dissertation used multiple font faces and sizes and regularly interspersed the paragraphs with monochrome screenshots. Whether the printer chose to render these using the black cartridge or in composite form from the CMY chambers instead was not totally relevant – we were more interested in clean sharp images. After all, this would have to be presented for marking at the end of the course and would count toward a final grade. We wanted to see output where the paper was not overly saturated and where the screenshots, many of which had a grey background, remained legible.

The Acrobat PDF was the first 50 pages taken from Apple's interface design document. Again this included a range of screenshots, some of which had a lightly shaded background, but unlike the mixed content dissertation it also had a number of colour icons in the margins that acted as guides for the reader. This was the first time the printers had been asked to produce colour output on standard photocopier paper so we wanted to see how well they managed to reproduce their colours when denied higher quality media.

Judging

Although speed is always important, it was more relevant to the lower-end printers than the models aimed at 'professional colour users'. In all instances we were looking for clean, sharp output but we didn't want to have to wait all day to get it. The more expensive printers, however, are generally more suited to photographic use and in this instance the quality of the output is more important than the speed at which it arrives, and this fact was reflected in our judging and the way in which prizes were awarded.
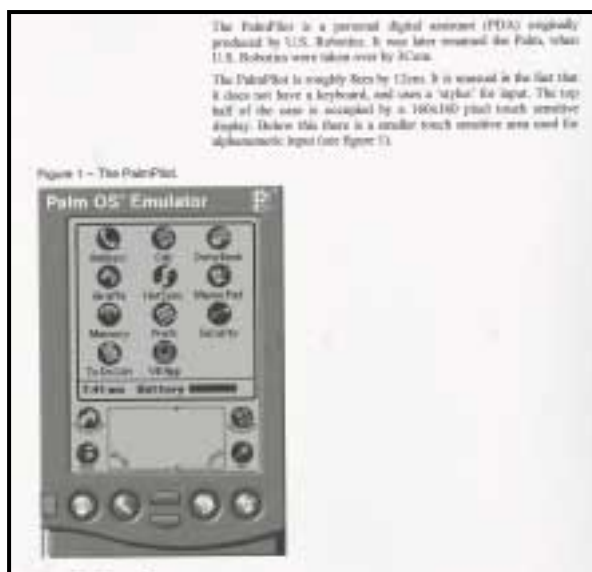
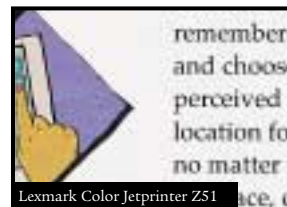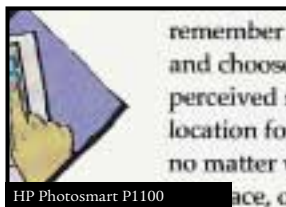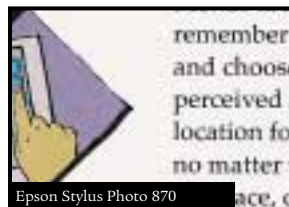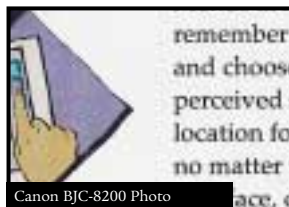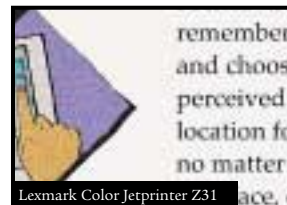*Most people want to print text and pictures on the same page*

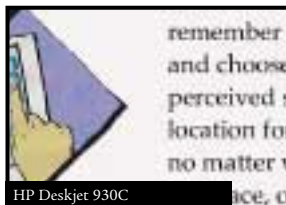# Test results   The red box indicates the area examined in all cases.

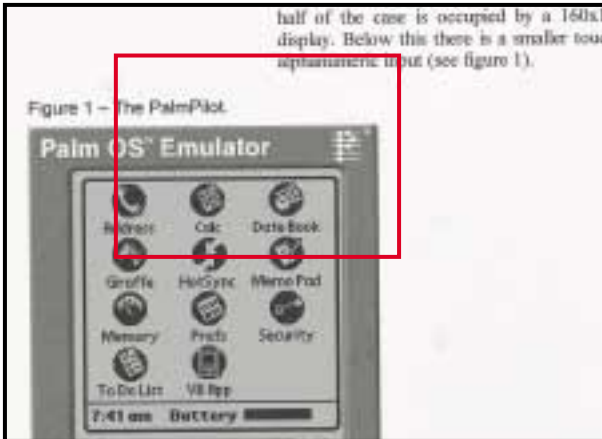| Canon BJC-3000 | Epson Stylus Colour 760 |
HP Deskjet 930C	Lexmark Colour Jetprinter Z31
Canon BJC-8200 Photo	Epson Stylus Photo 870
HP Photosmart P1100	Lexmark Colour Jetprinter Z51

Vector art image: here, we're looking for realistic, bright colours and smooth fades.

Menus are based on the principle of see-and-point. People don't have to remember command names because they can see all the options at any time and choose any available option. The menu bar also reflects the principles of perceived stability and aesthetic integrity. The menu bar provides a stable location for people to look for commands. It remains at the top of the screen no matter what the user is doing. To maintain the visual clarity of the interface, only the menu bar is visible until the user pulls down a menu to look at its contents. This feature allows people to concentrate on the main

| Canon BJC-3000 | Epson Stylus Color 760 | HP Deskjet 930C | Lexmark Color Jetprinter Z31 |
| Canon BJC-8200 Photo | Epson Stylus Photo 870 | HP Photosmart P1100 | Lexmark Color Jetprinter Z51 |
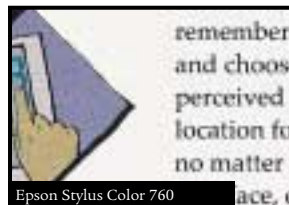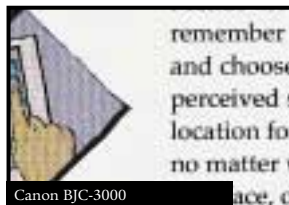
PDF document: should render smoothly in smaller scale. Colours should be good on photocopier paper.

Canon BJC-3000

Epson Stylus Color 760

HP Deskjet 930C

Lexmark Color Jetprinter Z31

Canon BJC-8200 Photo

Epson Stylus Photo 870

HP Photosmart P1100

Lexmark Color Jetprinter Z51

Mixed text output: characters should be sharp on photocopier paper. Images should be an even grey.

Canon BJC-3000

Epson Stylus Color 760

HP Deskjet 930C

Lexmark Color Jetprinter Z31

Canon BJC-8200 Photo

Epson Stylus Photo 870

HP Photosmart P1100

Lexmark Color Jetprinter Z51

Photo: colours and skin tones should be realistic. Contrasts should be sharp but not exaggerated.

Mixed output speed results (95 pages)

Printer	Time
HP Photosmart P1100	26:47
Epson Stylus Color 760	27:05
HP DeskJet 930C	33:31
Lexmark Color Jetprinter Z51	35:15
Canon BJC-3000	44:25
Lexmark Color Jetprinter Z31	45:43
Epson Stylus Photo 870	54:07
Canon BJC-8200 Photo	65:18

Scale: 0 20 40 60 80

ALL SCORES IN MINUTES AND SECONDS   SHORTER = BETTER
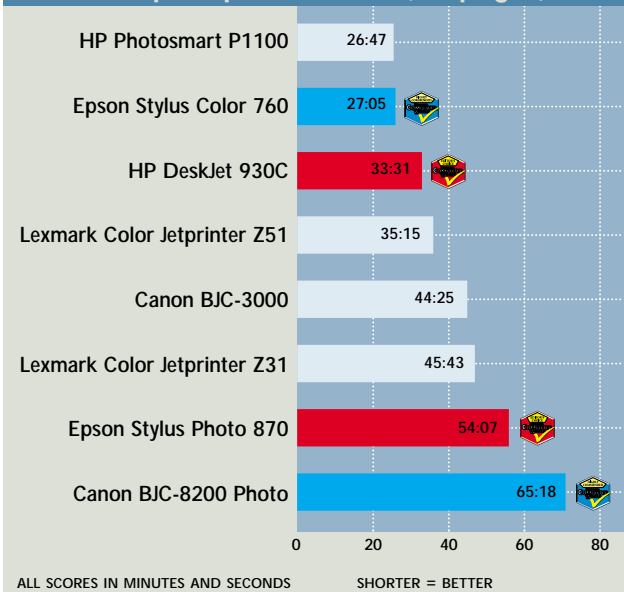
Text printing speed results (50 pages)

Printer	Time
HP Photosmart P1100	13:32
Epson Stylus Color 760	14:58
Lexmark Color Jetprinter Z51	15:53
HP DeskJet 930C	19:25
Lexmark Color Jetprinter Z31	24:10
Canon BJC-3000	29:21
Epson Stylus Photo 870	30:51
Canon BJC-8200 Photo	33:57

Scale: 0 10 20 30 40

ALL SCORES IN MINUTES AND SECONDS   SHORTER = BETTER
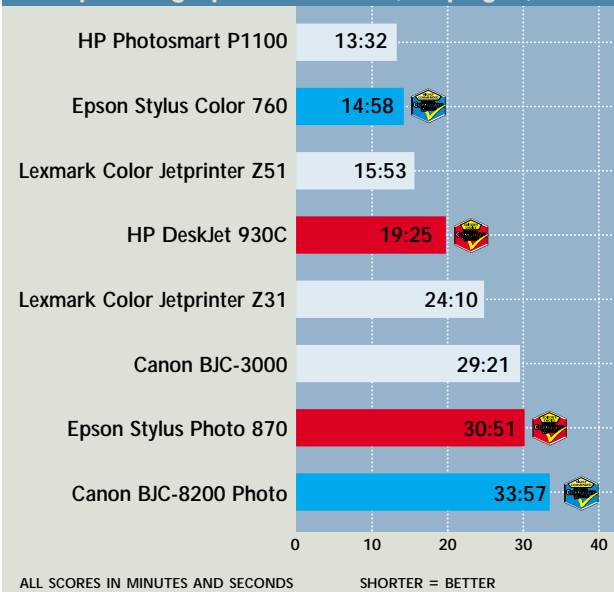
PowerPoint speed results

Printer	Time
Epson Stylus Photo 870	2:06
Canon BJC-3000	2:11
Epson Stylus Color 760	4:02
HP DeskJet 930C	4:31
HP Photosmart P1100	6:39
Lexmark Color Jetprinter Z51	8:17
Lexmark Color Jetprinter Z31	8:43
Canon BJC-8200 Photo	10:36

Scale: 0 3 6 9 12

ALL SCORES IN MINUTES AND SECONDS   SHORTER = BETTER

Photo printing speed results

Printer	Time
Epson Stylus Color 760	2:10
Epson Stylus Photo 870	5:36
Canon BJC-3000	7:29
HP DeskJet 930C	7:38
Lexmark Color Jetprinter Z31	9:04
Lexmark Color Jetprinter Z51	9:49
HP Photosmart P1100	10:45
Canon BJC-8200 Photo	12:04

Scale: 0 4 8 12 16

ALL SCORES IN MINUTES AND SECONDS   SHORTER = BETTER

Vector art printing speed results

Printer	Time
Epson Stylus Photo 870	1:32
Epson Stylus Color 760	3:14
HP Photosmart P1100*	4:12
Canon BJC-3000	4:50
Lexmark Color Jetprinter Z51	5:06
HP DeskJet 930C	6:08
Canon BJC-8200 Photo	6:17
Lexmark Color Jetprinter Z31	6:20

Scale: 0 2 4 6 8

ALL SCORES IN MINUTES AND SECONDS   SHORTER = BETTER

PDF printing speed results

Printer	Time
Epson Stylus Color 760	21:35
Canon BJC-3000	22:48
Epson Stylus Photo 870	26:04
HP Photosmart P1100	37:02
HP DeskJet 930C	39:18
Lexmark Color Jetprinter Z51	46:30
Lexmark Color Jetprinter Z31	48:02
Canon BJC-8200 Photo	56:36

Scale: 0 15 30 45 60

ALL SCORES IN MINUTES AND SECONDS   SHORTER = BETTER

* HP P1000 WAS UNABLE TO PRINT AT BEST QUALITY AND SO THIS SPEED WAS OBTAINED ON THE STANDARD DEFAULT SETTING

Table of features

Manufacturer	Canon	Epson	Hewlett-Packard	Lexmark
Model	**BJC-3000**	**Stylus Color 760**	**DeskJet 930C**	**Color Jetprinter Z31**
Supplier & phone number	Dabs Direct 0800 558 866	Dabs Direct 0800 558 866	Watford 0870 729 5600	Simply 020 8523 4020
Price inc (ex VAT)	£108.10 (£92)	£121.03 (£103)	£130.43 (£111)	£93.99 (£79.99)
Maximum resolution (dpi)	1,440 x 720	1,440 x 720	2,400 x 1,200	1,200 x 1,200
Parallel interface	✔	✔	✔	✔
USB interface	✔	✔	✔	✗
Input tray capacity	100 sheets	100 sheets	100 sheets	100 sheets
Output tray capacity	Not available	100 sheets	50 sheets	25 sheets
Internal memory	128KB	256KB	4MB	512KB
Cartridge types	Black, four-colour, photo, scanner	Black, three-colour	Black, three-colour	Black, three-colour, photo, waterproof black
Price of mono cartridge	*£8.21	£18.44 (£15.69)	£21.15 (£18)	£24.64 (£20.97)
Price of colour cartridge	**£8.21	£18.44 (£15.69)	£25.85 (£22)	£29.14 (£24.80)
Estimated life of mono/colour cartridge	500 pages/140 pages	900 pages/300 pages	830 pages/430 pages (860 for C6578A cartridge)	275 pages/450 pages
A4 print margin	3mm top, 5mm bottom	3mm top, 14mm bottom	Not supplied	1.7mm top, 12.7mm (black) 19.5mm (colour) bottom
Maximum paper weight	105gsm	194gsm	200gsm	270gsm
Operating system support	Windows 95/98/NT4, MacOS	Windows 3.1/95/98/NT4, MacOS	DOS 3.3, Windows 3.1/95/98/NT4/2000, MacOS	Windows 3.1/95/98/NT4, DOS in windows/OS/2 on demand
Printer weight	3.7Kg	5.8Kg	5.7Kg	3.6Kg
Printer dimensions w x h x d (mm)	418 x 169 x 306	450 x 269 x 175	440 x 196 x 400	461 x 293 x 520
Technology used	Thermal/drop modulation	Micro Piezo	Thermal inkjet	Thermal inkjet

Table of features

Manufacturer	Canon	Epson	Hewlett-Packard	Lexmark
Model	**BJC-8200 Photo**	**Stylus Photo 870**	**Photosmart P1100**	**Color Jetprinter Z51**
Supplier & phone number	Dabs Direct 0800 558 866	Simply 020 8523 4020	Watford 0870 729 5600	Simply 020 8523 4020
Price inc (ex VAT)	£270.25 (£230)	£207.98 (£177)	£289.05 (£246)	£136.29 (£115.99)
Maximum resolution (dpi)	1,200 x 1,200	1,440 x 720	2,400 x 1,200 (photo)	1,200 x 1,200
Parallel interface	✔	✔	✔	✔
USB interface	✔	✔	✔	✔
Input tray capacity	100 sheets	100 sheets	150 sheets	100 sheets
Output tray capacity	100 sheets	100 sheets	50 sheets	50 sheets
Internal memory	80KB	256KB	8MB	512KB
Cartridge types	Black, five-colour	Black, five-colour	Black, three-colour	Black, three-colour, photo, waterproof black
Price of mono/colour cartridge	*£10.56	£14.68 (£12.49)	£21.15 (£18.00)	£24.64 (£20.97)
Price of colour cartridge	**£10.56	£11.89 (£10.12)	£25.85 (£22.00)	£29.14 (£24.80)
Estimated life of mono/colour cartridge	360 pages/360 pages	540 pages/220 pages	830 pages/430 pages (860 for C6578A cartridge)	275 pages/625 pages
A4 print margin	3mm top, 5mm bottom	3mm top, 14mm bottom	Not supplied	1.7mm top, 12.7mm (black) 19.5mm (colour) bottom
Maximum paper weight	200gsm	194gsm	200gsm	270gsm
Operating system support	Windows 95/98/NT4, MacOS	Windows 95/98/NT4, MacOS	Windows 3.1/95/98/NT4/2000	Windows 3.1/95/98/NT4, DOS in Windows/OS/2 (some) host-based Windows Printing
Printer weight	5.9Kg	5.6Kg	5.9Kg (6.8Kg with duplex unit)	4.1Kg
Printer dimensions w x h x d (mm)	450 x 333 x 205	470 x 285 x 175	450 x 200 x 350	460 x 326 x 467
Technology used	Bubble Jet Advanced Microfine Droplet Technology	Micro Piezo	Thermal inkjet	Thermal inkjet

Note: cartridge life is estimated across A4 pages with five per cent coverage for black cartridges and 15 per cent coverage for colour cartridges (unless colour cartridge holds five colours, in which case 25 per cent coverage is assumed). *Price for black ink well only (inc VAT). This fits into the re-usable cartridge. **Price for individual colour ink wells (inc VAT). These fit into the re-usable cartridge.

Editor's **Choice**

I n years gone by it's been easy to pick a winner in the inkjet group test. This time things weren't so clear-cut. With advances in ink and paper technology, and the way the engine lays colour onto the page, it's no longer such an easy choice, and we were impressed by the overall standard of all of the printers submitted for review this time around. One thing that our tests showed is that it's generally no longer necessary to use special coated papers when all you want to print is text, but for graphics and photos the results are definitely worth the extra expense. Each printer excelled in a different area and so in judging we split the printers into their two defining groups – home or small office user printers and printers for colour professionals. We then looked at each test in isolation and marked the printers in comparison to the other entrants in their group – four points for the top performer, and dropping one point for each position lower on the scale.

The winners

Starting with the lower-end home and small office printers, we present our first **Editor's Choice** award to Hewlett-Packard's DeskJet 930C. Its photo printing performance was unbeatable. Skin tones were well defined and it demonstrated a smoother, less grainy continuous tone than any of its competitors, and produced more detail in shadow and mid-tone areas. Text was pin sharp. It was just beaten by the Epson Stylus Color 760 when it came to printing the vector image.

In the lower-end group, we award a **Highly Commended** accolade to Epson for the Stylus Color 760. Epson has always performed well when it comes to photo printing so we were a little disappointed that the 760's output was washed out and lacked definition in bright areas. However, it demonstrated excellent colour reproduction when tackling the vector art image and only just lost out to Hewlett-Packard when printing from PowerPoint because its colours were slightly less vibrant. Overall though, it fared well, positioned generally around the middle of the field, proving it to be a good all-round printer for everyday use.

The high-end printers were more difficult to judge. If it was to be decided on the quality of output across all areas it would have been a tie between Lexmark's Z51 and Canon's BJC-8200 Photo. However, we specified that we were looking for printers suited to colour professionals, and so in judging we put more emphasis on the quality of the photo and vector art image. This made it a dead heat between the Canon BJC-8200 Photo and Epson's Stylus Photo 870. The engineers at Canon will be kicking themselves for losing out on the Editor's Choice award this time around because it took so long to complete any job sent through. As the speed performance graphs show, in almost every instance this printer took far longer than any other in its class, sometimes taking twice as long. Although the results were excellent, we felt we couldn't justify waiting for them to arrive. The photo produced by the Epson Stylus Photo 870 was difficult to fault and arriving in a reasonable amount of time, wins Epson an **Editor's Choice** award. Detail was first class and transitions between shades were smooth. When it came to printing vector art, the Canon BJC-8200 Photo did well – its output was smooth and well rounded, and its colours were bright while not being garish, and so comes **Highly Commended**

We're also giving an **honourable mention** to Lexmark's Z51. It performed poorly in the photo test. Its output was dark and a little unrealistic, but it scored well throughout the rest of the tests, coming either first or second in every other category. If you're after a general high-end inkjet and photos aren't as important the Z51 is definitely worth a look.

The Hewlett-Packard 930C's photo printing was unbeatable for home users

Smooth transitions between shades earns Epson's Stylus Photo 870 the award

The Epson Stylus Color 760 is a top performer with excellent colour reproduction

Canon's BJC-8200 gave a well-rounded performance to come a close second

You lookin' at me?

Webcams are perhaps the most versatile and cheap peripheral you can buy for your PC. They can be used for video capture, video-conferencing, grabbing still images or just as plain old webcams. We've checked out 12 of the latest USB models to help you make an informed purchase.

The heyday of webcams has arrived. Starting life innocuously monitoring the status of a research lab's coffee pot, they're now trained on every segment of society. On the web you'll find everything from glimpses of *Eastender's* Albert Square to copulating couples. Nothing is sacred as the webcam's peering eye tantalisingly reveals all to the Internet.

If you've got a website and an Internet connection, then all you need to join in the fun is a webcam to take your pictures and a simple piece of software to upload them for all the world to see.

If you're not ready to reveal all to a worldwide audience but to just a chosen few, then video-conferencing is the way forward. Today, people from all walks of life are enjoying video communication with colleagues, friends and loved ones. Best of all, new technologies have allowed us to dispense with expensive point-to-point connections, enabling us to communicate with anyone in the world for the cost of a local Internet connection.

Perhaps you'd prefer to make a short video clip and email that instead? Or shoot a handful of still images? All this is possible with today's PC webcam packages – they even plug into your USB port for hassle-free installation. And the best part is that they cost, on average, a mere £70.

We've rounded up a dozen of the best webcams, have tested every aspect and explained how they work. Both fun to use and genuinely useful, a webcam could end up being the most flexible and best-value PC peripheral you ever buy.

contents

• *Webcams tested and reviewed by Gordon Laing*

PHOTOGRAPH PATRICK LLEWELYN-DAVIES

3Com **HomeConnect WebCam**

3COM'S HOMECONNECT PC Digital WebCam looks pretty serious in its slim, dark grey flat case and carries a price tag to match. While most cameras in this test cost around £70, 3Com's is the most expensive at a whopping £129.29.

The unit features a 3m, detachable USB cable, which has sufficient reach for you to point it at subjects other than those sitting in front of the screen. There is no built-in microphone, or even one included in the package, and the laptop clip is also optional. In use, an LED on the front of the unit flickers distractingly.

Installation is straightforward, and once up and running, you're presented with the 3Com HomeConnect Launcher. This presents a menu bar with three simple options: VideoPhone (which launches Microsoft NetMeeting), VideoMail (for capturing and emailing video clips using PictureWorks NetCard) and VideoGear. The last option has four sub-headings to fire up additional capture and editing tools, along with RealPlayer and WebCam 32, which guides you through setting up and maintaining a webcam in easy steps.

The imaging CCD features a true 640 x 480 resolution, which can be software interpolated up to 1,280 x 960. Other modes include 352 x 288, 320 x 240, 176 x 144, 160 x 120 and 128 x 96. The HomeConnect's quality is good, but does not justify its high price.

DETAILS
★★★

PRICE £129.29 (£110.03 ex VAT)
CONTACT 3Com 01189 278 300
www.3com.co.uk
PROS Good quality package and software
CONS Too expensive and annoying LED
OVERALL Good, but out-priced

Creative **WebCam 3 USB**

GOING FOR A STYLE all its own, Creative's WebCam 3 more than resembles a large bug on all fours, with its head looking upwards to peer at you – in a cute and endearing way, though.

The design also lets you tilt the head down, then pick up the entire unit for handheld work. This is the basis behind the similarly designed WebCam Go model, which also features built-in memory and standalone capabilities as a basic digital camera for £119.

Back to the WebCam 3; it doesn't feature a built-in microphone, but does come with one of Creative's tall mics on a stick. The 640 x 480 pixel CMOS sensor captures virtually fault-free smooth video at 352 x 288 in 30fps, or around 10 to 15fps at full 640 x 480 resolution.

The software package is good, with ArcSoft Polaroid PhotoMAX capturing stills, then editing them with serious tools or fun special effects before placing them in an album or emailing them.

Video Blaster WebCam monitor is a great surveillance package, which can be set to react to different levels of motion, then set off an alarm, send a message or post an image to a website – this can also be used as a standard webcam tool. Microsoft NetMeeting 3.01 for Internet video-conferencing completes a well-rounded package.

DETAILS
★★★★

PRICE £69 (£58.72 ex VAT)
CONTACT Creative Labs 01189 344 744
www.europe.creative.com
PROS Well built and great software package
CONS Not as slick as others
OVERALL Great unit, but just beaten by our winners

How a webcam works

The story starts with the lens, typically 5mm in focal length, with coverage roughly equivalent to a standard 50mm lens on a 35mm camera. Behind the lens lies the imaging chip, which is usually either a CCD or a CMOS sensor, although for typical online applications, there's little difference between the two technologies in terms of quality.

At this point, the camera is instructed which resolution to use by the PC; typical modes include VGA (640 x 480), Common Interchange Format CIF (352 x 288), QVGA (320 x 240), QCIF (176 x 144), along with 160 x 120 and sometimes even lower resolutions still. The quality, however, is very much limited by the camera's connection to the PC.

Modern webcams, including all 12 models in this test, use USB connections. In theory, USB can deliver 12Mbits/sec, which is sufficient to deliver an uncompressed 160 x 120 pixel window in 24bit colour at 25fps. Dropping to 16bit colour could increase the resolution or the frame rate.

Fortunately, most webcams capture video in a more efficient YUV colour format, which can deliver smooth windows at higher resolutions still. Add a little in-camera JPEG compression, and it's possible to deliver smooth 320 x 240 pixel video in what looks, to all intents and purposes, like full colour.

Remember that current webcam technology may be relatively simple, but it's more than sufficient for today's typically modest Internet connections. After all, online webcams typically update every 20 seconds and most video-conferencing users have learned to accept small 160 x 120 images at relatively modest frame rates of 15fps.

USB connections can theoretically deliver 12Mbits/sec

D-Link **DU-C300**

ONE OF THE MOST old-fashioned looking webcams in this test, D-Link's DU-C300 is perched on a tall, non-removable stand. The unit doesn't have a built-in microphone, but comes with a conventional model that you can connect directly to your sound card.

Installation was smooth, but not as slick as the rest. At one point, the installer asks which port the camera is connected to, and offers the choice of COM1, COM2 or ECP, when the device employs USB. The printed A4 sheet illustrates this step and tells you to press OK and move on. If you follow the instructions it all works fine, but seeing dialog boxes such as these after the smooth processes of other cameras is a bit of a let down.

It comes supplied with SmithMicro VideoLink Telephone, which lets you make direct, point-to-point video-conferencing calls using the H.324 protocol or across the Internet using H.323. We also got the unit to work using Microsoft NetMeeting 3.01 for Internet video-conferencing. SmithMicro VideoLink Mail creates self-executing compact video clips for the PC or Mac, which are perfect for attaching to emails. Video is captured at rates between 19.2 and 128Kbits/sec. There's no webcam software, but the unit worked fine with SpyCam.

DETAILS
★★

PRICE £81.08 (£69 ex VAT)
CONTACT D-Link 020 8235 5555
www.dlink.co.uk
PROS Includes direct H.324 video-conferencing software
CONS Not the slickest installation
OVERALL Average package, but not the best

Intel **PC Camera Pro Pack**

INTEL HAS BEEN in the video-conferencing market for some time, and its PC Camera Pro Pack is testament to the chip giant's experience. It's an attractive-looking device, no bigger than it has to be, with a curving, cream case, a smart, blue base and a big, blue button on the top. Intel also joins Logitech in being the only companies to fit a sliding plastic lens shutter for guaranteed privacy and lens protection.

Intel doesn't include a microphone in the unit or the bundled package, but has built the only model with an alternative video input. Round the back, you'll find a standard composite video phone jack into which you can connect a camcorder, DVD player or VCR, and deliver their video into the supplied software applications in the same way as the live camera output. Speaking of which, the 640 x 480 CCD captures smooth and clear video at 320 x 240 pixels.

Intel supplies its own highly capable Create and Share software package, which from a single smart interface can deliver anything from high-end video-conferencing to great fun games courtesy of Reality Fusion. Almost uniquely, Intel has not supplied NetMeeting, but its own Videophone instead, and while it's missing some of Microsoft's bells and whistles, it does support direct H.324 connections.

DETAILS
★★★★

PRICE approx £69 (£58.72 ex VAT)
CONTACT Intel 0870 607 2439
www.intel.com/pccamera
PROS Great quality and unique video input
CONS No microphone
OVERALL Superb, but pipped at the post

Kensington **VideoCAM VGA**

KENSINGTON OFFERS three versions of its VideoCAM, with increasingly higher resolutions. We reviewed the middle-of-the-range VideoCAM VGA, which costs £79.99 and delivers 640 x 480 resolution.

The unit is a smart looking semi-circular design that, from the front, shares a similar outline to a snow-storm toy. The optical portion tilts back and forth and, like all the cameras reviewed here, employs manual focus adjustment. However, unlike the others, we found it was easy to actually pull the lens off our sample while focusing it. The lens barrel slid back on again without complaint or damage. There's no microphone either built-in or bundled with the package, but the 3m USB cable certainly gives you plenty of room to manoeuvre.

The CMOS sensor supplies 640 x 480 pixels, and also supports 352 x 288, 320 x 240, 176 x 144 and 160 x 120 modes. While the 352 x 288 mode delivers smooth video, Kensington only states the unit will produce 30fps in the lower 176 x 144 mode.

The VideoCAM software fires up a well-designed interface, which lets you capture video and stills. NetMeeting 3.01 handles Internet video-conferencing, but you'll need to supply your own webcam software.

DETAILS
★★

PRICE £79.99 (£68.08 ex VAT)
CONTACT Kensington 0800 252 359
www.kensington.com
PROS Well-designed software interface
CONS Loose focuser on ours, no microphone
OVERALL Average package, but there are better ones available

Kodak **DVC325**

KODAK WAS ONE of the first manufacturers with a USB webcam and suffered from the early days of USB problems under Windows 95. Fortunately those days are long gone and the

DVC325 installed itself without delay.

Worryingly, the installer instructs you to press Ctrl & Alt & Del and close all tasks other than Explorer and SysTray before proceeding. A technical user may not be phased by this, but others might find it odd, particularly when compared with the hassle-free installations of some other cameras.

Within the *Star Trek* phaser-styled device lies a 640 x 480 pixel CCD that delivered good-looking images. Video captured at 320 x 240 pixels was smooth but, generally, this webcam stood in the middle of the pack in terms of overall quality. Like the others, video captured at 640 x 480 pixels was jerky. Sadly, there's no built-in microphone, or one supplied as part of the package. The

camera's stand does tilt an impressive 75 degrees up or down, though.

Presto VideoWorks and Mr Photo handle the tasks of capturing and managing still and motion video. Kodak's own interface is typical of the company's products, with a consumer-oriented style. Microsoft NetMeeting 3.01 is included for Internet video-conferencing, but there's no webcam software.

DETAILS
★★★

PRICE £69.99 (£59.57 ex VAT)
CONTACT Kodak 0870 243 0270
www.kodak.com
PROS Well-designed software interface
CONS No microphone
OVERALL Good unit, but beaten by others

Getting your work on the web with SpyCam

The theory behind webcams is straightforward.
1. Simply take a photo every so often and upload it to a website where a page then displays it to the world.
2. Make sure you use the same filename for the image, so that the new picture replaces the old one.
3. Ensure the web page instructs the browser to refresh at regular intervals in order to automatically update the picture to your viewing public. Easy.

While all the cameras on test could make perfectly adequate webcams, few

actually came with the required software to do it. Fortunately, all worked fine with a shareware utility called SpyCam, by Bill Oatman. Version 6.20 is a 997KB download with a suggested $15 (£9.38) contribution.

SpyCam simply takes your website's FTP details, snaps a picture with your installed webcam, then uploads it at intervals set by yourself. Obviously, you'll need to be online for this to happen, and SpyCam can either dial up for you or transfer images while you're already connected; clearly this is where permanent connections to

the Internet come into their own.

You'll need to build a web page with a couple of lines instructing how often you want the page to refresh, and this should match the frequency that you're uploading images. The SpyCam website gives suggested HTML code, or you could check out our *Hands On, WebCam* workshop in the December 1999 issue.

There are a couple of catches webcam users should be aware of. First is that the auto refreshing HTML code used on webcam pages will instruct the browser to slowly

reload the entire page and all its elements, just as if you'd pressed F5. Therefore, keep your webcam image on as bare a page as possible, or isolate it in a frame.

Second, many people will be viewing your pages with a slow Internet connection, so be careful with file sizes and refresh times. SpyCam produced suitably compact images – a typical 320 x 240 pixel JPEG image measured 17KB, while a 160 x 120 JPEG came in at a mere 8KB. Both are acceptable sizes to update at least every 20 seconds.

Third, don't get too carried away with update speeds, as you may find your ISP has bandwidth limitations. Many accounts are limited to 1GB per month before additional charges are levied.

This may sound like a lot, but it works out at around 1MB per hour, and that must be shared between all visitors. Already that's nowhere near enough for a single user to constantly view a new 20KB JPEG every 20 seconds.

Admittedly, most users won't be connected to your webcam 24 hours a day, and you probably won't be web-casting for this amount of time, but it's worth checking your ISP's terms and conditions and doing the sums nonetheless.
www.getspycam.cjb.net
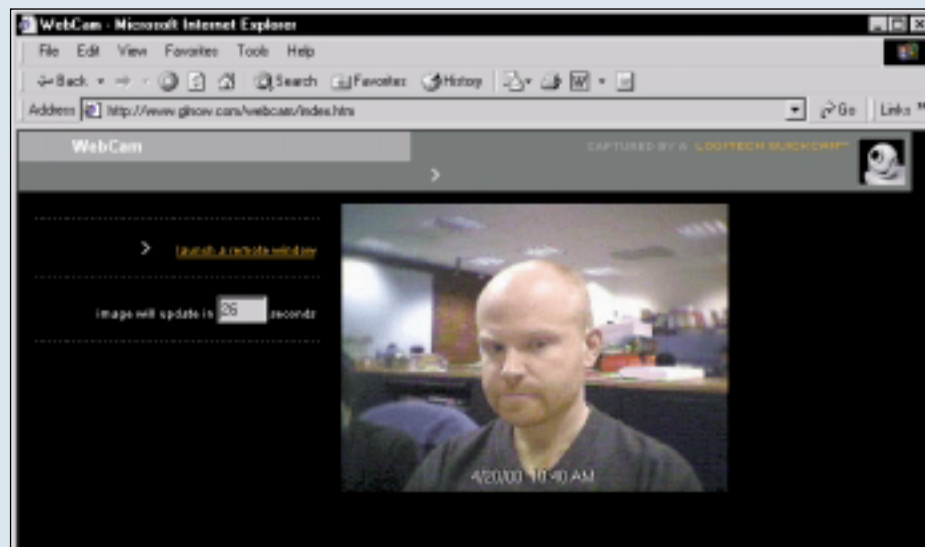
A webcam in action, with a page automatically generated by the Logitech QuickCam Web package

Logitech **QuickCam Web**

WHILE LOGITECH'S vertically designed QuickCam Web can sit freely on your desk, it seems best suited to sit on top of your monitor, overhanging slightly and pointing more directly at your face, although the overhang may obstruct the tops of displays with thin bezels. There is small sliding cover over the lens for privacy.

Like the Philips Vesta Pro, the QuickCam Web features a built-in microphone which transfers its data along with video and power on a single USB cable. This eliminates the need for a sound card for input, although you'll still need some type of audio hardware to hear your caller.

The QuickCam Web features a 512 x 582 pixel CCD, which can generate video stills of up to 640 x 480 pixels. For smooth playback, you'll be working at resolutions of around 320 x 240.

Installation is easy, after which you get a bright, clear interface. The webcam software is Logitech's own and simple to use. You can create a webcam page in moments, albeit one branded by Logitech. Microsoft NetMeeting 3.01 for Internet video-conferencing is also supplied, along with some fun games from Reality Fusion.

DETAILS
★★★★

PRICE £79.99 (£68 ex VAT)
CONTACT Logitech 01306 734 300
www.locitech.com
PROS USB mic, easy installation, good software
CONS Overhanging position may clip the top off some images
OVERALL Superb package, but pipped at the post for our Editor's Choice award

Philips **Vesta Pro**

PHILIPS' VESTA PRO stands out from the crowd with its bug-like appearance. The bulbous unit is designed to sit on a rubber-footed stand, which grips the camera well and lets you position it with ease. Alternatively, the 0.25in standard tripod thread lets you attach the unit to something more serious; Philips even supplies a tiny tripod with bendy legs.

The Vesta Pro features a built-in microphone and, as there's only one cable coming out of the back, this transports the audio information across the USB interface. This is also employed by Logitech, with neither requiring a sound card for audio input, although you will need additional hardware to hear the caller at the other end.

The 640 x 480 pixel CCD can deliver up to 15fps at VGA resolution, or smooth 30fps at resolutions of 128 x 96.

Installation is easy and the supplied CD has short video clips demonstrating where to plug in the unit. The software bundle is excellent, with a choice of SmithMicro VideoLink or Microsoft NetMeeting for video-conferencing, along with Ulead PhotoExpress 2 SE and Media Studio Pro 5.2 Video Edition. SmithMicro's software allows point-to-point calls using H.324 protocols. No webcam software is supplied, but we got it working with SpyCam.

DETAILS
★★★★★

PRICE £52.87 (£45 ex VAT)
CONTACT Microtronica 01189 633 733
www.pcstuff.philips.com
PROS USB mic, easy installation, good software
CONS No webcam software supplied
OVERALL An excellent, well-priced package

SIIG **Eye for PC**

SHARING THE SAME spherical design as the Vcam and Zoom cameras, the SIIG Eye for PC is described as being 'SIIGnificantly Better'. It is, in fact, SIIGnificantly similar to the Vcam USB Digital PC Camera also reviewed in this test. Like the Vcam, there's a button on the top of the unit to fire up the still image capture software, but no microphone.

The Eye for PC houses a 640 x 480 pixel CCD and can support multiple resolutions, including 352 x 288. Like its competition, SIIG claims its camera can capture a 352 x 288 pixel video at a smooth 30fps. While all the models in this feature had a good stab at this claim, all suffered from slight jerkiness.

Admittedly, 352 x 288 looks pretty good on the Eye for PC, but for guaranteed smooth video playback, you'll have to choose a lower resolution. Again, like the competition, the full 640 x 480 pixel resolution drops the Eye for PC's video frame rate to between 10fps and 15fps.

SIIG throws in Ulead iPhoto Express 1.1 for image editing, Intercom Live Express for sending video emails, and Intercom Live Snap for capturing and managing still images. Microsoft NetMeeting 2.1 is supplied, but we did get it working with 3.01 and SpyCam.

DETAILS
★★

PRICE £89.99 (£76.59 ex VAT)
CONTACT Ivell 01206 878726
www.ivell.com
PROS Non-transparent blue finish may be right up your street
CONS Pricier than similar Vcam model
OVERALL Average, but there are better units

Vcam USB Digital PC Camera

LIKE THE ZOOMCAM USB and SIIG Eye for PC, the Vcam USB Digital PC Camera is a spherical design, held by a small stand, allowing it to tilt up and down. You can also screw it into an optional tripod. Unlike its spherical cousins, the Vcam is finished in an iMac-style transparent blue case, with a clear USB cable coming out of the back. It'll either fit right in with your setup, or stand out like a sore thumb.

The Vcam doesn't feature a built-in microphone, nor does it come with a separate one. The imaging CCD is rated at 350K pixels, good for resolutions of up to 640 x 480, and supporting smooth video recording and playback with lower resolutions up to 352 x 288.

A reasonable software bundle includes Intercom Live Express for sending video emails, Intercom Live Snap for quick and simple still capture, Ulead iPhoto Express for image editing, Microsoft NetMeeting for Internet video-conferencing, and a trial version of Gotcha SE for security and remote surveillance. Live Snap has an attractive interface which pops your images into a mini gallery. The quality is reasonable but, like the other webcams, it won't give a proper digital camera a run for its money. There's no webcam software, but we got it working with SpyCam.

DETAILS
★★

PRICE £51.06 (£59.99 inc VAT)
CONTACT TriSys 020 8808 2130
www.trisys-europe.com
PROS Transparent blue finish may be right up your street
CONS No microphone
OVERALL Average, but better units available

Video-conferencing over the Internet

People don't need identical devices to video-conference, but they do need communication software that conforms to certain standards. The International Telecommunications Union (ITU) has defined the H.323 and H.324 protocols for that very purpose.

If you want to dial a number directly and place a video call, then look for H.324 compatibility, be it on a PC or standalone device. As long as both devices support H.324, you'll be able to dial each other directly, independent of the Internet.

SmithMicro's VideoLink software, supplied with many of the cameras tested along with Intel's own Create and Share software, will do the trick. A direct H.324 call will make the most of your connection's bandwidth, but will incur a point-to-point charge, which is prohibitive for international calls.

Communicating via the Internet is preferable as you only incur local ISP dialup charges. The downside is that the bandwidth can be variable and often intolerable for video-conferencing. But, then again, a local rate for an international video phone call is too tempting to ignore, so how's it done?

For video-conferencing on the net, you'll need software that supports the H.323 protocol. A popular choice is Microsoft's NetMeeting, currently in version 3.01 and supplied with Windows 2000 as standard, or as a free 1.56MB download from the company's website.

NetMeeting 3.01 is an improvement over the previous 2.1 version, and it's remarkable that Microsoft gives it away for free. The interface is a simple, tall thin window, split between video and text frames. It's possible to place your own video in a separate window or as a minimised picture-in-picture in the corner of the receiving video window. Audio uses a fixed amount of bandwidth, comparable to telephone quality, while the video takes whatever is left.

Since you're on the Internet, you'll have an IP address, and the easiest way to call someone is by entering their IP address and pressing dial. It may also be possible to connect using an email address or telephone number. Clicking on About NetMeeting reveals your own IP address, although office network users may need to talk to their MIS departments about security and allocation issues when attempting to establish an external call.

At the bottom of the main NetMeeting window are four large icons activating program sharing, a chatboard, whiteboard and file transfer. The whiteboard is terrific, firing up a window on both machines for people to draw on live. The program sharing is nothing less than complete remote access and control, rendering the same facilities from pcAnywhere and LapLink redundant.

You may get frustrated with the often poor quality of video-conferencing over the Internet, but it's cheap, and when it works it's great. Remember, faster connections are just around the corner. Either way, install a copy of NetMeeting now!
www.microsoft.com/ netmeeting

Microsoft NetMeeting 3.01 is a great utility for video-conferencing over the Internet. It's free of charge and even lets you remotely access and control another PC. Remember that everyone can see you sip your coffee, though

VideoLogic **HomeC@m**

VIDEOLOGIC IS known for producing solid PC peripherals and its HomeC@m is no exception. The unit features an interchangeable base for either sitting on top of your monitor or notebook,

while a button on the top activates the picture capture mode.

The HomeC@m features a built-in microphone that connects to your sound card's microphone input via a separate cable. It's not as cunning as the Philips and Logitech models, but at least you don't have to worry about a separate device on your desk. The HomeC@m's USB and microphone cables are 1.8m long and connected to the unit permanently.

The imaging CCD features true 640 x 480 pixels and can deliver this for video and stills, along with 352 x 288, 320 x 240, 176 x 144 and 160 x 120 modes. Relatively smooth playback and video recording was only possible at up to 352 x 288, with VGA mode

being too jerky for most applications.

Installation was easy and the software bundle included tools for video capture and editing, still image editing and management, and demo or shareware packages for web page creation and surveillance. VideoLogic also threw in the SpyCam utility for maintaining a webcam.

DETAILS
★★★★
PRICE £59.57 (£69.99 inc VAT)
CONTACT VideoLogic 01923 277488
www.videologic.co.uk
PROS Built-in mic, easy installation
CONS No video-conferencing software supplied
OVERALL Decent unit, but beaten by others

ZoomCam **USB**

THE ZOOMCAM USB can sit either on its stand or on an optional tripod. There's no built-in microphone, but Zoom throws in a separate one to plug into your sound card. Rather than

gripping or pushing the edge of a wheel, you have to press your finger on to a front-facing wheel to focus, which can be quite fiddly. The internal CMOS sensor features a relatively low 352 x 288 pixels, which can be interpolated up to 640 x 480 or 704 x 576 pixels.

Zoom supplies software, including PaintShop Pro 4.15 SE, Exterminator AntiVirus, Howdy email postcards, Web Cannon for web page creation, Ivisit CU-SeeMe video chat software, and SmithMicro VideoLink Mail and H.323/H.324 packages. Compatibility with H.324 lets you make direct point-to-point, video-conferencing calls. We got the unit working with NetMeeting 3.01 for Internet video-conferencing, and SpyCam for creating a webcam.

Insertion of the USB device fires up the standard Windows driver request, but the supplied disc doesn't deliver the required files at first. Instead, you must cancel this step, after which the CD auto presents you with a list of options including driver installation. Installation is not as slick as other units on test.

DETAILS
★
PRICE £59.57 (£69.99 inc VAT)
CONTACT Zoom 0870 720 0060
www.zoom.com
PROS Includes direct H.324 video-conferencing software
CONS Lowest native resolution of only 352 x 288 pixels
OVERALL Small details let this package down

Checking out the competition

The problem with webcams is that, although you might think a picture of your office or bedroom updated every 20 seconds is fascinating, others on the web may not. And once you think you've come across something that would make a good subject for a webcam, you do a search on the web and find there are already a hundred different webcams in a hundred different countries, all doing the same.

A good place to start if you want to check out what other people are doing with their

webcams is **www.cams2000.com**. This site has a neat index of a couple of hundred webcam sites, split into categories such as science, wired and sports cams.

Another searchable list of good webcam sites, which also has links to sites with tips on setting up your own webcam, can be found at **webring.webcamworld.com**.

But for the ultimate in webcams, check out **www.percetualrobotics.com**. This company makes robotic cameras that can be controlled over the web. Want

Try www.cams2000.com for sites or check out NASA's cameras

to zoom in on a part of the image to get more detail? No problem, how about x32 zoom. You can even move the camera to look at another point in the room. The company's web site has lots of

links to sites using its cameras, from NASA (which has one in its Goddard Space Flight Center) to Granada TV (which has one of its cameras pointed at Big Ben).

NIALL MAGENNIS

Table of features

Manufacturer	3Com HomeConnect	Creative Labs	D-Link	Intel	Kensington	Kodak
Name	PC Digital WebCam	WebCam 3 USB	DU-C300	PC Camera Pro Pack	VideoCAM VGA	DVC325
Price (inc VAT)	£129.29	£69	£81.08	£69	£79.99	£69.99
Contact	3Com	Creative Labs	D-Link	Intel	Kensington	Kodak
Telephone	01189 278 300	01189 344 744	020 8235 5555	0870 607 2439	0800 252359	0870 243 0270
Web address	www.3com.co.uk	www.europe.creative.com	www.dlink.co.uk	www.intel.com/pccamera	www.kensington.com	www.kodak.com
Type of sensor	CCD	CMOS	CCD	CCD	CMOS	CCD
Native resolution	640 x 480	640 x 480	640 x 480	640 x 480	640 x 480	640 x 480
Microphone	✗	External	External	✗	✗	✗
Webcam software	WebCam 32	Creative Labs	✗	✗	✗	✗
H.323 software	NetMeeting	NetMeeting	SmithMicro	Intel	NetMeeting	NetMeeting
H.324 software	✗	✗	SmithMicro	Intel	✗	✗

Table of features

Manufacturer	Logitech	Philips	SIIG	Vcam	VideoLogic	Zoom
Name	QuickCam Web	Vesta Pro	Eye for PC	USB Digital PC Camera	HomeC@m	ZoomCam USB
Price (inc VAT)	£79.99	£52.87	£89.99	£59.99	£69.99	£69.99
Contact	Logitech	Microtronica	Ivell	TriSys	VideoLogic	Zoom
Telephone	01306 734 300	01189 633 733	01206 878 700	020 8808 2130	01923 277 488	0870 720 0060
Web address	www.logitech.com	www.pcstuff.philips.com	www.ivell.com	www.trisys-europe.com	www.videologic.co.uk	www.zoom.com
Type of sensor	CCD	CCD	CCD	CCD	CCD	CMOS
Native resolution	512 x 582	640 x 480	640 x 480	640 x 480	640 x 480	352 x 288
Microphone	Built-in USB	Built-in USB	✗	✗	Built-in	External
Webcam software	Logitech	✗	✗	✗	SpyCam	✗
H.323 software	NetMeeting	NetMeeting	NetMeeting	NetMeeting	✗	SmithMicro
H.324 software	✗	SmithMicro	✗	✗	✗	SmithMicro

How we did the tests

All the cameras recommended a PC with a minimum 166MHz Pentium processor and 16MB of RAM. We used a Dell system with a 350MHz Pentium II processor and 64MB of RAM for our tests. All the cameras were USB devices, demanding at least Windows 95 OSR2 or only supporting Windows 98. For the greatest compatibility, we used Windows 98 SE. For the test, our users sat at PCs, all of which contained a camera on top of the monitor.

We looked carefully at how easily each camera was to set, as that fact alone can make or break a product's success. While most of the cameras were pitched as video-conferencing or video-emailing devices, we wanted to see how they fared on all-round use. Consequently, we tested them with their bundled still and motion-video capture software, along with any supplied video-conferencing and webcam tools.

Where not supplied, we used NetMeeting 3.01 to test Internet H.323 video-conferencing, and a shareware version of Bill Oatman's SpyCam 6.20 to drive the cameras as webcams. Video-conferencing was tested over a busy office 10Mbit Ethernet network and also across the Internet using standard 56K modems and dialup accounts.

Still images were captured at 640 x 480 pixels and motion video at both 320 x 240 pixels and 640 x 480 pixels at the highest frame rates offered. We did not alter the default settings, instead evaluated the units as they came out of the box.

Editor's **Choice**

Before revealing our award winners, here are our experiences with the devices as a whole. Despite asking manufacturers to supply webcams, most of the packages we received didn't offer the facility out of the box. The hardware and drivers were up to the job, but in only a handful of cases was there any software supplied to regularly upload images to a website. Fortunately, a wealth of third-party and shareware products are available which should work happily with these cameras. We tried them out with the ever-popular SpyCam 6.20 shareware utility, which, while not boasting the slickest interface, certainly does the job.

But is a webcam for you? While the marketing people like to talk about exciting and exotic applications, the fact remains that many people leave theirs on top of their monitors at work, offering a fascinating glimpse into them looking bored in the office – do us all a favour, and point your webcam at something interesting or useful!

Since these devices double up as video-conferencing cameras, the chances are that they will end up spending much of their life pointing at you from above or below your monitor. The problem is that while watching your friend or colleague on-screen, you're far from looking directly into the camera. Try to place the video window as close to the location of the camera as possible for the most natural results. Be aware of your surroundings too, as a bright background will simply render you as a silhouette.

We can't tell you how much easier this group test was to get through with the help of the standard USB interfaces on these devices. Certainly there were some installers that were slicker than others, but it has to be said that none gave us any trouble to speak of. Then again, we were using Windows 98 SE, with full support for USB. Many of the cameras claimed compatibility with Windows 95 OSR2, but in our experience, USB on this platform can be far from a fun experience. Looking forward, there's no reason Windows 2000 couldn't be supported, so check the manufacturer's websites for relevant advice or driver updates. Either way, if you're into webcamming today, go for Windows 98 SE.

Quality-wise, all the devices were capable of delivering the goods in an online environment, but remember that your connection will probably be the limiting factor. Making video calls with a 56K modem over the Internet produces highly variable results, but it's worth a shot, particularly for cheap long distance chats. Also, remember that a regularly updated webcam will need to be equally regularly connected to the Internet, and for dialup accounts, this could prove expensive or infrequent. Clearly a permanent connection to the Internet is highly desirable in this respect, and the forthcoming availability of ADSL and cable modems should see these applications rocket.

Locally speaking there were slight differences between the devices. The 640 x 480 pixel still images captured with each device varied in quality, but none were anywhere near the quality you'd get on a cheap digital camera or scanner. It's best to consider still capture as a bonus, that's adequate for a quick snap.

Motion capture was more promising, but limitations meant smooth frame rates were only possible at resolutions of less than 352 x 288. Then again, our eyes are expert at picking up moving details, and even on a tiny 160 x 120 window, a short video clip with audio is useful.

The winners

Now for the awards. All 12 devices could do the job, but a handful stood out from the crowd. Creative Labs and VideoLogic deserve a mention for a pair of great products which were just pipped at the post, but our **Highly Commended** awards go to Intel's PC Camera Pro Pack and Logitech's QuickCam Web. Intel boasted a composite video input for capturing from other sources, while Logitech's built-in USB microphone and clever overhanging mounting were welcome innovations. Both offered excellent quality, great software, and were also the only two to offer sliding privacy shutters.

Beating both for the **Editor's Choice**, but only by a hair's breadth, was the Philips Vesta Pro. Like the Logitech, it was a superb design with built-in USB microphone, and a great all-round package. The clincher, however, was the price: while Logitech and Intel's products retail at around £70, Philips was only asking £52.87. Shop around and you may find a better deal, but for our money, you can't go wrong with the Philips Vesta Pro – just make sure you download some webcam utilities.

Philips Vesta Pro wins on design and price

Intel's offering has composite video input

Logitech's mounting caught our eye

hands on

O n this month's cover disc you'll find the Personal Edition of BeOS 5. If you've never tried another OS, now's your chance. You really have nothing to lose as BeOS installs as a file under Windows, and if you don't like it you can simply remove the OS in the same way that you would uninstall any other application. Once you've tried it, though, we think you'll like it and to get you started, this month's **Workshop** [p240] offers a helping hand.

If new OSs aren't your thing then we've got plenty of other expert advice. Tim Anderson checks out what Netscape 6.0 will mean for **web developers** [p274] and Ian Waugh in the **Sound** column [p262] shows you how to avoid gaps between tracks when burning audio CDs.

Over at **3D** central, Benjamin Woolley gets all graphical about graphs [p266], and in the **Unix** [p250] column Chris Bidmead breaks free of Windows to get his ADSL connection up and running with Linux. And, as ever, all our experts chip in to help you solve your problems in the **Q&A** section [p236].

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contents

Advice from our experts

Got a problem? Our *Hands On* columnists answer questions and solve your problems.

Windows

Q *When I switch on my PC, I get an error half way through booting: 'VMM32.VXD Missing. Unable to load'. If I hit the Restart button, then Windows usually loads normally. This seems to have started ever since I installed a Umax scanner.*
Graham Berry via email

A This is almost certainly down to the scanner drivers. Umax has a fix for this on its website at (http://support.umax.co.uk/technotes/f108B.htm).

Q *More and more PC suppliers' websites are letting you read their manuals in PDF format online. I would much prefer to download the file and read it off-line, but I can't find a way of downloading the file or recovering it from a temp file, even if I wait for the whole thing to be shown on the screen. Is there a way of doing this?*
Colin Pape via email

A This is a common problem: it doesn't just happen with PDF files and the answer isn't hidden within the options of Internet Explorer, but in Windows Explorer.

Go to View, Folder Options, File Types. Select Adobe Acrobat Document from the list and hit Edit. Check the box marked 'Confirm open after download' in the next dialog. OK out of both dialogs, and in future you will get a prompt asking where to save the file when you go to download a PDF.

Q *How can I increase the text size in Windows 98 Help? Windows 95 had this in the Options menu, but it seems to have disappeared in 98.*
Jane Alexander via email

A Indeed, the option has disappeared. There are two ways round this, but neither is really satisfactory. The method that the Help file itself recommends (search for 'help font') is to go to Internet Explorer Properties, General, click on the Accessibility button and then tick the 'Ignore font sizes specified in web pages'

Increasing the Help text size…

…in a roundabout way

box. However, this increases the font size in the right-hand pane only, but has the side-effect of increasing the text size in the left-hand pane of folders when in web-page view and – as you might imagine – changing the font size used in web pages. This can make the latter difficult to read, as lines of text start to overlap.

You can create even more havoc by ticking the 'Ignore font style…' option, then choosing a different typeface from the Font button in the main Internet Explorer properties dialog.

The other approach is to open any web page in Internet Explorer and then change the text size from the View menu. This will also affect the Help text (but again, only the right pane) and the text on web pages will resize in a far more graceful manner.

Finally, the only way to increase the text size in the left-hand pane seems to be

by selecting 'Large fonts' in Control Panel, Display, Settings and Advanced.

Q *Do you know of a utility (preferably freeware) to synchronise the clocks on two networked PCs?*
John Beale via email

A Open a DOS window, type NET TIME \\name /SET/YES, followed by <Enter> where name is the name of the computer to which you want to synchronise.

Spreadsheets

Q *I have a list of people I slip bungs to when they give me a lead. To keep a running balance, I can add every new amount to the existing total. But using the same format, how can I quickly keep running totals for each person in Excel?*
Mark Wagman via email

A One way is to use an array formula. If the names of the people are in column B and the amounts are in column C, then in cell D2 enter =SUM(IF($B$2:B2=B2,$C$2:C2)).

As this is an array formula you then press Ctrl & Shift & Enter instead of just Enter. Excel will add curly brackets at each end to acknowledge it understands. Now drag this formula down column D to the end of your list. In the example given, cell D16 will have the formula {=SUM(IF($B$2:B16=B16,$C$2:C16))} and Ben shows a total of £50 as he has had five payments of £10 each so far.

Q *When using the Find option from the Edit menu in Excel 2000, is it possible*

to search across several sheets within the workbook rather than each sheet individually?

Russell Jenkins via email

A Yes, it is. First Group the worksheets, then do the Find. To Group the sheets, hold down Shift and click on the first and then the last tab in the workbook. To Ungroup the sheets afterwards, click on any tab.

Q How can I create weekly column headings in Excel?

Ruth Wriggly via email

A Enter the first date in cell B1. In C1 enter =B1+7, then drag the Fill Handle (in the lower right-hand corner of the cell) to the right. Format to taste.

Word Processing

Q I frequently need to list websites in Word and other applications. Is there a way to copy URLs from the Favourites folder (or elsewhere) and paste the addresses in as text?

Peter Lynch via email
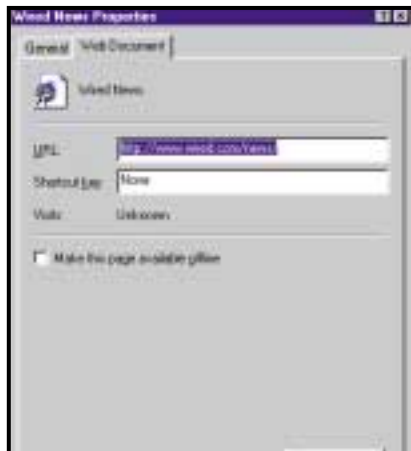
Grabbing the text of a Internet Shortcut in the Favourites folder

A As you have doubtless found out, copying the link from the Favourites will only insert a hyperlink or Shortcut Object: there is no Unformatted Text option in Paste Special. One way to get the text is to right-click on the link, and select Properties.

The property sheet that appears will have the URL already highlighted (see above), so you can copy it from here. If you copy items from the History folder, however, you will find that Word gives you an Unformatted Text pasting option.

Q I'm having real problems with Word in Office 2000, in that its Artificial Unintelligence seems to think it knows what I want better than I do. For instance, I set up a letterheading, centred, 12 point, Times New Roman in Bold. I then save it, but when I open it again it is in 10 point, Times New Roman, left-justified and a page of junk always ending in 'Word.Document8'.

Martyn Taylor via email

A What's happening is that Word is extracting what it believes to be the text content of the file. While this can be useful for unknown file types, it makes a mess of Word documents. It's a sticky setting in the Open dialog, which is how many people get caught out. If you set the 'Files of type' back to 'All files' or 'Word documents', then all will be well.

Hardware

Q I am unable to get my new home-made PC to display anything. It doesn't even beep on pressing the power button. Also, when pressed, the power switch will not turn off the computer.

Nicholas Kirby via email

A Make sure everything is correctly seated in the slots – AGP graphics cards, memory cards and even CPUs sometimes slightly pop out, preventing a PC from starting up. Also, to power off an ATX system outside of Windows, you will need to press and hold the power button for about four seconds.

Q I'm currently looking for a motherboard that supports dual AMD K6-2 500s.

Dino via email

A Sadly, the K6-2 does not support dual configurations.

The K6-2 can't be used in dual-processor configurations

Q I have a USB port and am considering buying a hub with a parallel port socket. I know that USB is faster than parallel, so does this mean I will get a significant speed improvement with data transfer, or will the parallel port on the USB hub limit the speed to normal parallel transactions?

Brendan Smith via email

A USB is indeed much faster than parallel, but such a converter in or outside a hub will be limited to the speed of the standard parallel port spec.

Q I bought a couple of TMC PAT486SN motherboards recently and can't seem to get into the BIOS SETUPs because they are password-protected. The password appears to be stored in non-volatile memory, as battery removal has no effect.

Jim via email

A You need to reset the BIOS. This can normally be done by either shorting the correct jumper on the motherboard (see the manual, which will be available on TMC's website), or by removing its power source.

The BIOS tends to remember its settings without battery power for some time, so try removing the battery for a few hours before replacing it. If all else fails, humans can be unimaginative creatures, and many BIOS passwords are simply 'password' or 'bios'.

Q I still use DOS a great deal and would like to be able to write CD-ROMs under DOS 6.22 for backup purposes. I have searched the web, but have not discovered any software, free or otherwise.

Richard Pankhurst via email

A Unfortunately, we couldn't find anything either. Does anyone have any suggestions?

Q I remember a feature in PCW about an IrDA connector which plugged into PC motherboards to make them infra-red aware. I have a Psion 5mx which I'd like to connect to the PC without having to fiddle with cables.

Gordon McLennan via email

A We found that the Asus Pent II 440LX/BX IrDA module, available from Dabs Direct's website (www.dabs.com) for £15 (ex VAT), could be connected to many non-Intel

motherboards, equipping them with infra-red capabilities. Check your motherboard manual for details of an infra-red TX/RX jumper, usually five or six pins in length.

You will also need to change one of your serial port UART settings in your BIOS to offer infra-red capabilities but, if all works well, Windows 98/2000 will recognise your new hardware and install the correct drivers: note, it will only work at up to 115Kbits/sec.

We have had success with motherboards from Asus, Abit and Supermicro, but you will have to manually mount the transceiver or, like us, have it messily dangling out the front.

Databases

Q *In my Access 97 database, some extra tables have suddenly appeared. These all have names such as MSysACEs, MsysModules and so on. However, they aren't mine. Help!*

Barry MacDonald via email

A Don't panic (but also, don't mess about with them!). These do actually belong to you in the sense that they are part of your Access database. They are the system tables where Access stores information about the database itself: the so-called meta-data. These tables are normally hidden, but you can make them visible and, in your database, it appears that they have become so by mistake. To make them invisible again, select Tools, Options and de-select System Objects.

Unix

Q *Linux is turning into a nice GUI system, but a lot of what appears in your Unix column is still stuck down at that*

old DOS-style command line. The Unix incantations are bizarre and no mere human could ever be expected to learn them. Do you really have to rely on the command line?

Bobby Lonsdale via email

A People tend to find that the better they get to know Unix – however well-decorated their version may be (and Linux is looking pretty sexy these days) – the more they value that old character-based shell. And, by the way, 'DOS-like' is a rotten description: the power of the Unix command line is orders of magnitude greater than anything DOS had to offer.

TkWorld can be a great introduction for those new to the world of the Unix command-line interface

Any GUI-addicted readers who fancy a gentle introduction to the command line might like to try Wes Bailey's TkWorld which can be found at www.tkworld.org.

This puts GUI upholstery around the sometimes starkly incomprehensible Unix command line interface. It makes a great introduction for beginners who would like to get a feel for the real power that lurks beneath the fancy front end.

Graphics and DTP

Q *Every time I scan an image into Adobe Photoshop 5.5, a progress bar appears that says, 'detecting watermark'. Is there any way to turn this off?*

Mark Smith via email

A Remove or rename the Digimark directory in the Photoshop plug-ins folder.

Q *I have noticed something peculiar when using Image Ready to prepare graphics for the web. Even when the websafe*

hex code for RGB colour in an image is identical to that of the background colour in a web page, the on-screen colours of the image and the background don't always match, so the square outline of the image is clearly visible. Have you any idea why this might be? (One solution I've come across is to alter the background colour hex code slightly until a match is achieved).

David Watson via email

A What optimisation settings are you using when saving the file? If you are saving a JPEG, then it's possible that the file compression is the cause of the colour shift. This is particularly likely if you are using high-compression, low-quality JPEG settings.

As you can see from the screenshot below, the top two colour quadrants are from the original, unoptimised file, while the bottom ones are from a lowest-quality JPEG optimised version. The colour-sampler readouts in the info palette demonstrate a clear shift in the colour values, which would show differently on a flat-colour HTML page background, defined with the (pre-optimised) RGB values from the original.
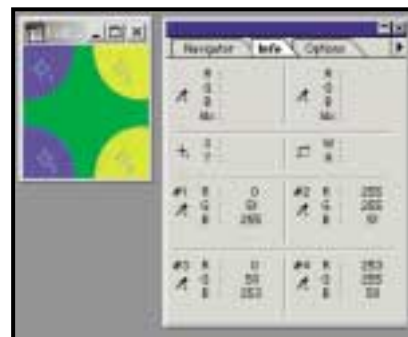
The same thing can happen with GIF optimisation, where reducing the colour palette can sometimes produce dither or colour switches, depending on the Image Ready settings. The solution to this is to use GIFs and optimise with the full 216-colour web palette, or reduce the palette, making sure that the optimised palette contains a swatch with the colour value you have defined as the HTML background.

BeOS beginnings

You'll find BeOS 5 Personal Edition on this month's cover disc. Here Dave Fearon gets you started.

BeOS 5 is the latest release of perhaps the most modern of all available desktop operating systems for the Intel platform. The Personal Edition of the OS is a fully working version which you can continue to use indefinitely for free, for personal non-profit use. Naturally, we couldn't resist putting it on this month's cover CD.

The company itself, Be Inc, is the brainchild of Jean-Louis Gassée, and was formed in 1990 after his departure from Apple. He's still the man in the driving seat, as is evident from his short column in the *Be Developer* newsletter. Subscribe by hopping over to www.be.com/about be/mailinglists.html.

From the start, one of the central ideologies behind BeOS was that a modern OS should be able to take advantage of the potential power of multiple processors, exploiting the fact that several mid-range CPUs can cost less and possess more computing power overall than a single high-end processor.

Initially, the OS was developed in tandem with custom hardware and even the very earliest incarnation of this, which appeared in 1991, used dual AT&T Hobbit microprocessors. The first retail offering of the BeOS was in 1995 when Be released the BeBox, based around Motorola's PowerPC CPUs. The BeBox

Not only is BeOS Personal Edition available to use for free, there's no need to worry about partition manipulation when installing it

an existing FAT partition within Windows, where it exists as a standard application. The OS itself simply lives in one 500MB disk image file, which can be accessed and used as a standard local volume by the OS once it's running. To get it going you need to reboot, of course, and if you've installed the OS from NT4 or Win2000, you'll need to create a boot floppy (the installation process prompts you to create one).

Starting the OS from within Win98 should simply drop you out of Windows and reboot the system into BeOS. There have been some problems reported with

Don't forget, you can mount FAT16 and FAT32 volumes for full read and write access

ultimately failed, and after Apple's decision not to license or develop BeOS for its own systems in 1996, the Intel build was created.

If you're already a Linux user or have a second OS on your machine and you're put off by the thought of yet another round of partition creation, resizing and general faffing about to be able to try BeOS, don't worry – the Personal Edition version of BeOS 5 doesn't require any partition manipulation at all. Running the setup.exe file simply installs the OS to

the reboot process though, so if you find the machine just hangs, create a boot floppy and try again.

One of the limitations of Personal Edition is that the size of the disk image file that's created – and thus the size of your BeOS root volume – is fixed at 500MB. You can create new Be volumes by initialising existing partitions on a given volume using the Drive Setup applet from Preferences, but you can't manipulate the partition on a mounted volume from within BeOS.

Don't forget, however, that you can mount FAT16 and FAT32 volumes for full read and write access, plus you can now mount NTFS volumes for read-only access. Just right-click on the desktop and move down to the Mount option, which will give you a list of mountable volumes on the system.

The fixed 500MB limit on the BeOS volume also means that if you install pretty much anything on this volume you'll run out of space for the virtual memory swap file, which can only reside on the BeOS root volume. You need to maintain 357MB free to be able to use virtual memory. The good news, however, is that the efficiency of the OS means it'll run happily without it, as long as you have plenty of RAM.

One of the things that's missing from BeOS 5 PE is a Network Neighborhood-style network browser. If you've previously been using r4.5 but couldn't get the network support going at all, you may not be aware that there's an unsupported experimental network browser called WON (world o' networking) buried on the r4.5 CD in packages/extras/optional/experimental/WON. This seems to work fairly reliably with version 5, too. Just double-click on the WONSetup file and configure it with the name of your workgroup and so on. You'll need to restart networking, after which you should be able to see all the local machines on your LAN by opening up the WON icon on the desktop. It is a little bit flaky and fairly slow, but it's good enough to provide you with a means of transferring the odd file across from another machine.

Rather bizarrely, the readme file that's installed when you set up BeOS says that because of technical limitations, the

Step-by-step guide to hooking up to the web

1 There's no point in having an operating system these days if you can't hook up to web or other machines, so setting up BeOS' networking, whether dialup or LAN, is the first thing on the priority list. There is, in fact, very little to it. Both dialup networking and LAN settings are accessed from the Preferences menu, in much the same way as Windows.
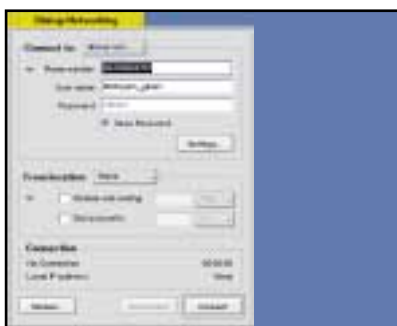
2 For modem access, open the Dial-up Networking preferences box. You'll see that there's not much difference between this and the equivalent Windows dialog. You can't edit any of the text boxes until you choose to make a new account via the button at the top of the box.

3 Click on the Modem... button at the bottom left of the Dial-up dialog and choose your modem from the list or click Custom... to set up your own. As with Windows, take care when the 'Make connection when necessary' checkbox is activated, if you don't want any nasty fiscal surprises from BT. When you're done, just hit Connect and off you go.
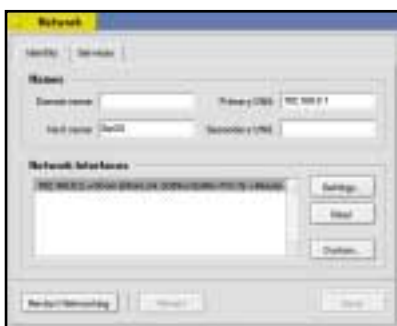
4 Setting up version 5's LAN networking is, like DUN, exceedingly simple, and one of the beauties of BeOS is that having made changes, the networking system can be restarted without having to reboot. Version 5 now autodetects your network interface card (NIC), so to connect to the Web via your LAN, you only need to check a couple of things.

5 If your BeOS machine shares the network with a NAT server – that includes Windows 98SE's Internet Connection Sharing – just click the Settings button from the main Network preferences dialog and check 'Obtain settings automatically'. If you don't have DHCP facilities you can run winipcfg from a Windows machine to get the relevant settings. When you're done the system will prompt you to restart networking.

6 While you're at it, you can set up your BeOS machine as an FTP and/or TelNet server, which is useful since there's no inbuilt facility with BeOS 5 PE to browse network machines. Always bear in mind, however, that running FTP and TelNet servers, particularly on standard ports, represents a potential security risk.

Personal Edition doesn't support multiple processors. However, this is not totally correct. If you run BeOS from a Windows session, only one processor will be used (this is because Windows 9x does some jiggery pokery to turn off the second processor and it can only be restarted via a cold boot). However, if you create a boot disk and boot from that, then both processors will be enabled.

You can test the effect of dual CPUs by starting the Pulse application from the Applications menu and then starting up, for instance, the GLTeapot and Charts demos. Pulse allows you to switch either one (but not both) of your CPUs on and off on the fly: switch one off and watch the frame rate counts decrease.

Of course, an OS isn't much use without applications to use with it, and this is the situation with which BeOS is battling. If you're into 3D, try Blender from NaN software (www.blender.nl), which is also on the cover CD. It's a great – if quirky – 3D-modelling app that's also popular on Windows and Linux. Resources for other apps and the various freeware

Setting up network printers

1 If you're not new to BeOS and have a copy of the r4.5 CD, you can make use of the WON (world o' networking) widget in the experimental folder. You'll find it buried on the CD in packages/extras/optional/experimental/WON. It seems to work fairly reliably with version 5. WON allows you to print to machines sharing a single printer over a Windows network in the usual fashion.

2 With WON up and running, open a window onto the network and browse to the relevant machine. What we're after here are network printers to allow us to share a single printer among a number of different machines. Any shared printers should be visible from this window. Double-click the one you want and BeOS will lead you onto the next screen.
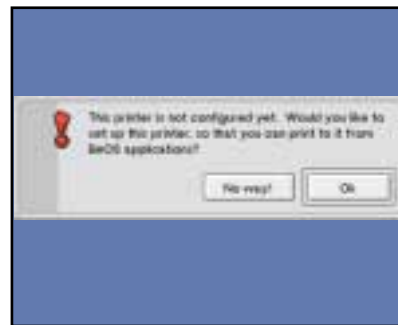
3 BeOS should recognise the fact that you haven't used the printer before, and start its equivalent of a wizard. As happens often with BeOS, you'll get a nice, jovial dialog box. This is one of the best things about BeOS – its user friendliness.
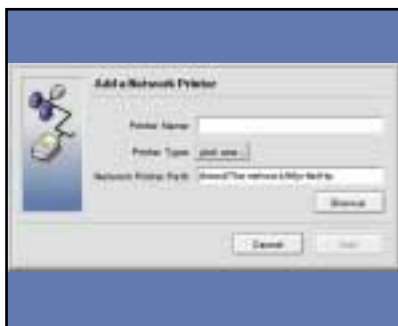
4 The network path to the printer should be filled in automatically when the wizard starts. Again this shows just how user friendly BeOS can be in comparison to the often command-line interface of, say, Linux.

5 There are very few specific drivers for BeOS, so you'll just get a list of generic types and languages from the Printer Type drop-down. For most units, PCL3 should work OK – I tested it on an ancient DeskJet 540 inkjet and it was fine. Give it any name you like and hit Add.

6 If you're successful you'll get a status dialog listing the printer's type, language and a job list. Just like Windows, in fact. Now you should be able to share the printer across the network without any problems. If you do run into difficulties, go back and check all your settings carefully.

and shareware widgets out there can be found at www.bedepot.com.

BeOS is strongly geared toward making life easier for developers, and to this end there's an integrated development environment, BeIDE, as well as various tools that are available for free. They're not included with the standard BeOS 5 PE though, you'll need to download them separately from the FTP site at ftp.be.com/pub/beos. The download is 20MB, and includes an implementation of GNU C++, as well as the full set of API classes, including those for driver creation, MIDI, networking and OpenGL, along with documentation. The jumping-off point after unzipping the tools is <installation directory>/beos/documentation/Be_Developer_Resources.html.

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Redmond skins up

Tim Nott tests the latest beta version of Media Player and finds Microsoft has gone skin crazy.

Last month I briefly mentioned 'skinning' – an activity made popular initially by music players (aka jukeboxes) such as WinAmp and Sonique, where the shape and look of the application is nothing like the Windows norm. Since then, being something of a collector of these things, I've discovered more skinnable juke boxes for playing digital media such as MP3 files or audio CDs. For sheer elegance, the Korean Soritong takes the prize – it looks like something totally unaffordable in a Zurich hi-fi shop. In fact, it's free, from www.sorinara.com. Should you find its elegance too restrained then there are plenty more skins, including some delightfully cheesy anime creations and one modelled, somewhat bizarrely, on a Sims living room.

The shock news is that Microsoft has now got into the skins game with the latest version of Windows Media Player. At the time of writing, this had reached the beta stage (known as a 'Technology Preview') and was freely available for download. A rather bewildering interface offers you the choice

Soritong's cool metal elegance...

of playing from your Media Library, CD Audio, Radio Tuner or Media Guide – the last two involving an Internet connection. I did try very hard at this, but although several of the pre-set radio stations opened as web pages in Internet Explorer, everything else stayed silent. I also had a lot of difficulty getting a CD to play. At one stage it made a spirited attempt to play the Oxford English Dictionary on CD-ROM in another drive (not to be recommended for listening pleasure) but finally I managed to get a CD playing. Performing an Internet track look-up was something of an adventure. After a lot of faffing about, a wizard eventually shuffled along, but failed to find a track list for the album – something that MusicMatch jukebox can do instantly.

Moving on to MP3 format was a little more encouraging, I managed to play tracks on my hard disk by dragging them into the Media Player, but the

...or how about a head from Microsoft?

logic behind Microsoft's conception of a playlist eluded me. There's also an option to copy music to a portable player – which, alas, I couldn't try as I don't have one; and also to record CDs to your hard disk in compressed format. Nothing new there, you might think, but this is not MP3, it's Microsoft's own-brand format – Windows Media Audio (WMA). This claims to offer twice the quality and compression ratio of MP3 but, confusingly, the Options dialog shows that a CD recorded at 128Kbits/sec needs 56MB, which is about the same. However, since I couldn't get it to copy anything at all, I wasn't able to check this.

Anyway, enough of this churlish nit-picking. What really matters is that Microsoft has embraced skins with all the enthusiasm of a gamekeeper turned poacher. Among the available sample skins are a cute little cartoon character called Toothy, whose single tooth moves across his mouth as the track progresses; and a truly amazing green head, with ears that pop-out to reveal the playlist and a graphic equaliser.

There's also a range of 'visualizations' – graphic effects that respond to the music, as seen in WinAmp, Sonique and other players. You can even create your own skins, though this isn't for the faint-hearted, as you need to write the configuration file in XML. For those brave of heart and stout of anorak there is an excellent guide available – the Media Player Software Developers' Kit. This is also available as a free download and features a hefty help file giving the low-down not just on creating skins, but also on using ActiveX controls to play media in web pages and on designing custom visualizations.

Let's hope by the time Media Player 7 ships for real – expected to be with Windows Millennium Edition later this year – Microsoft will have sorted out the minor details, such as actually getting the thing to play music. At the time of writing both the Media Player and the SDK were
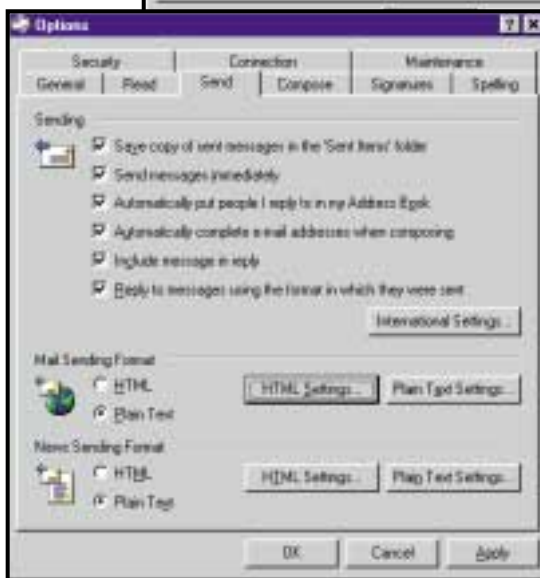
available to download at www.microsoft .com/windows/windowsmedia.

What's DAT?

If you've ever received a mystery attachment to an email message, with the .dat extension, then the chances are you won't have a clue what to do with it. A recent newsgroup discussion came up with various ideas: 'It's a Mac format' and 'It's a collection of multiple files' being two of the more sensible suggestions. What it is, in fact, is a file created by Microsoft Outlook. And to make any sense of it, you need... Microsoft Outlook. Outlook Express won't, it seems, read these files, and nor will most other email applications.

This brings me neatly to my seasonal lecture on email etiquette. If you are using Outlook (or Outlook Express) as your email client then you will win friends by keeping your messages to plain text. Otherwise, at best your message is sent twice – one version in plain text, and another with HTML formatting that will roughly quadruple the size of the message. At worst, you'll be sending people useless .dat attachments.

Either way, it takes longer to upload and download, and takes up more storage space. Multiply this by the thousands of emails that are in transit at any moment and it adds up to a lot of squandered bandwidth. Furthermore, most users are paying for their connect time, so it's downright rude to abuse this. Many people who wouldn't dream of sending an unstamped package, expecting the

messages (in the Format menu) and individual contacts (check the box under the email address). In Outlook Express the global option is under Tools, Options, Send; the per-contact option is in the

Most users pay for connect time, so it's rude to abuse this with hefty HTML emails

recipient to pay the postage, have no compunction in saddling them with long, expensive, downloads. In Outlook you can set plain text as the default format from Tools, Options, Mail Format. You can also set the option for individual

Name tab of the Windows Address Book; and the per-message option is once more in the Format menu of the message-editing window. Note that if you choose a 'Stationery' from the New Mail button, this overrides the Plain Text default.

Top: Brush up on your Internet etiquette with a little plain speaking in Outlook...
Above: ...and in Outlook Express

Magnificat

Being of reasonably sound body, if not mind, I've never had occasion to use the Windows 98 Accessibility options. But if anyone does have difficulty seeing the screen, hearing system sounds or manipulating the keyboard and mouse, there's considerable help available here, with a wizard to guide the way through the considerable list of options.

One accessibility tool that really deserves a wider audience is the Magnifier. This sits at the top of the screen by default, and shows a double-size view of the area around the mouse pointer or text-editing cursor. You can, however, drag it into a normal window and there are a number of other options, such as varying the magnification level and using high-contrast or inverted colour schemes. It's very useful for all sorts of things, such as checking the details in bitmaps, or font smoothing, but where it really earns its keep for me is in selecting portions of screenshots, such as toolbars or individual buttons. Rather than the hit and miss attempt of trying to locate a pixel at normal resolution, it means that I can crop or select a region with pixel-perfect accuracy.

Taskbar tip

Every so often, someone stumbles upon one of those tips that are so obvious – and so useful – that you wonder why you never heard about or realised it before. As you doubtless know, you can select more than one file in a folder by holding down the Control key as you click on them. What I'd never realised, until Michael Farrow informed me, is that you can do the same thing with buttons on the Taskbar. So, for example, you can save a few clicks at the end of a heavy day by Control & clicking each task, then right-clicking Close. Even better is that you can select two (or more) buttons, then right-click Tile. The selected Windows will tile 'on top' of all other open Windows. This is especially useful if you are trying to copy files between folders – it's almost as good as the old File Manager multiple-pane view.

Speaking of which, I've always had a soft spot for File Manager, for this very reason – you can set up multiple views in the main window, and if you tick the appropriate option in the View menu, it will save those settings. This makes it excellent at the job of, well, managing files. There are also all sorts of view options – you can have one pane showing just file names, for example, with a tree-and-full-details view of another location beside it. It will also tell you the plain truth about special folders, and I've often used it to winkle out junk files that have become 'invisible' to Windows.

It does, however, have its limitations. Some versions are not Y2K-compatible, but this is easily fixed with a visit to the Microsoft website. It doesn't support right-button dragging, but the Shift and Control modifiers work as per Windows Explorer, forcing a move or a copy respectively with the left button.

What is harder to live with, however, is the ugly duckling approach to long file names, which truncates, for example, 'program files', to 'progra~1'. If you have several folders with the same starting letters, then identifying these becomes pure guesswork, eg 'micro~1', 'micro~2', and so on. There is, however, a shareware utility to add long file name capabilities to Windows File Manager, written by Dieter Prifling of Neutraubling, Germany, and costing £6.06 (or 15DM) to register.
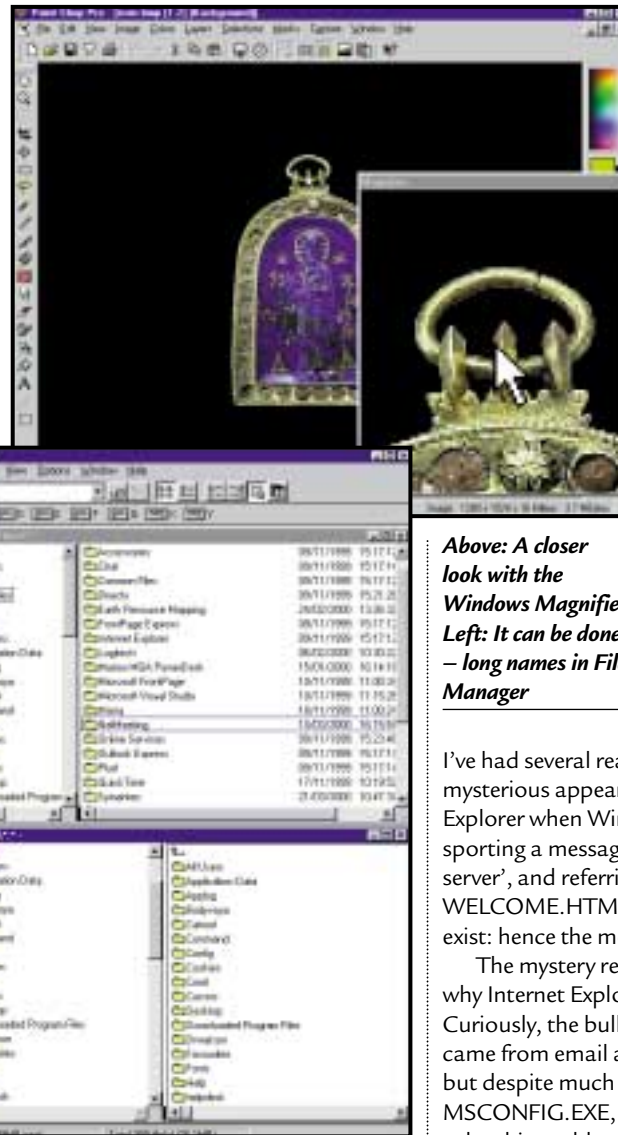
Above: A closer look with the Windows Magnifier
Left: It can be done – long names in File Manager

and has a slight modification to the Caps Lock key that seems expressly designed to ensure thAT I KEEP HITTING IT BY

I've often used File Manager to winkle out junk files that have become invisible to Windows

It goes under the snappy name of FmLfns, and is at www.wincorner.com /home/ fmlfns.html.

Kernel blimp
Another oldie but goody came up trumps this month. I recently changed my keyboard from the original Microsoft Natural to the Microsoft Natural Elite. Both have a similar domed construction, splitting the keys into two angled banks, but the latter is rather more compact,

ACCIDENT. This was driving me so mad that it rang a distant bell. The Microsoft Kernel Toys – sibling to the more famous PowerToys – is a free set of goodies that appeared shortly after Windows 95, and came with a keyboard-remapping tool. Sure enough, they are still available for download from the Microsoft website (and many others). Although I have not tried the other toys under Windows 98, Keyremap works fine. What it does is add another page of options to Control

Panel, Keyboard, properties. These let you map the action of any of the Shift, Control, Alt and Caps Lock keys (on the left-hand side) or Windows, Menu, Control and Alt keys (right-hand side) to another key in the same set. So having mapped Caps Lock to behave as Shift, I have stopped this involuntary shouting.

Not welcome
Hats off to John-Dawn McHugh, who appears to have solved a long-running mystery. I've had several readers complain of the mysterious appearance of Internet Explorer when Windows is started, sporting a message that it 'cannot find server', and referring to a local file named WELCOME.HTM. This file does not exist: hence the message.

The mystery remains, however, of why Internet Explorer is trying to find it. Curiously, the bulk of these complaints came from email addresses at Freeserve, but despite much vicarious fiddling in MSCONFIG.EXE, I've not been able to solve this problem, or even reproduce the symptoms on my own PC.

Anyway, John-Dawn spotted the culprit in Internet Explorer properties. On the Advanced tab, there was an option to 'Show welcome message each time I log on'. This was ticked – but, as we've seen, there is no welcome message to show. Hence the error message. Unticking the option cured the behaviour. And the reason I was unable to diagnose or reproduce the problem was that not all versions of IE5 have this option.
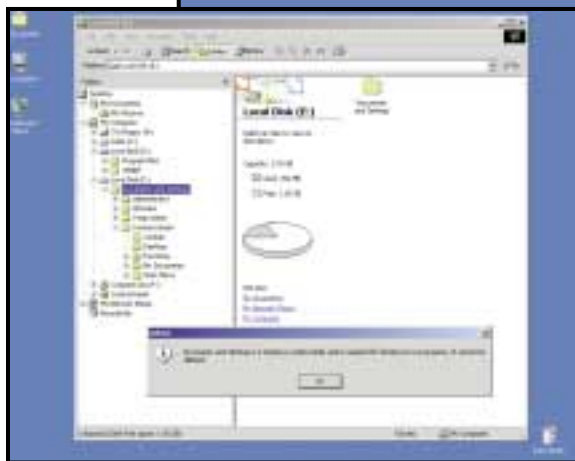
Tricky manoeuvres

Thinking of moving? Terence Green shows you how to take your Documents and Settings with you.

I have been trying to locate all the places in which Windows 2000 Professional stores personal data, in particular My Documents, Internet Explorer files, and, although I don't use it for mail myself, the Outlook Express message store. I do this in order to locate my data on a different logical drive from the system files as a safety measure to protect my data against the occasional disaster caused by inveterate fiddling. It ensures against loss of data if I need to vapourise the system drive and reinstall.

It's easy to move My Documents through its Properties settings, as mentioned in the April column. Similarly, Outlook Express data can be moved using Tools, Options, Maintenance, Store Folder; and Internet Explorer temporary files can be relocated with Tools, Options, General, Settings. Moving other files, Internet Explorer Favourites and backup logs, for example, is a different kettle of fish altogether. These are

Top: With care, the Documents and Settings folder can be moved to a new location
Above: The move has succeeded if you can delete Documents and Settings from its original location on the system drive

stored in a directory tree called 'Documents and Settings' on the Windows 2000 Professional system drive. If you try to move this directory Windows 2000 will politely refuse. An article on Microsoft's KnowledgeBase says that 'this behaviour is by design', but goes on to give directions, accompanied by dire warnings of doom and disaster as to how it can be moved.

Please note that this only applies to standalone Windows 2000 Professional systems. If your computer is part of a Windows 2000 network running Active Directory, there is an established procedure using Group Policy to move the user profiles stored in Documents and Settings. Don't use this procedure unless you have complete authority for

your computer. If you're in any kind of shared or group environment or network you will probably mess up something and may even destroy someone else's data.

Option one is to rename Documents and Settings when Windows 2000 Professional is being installed. But this requires an unattended install which, for most home and small business users, is more trouble than it's worth. And it can't change the location post-install. Option two, accompanied by exceedingly dire warnings, involves editing the registry. I'm not going to mention the article number which explains this procedure because it's a confusing document that appears to contain some incorrect or misleading information. When I misread it, it quickly led me into a disastrous loss

of all my settings. If you decide to do this and locate the relevant KnowledgeBase document, you should follow the 'Entire Folder' option with the following important provisos and exceptions.

You must use an administrator account for this process. But consider creating a new temporary administrative user account (I called mine Temp Admin), which you will only use for this operation and can then discard. This will mean a bit more work but may save you some grief if your first attempt misfires. When you come to steps eight and nine in the 'Entire Folder' process, don't follow it literally. If you do as it says and simply copy the current user's profile to the new location, you'll overwrite and delete the other profiles you copied in earlier steps. What step nine should say is to create a folder named after the current user, Temp Admin in my case, and then copy the current user profile to this folder.

If you decide to move Documents and Settings, and Microsoft strongly recommends that you don't, PLEASE take the utmost care, make a full backup of your registry, and update the Emergency Recovery Disk before starting. If possible, try doing so immediately after a fresh install of Windows 2000 when you have not yet begun to use it and establish personal settings. This at least will minimise the damage if it goes wrong.

If, after all these warnings, you still want to do it, then read on. Open Windows Explorer and navigate to Documents and Settings in the System Folder. Change its properties under Folder Options, View, Advanced properties to show hidden files and folders. Clear the check boxes next to Hide File Extensions and Hide Protected System Files.

Now copy (NOT move) all the named

Accessibility options inaccessible

Pota Kalima wanted to remove Accessibility Options and the associated programs from Windows 2000, but they don't appear in the Windows Components section of Control Panel's Add/Remove Programs tool. Even trying to work around

Your Windows 2000 questions are answered online in KnowledgeBase's TechNet section

the problem by installing and uninstalling them didn't work. As it happens there is an easy answer which doesn't seem to be mentioned in the standard Windows 2000 Pro release documentation or help files.

I hate to give away my trade secrets, but whenever I can't find the solution to a problem I turn to the Microsoft KnowledgeBase for an answer. For preference I use Microsoft TechNet, a subscription service delivered on CD that includes the latest service packs and updates, lots more technical data and the complete KnowledgeBase. But if you can't justify the subscription, you can access the KnowledgeBase on the Microsoft website. Click on Support at the top of the page and select KnowledgeBase from the drop-down list or, to see more of TechNet online go to **www.microsoft. com/technet**.

A quick search of the KnowledgeBase from TechNet on the web threw up the answer to Pota's problem in the form of Article Q223182. Accessibility Options (along with several other components including games, Outlook Express, and multimedia components that are all installed with Windows 2000 by default) aren't listed in the Add/Remove Windows Components list in Add/Remove Programs. To

unmask them, log in with an account which has administrative privileges and use Search to find the SYSOC.INF file. It's in the INF subfolder of the Windows 2000 System folder. Open SYSOC.INF in Notepad and edit the section shown in Fig 1.

Remove the ',HIDE' from the items you want to surface in Add/Remove Windows Components so that:
```
AccessOpt=ocgen.dll↙
,OcEntry,optional.↙
inf,HIDE,7
```
becomes:
```
AccessOpt=ocgen.dll↙
,OcEntry,optional.↙
inf,7
```
You must also remove ',HIDE' from the second line, AccessUtil. This is the category heading for the other components which you can access by clicking on 'Details' when Accessories and Utilities is highlighted in Add/Remove Windows Components.

Accessibility can be made accessible again by editing the SYSOC.INF file

folders, EXCEPT the one for the current user (eg Temp Admin), under Documents and Settings to the new Documents and Settings location. If you name the new location Documents and Settings you'll save yourself a bit of time as you'll soon discover. Now comes the fun bit. Start up the Registry Editor (Start, Run, Regedit), open the Find window (Edit, Find) and enter 'documents and settings' as the string to find.

You MUST find and replace every single reference to the old Documents and Settings with the new location, including Keys, Values, and Data. For Keys, right click on them to rename them. For Data and Values double-click on the Key to open the edit window. In most instances you'll be dealing with direct references, eg D:\Documents and

Settings. However, you also need to change some of the references to %SYSTEMROOT%\Documents and Settings variables, to point towards them the new location, eg E:\Documents and Settings. You'll also come across a few references to \HarddiskVolumeN\ where N is a number. These are sequential numbers. In other words if Drive D: is HarddiskVolume2, then E:\ is HarddiskVolume3.

Once you have changed every reference, close Registry Editor, log out, and log in again with an administrative account. You may see a brief reference to All Users not being found. Don't worry – it will be recreated. The proof of the pudding is if you are able to delete the original Documents and Settings folder and all its subfolders. If not, try running

Registry Editor again and check that you have changed all references to Documents and Settings to the new location.

Where's the boss?

I must apologise to Nicholas Jenner who could not find the Boss Key for games that I mentioned in May. Although it was present in the release candidate, it seems to have been excised from the final shipping version.

CONTACTS

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Support group

Stop thinking NT is the poor brother when it comes to attaching hardware, says Roger Gann.

A recent email to this column from reader Robin Tucker posed a simple hardware support question. He wrote: 'I am running NT4 on a laptop with a DVD drive. Could you inform me of the existence (if any) of software that will enable me to use this technology under the NT4 operating system?'

This got me thinking about Windows NT4's support for hardware in general and how well it fares, bearing in mind the number of new hardware technologies that have emerged since Windows New Technology was launched. It's true, Windows NT4 has never had the kind of hardware support enjoyed by Windows 9x and has a reputation for supporting only 'bread and butter' hardware devices – to use some exotic multimedia card then, generally, you had to go downmarket and use Windows 9x.

However, if you dig beneath the surface, you'll be surprised at just what hardware you can attach to your Windows NT4 box – the advantage enjoyed by Windows 9x isn't that significant any more. After all, many high-end notebooks have been shipping with NT pre-installed and NT4 isn't the most laptop-friendly OS on earth. So, solutions to the lack of support for things such as DVD, USB, power management, and infra-red are available.

OK, back to Robin's problem. You probably know this, but NT4 has no native support for DVD-ROM drives – you need drivers from the drive manufacturer before the drive will work. DVD-ROMs are recognised as CD-ROM drives under NT4, unless you have the

Top : You can run a wide range of DVD drives under NT4 using Software Architect's Write DVD!
Bottom: USB drivers and adaptors are available from Inside Out Networks' Edgeport range

correct drivers. If you have an ATAPI DVD drive which is recognised as a CD-ROM, you can download the freeware Universal Disk Format (UDF) Reader driver from Adaptec. The UDF Reader installs support for UDF 1.5, a superset of the UDF 1.2 file system, which is used to record DVD-ROMs.

UDF is a file system with support for the current generation of CDs and DVDs, such as CD-RW, DVD-ROM and DVD-Video. There are two versions of UDF. UDF 1.02 is the version used on DVD-ROM and DVD-Video discs. UDF 1.5 is a superset which adds support for CD-R and CD-RW. Adaptec's UDF Reader for Windows 95/98/NT also enables some MultiRead CD-ROM drives to read UDF-formatted CD-RW discs (such as those written with DirectCD) under NT4 SP3 or higher. Get it from www.adaptec.com

/support/advisor/cdr updates/udfreaders.html.

So far so good. Now this driver will let you recognise a DVD-ROM disc when inserted into your notebook's drive, but playing back a DVD movie is another matter entirely. If you have a desktop PC running NT, you could fit an MPEG decoder card, such as the CoolDVD from Dooin Electronics (www.dooin.co.kr/eng/product/dvdnt.htm). It supports the full DVD specification, including MPEG-1, MPEG-2, and Dolby Digital (AC-3).

If you have the Creative Labs PC DVD Encore drives, these have always supported NT4. You can download drivers for it from the Creative website – for example dvd5xreg.exe, which you can download from http://support.soundblaster.com /files/download.asp?OS=NT&prod= encore, includes drivers for NT4.

DVD-RAM support is another matter entirely. To format DVD-RAMs for an NT system, you must use third-party software, which typically doesn't ship with the drives. DVD-RAM manufacturers usually pre-format DVD-RAMs as FAT16, at the cost of restricting compatibility with other operating systems, should you want to exchange discs with other PCs. You can use Disk Administrator to format DVD-RAMs as NTFS to give you added data security.

To reformat a FAT16-formatted DVD-RAM, open Disk Administrator, which allows a signature to be written to the disc, save the configuration changes, and exit Disk Administrator. You can now format the disc by selecting the drive in My Computer and selecting NTFS as the file system in the Format dialog box. It takes less than 30 seconds to format one side of a DVD-RAM.

As far as I can tell there are only two third-party suppliers of drivers (Windows NT4 and 2000) for these vast removable media drives. The first is Software Architects (www.softarch.com/) with its WriteDVD! for Windows NT4 package. It supports all SCSI and ATAPI DVD-RAM

drives, including Hitachi, Panasonic, Toshiba, AOpen, Creative Labs and Pinnacle Micro. In the UK, its products are sold by 'Mac and More' on 01442 870 300. The second is Microstaff with its SCSIkid Wintool NT (www.microstaff. co.jp/english/wintoolnt.htm).

USB support

There's some light at the end of the USB tunnel, too. USB is another useful technology, conspicuous by its absence from NT4; but to be fair, it's only really been around since Windows 98. Microsoft has stated that 'There are no plans to provide USB support in NT4 in a future service pack.'

However, there are one or two companies that make USB adaptors and drivers for NT4. Inside Out Networks (www.ionetworks.com/) makes the Edgeport range of USB devices. Its EdgeUSB driver stack adds Microsoft-compatible USB support to Windows NT4 and NT Embedded. It emulates the Windows Driver Model (WDM), Plug and Play, and USBDI interfaces provided by Microsoft in Windows 98 and 2000. It's fully hot-swappable, Plug and Play compliant and is compatible with USB v1.1 specifications. You can use the Edgeport/4 and Hubport/7 to connect multiple high-speed serial devices to a single USB connector using NT4 Workstation. These include PDAs, modems, scanners, cameras, and any other serial-connecting peripheral that has support for NT4.

The punchline here is that, as ever, enabling the interface is only half the

Once you've enabled the DMA mode, you can expect a serious improvement to your PC's performance

IDE Programmed I/O (PIO) modes: the default NT IDE drivers support a maximum transfer rate of Mode 2 on IDE drives, ie 8.33Mbits/sec. Bus-mastering drivers support the full range of drives including Ultra IDE Direct Memory Access (DMA) Mode 2 or 33.3Mbits/sec.

However, few users realise that Microsoft addressed this concern with Service Pack 3. On the CD-ROM version of SP3, go to the \support\utils\i386 folder to find DMACHECK.EXE. Or you can download it from the Microsoft Downloads Center at www.microsoft. com/downloads/search.asp.

You can use this utility to activate a little-known DMA bus-mastering capability that Microsoft added to the ATAPI.SYS driver in SP3. When the utility initially starts, radio buttons indicate the current settings for each channel. To change the detection status, click the

In addition to a sizeable performance boost, you'll see a drop in the CPU overhead

story – many USB devices come with software that doesn't support NT4 because it 'doesn't support' USB! So, you may have a fully functioning USB hub on your workstation, but what you can plug in to it is unnecessarily restricted.

Enhanced IDE support

Finally, here's a free upgrade that'll definitely boost performance if your NT box has Enhanced IDE drives. When Microsoft released NT4, back in July 1996, some industry experts criticised the company for supporting only the low-end

preferred setting and it is saved when you exit DMACheck.

By enabling this capability, you let ATAPI invoke the higher-performance, multi-word DMA mode found in most PC chipsets (Intel's FX, HX, LX, and BX chipsets all have this capability). Service Pack 4 went one better – the ATAPI.SYS included here features native support for bus-mastering Ultra IDE drivers.

The results of using this utility are impressive: in addition to a sizeable performance boost (anything from 15 to 30 per cent), you will also see a drop in

the CPU overhead needed to service disk I/O operations.

DMA bus mastering works by offloading responsibility for most disk-to-memory transfers from the CPU to the DMA controller. This transfer of power frees the main processor to concentrate on more important tasks (such as running the application with which you're interacting).

A caveat: by default, when DMA is enabled it is enabled for all devices on that IDE channel. This is the Registry entry DMACheck makes: HKEY_LOCAL_MACHINE\SYSTEM\ CurrentControlSet\Services\atapi\ Parameters\Device 0 DriverParameter "DmaDetectionLevel=0x1;".

And if you have devices connected to the secondary IDE port and you enabled DMA support for the secondary IDE port in the DMACHECK utility they will have a second entry labelled: HKEY_LOCAL_MACHINE\SYSTEM\ CurrentControlSet\Services\ATAPI\ Parameters\Device1 DriverParameter "DmaDetectionLevel=0x1;".

However, you'll experience problems if your CD-ROM is not capable of DMA transfers. To enable bus mastering for one device and disable it for the other, edit the following Registry key: HKEY_LOCAL_MACHINE\SYSTEM\ CurrentControlSet\Services\ATAPI\ Parameters\.

To turn DMA off, change the value of DriveParameter to 0x0. '0x1' is DMA on, '0x2' is DMA forced on. Don't forget to take the usual safety/backup precautions when editing the Registry – making mistakes here can seriously ruin your PC's health! I'll be returning to this subject in a forthcoming *Hands On* column, as there is a lot more meat to chew on here!

CONTACTS

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Permanent connections

Chris Bidmead checks out a BeOS installation and gets his ADSL connection running with Linux.

Windows users will find BeOS for Windows (beospe.exe) on the cover CD this month as well as a BeOS workshop on page 240, but Linux users needn't feel left out – there's also a Beos4Linux.

Alas, there wasn't enough time to get the Linux version on our CD, but if you have a reasonably fast Internet link Beos4Linux.tar.gz is a 40MB download from http://be.com/products/freebeos. This is a way of trying out BeOS without having to mess up your existing Linux installation. When you unpack the download, the output is just three files: a readme, a floppy disk image and a huge, 500MB-plus file that actually contains a ready-built BeOS, installed inside its own file system. Make a boot floppy from the diskette image (|dd if=floppy.img of=/dev/fd0|) and move the BeOS file system file to a directory under a root called /beos. Now just reboot on the floppy.

The result (after some easy-to-handle, BeOS-managed, manual, screen-resolution adjustments) is what you see in screenshot 1. However, after setting up the Internet connection and getting sound going (all very simple and intuitive tasks), I started to miss the power, versatility and familiarity of Unix.

BeOS lets you mount any existing Linux ext2 file systems, albeit read-only. And when I brought up the BeOS terminal window I immediately felt at home. Typing sh –version, the command line revealed that I was back in good old bash. From the terminal window I also found I could FTP and TelNet to any of the other machines on my network. So, under the bonnet, BeOS seems to be a lot like Unix.

Incidentally, you'll read on the Be website that the feature of loading BeOS from a single large file – without affecting your existing Windows or Linux installation – comes to you thanks to an innovative new technology from Be. Actually, Linux has had loop devices (files that can be mounted as complete file systems) for several years and this is the

Screenshot 1

BeOS Personal Edition is free and seems largely directed to persuading you to buy extra proprietary software (note the Software Valet window). But underneath it has a Unix feel, as the bash shell suggests

approach taken by WinLinux (www.winlinux.net) to allow Windows 9x users to try out and run Linux without risk.

Continuous on

Last month I mentioned my ADSL connection installed on a Windows machine because the ISP, HomeChoice, won't support Linux machines. Ironically, HomeChoice – primarily a video-on-demand (VoD) supplier – actually runs its entire bank of video servers on Linux. The Internet service is a clever offshoot of this: the ADSL connection from HomeChoice has a total downstream bandwidth of around 2.4Mbits/sec. The video stream only uses about 2Mbits/sec of this, and the rest was originally reserved for software downloads to the set-top box (STB) and, upstream, to allow users to pause and rewind movies.

This control channel is 256Kbits/sec in both directions – overkill for what is mostly just remote control operations – so 115Kbits/sec of this is presented out of the STB as a modem-like serial Internet connection for your PC. This is slow(ish) by ADSL standards, but it is still almost twice as fast as a single ISDN channel. And the HomeChoice Internet service is cheap: £20 per month, rather than the £200 or so per month I had been

paying for my single ISDN line.

I wouldn't dare mention this in the Unix column unless I'd managed to free the service from its initial shackles to Windows. It turned out to be easy, although I was distracted at first by an offer from a commercial UK router company to lend me hardware which would connect the HomeChoice Internet service straight into my local area network here. This is how I've been using my ISDN router for the past three years. One Internet connection to the router more or less automatically puts all my other machines – whatever operating system they're running – on to the Internet too.

For various reasons – some of them my own fault – the router company failed to deliver for the next three months. Eventually, I became fed up enough to start taking a look at how I might pipe the ADSL link direct to my favourite workstation. Not as good a solution as the router, but better than having to put up with a Windows-only connection.

Inspection of the Windows installation and some phone chats with HomeChoice technical staff revealed that the STB is doing more or less straight ppp-over-serial down to the PC. Excellent. So I plugged the connector into my Linux serial port, loaded the ppp.o module (which also needs the slhd.o module) and then tried to figure out what sort of handshake the pppd daemon at the other end was expecting. When I knew that, I'd know what parameters to pass to my own ppp daemon on loading, either through the command line or in the etc, ppp, options file. Bill Unruh has written an excellent primer on all this, which you can find

at (http://axion.physics.ubc.ca/ppp-linux.html).

With an ordinary modem connection (and much of what follows applies to that), you might start by investigating what sort of chat handshake the other end of the serial line is expecting. The usual trick is to TelNet to the device at the far end – a standard modem will respond to ATZ with OK. But this particular device was positively Trappist in its responses. Then I realised that it doesn't need to dial, and probably doesn't need to do authentication either, as the STB already knows everything about me.

So I had three of my pppd parameters already. The comms port, the speed and the way to do authorisation: /dev/ttyS0, 115200, noauth.

However, some kind of initial chat dialogue, even senseless communication, seemed to be necessary to get anything at all moving along the line. This was the clue for my fourth parameter: local. Don't confuse this with local as in TCP/IP addressing. We haven't got TCP/IP going yet. This local just tells the ppp daemon to ignore the state of the serial control lines when establishing initial communication with the far end.

These parameters are all listed in the pppd man page – among many, many others. The huge choice was bad news, because the connection still wasn't working.

To find out more, I set up pppd to report to the syslog daemon, so I could watch its inner workings as it ran. The syslog daemon (syslogd) reads a file called /etc/syslog.conf and maintains log files according to instructions it finds there.

Screenshot 2

Run your pppd experiments under X (but as root, of course) and you can run tail -f in its own xterm, while starting and stopping pppd in another window

(All this is done as root, of course). In order to watch /var/log/ppp running live, I used the tail utility with the -f option (see screenshot 2). Tail says: 'Just show me the end of the file', and the -f option (brilliant, this...) says 'Keep showing me the new lines appended:

```
tail -f /var/log/ppp
```
as the file grows'.

I ran pppd again, adding debug as an extra parameter in order to see the whole show. Tail's view of the syslog output went something like this:

```
Apr  4 11:16:30 pc315 ✔
pppd[15468]: pppd 2.3.8 ✔
started by root, uid 0
Apr  4 11:16:30 pc315 ✔
pppd[15468]: Using ✔
interface ppp0
Apr  4 11:16:30 pc315 ✔
```

Some kind of initial chat dialogue was necessary to get anything moving along the line

On my Mandrake Linux system I added the following lines to the end of the existing /etc/syslog.conf:
```
# Check up on ppp
local2.*          /var/log/ppp
daemon.*          /var/log/ppp
```
...and then restarted syslogd. There's usually an init script for this – on Red Hat-type systems you can do this by running:
```
/etc/rc.d/init.d/syslog ✔
restart
```
(*Key:* ✔ *code string continues*)

```
pppd[15468]: Connect: ppp0 ✔
<--> /dev/ttyS0
Apr  4 11:16:30 pc315 ✔
pppd[15468]: sent [LCP ✔
ConfReq id=0x1 \
<asyncmap 0x0> <magic ✔
0xd3eadd4b> <pcomp> <accomp>]
... and then, sadly
Apr  4 11:16:57 pc315 last ✔
message repeated 9 times
Apr  4 11:17:00 pc315 ✔
pppd[15468]: LCP: timeout ✔
sending Config-Requests
```

```
Apr  4 11:17:✔
00 pc315 ✔
pppd[15468]: ✔
Connection ✔
terminated.
Apr  4 11:17:✔
00 pc315 ✔
pppd[15468]: ✔
Exit.
```

I confess, I got excited when I saw Connect: ppp0 <-->/dev/ttyS0. But this isn't an end-to-end connection down the wire; it's just my pppd connecting with my com port. You can see it send out a confirmation request (ConfReq) to whatever pppd might be listening at the other end but, unfortunately, there is no answer.

The next thing I did was check in the pppd man page to see what that asynchmap and magic stuff was.

The asynchmap describes which control characters cannot be successfully received over the serial line. Pppd will ask the peer to send these characters as a two-byte escape sequence.

It seemed to me that perhaps we shouldn't burden the STB's pppd with async-map negotiations. Happily, there's a parameter default-asyncmap that tells your own pppd not to bother with them. Likewise that mention of magic. Unfortunately, nomagic, the parameter recommended to silence magic negotiations (whatever they might be) was greeted by my pppd with 'unrecognised option'.

And here's the point of open-source code. When things don't work, read the man pages. When the man pages don't work, read the code. You don't have to be a codester – I'm not. There will be comments in there, there will be at least something intelligible in the body of the code and, bottom line, there will almost certainly be an email address of the maintainer.

You may find the source code on the CDs that came with your distribution, or you can search (http://freshmeat.net) – a great repository of news about and pointers to free software. The options.c file in the ppp source-code directory suggested that nomagicnumber was the correct parameter (this was ppp version

Avoiding the command line with KDE's kppp

Above: If yours is a straightforward ppp connection to a dialup account, then kppp, which is part of the KDE desktop tools, can be very helpful. But bear in mind that it's just fancy upholstery, a guide for beginners in setting up the config files in /etc/ppp. If you want to understand what's really happening (hey, you're reading this column, aren't you), take a look at those config files

Below: The find command is a great way of discovering what files have been modified or created by a GUI utility such as kppp. Unix hackers will use something like find /etc -cmin -5 to show all the files under /etc that have been changed in the past five minutes. If you can't remember these command line switches for find, then you're probably a candidate for that other piece of fancy upholstery, TkWorld
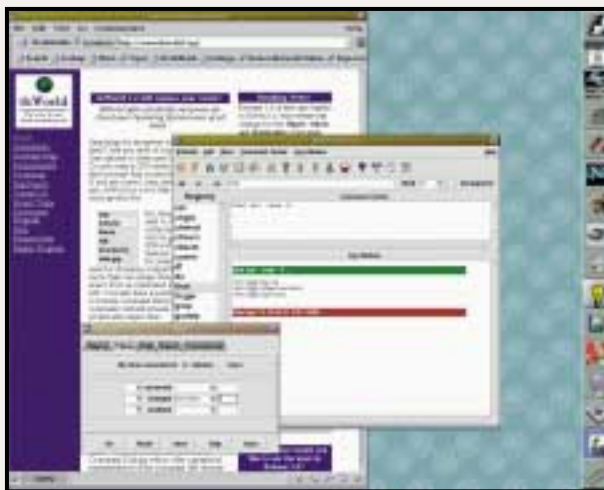
2.3.8, but somebody was obviously on to this because now I'm writing this up I see that ppp 2.3.10 accepts either).

I was thrilled to discover that this worked and my /var/log/ppp started showing a response from the other end. In screenshot 2, you'll see the kind of dialogue a live connection produces. Note the way the STB hands my own pppd the IP addresses to be used at both ends of the line. The /etc/ppp/ip-up script that gets started is actually empty in this case, but it's an opportunity to run any initialisation once the TCP/IP connection is established.

One kind of initialisation you certainly need is to set up the correct routing. You want to make sure that any accesses from inside your own machine (or in my case LAN) that don't find their target locally are directed out on to the Internet. For example, my hosts file doesn't know of an address 199.183. 9.107 and I need to say: 'Oh, well, in that case, default to routing out of here via the remote address my ISP has handed me.'

The code to do this might look something like this:
```
#!/bin/sh
/sbin/route route add ↵
default gw 158.152.1.222
```
But then, of course, I have the

complication of having to grope through /var/log/ppp to find the remote address in order to feed it into the /etc/ppp/ppp-up script. Happily, the amazing ppp daemon (it's virtually a mini operating system in its own right) knows how to set up a default route for you – just add one more option defaultroute.

Once that was done, and I'd set up the HomeChoice nameservers in my /etc/resolv.conf file:
```
search cbidmead.home.edu
nameserver 10.3.11.1
nameserver 10.3.15.1
```
my machine finally became Internet-connected – continuously!

I find it hard to write – in any way that doesn't make me look completely smug – about the deep glow of satisfaction it gave me to have thought all this through and actually got it working. Of course, you might say, in a Redmondish sort of way, 'Hey guy, this is software in Y2K. Fill in a few dialog boxes and it should just work. You don't need to understand it. What's great about commercial software is they've done it all for you.'

First of all, let me acknowledge that indeed they (the guys who put together pppd) have practically done it all for me. But, as you'll see if you investigate the

amazing bundle of source code, FAQs, readmes and what-have-yous that come with the pppd source, they have also taken the trouble to explain what they've done at whatever level I care to delve down to.

So, although I am riding on the shoulders of giants here, I get to feel more like a driver than a passenger. If this ppp link goes wrong, then I know how to fix it. And if I want to develop this ppp link into something even more wonderful, useful and interesting, the ground work I've done so far is something I can build on.

What could be more wonderful, useful and interesting? Well, how about a dedicated machine on my network which routes from my local Ethernet out through ppp to the STB and the world beyond – a homebrew version of that commercial router that failed to materialise. Yes, I've got that working, too. And next month I will tell you all about it.

CONTACTS

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Greased chipsets

Price versus performance is the issue of the day as Gordon Laing compares chipsets and memory.

I promised you last month that I would be testing different types of memory running under a variety of chipsets. I was particularly curious to see how SDRAM performed on an ageing BX chipset compared with a new 820/840 chipset using the Memory Translator Hub (MTH).

I recently upgraded my main motherboard from an Asus P2B with a BX chipset to a Supermicro PIIIDME with an 840 chipset – both were fitted with a pair of 256MB PC100 SDRAM DIMMs. I tested them with the Wstream memory benchmark, which gives a good indication of data throughput (www.cs.virginia.edu/stream/).

Under Windows 98, I achieved around 10 per cent better performance from my SDRAM under the 840 compared to my BX. Venturing into the VNU Labs, I ran the same benchmark on a number of other systems. Superior quality SDRAM with lower latency fitted to another Supermicro PIIIDME motherboard saw an increase of around 20 per cent over my own DIMMs.

Early RDRAM tests showed that PC800 (also known as RDRAM) memory under an 820 chipset ran about 60 per cent faster than the PC100 SDRAM memory on my BX motherboard; not a bad result, but remember that RDRAM is four times the price. Most interesting of all, though, was a system with a BX chipset motherboard overclocked from 100 to 133MHz. Since it had been fitted with a CPU and decent SDRAM designed

Intel's top of the range 840 chipset, pictured here on a Supermicro PIIIDME motherboard. Note the 45 degree orientation of the chipset components to ensure track lengths are exactly correct, and MTH support for SDRAM DIMM slots on the right. Even with dual memory channels though, is the 840 the best chipset for SDRAM performance?

an 820, and at a fraction of the cost. Overclocking the BX to 133MHz is, of course, totally unofficial, but enthusiasts who couple it with the right components could enjoy a winning combination of price and performance!

Dual-CPU problems

Since the Abit BP6 motherboard brought symmetric multiprocessor (SMP) awareness to the masses, it seems that everyone is talking about building dual-

Early tests showed PC800 memory under an 820 chipset ran about 60 per cent faster

for a 133MHz FSB, the only thing that was being pushed was the actual chipset and the AGP bus, both running one-third faster than they really should.

Choose your graphics card carefully and keep the chipset cool, and you could have a winner on your hands. I measured memory throughput to be only around five per cent slower than the RDRAM on

CPU machines. One of the most talked-about issues of recent months has been the SMP capabilities of new Intel processors, particularly the socketed FlipChip Pin Grid Array (FC-PGA) models. The big question is whether or not they will work in pairs.

Intel's official line is that the original core-stepping used on the first FC-PGA

socketed Pentium IIIs was not validated for dual-processing configurations. However, Intel says that its new core-stepping is validated for dual processing, and claims that processors featuring it have been available for some months.

The old core-stepping was called cA2, and the new one is known as cB0, but how do you tell which one you have? For that answer, you'll have to do a little bit of investigative work. First, you must find out the S-Spec of your CPU. This is labelled as five alpha-numeric characters on the actual CPU itself: on Slot 1 CPUs, you'll find it written on the top of the cartridge, while on FC-PGA CPUs you'll find it written on the surface of the chip circuit board, which lies under the heat-sink. It will read something like SL49H.

Now all you have to do is go to Intel's website at http://developer.intel.com/design/PentiumIII/qit/ and click on the appropriate S-Spec to discover its finer details, including the core-stepping. You'll also find a downloadable Acrobat PDF with them all listed. For example, the FC-PGA 750MHz Pentium III is listed

as being available with S-Specs of SL3VN, SL3VC, SL3XZ and SL462, but only the last two have core-steppings of cB0, and hence validated dual-processing capabilities.

It's confusing stuff all right, and one wonders how readily a supplier will reveal the S-Spec of a CPU before you buy. The good news, however, is that by the time you read this, Intel claims all FC-PGA CPUs in the market should be using a core-stepping validated for dual processing. Finally, it's worth remembering that no Celeron CPU has ever been validated for dual processing, yet thousands of Abit BP6 owners are happily using pairs of them in such configurations. So, in theory, older cA2 core-stepped CPUs may also work in dual mode, it's just that Intel won't guarantee it.

Celeron's new coat

CPU speeds are always on the increase, but every now and then they change their outfits. Take the humble Celeron, champion of the budget over-clocker, and all-round good egg. When Intel dumped the Celeron's cartridge housing, it chose the Socket 370 Plastic Pin Grid Array (PPGA) to carry the product line forward.

With the release of the new 566 and 600MHz Celerons, Intel has switched to the FC-PGA packaging for its socketed Pentium IIIs. The good news is that these new Celerons are made using the same 0.18micron process as the Coppermine Pentium IIIs and indeed share many similarities. For the first time, these new Celerons include the PIII's Streaming SIMD Extensions, which can significantly speed up applications that support them. In fact, the only difference between 0.18micron Celerons and PIIIs are that the former only run at 66MHz externally (compared to 100 and 133MHz FSB of current PIIIs) and that the Celeron still has 128KB of Level 2 cache compared with 256KB on the PIIIs.

It's worth looking a little closer at that cache, however. In the old 0.25micron process, the data-path between CPU and Level 2 cache was 64 bits wide, whether on-die with the Celerons, or off-die with the Pentium II and early IIIs. With the 0.18micron Coppermine process, Intel increased the (now on-die) Level 2 cache data-path to a width of 256 bits. This faster 'Advanced Transfer Cache' is now a welcome feature on the new Celerons,

New Year resolution

In last month's *Reviews* section we were lucky enough to get our hands on a pair of the latest and greatest, highest-resolution digital cameras yet: the Canon S20 and Fujifilm FinePix 4700. Boasting 3.3 and 4.3megapixel resolutions respectively, each claimed considerably greater imaging capabilities than existing 2.1megapixel models, but did they deliver the goods?

In terms of file sizes, they certainly did. While uncompressed 2.1megapixel images measure around 6MB, those generated from these 3.3 and 4.3megapixel cameras resulted in whopping 9MB and 12MB files respectively. However neither the S20 nor the 4700 offered uncompressed TIFF modes, instead forcing you to employ various levels of JPEG compression.

Interestingly, when set at the best quality, Canon's S20 produced typical file sizes of 2.2MB compared with images from Fujifilm's 4700 weighing in at 1.6MB. Remember that the Fujifilm started off with a bigger image than Canon did, so clearly even its best-quality compression mode is much more severe.

Comparing optical resolution tests from the
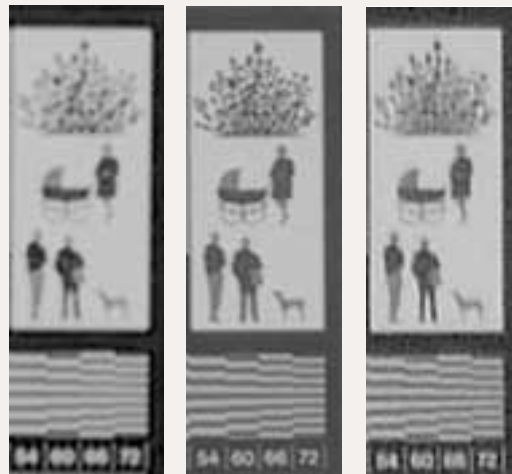
A close-up of an optical test target shot by the Canon S10, Canon S20 and Fujifilm 4700 digital cameras. With resolutions of 2.1, 3.3 and 4.3megapixels respectively, we should see the level of detail increase. However, Fujifilm's higher compression, even using its best-quality mode, results in the finest details being blurred. Despite claiming 4.3megapixel resolution, our results from the 4700 lie somewhere between 2.1 and 3.3megapixels

S20 and 4700, it's plain to see that the Canon delivered more detail. In fact, Canon's 2.1megapixel S10 camera looks pretty close to the Fujifilm 4700. In briefings for its own 3.3megapixel S70 camera, Sony claims that the Fujifilm 4700 houses nothing more than a 2.4megapixel CCD. Fujifilm admits that this is the case, but says its new SuperCCD technology results in quality that is equivalent to a standard CCD which is 1.6 to two times higher resolution – hence it reckons a 2.4megapixel SuperCCD

can be described as matching a 4.3megapixel conventional CCD.

However, the fact remains that whether through interpolation or over-compression, our optical tests revealed that the finest details were lost on the 4700, with an end result somewhere between a conventional 2.1 and 3.3megapixel camera. We look forward to testing Fujifilm's forthcoming '6.1megapixel' digital SLR, which includes an uncompressed TIFF mode and should at least show us what the SuperCCD is capable of.

although remember that they only have 128KB of it compared to 256KB on the PIIIs.

It's not all good news, though. Anyone fancying a quick upgrade from one Celeron to another should remember that the new Celerons running at 566MHz or above are supplied in the

FC-PGA packaging. This means they're not compatible with so-called legacy motherboards fitted with PPGA S370 sockets, and that includes the Abit BP6.

Instead, you'll need a new FC-PGA-aware motherboard, or use a Slocket convertor to pop the CPU in a Slot 1 motherboard. As mentioned in the

Teaching the BP6 new tricks!

Abit's remarkable BP6 is truly the motherboard that keeps on giving. Many users, including several members of the *PCW* team, have discovered the joys that a pair of Celerons can bring, but wouldn't you know it, we always want that bit more.

When it was revealed that Intel was going to gradually replace all Slot 1, cartridge-based Pentium IIIs with a socketed solution, many Celeron owners were forgiven for thinking they may have a neat upgrade on their hands. BP6 owners got even more excited with the thought of a dual-socketed PIII system.

While the new socketed Pentium IIIs did indeed share the same physical Socket 370 interface as PPGA Celerons, Intel employed a new packaging design. Named the FlipChip Pin Grid Array, or FC-PGA for short, the actual CPU die faced upwards for direct contact with the heatsink. Sadly, Intel also changed a few of the pins around, which meant the socketed FC-PGA PIIIs were not compatible with legacy Socket 370 motherboards, including the BP6.

Over the past few months there has been great speculation as to whether someone would create a PPGA to FC-PGA adaptor, or if Abit had a dual FC-PGA project up its sleeve. Well, I'm pleased to say the answer is a big yes to both questions. As we went to press, PowerLeap was on the verge of releasing its NEO S370, a 4.4mm thick adaptor which sits in legacy PPGA sockets, yet claims to talk to FC-PGA CPUs; the additional height above the socket means you'll need a special heatsink and fan. The newly designed BP6 enthusiast's website has further information. Note that there are some issues in running certain FC-PGA CPUs in dual configurations – see main feature.

After several conversations with system integrators, we're also led to believe that Abit has created a dual FC-PGA motherboard which may use a VIA chipset with support for 133MHz SDRAM. Abit couldn't confirm or deny, but implied that such a product wasn't out of the question for PC OEMs or perhaps end users. We're hoping to see this and other innovative products are the upcoming Computex show in Taiwan.

www.bp6.com
www.powerleap.com

BP6 box (above), you could, in theory, also use the PowerLeap NEO S370 adaptor, which sits in between FC-PGA CPUs and conventional PPGA sockets, but this is as yet untested with the new Celerons. Note that Intel claims the new FC-PGA Celerons do not have dual-processing capabilities, but then again, the old Celerons were also not validated for such configurations, yet work happily in thousands of Abit BP6s around the world. The unofficial BP6 website (www.bp6.com) will no doubt have further information by the time you read this issue.

Can it go faster?

As over-clockers know, the 0.18micron process is capable of manufacturing

Celerons are a bargain — as long as your motherboard can take an FC-PGA processor

multipliers of 8.5 and nine times respectively.

Doing the old trick of upping the FSB to 100MHz would then attempt to drive them at 850 and 900MHz respectively, which could end up being a bit too far. Some enthusiasts' websites have reported success, although we have not tried it yet. Bear in mind that newer Celerons running faster than 600MHz will have even higher clock multipliers, which pretty much rules them out for over-clocking.
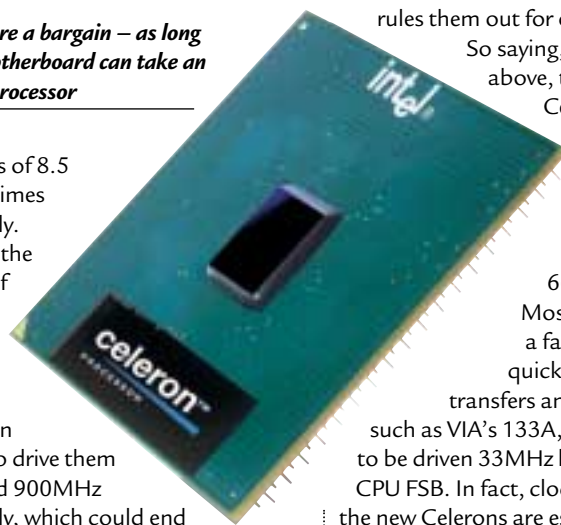
So saying, at 566MHz and above, these new Celerons are still going pretty quick, and are set to go faster still. Don't feel too bad about the 66MHz FSB either. Most of the benefit of a faster FSB is in quicker memory transfers and some chipsets, such as VIA's 133A, allow the memory to be driven 33MHz higher than the CPU FSB. In fact, clock multiplier aside, the new Celerons are essentially just Pentium IIIs with half the Level 2 cache and as such, continue to represent an absolute bargain – as long as you've got a motherboard that can accept FC-PGA processors, that is.

At 566MHz and above, new Celerons are going pretty quick and are set to go faster still

CPUs running in excess of 1,000MHz. However, consider the clock multipliers of the new Celerons. With external front-side bus speeds of 66MHz, the 566 and 600MHz Celerons require clock

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Farm hand

Stephen Wells helps feed the animals and solves the problem of recording pre-1900 dates.

Sean Mills, who is a farmer, has asked for help in developing a mix for animal feed. 'To take an example, suppose the feed is made up from corn, soybeans and cottonseed and I want it to contain 22 units of protein, 28 units of fat and 18 units of fibre. Using Lotus 1-2-3 97, how can I calculate the amount of each ingredient to be used?' Sean provided a table showing the average content of protein, fat and fibre in corn, soybeans and cottonseed. This can be seen in Screenshot 1 in the range A3:D6.

One quick way to calculate the correct mix is to use 1-2-3's built-in matrix macros. A matrix is simply a rectangular array of numbers related to algebraic equations. In this case, if a is the number of units of corn, b is the number of units of soybeans and c is the number of units of cottonseed, you could state the problem as: 0.25a + 0.4b + 0.2c = 22 units of protein; 0.4a + 0.2b +0.3c = 28 units of fat; and 0.3a + 0.2b + 0.1c = 18 units of fibre.

But you don't need any formulas to solve the problem. Just choose Range, Analyse, Invert Matrix. To fill in the From slot in the displayed dialog box, just highlight the range B4:D6. To fill in the To slot, click on cell B8. 1-2-3 will then create the inverted matrix shown in the range B8:D10 in the illustration. Now choose Range, Analyse, Multiply Matrix. In the new dialog box enter or highlight B8:D10 as the First Matrix; F4:F6 as the Second Matrix; and B12 as the Resulting Matrix.

In the range A12:B14, 1-2-3 gives the results. In this case, Sean would need a mix of 40 units of corn, 15 units of soybeans, and 30 units of cottonseed. If you would like to cross-check how the protein, fat and fibre content is split between the ingredients you can add

Screenshot 1

Screenshot 2

Top: Calculating a mix for animal feed with the correct balance of protein, fat and fibre is possible using Lotus 1-2-3 97's built-in matrix macros
Bottom: As a cross-check, you could add another simple table which confirms that the mix contains the correct ratio of protein, fat and fibre

a table as in the range C11:E15. Just multiply the mix results times the relevant figure in the first table. So cell C12 has +B12*B4 and C13 has +B13*C4 and so on across to cell E14 which has +B14*D6. Enter totals in row 15 and you'll see that the protein, fat and fibre results are 22, 28 and 18 respectively, as they should be (screenshot 2).

Grave problem

Rod Strong emailed to say: 'I need to record some data from a church burial register going back to 1812, but dates saved in Excel 97 are not recognised prior to 1900. I know that dates are stored as number values starting at either 1900 or 1904 but I want to use the Excel graph and data-crunching functions. I haven't

found a fix (or an acknowledgement of this deficiency) on the Microsoft website. Can you help?'

Neither Excel nor Lotus 1-2-3 dates work before 1900. The best solution that I was able to offer Rod is to use Corel Quattro 8 which starts at 1 January 1600. The Corel office package is quite inexpensive. Excel and 1-2-3 are American, and apart from the Mormons, to whom genealogy is important, our cousins across the pond aren't into history much. Corel is Canadian.

By the book

Bob Monroe wrote in with a plea for help. He says: 'I can open a new Excel 97 workbook, but when I try to save it, the whole thing crashes. All I can do is open existing files and save them without a name change'.

I suggested that he delete Excel (via Control Panel and Add/Remove Programs) and then install it afresh. He wrote back to say that this worked and theorises that his problem may have stemmed from compacting his Registry with Norton Utilities. Who knows?

Number games

Tim Nott plays around with page numbering in Word and takes a few tips from readers.

This month brought a new challenge. For reasons too boring to go into, I needed a Word document to have two systems of page numbering – one overall, and one restarting every chapter. Now, it's easy enough to switch between the two using the Format Page Number button on the header and footer toolbar. And it's possible to stick page numbers in both the header and the footer – or even more than one in each. But any attempt at changing the formatting on one, while preserving it on the other, is doomed – it's global or nothing.

However, page numbers are just fields, and readers of February's column may remember a trick used to get the name of the previous month into a field. And sure enough, the QUOTE field is again the one we want, as it enables us to display the result of calculations involving fields, operators and numbers.

So, if you QUOTE the current page number minus the number of the last page of the previous chapter, you'll get the result required. And had we but world enough and time there is probably some way of automating that further, but screenshot 1 shows the principle.

Serendipity corner

In Word, what you see is – more or less – what you get. But it's the 'more or less' that can be irritating. I often find I want to see my text and images at the actual size they will print at, which doesn't seem too much to ask. However, Word's idea of 100 per cent zoom factor is a little woolly, and depending on the screen resolution it seems to vary by 25 per cent either way.

But while looking for something else, I found out how to get this exactly right. It's a Windows setting, but since most other applications seem to ignore it (with the honourable exception of Windows Paint) I make no apology for including it here. First find a plastic ruler marked in inches. Then go to Control Panel,

Screenshot 1
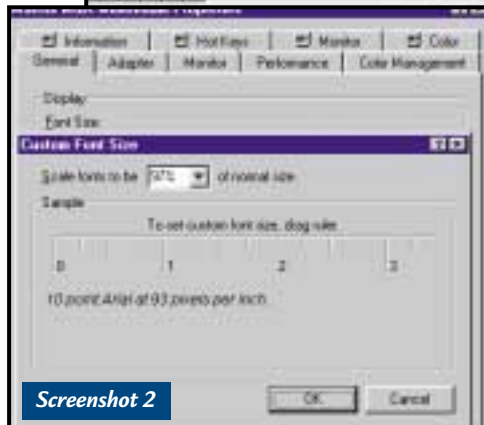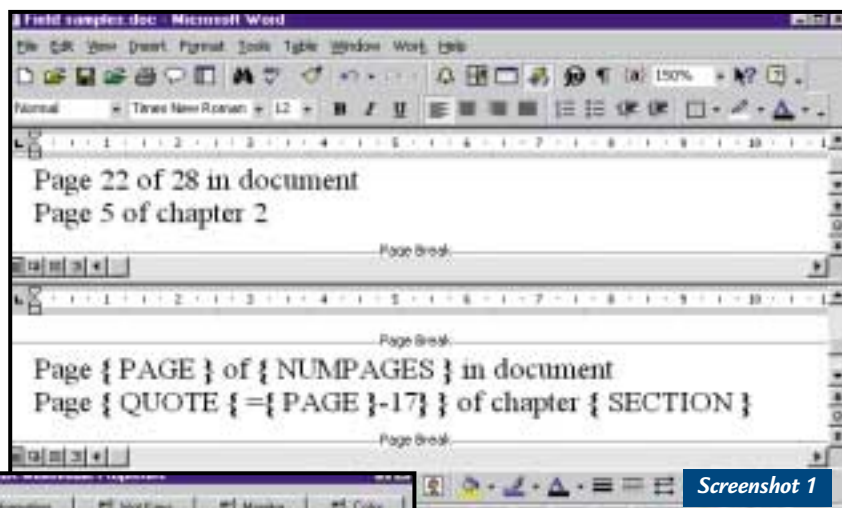
Above: Running two systems of page numbering is a simple field problem
Left: Inches rule OK for getting life-sized documents at 100 per cent zoom

Screenshot 2

Display; turn to the Settings tab, then click the Advanced button. In the Font Size list, choose Other, and a Custom Font Size dialog will appear, which is equipped with a ruler. Drag the latter until it matches the real thing. Press OK, and restart your PC (see screenshot 2).

There are a few provisos: you get a warning that some applications may display incorrectly (though I haven't had any problems so far). If you're viewing at 640 x 480, you don't get the Font Size option. Finally, if you change resolution, you'll have to recalibrate as the setting is global, and hence can only be accurate for one resolution at a time.

Return to RTF

My thanks to Paul Herber, among others, who pointed out that there is a flaw in the strategy of avoiding macro virus transmission by using the RTF file format for email. If you rename a .DOC as .RTF,

Word will still open it without protest. In fact it will bypass the 'Confirm conversion' dialog, if you have this option enabled, unlike a real RTF file. It won't, however, get past the macro security check, so ensure you have this set to medium or high when opening DOC or RTF files of uncertain provenance.

Back at the office

Further to March's item about installation problems with Microsoft Office, Keith Grayson wrote in to say he had a problem with 'DLLs failing to register'. He cured the problem by going to Control Panel, System, Performance, File System, CD-ROM and temporarily setting the Supplemental Cache to 'Small' and the Optimise Access Pattern to 'No read-ahead'. This would seem to indicate a media manufacturing problem, as I've never had another CD-ROM require this.
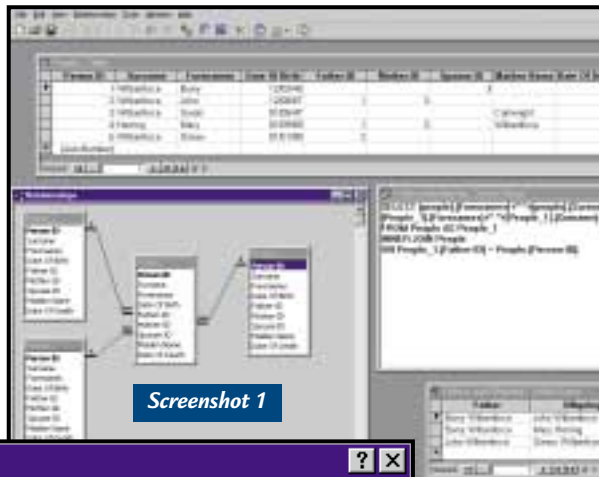
Keep it in the family

Mark Whitehorn trims a few family tree problems and keeps you from becoming your own dad.

I n May I asked you to vote whether you wanted more or less SQL problems/solutions. The answer was clear – all the votes cast were for more SQL, which means no-one wanted less. Well, that's comforting. I had feared I was alone, so it is good to know that there is a small band of us being cared for in the community. However, if you hate SQL and didn't bother voting, feel free to do so now. The column is always open to steerage from the readers.

Family tree

Tom Brown (acasia@totalise.co.uk) wants to create a database to hold a family tree. In his table, the Fields Father-ID, Mother-ID and Spouse-ID are destined to hold references to Person-IDs in the same table. As he points out, most people only have one father and one mother, but fathers and mothers can have multiple offspring, so he wants the relevant controls in place to ensure that all works properly. Tom uses Access 97, but the problem is generic, as is the solution.

In fact, the only thing that makes this problem look tricky is that we are dealing with one table, rather than multiple tables. If we held, say, all the father information in one table and all the child information in the other, then it would be simple, but also inefficient. So the trick is to store the data in one table, and simply behave as if there are multiple tables when you need them, as demonstrated below.
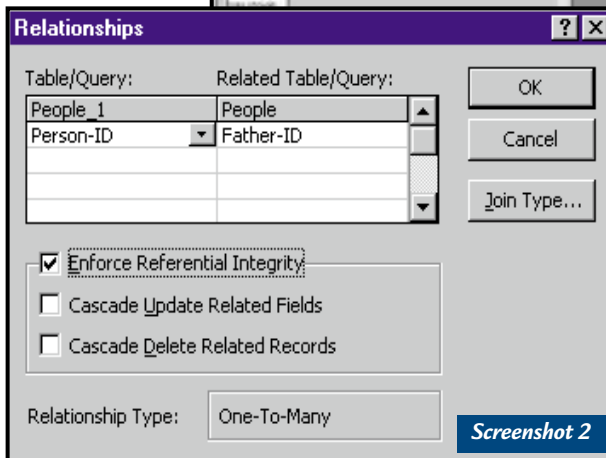
Screenshot 1

Screenshot 2

Top: Showing a proto family database, holding data in a single table. I've set up relationships (small pun) between the fields (bottom left), entered some data (top left) and shown a query (top right) that extracts some data (bottom right)
Bottom: Enforcing referential integrity between a table and itself will protect against invalid figures being entered

The trick is to store the data in one table and to behave as if there are multiple tables

Screenshot 1 shows some sample data in the table (top window in the screenshot). The database structure that Tom has already suggested ensures that the relationship between any child (in the biological sense) and its father is correct. Each record can have only one pointer to a father (the pointer will be located in the Father-ID field), because there is only space in the record for a single pointer.

This means that the database can only ever show one father for each person. So, all I had to do to indicate that Barry Wilberforce is the father of Mary Herring was to enter the value 1 into the Father-ID field of her record. However, we need to apply the normal integrity constraints on the values that are put into Father-ID. For example, we must protect against the user entering an invalid figure such as 26, because there is no person with an ID of 26.

This sounds like a case for (cue trumpet fanfare) referential integrity! And so it is, but how can it be set up within one table? In Access 97, you open the Relationship window and add the table called People to the relationship editor, not once but twice. You will find that the second time it appears it is called People_1. Now simply create a one-to-many join between People_1.Person-ID and People.Father-ID with enforced referential integrity (screenshot 2). In the example I have roughed out I have added joins for the Mother and Spouse as well. If you are using another database engine, then you can set up this referential integrity in whatever way the engine prefers.

So far, so good, but we are still able to add nonsense data – for example, I can make someone his (or indeed, her!) own dad. I know that there is a song called *I'm my own Grandpa* which claims to prove this unlikely juxtaposition, but very few people would claim to be their own father (and if there is someone out there who does make such a claim, then I really don't want to know about it).

We can control this sort of invalid input using a 'business rule', which is often enforced at the form level (screenshot 3). This simply ensures that no-one is listed as their own father, but you can make it as complex as you like, checking date of birth, etc. If you add a field called 'Sex' to the table, you can ensure that the females don't end up listed as fathers and vice versa.

To extract information about the human relationships, again you treat the one table as if it were two. You make a join between the table and itself at query time, but you refer to the table by two different names. So, for example:

```
SELECT [people].✔
 [Forenames]✔
+" "+[people].✔
 [Surname] AS ✔
Father,
[People_1].✔
[Forenames]+" ✔
"+[People_1].✔
[Surname] AS ✔
Offspring
FROM People AS ✔
People_1
INNER JOIN People
ON People_1.✔
[Father-ID] = ✔
People.[Person-✔
ID];
```

(*Key:* ✔ *code string continues*)
...pulls out all the fathers, complete with their children. And...

```
SELECT [people].[Forenames]✔
+" "+[people].[Surname] AS ✔
Father,
Count([People_1].✔
[Forenames]+" "+[People_1].✔
[Surname]) AS Offspring
FROM People AS People_1
INNER JOIN People
ON People_1.[Father-ID] = ✔
People.[Person-ID]
GROUP BY [people].✔
[Forenames]+" "+[people].✔
[Surname];
```

...lists the number of offspring for each father.

Note that this SQL happens to be using, as the name of the 'second' table, a name which I used in the relationship editor (namely People_1). However, these two names are not related. The SQL statement defines for itself which name it will use for the second instance of the table in the bit which reads:
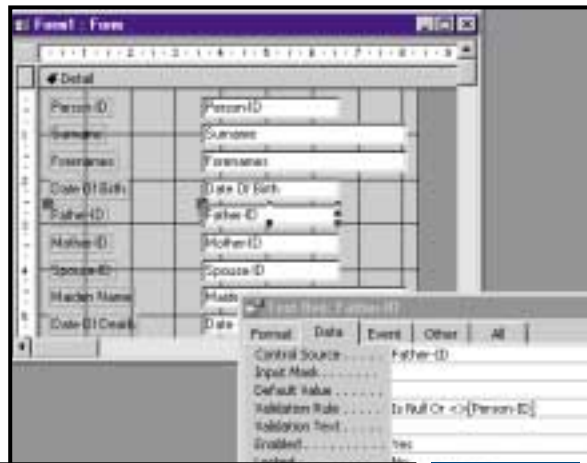
Screenshot 3
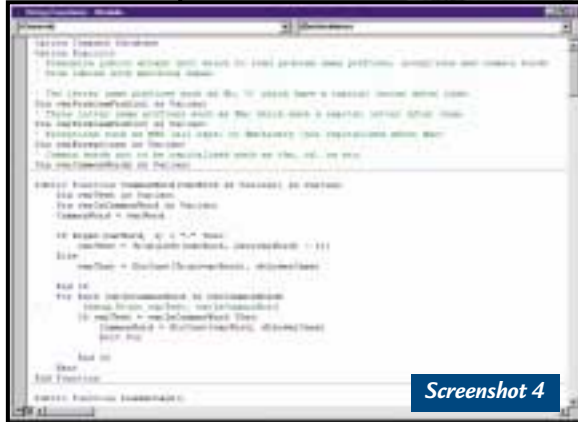
Screenshot 4

Top: Using a business rule, we can ensure that no-one in this database is going to be their own Pa
Above: John McClenahans' code not only seems to work, it is even documented so that you can see how it works

```
FROM People AS People_4
```

It is left as an exercise for the reader (don't you love that expression!) to devise a query that will do the same for parents, not just fathers.

You'll find the sample database on the cover CD as Family.mdb.

Table teaser
Paul Edwards (pedwards@e-promotions.co.uk) wants more SQL and suggested this poser that has been bugging him for a year. He has two tables:
● tblSubject: SubjectID, SubjectName, ShowCount
● tblArticle: ArticleID, ArticleTitle, ArticleText, WhenCreated, SubjectID.

He wants a list of recent articles, but wants to see the 10 most recent articles on SQL, SubjectName = "SQL", ShowCount = 10; the five most recent on Windows NT, SubjectName = "Windows NT", ShowCount = 5 and only the two most recent on DOS, SubjectName = "DOS", ShowCount = 2.

He has tried this in SQL Server, but has been forced to use a cursor and dynamic SQL instead:

```
"UNION SELECT ✔
TOP " + ✔
@ShowCount + ✔
".......FROM ✔
tblArticle
WHERE SubjectID ✔
= " + ✔
@SubjectID
```

I haven't had a chance to play with this problem yet, but you are all welcome to give it a try and let me know how it goes.

The case of the proper name
In the May issue I offered a simple solution for capitalising proper names and touched on a more complex one which deals with names such as MacDonald.

John McClenahans (john@mcclenahans.freeserve.co.uk) sent in a very comprehensive solution that he recently developed for a name and address database (see screenshot 4).

This is provided as an Access 97 library database, ProperCaps97.mda on the cover CD. For those who haven't used a library, he has included instructions on how it can be used from your own mdb (see John.txt which you'll also find on the CD).

This particular solution is elegant because of its adaptability. He has included four tables in the database that contain four different types of exceptions to the normal capitalisation rules. The beauty of this approach is that you can edit these tables to suit the exceptions you hit, or modify his code and generate new tables for other variant types.

Access
Geoffgoddard@ouvip.com uses a routine for performing capitalisation that he found at Access Web (www.mvps.org/access) – a great source of Access stuff.

Waste of space

Ian Waugh explains how to remove those unwanted pauses between tracks on your audio CDs.

Over the past few issues we've looked at the process of editing audio files, copying vinyl records to your hard disk and converting CDs into MP3s. Do it now before Big Brother (aka the music companies) tells us it's illegal to record your dog barking without three sets of licences, all in triplicate.

When converting LP tracks to CD or creating a 'best of' collection of your favourite audio tracks, a couple of situations can arise which are not always taken care of by the standard audio CD-writing process. These involve an unwanted pause or gap between tracks, and splitting a long recording, such as a live album, into individual tracks.

Inter-track gaps seem to cause a lot of problems. The Red Book format – which is the specification that audio CDs are based on – states that the pause time should be between two and three seconds. Other formats, such as the Yellow Book specification, upon which CD-ROMs are based, specify a two-second pause, so for compatibility reasons most audio software is happy to go with two seconds. Most software inserts this gap automatically, and what often confuses people is that even if they copy two tracks with no gap between them, when these are written to CD, the gap appears.

To get rid of the gap you must use DAO (Disc At Once) writing. As its name suggests, this involves writing the disc in one go as opposed to TAO (Track At Once), which writes a track, pauses while it does some housekeeping, writes another track and so on. It's during the housekeeping phase that the gap is inserted and with TAO there's not much you can do about it.
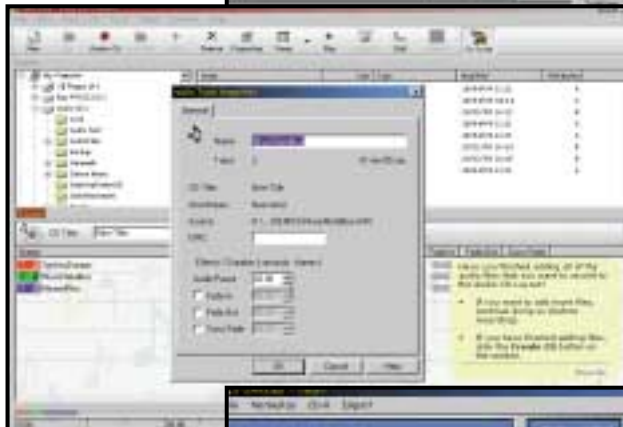
Top: Steinberg's WaveLab makes it easy to change the inter-track pause times and it's an absolute doddle to create several tracks from one large audio file
Middle: You can change the pause time in Adaptec's Easy CD Creator 4 Deluxe from a track's Properties dialog
Bottom: Steinberg's Clean offers easy access to the pause parameter and it can spruce up your audio recordings too

When writing audio CDs, you should always use DAO for several reasons. Apart from the fact that it gives you control over the gap, some CD players may click when playing TAO discs. If you're recording your own music and want to give the CD to a mastering house, it'll also need it in DAO format.

Do note, however, that not all CD-Rs support DAO – although the majority of modern machines do. Also note that not all software supports it but, again, most modern releases do. There must always be a gap of between two and three seconds before the first track. There's not much point in trying to change this as no-one hears it anyway.

Assuming you have the gear, all you do is select DAO writing, access the part of the program where the pauses are listed and change them. If they aren't listed, the software won't support changes, so you'll have to look for other software.

In the CD program section of Steinberg's WaveLab, for example, you can expand the individual track listing to reveal information such as the start and end times and the length of the pause. Double-click on the pause time, enter another one and Robert is your father's sister. You can increase, shorten or set the pause to zero. Other software which will also do the job includes Red Roaster from SEK'D and Sonic Foundry's CD Architect.

Okay, these are heavy pieces of gear, particularly WaveLab which weighs in at £399, but there are cheaper options. Adaptec's multi-purpose Easy CD Creator 4 Deluxe at £49 or less can do the job. After dragging the audio files into the layout area, right-click on one, select Properties and there's the pause time for you to change. Select DAO recording from the CD Creation Setup dialog box.

Steinberg's Clean at around £79 also allows you to change the pause time and it's right up there on the main page. Ahead's Nero can do it, too, and the pause is accessed from the track's Properties dialog.

If you're a bit strapped for cash, you can try CDRWin shareware (available from www.goldenhawk.com). It's fine for standard burning and although it can handle some of the more technical stuff, it's a bit of a pain to get your head around. You tend to get what you pay for, after all.

It can record in DAO mode and you can mess with the pause and other settings, but it involves manually editing the Cue Sheet which is a text file listing of the tracks and their settings. More than a touch anachronistic, I think you'll agree. If you otherwise like the program, surf to www.dcsoft.com/prod03.htm for a copy of CDRCue, which you may find eases the Cue List editing process somewhat.

Another common problem is that of dividing a continuous audio file, say from a live recording, into individual tracks. In fact, you can demonstrate your creativity by creating an album yourself consisting of one long file by cross-fading each track into each other. But, how do we tell when one tracks ends and another begins?

To do this we need to explore the murky world of sub-codes. We're going to have to get our hands a bit dirty, but the good news is there is software that lets you do what you need to do without having to look under the hood.

There are eight sub-code channels labelled P to W. Audio data is divided into frames (for the techies, a frame is
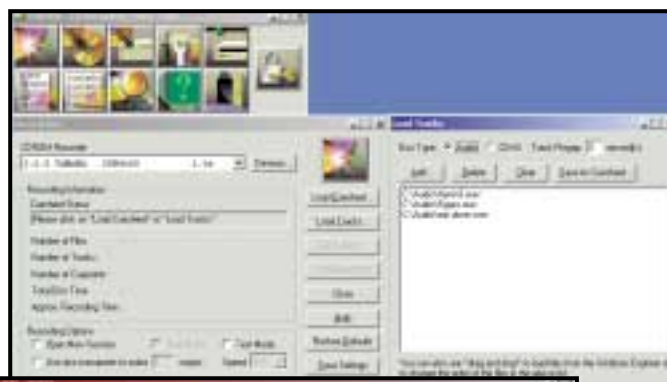
**Top: CDRWin lets you change the pause times, but you have to edit a Cue sheet in a text editor and it's a bit clunky
Middle: The Track Properties dialog in Nero shows the pause time between tracks and can be easily altered
Bottom: With Spark on the Mac you can specify whether the start, middle or end of a cross-fade will be used as the track index**

1/75th second) and the sub-code channels are small amounts of data in between these frames. The P and Q sub-codes store information such as the track start and sub-index information. There are a number of rules about setting PQ sub-codes, such as there should be silent frames before each track, sub-indexes should be early and so on. So, if you have access to the sub-codes from your CD-writing software and know the rules, all you've got to do is edit the codes.

Fortunately, there is software that offers an easier solution. Sorry to hark

back to WaveLab but it makes the job very easy indeed. You simply drop start and end of song markers into an audio file and save the file. When you import the file into the CD layout section, the tracks are already there.

Mac users should take a look at TC Works' Spark 1.5. It costs £299 but is a wave editor with a neat line in audio-effects processing, as well as being a whiz at assembling individual tracks into albums. You can adjust the pause time between tracks and create cross-fades between adjacent tracks. The best bit is that it even lets you decide whether the start, middle or end of the cross-fade is used for the track index.

If your software doesn't offer an easy way to divide a file into separate tracks or give you access to the PQ sub-codes, you could try a work-around by physically splitting the long file into several smaller track-sized files and then assembling them with a pause time of zero.

This may require experimentation and it may happen that some CD writers won't create a seamless join. Some CD players may not play it back seamlessly either, but that's the way it is with CD-Rs. Even though the technology has been with us for some time, all CD-R units are not the same. Even some combinations of CD-R drive and CD-R software can work better than others, although differences are generally more apparent in CD ripping than in writing.

If you're experiencing problems with your system or want to do some checks before buying a new drive, go to www.tardis.ed.ac.uk/~psyche/cdda.

CONTACTS

Hunt the picture

Ken McMahon looks at software that helps you keep track of your growing digital photo collection.

Keeping track of pictures has become a frustrating business for me, both at home and at work. While digital imaging – everything to do with the creation and manipulation of photographs – has come of age, keeping track of these pictures has taken a back seat.

At home, a kitchen drawer containing children's birthday cards from three years ago, bicycle parts and miscellaneous photos from the last decade of summer holidays has been replaced by a kitchen drawer containing children's birthday cards from four years ago, bicycle parts and a CD containing all the photos from last year's summer holiday.

At work I no longer have to hunt through plan chests, filing cabinets and in the gap between the light box and the answering machine for a transparency I last saw 12 months ago. Instead, I can happily spend an entire morning browsing CDs for an image I vaguely recall having skipped past while looking for something completely different.

In the professional arena, those who need to maintain large collections of pictures rely on picture database applications such as Extensis Portfolio. While they're not cheap, if your image library consists of thousands of pictures and you need to search it by keyword,
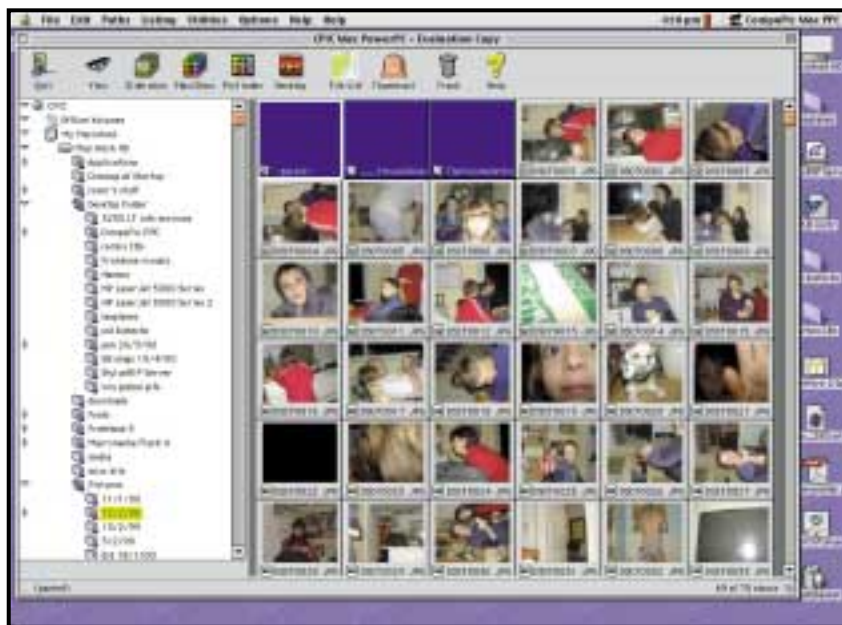
With Compupic's browser, Photoshop users can view their photos as thumbnails, making it easy to locate individual shots or perform batch conversions

this is the only sensible way to do it.

I don't have thousands of images to search and my problems are more mundane. Usually I gather together pictures for a project from a number of sources – CDs and online, royalty-free collections mainly – and chuck them all in a single folder. The problem then becomes one of browsing. I need to see thumbnails of all the pics at once to decide which ones I am going to use.

Even assuming you have a viewable thumbnail, scrolling down the file list in

Photoshop's Open File dialog box is a tedious process. Both Paintshop Pro and Corel Photopaint have excellent browsers. However, if you're exclusively a Photoshop user, a better alternative might be Compupic – a nifty browser application from Photodex.

Compupic displays thumbnail views of all images in a folder and also has slide

My problem is how to organise the torrent of digital pictures from my Fujifilm MX600 Zoom

show, preview and batch conversion features, as shown above.

Back home, my problem is how to organise the torrent of digital pictures that flows unabated from my Fujifilm MX600 Zoom. The first thing is automatic naming. Most digital cameras number images sequentially, the MX600 format prefixes each filename with DSCF, followed by a four-digit number with leading zeros. Hence you get DSCF0001, DSCF0002, etc.

If you're going to use a database to keep track of images, it's essential that

you rename them. This is vital if you have numerous directories all containing pictures with the same name, otherwise both you and your database are going to become severely confused.

I've been using PhotoSoap 2 for organising my personal photo library, because in my opinion it has got the best combination of database, viewing and editing facilities. One useful thing that Soap can do is automatically rename all your images. Once I've downloaded a card full of pics, I create a new desktop and open a folder of images onto it. Selecting Rename and entering a descriptive title will rename each pic with that title, followed by a two-digit number with a leading zero. The leading zeros are important, because without them number one would appear in the file list after 11, etc.

Another useful Soap feature is its ability to batch rotate. In any given batch of my shots at least 10 per cent are portrait and need rotating by 90 degrees. It helps if you always take your portrait shots with the camera turned in the same direction, then you don't have to do both clockwise and anti-clockwise rotations.

I used to do this with a Photoshop action, but it's much easier in Soap – you just Shift-Select all the portrait pics and select Rotate from the View menu. When you come to save the desktop, Soap tells you how many images have been rotated; you tell it to Apply and Resave into the same folder replacing the originals.

So what about searching for photos? Soap allows you to caption pictures and there's also a keyword field. But searches are limited to the currently open desktop. If you want to find all the pictures in your collection with the keywords 'needle' and 'haystack'; well, you need something more sophisticated.

Extensis Portfolio is used by photo libraries to organise and search picture archives and, though it might be considered overkill for your holiday snaps collection, provides powerful search tools to help you locate the right image.

When you import files into a Portfolio database, it automatically adds the filename and path as keywords and can thus track down images even when the originals are on unmounted volumes.

While Portfolio can't search across catalogues, you can create quite large catalogues with gallery views for parts of that collection. So you could keep adding to the catalogue for, say, an entire year and create a new gallery for each session.

With PhotoSoap 2 you can batch rotate portrait shots, so your pics are the right way round

Intellihance has lots of filters and effects and it's online

Portfolio doesn't have the image-editing capability of Soap. You can rotate thumbnails but not images, for example, but you can launch your image editor from Portfolio to carry out the rotation then update the catalogue. For this to work satisfactorily you must check the 'regenerate thumbnail' box, which can be found in the Rules tab of the Cataloguing

Options dialog. Needless to say, this whole process is much quicker and simpler if scripted.

I'm torn between Soap's good looks and simplicity and Portfolio's power features. One critical factor with Soap is support, being one of the casualties of MetaCreations reinvention (see *Hands On*, *3D Graphics*, *PCW* May 2000). It needs bug fixes and improved cataloguing features to complement its excellent retouching features and superb interface, but it remains to be seen if new owners Scansoft will come up with the goods.

Enhance your image

In January last year I showed how you can quickly make big improvements in image quality using the Intellihance plug-in from Extensis. Even a moderate outing with the digital camera results in too many images to make individual tweaking an option and you can run 20 images through the enhance filter in under a minute.

You can now try Intellihance online at www.creativepro. co.uk/. Last year Extensis turned itself into a 'dot.com' company and was recently taken over by Internet printing company ImageX.com. It is now offering most of its software as online services. As well as Intellihance you can preflight, frame and add special effects to your images. Other features of the site are a file format converter, RGB to hex converter, a stock photo library search

engine and directories of design studios, output bureaux and printers.

Online image processing is faster than you would expect. I managed to browse for, enhance and save back to disk a 300KB image all in less than a minute (the actual enhancing took less than 10 seconds. All the same, I wouldn't recommend it for your entire photo library. It does give you a chance to try it out though, and when cheap, high-bandwidth Internet access (ie ADSL) becomes a reality, I wouldn't mind betting this is how most, if not all, image processing will be done.

Panoramas – the last word

Yes, I know, I'm becoming obsessed with panoramic photography, but I promise that after this month I'll give it a rest. I just had to tell you about www.hotspots. hawaii.com/wrinkleintime where you can find what must surely be some of the most outstanding QTVR panoramas ever created. It's all part of something called Wrinkle 2000, a project involving 'panographers' all over the world who spun their cameras through 360 degrees on New Year's day. This has captured some stunning views (with the exception of Hastings and a particularly dull road somewhere in Argentina) from all over the globe at the dawn of the 21st century.

Abstract constructs

Benjamin Woolley finds that building 3D images from data sets can take you out of this world.

One of the attractions of 3D is that you can use it to explore places and phenomena that would otherwise be inaccessible. This applies particularly to the realm of science.

This month I want to look at two areas where science and 3D can come together, even in the modest setting of a graphics enthusiast's PC.

The first concerns an email I received a couple of months ago from Dr Stuart Leask, a clinical lecturer in psychiatry at Nottingham University. He is investigating the relationship between parents' weight and the birth weight of their offspring, and was looking for a way of plotting the results in three dimensions to compare particular parents against national averages.

Dr Leask produced a basic chart illustrating his results generated by a statistical package called S-Plus from Mathsoft. Being a dabbler in 3D with access to a copy of Caligari's Truespace, he was interested in seeing if there was any way of converting this chart into a 3D model.

In the trade, they call this kind of application 'scientific visualization', and there are lots of very complex and expensive packages available for doing it. However, Dr Leask wanted something simpler, which relates not just to the sort of work he is doing, but to anyone who wants to turn data into 3D models. All spreadsheet and statistical packages, after all, offer a form of 3D charting. All he wanted was a way of getting it to produce a chart that could be exported to a general-purpose graphics package such as Truespace.

No problems, I thought. There must be an easy way, a handy utility, a simple plug-in.

A web search showed that there is plenty of visualization software around,
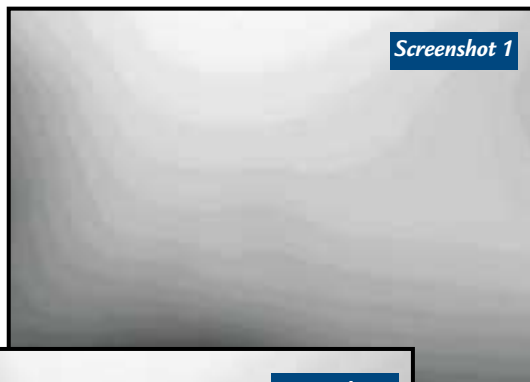
Screenshot 1
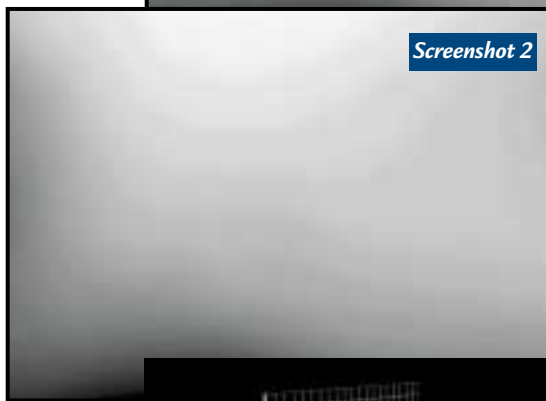
Screenshot 2
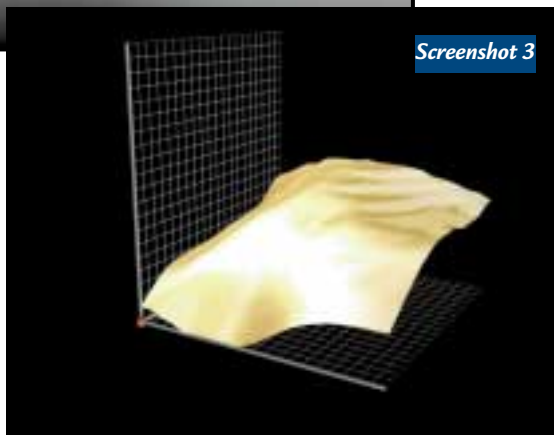
Screenshot 3

Top: Dr Leask's original contour map, representing the scientific data he wanted to visualize
Middle: A version of the contour map softened using the Gaussian blur facility in Adobe Photoshop
Bottom: The finished result. The gold lamé finish is optional

but nearly all of it is highly specialist and aimed at running on Unix workstations. I tried the various 3D graphics sites in the hope of discovering a conversion utility, but could find nothing.

So, I wondered if there might be a homebrew solution to the problem. Various renderers (notably POVRay) use

a scripting or 'scene description' language to describe the models and textures they render. The models are usually described by means of a numerical array, containing a list of co-ordinates. Such arrays look very like the sort of spreadsheet of sample data that Dr Leask had sent me, so I wondered if it would be possible to convert one into the other.

My cunning plan was to use VRML. A VRML wrl file is a text file containing a scene description. The idea was to use a 3D package to create a plane or 'quadpatch' with a vertex for each point in Dr Leask's data, export it as a wrl file, then cut and paste Dr Leask's results (appropriately scaled) into the array of coordinates in the VRML file.

Suffice to say, the result looked like something that had come out of a car crusher, and nothing like the curved surface I required. The problem was that in VRML there are two arrays describing the quadpatch, one comprising the co-ordinates that specify the position of each point in the patch, and the other the 'IndexedFaceSet', which as far as I could work out, represented the position and orientation of the faces that linked up the points of the plane.

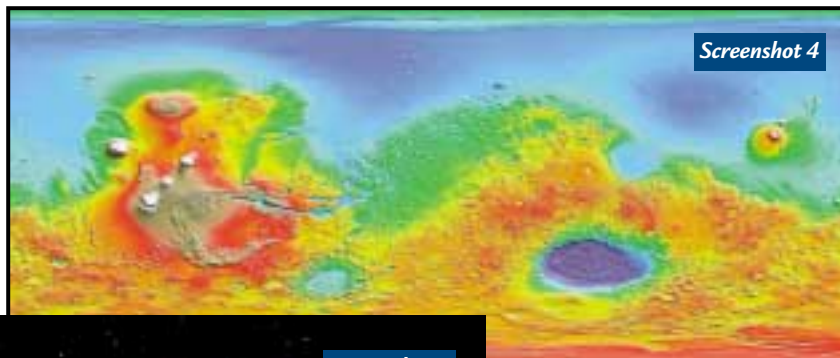Having failed with VRML, I had to resort to a less sophisticated, but more practical, solution. It transpired that Dr Leask's software could output the data as a 'contour map', with the distribution of values represented by different shades of grey. Unfortunately, the output image produced by his software (see screenshot 1) was not particularly promising. It not only used too few shades, creating a stepping

effect, but attempted to compensate for this by 'dithering', mixing lighter and darker shades to produce an overall effect somewhere in between.

In order to produce a smoother image, I used a filter called Gaussian blur in Adobe Photoshop (screenshot 2), which overcame some of the problems, although no doubt at the expense of accuracy. Still, the result was an improvement.

The next step was to turn the greyscale contours into geometry. To do this I used 'displacement mapping', a facility offered by many 3D packages. This is similar to bump mapping. The image is applied to a surface, such as a texture, and then the luminance of each pixel is used to determine the height of the corresponding section of the surface. The big difference between displacement and bump mapping is that the former actually changes the geometry of the surface, whereas the latter only changes its appearance once it is rendered.

The surface to which I applied screenshot 2 was a simple, flat plane. However, I had to decide how many faces and vertices it should have. The more faces, the more accurately it would

Screenshot 4

Screenshot 5

Top: Elevation map of the surface of Mars, generated by the MOLA instrument on the Mars Global Surveyor
Bottom: Slap Screenshot 4 as a bump map onto a simple sphere, add a star field to the background and you've got Mars

NASA may have had a bit of a bumpy ride with its Mars missions recently, but at least one of its probes is performing properly: the Mars Global Surveyor (MGS). This has an instrument on board known as the Mars Orbiter Laser Altimeter or MOLA, and it is producing some quite stunning results, many of which have been reproduced in the form of JPG image files. You can get access to many of them through the MGS website at the Jet Propulsion Laboratory (**mars.jpl.nasa.gov /mgs/**), including the one used in screenshot 4.

Screenshot 4 is a medium-resolution version of one of the elevation maps generated by MOLA. The colours represent the altitude of surface features. So, by applying the image as a bump map to a sphere, you get an accurate model of Mars, based on data taken directly from scanning the planet's surface.

There is a series of MOLA images and data files which you can download from NASA. They are available free of charge, although NASA places conditions on their use. Also, as you would expect, it's not NASA's job to provide texture repositories for 3D enthusiasts, so you will have to do a bit of hunting around to get hold of them. If you do, it is at least theoretically possible to download incredibly detailed images, based on MOLA data, and then use them literally to explore the surface of another planet.

By applying the image as a bump map to a sphere, you get an accurate model of Mars

reflect the colour contours of the bitmap, the fewer, the better it would average out such artefacts as the greyscale banding. In the end I opted for a plane with 800 triangular faces. I then added a simple gold texture for effect, and placed copies of the original plane along the X and Y axes, which I rendered using a wireframe texture (a 3D Studio feature) to get the mesh effect. The final result can be seen in screenshot 3.

Within a few days of first experimenting with this technique, I got

an email from Dr Leask informing me that a colleague had access to software that could generate a surface from the sort of data he was using – a bit of a setback after a lot of hard work. However, it turns out the software in question comes bundled with a laser scanner and costs around £5,000 on

its own. My solution cost a lot less than that.

Anyway, having started down this road, I am keen to hear from any other readers in the scientific world who have tried to combine their research data with 3D, successfully or otherwise.

NASA

The problems faced by Dr Leask evaporated when it came to using scientific data, or at least one form of it, from another source: NASA.

A trip to the C-side

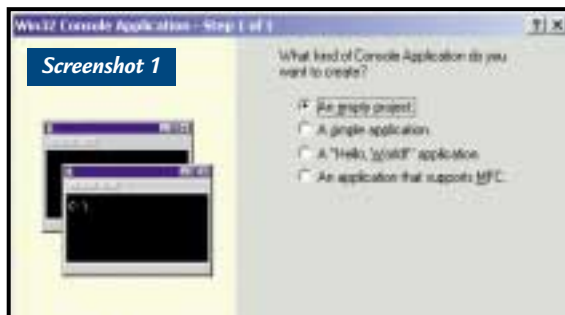**Tim Anderson explains how to create cross-platform C in Visual C++ and salivates over Kylix.**

I had an interesting email recently from Alastair Grant. He wanted to produce C programs (not C++) using his copy of MS Visual C++ 6. 'I have clicked here, there and everywhere, but I still can't seem to create a bog-standard command-based interface C program,' he complained. True, Visual C++ is bewildering at first, but creating a C application is not too difficult. From the File menu, choose New, Projects, Win32 Console Application.

In the next dialog, choose Empty Project (screenshot 1). You will end up with exactly that. Now go to File, New, C++ Source File, but for the file name use a .c extension, for example stuff.c. Then you can get coding. The simplest C application is just a few lines:

```
#include ✓
<stdio.h>
void main()
{
printf('Refreshingly easy\n');
}
```

(*Key: ✓ code string continues*)

Now the Build menu offers to compile an .exe from your project. On my system the debug build is around 150KB, while a release build comes down to 28KB, which makes a nice change from MFC applications.

And in Linux...

The great thing about standard C or C++ code is that it opens the door to cross-platform usage. It's interesting to note that while Java has grabbed attention as a cross-platform solution, key cross-platform applications such as Apache, Netscape Navigator or WordPerfect are written in C++. If you have Linux installed, including Gnu C++ (which comes with every Linux distribution I know), you can easily get started. From the command prompt or a terminal window, create stuff.c using your preferred text editor – vi, pico, kedit or whatever. Then type:

```
gcc stuff.c
```

You can usually use cc instead of gcc, as this is the standard name for a C compiler. Assuming a successful compilation, this creates a file called a.out. Run it by typing:

```
./a.out
```


Screenshot 1

Screenshot 2

**Top: Create a C application in Visual C++ using this dialog
Bottom: KDevelop offers an interesting Linux development environment reminiscent of Visual C++**

> ## Linux will have a development tool that is the equal of Delphi, one of the best under Windows

and you will see the output of your application.

If you want to work in C++ rather than C, simply use a .cpp extension.

Visual Linux

Whatever its advantages, compiling console applications from C code is not visual programming. Creating GUI applications on Linux is not so hard though – for example, you can use KDevelop, currently in beta but usable nevertheless (screenshot 2). It has a distinct Visual C++ look to it, although KDevelop is free software. There is a New Project wizard that creates skeleton KDE, Qt or console projects. The IDE has a split screen, with a left-hand panel offering a class view, two file views, and a documentation view that gives easy access to extensive documentation and tutorials. Qt, by the way, is a multi-platform C++ GUI toolkit that lets you build cross-platform Windows and Unix applications. If you can work with MFC and Visual C++, picking up Linux development with KDevelop should not pose a huge challenge.

Kylix is coming

A tool such as KDevelop, along with well-designed class libraries, makes it easier to do GUI development on Linux, but it is still a far cry from the drag-and-drop visual programming you get with Visual Basic, Delphi or JBuilder. The tool that is going to change all that is Kylix, the forthcoming Delphi/C++ Builder clone from Borland/Corel, availability of which is promised this year (screenshot 3, opposite). The core features of Kylix are a new native-code Linux compiler, together with a Kylix VCL (Visual Component Library) and a Delphi-like IDE (Integrated Development Environment). Both Object Pascal and C++ will be supported.

This means that Linux will have a development tool that is the equal of

Delphi, one of the best under Windows. You will able to drag a button onto a form, double-click to open its event handler, and write code that manipulates visual objects through properties and methods.

Linux is currently a great web platform and ideal for anyone who wants a feature-rich operating system for free. However, it is still difficult to recommend it for general-purpose use. The average business user would hate to be excluded from Windows applications, while non-technical home users would be cut off from most of the software they want to use. Dual-booting and emulation works, but is no real solution for those who want an easy life. With Kylix and Linux though, developers will be able to create custom applications for Linux as easily as for Windows, and at a significant price advantage.

The question on everyone's lips, though, is to what extent existing Delphi or C++ applications will port to Kylix. While details are not yet known, the broad answer is that it depends on your coding approach. If you want to build an application that ports easily, the answer is to avoid anything Windows-specific, such as direct API calls and COM/ActiveX components. Even the BDE (Borland Database Engine) may disappear, although classes such as TDataset will not. Borland has indicated that for database work both MySQL, covered in April's *Web Development* column, and Interbase will be supported.

No real-world application is going to

Screenshot 3

Screenshot 4
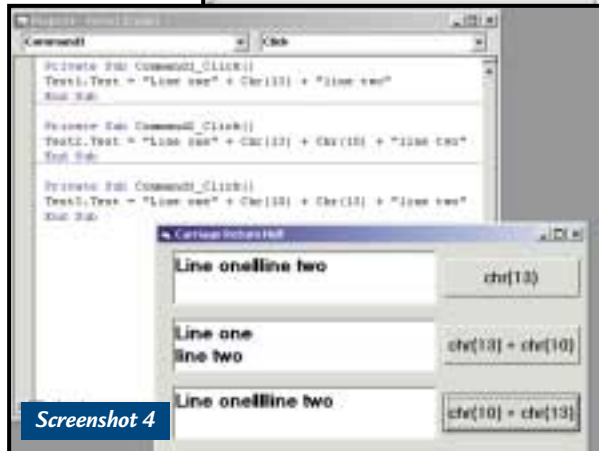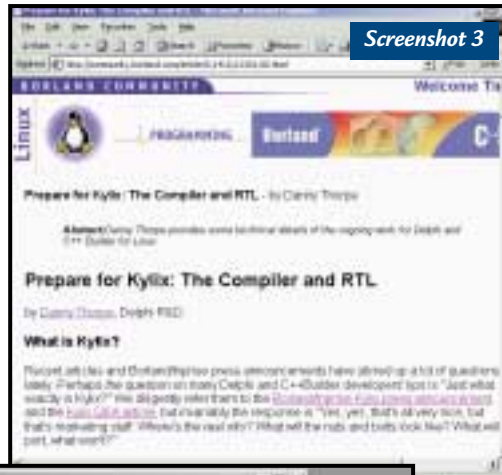
Top: Prepare for Kylix: Linux is to get true RAD
Bottom: Carriage return hell in Visual Basic

Preparing for the new era

Last month's *Visual Programming* column looked at COM development with Delphi. The month before was about JBuilder and this month highlights Linux possibilities. The common theme here is that successful applications in the new era will make few assumptions about what client they are running on. It is not the end for Windows, far from it. Windows 2000 is an outstanding operating system, and Microsoft has

The problem is the computer industry is inconsistent about how to end a paragraph

move seamlessly from Delphi to Kylix, and Unix is just too different. There is, however, an excellent prospect of a smooth porting process and, if it happens, it will be a first for VB and Delphi developers. The closest equivalent I can think of was VisualAge Basic for OS/2, which was a disaster.

some great web technology as well. However, it means the end for the assumption that everyone will be using Windows, whatever the outcome of legal challenges to Microsoft's market dominance. Change is being driven not by the law courts, but by the web, by the

spread of technology towards new kinds of clients, and by the obvious attraction of open-source or low-cost software that works well.

Carriage returns

It may seem a minor detail, but the humble carriage return is a constant irritation to developers. Reader A Davidson has written with the comment: 'The label recognises a chr(13) and puts a carriage return in – the text box, however, does not – so now I am stuck.'

Similarly, Peter Buxton asks: 'I have started to use Visual Basic 6.0 to create a Windows version of a text adventure, originally made in QBasic, but every time I use a text box for my output box the chr(13) doesn't give a carriage return, it gives a little black blob instead.'

The problem is that the computer industry is inconsistent about how to end a paragraph. Windows takes the view that a carriage return (which means 'go to the beginning of the line') is distinct from a line feed (which means 'go down a line'). In Windows, therefore, it is generally right to use the combination chr(13) + chr(10) and you should use them in that order (screenshot 4). A VB text box doesn't know what to do with a line feed followed by a carriage return, nor indeed a line feed on its own. You must also set the Multiline property to True, another trap for the unwary.

Unix takes a different view, and typically uses a single line feed character. The web has highlighted this, as many Windows users have experienced downloading something like a log file from a website, opening it in a Windows application, and getting one long line of text. A programmer's editor such as Premia's CodeWright is great for this kind of problem, as it understands Unix line endings and also has a hexadecimal view so that you can see exactly what's in the file. In this view a line feed appears as 0A and a carriage return as 0D.

The Mac, which Apple markets with the advertising slogan 'Think Different', uses the carriage return but not the line feed, giving maximum confusion potential.

MIDI development

Steve Berry wrote in to ask: 'I am new to visual programming (the last programming I did was on an Atari800XL

using Turbo Basic!), and I'm hoping to write an editor/librarian for my aging Yamaha FB01 sound module. Unfortunately, I just can't find any way to access the MIDI ports of my sound card (it's a SoundBlaster Live, but I'd like to be able to access any manufacturer's MIDI ports as I hope to make this freeware when it's finished). Most of the books I've read don't even mention MIDI.'

The sea-change in programming since 8bit Atari days is all about object orientation and the associated concepts of encapsulation and abstraction. The Windows API itself was not very object-oriented in its early days, but did use important ideas such as wrapping the details of printer drivers behind a device-independent API. As Windows and its API has evolved, it has gradually introduced greater levels of abstraction and encapsulation, making it easier to do multimedia programming, among other things.

There are three different approaches you can take for MIDI. The simplest is MCI (Media Control Interface). This is a simplified multimedia API that includes some MIDI functions. The Visual Basic Multimedia Control wraps MCI, but to get deeply into MIDI, MCI is inadequate.

A separate range of MIDI API functions offers low-level control and most of these functions begin 'MIDI...', so you can easily look them up in a Windows API reference. Finally, the up-to-date approach is DirectX, a COM interface to the multimedia features of Windows, including MIDI. This is the preferred route if you can find what you need in the DirectX API.

These things are not well documented from a VB perspective because, like all advanced Windows programming topics, there is an assumption in Microsoft's documentation that you are using C++. However, that does not mean you can't use VB or Delphi, but it does mean that you are stuck with C++ documentation.

Execute and wait

David Stern writes: 'I was interested in the short section on running apps from VB in your May 2000 issue. This looks fine, but it may not be what everyone needs. For some of my work I wanted to run another application and then know when it had completed so I could pick up some results from the other app. The Shell command seems to run
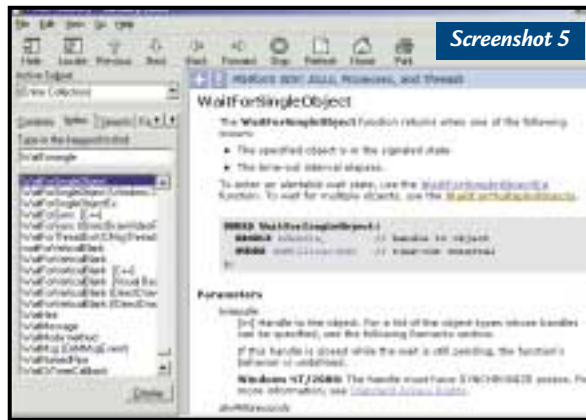
Above: The Microsoft Developer Network Library is the essential reference for API functions including WaitForSingleObject

asynchronously and, as far as I know, cannot do this.'

Stern goes on to give some example VBA code which he uses from Excel. The code is of particular interest because it uses Win32 synchronisation features, rather than alternative hacks such as having a Do Events loop iterate through top-level windows until the one you are interested in no longer appears.

The key to it is the WaitForSingleObject function (screenshot 5), for which the C declaration looks like this:

```
DWORD WaitForSingleObject(
  HANDLE hHandle,        // ↵
handle to object
  DWORD dwMilliseconds   // ↵
time-out interval
);
```

The time-out is self-explanatory, however, the handle is not. This can be a handle to a number of synchronisation objects, including a mutex, a process, a semaphore, a thread, or console input. In order to use this with an executable, you need a handle to a process object. This is obtained by a call to CreateProcess, another API function.

The only really tricky part to this is satisfying the demands of the 10 parameters required by CreateProcess, which handle such things as security attributes. Once this is achieved you can call WaitForSingleObject, using the handle of the process object obtained by CreateProcess, and your VB code will simply pause until the process has completed.

There are a couple of problems with code such as this. WaitForSingleObject really does pause the thread and, as VB is more or less single-threaded, that means

your application stops as well. This is poor user-interface design, as users expect to be able to do things like moving windows about their desktop irrespective of how busy the application is.

In the worst case, the called process might need a response from your application before it can quit, leading to deadlock. I realise that in most cases the intention is that the user is focused on the shelled process, rather than on the calling application, but it still strikes me as poor design.

One way to get around this is to use WaitForSingleObject with a timeout of zero. If it returns WAIT_TIMEOUT, then the process is still busy, otherwise it has completed. Now, once you have got the process handle, you can call WaitForSingleObject from a timer event. In your application, you will need to do the work of disabling invalid activities until the process completes. This also makes it possible to provide a way out, such as a Cancel option, in case of problems.

Stern's code is included on this month's cover CD in the Visual Programming section.

JBuilder example

In the May 2000 issue of *PCW* there is a JBuilder example application. Unfortunately, this featured a hidden challenge in the form of a line of code that was omitted. The line you need to add is the line beginning 'DefaultListModel'. The first line is given below for context:

```
public class ↵
InterestCalcFrame extends ↵
JFrame {
  DefaultListModel ↵
ResultsListModel = new ↵
DefaultListModel();
```

CONTACTS

Tim Anderson welcomes your feedback on the Visual Programming column. Contact him via the *PCW* editorial office or email **visual@pcw.co.uk**

Better browsing

Tim Anderson takes a first glance at Navigator 6.0 and offers a complete guide to Mime.

Everybody knows that Netscape Navigator used to be the most popular web browser by far. Then Microsoft competed aggressively for market share, in part by producing a superior browser, Internet Explorer 5.0. The great thing about IE, from the developer's perspective, is its rich support for a DOM (Document Object Model) and for Dynamic HTML, enabling a high degree of programmatic control over the contents of a web page.

By contrast, Netscape Navigator 4.0 is weak in its support for these same technologies. Furthermore, Navigator's <layer> tag, a key part of its DOM, appears to be a dead end. Web developers have the choice of either creating lots of conditional scripting code, supporting only Internet Explorer, or sticking to basic HTML 3.2 code that renders successfully on IE or Navigator 3.0 and higher.

The browser said to change all this is Netscape Navigator 6.0 (see screenshot 1). The alleged reason for the jump from 4.0 to 6.0 is that version 5.0 was an unreleased upgrade to the current 4.x range, while 6.0 is based on entirely new code from the open-source Mozilla browser project.

Mozilla provides 'Gecko', an embeddable cross-platform layout engine. The thinking behind Gecko is to support W3C (World Wide Web Consortium) standards for key features including HTML, XML, DOM, Cascading Style sheets and JavaScript. Another interesting feature is the OJI (Open Java Integration), which lets you easily update the JVM (Java Virtual Machine). Along with Microsoft's stated intention to support these same standards, with the contentious exception of Java, this should make life easier for web developers.

Screenshot 1
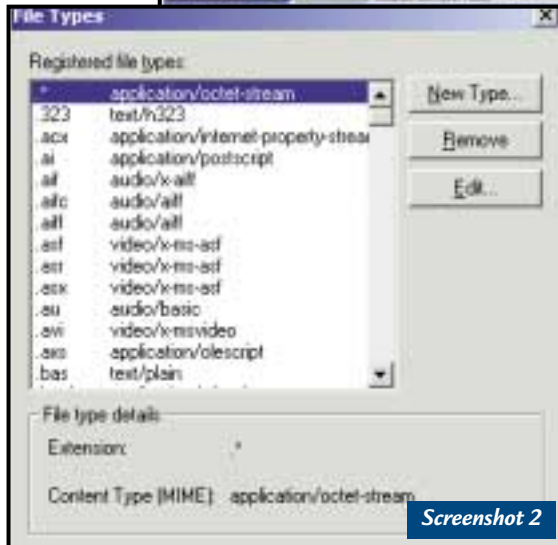
Screenshot 2

Top: Navigator 6.0 is a great prospect, but judging by the preview there is a lot still to do
Above: Configure Mime types in Internet Information Server using this dialog, found in the Internet Service Manager

The two key issues are: first, whether Microsoft will really support these standards to their fullest extent, and second, how long it will take for a usable Gecko-based browser to appear. Netscape has made a preview of Navigator 6.0 available for download and, while it is a fascinating product, it is also something of a marketing disaster, being slow, ugly and buggy. On Windows 2000 it was so bad that I resorted to using Internet Explorer 5.0 to peruse the online documentation.

The problem seems not to be Gecko, but XUL, an XML-based mark-up language for defining a user interface. This has great potential for enabling cross-platform applications, not only for browsers, but more generally as well. XUL has been developed by Netscape and is used for the GUI in Navigator 6.0. Unfortunately, it has resulted in a clunky interface, in this release at least, suggesting it may not be ready for general use.

Netscape Navigator, in both 4.x and 6.x versions, has one killer feature – cross-platform support. There is an IE for Unix, and version 5.5 has been well received on the Macintosh, but they are all different and come out at different times. By contrast, Netscape is using technologies that are cross-platform from the ground up. A cross-platform browser supporting the latest web standards is a mouth-watering prospect, but the Navigator 6.0 preview release is not a good advertisement for the project.

Mime and Freeserve's error

Mime stands for Multi-purpose Internet Mail Extension, so called because it was first used to describe email attachments. The idea is that a browser needs to know what sort of content it is receiving in order to render it properly. For example, a JPEG image is sent with a header that states 'Content-Type: image/jpeg'. The browser can then decide whether to render it, pass it to another application or plug-in, or offer to download it as a file.

For this to work, two things must be set correctly. First, the web server must be configured to send the correct header information. For IIS (Internet Information Server), this is a setting called Mime Map, found in the properties dialog for both the IIS service and individual websites, the latter taking precedence so that individual sites can have different settings

(see screenshot 2, opposite). With Apache, there is generally a configuration file called mime.types that lists the content types and associated file extensions.

Apache has a range of additional Mime options, including an AddType directive, ForceType, which automatically treats the contents of a given directory as being a certain type, and an optional extension called mod_mime_magic, which lets you check the actual contents of a file to determine its type. This is important if you have files that have the same extension but are of different types, for example, not all .doc files are Microsoft Word documents.

All this does no good unless the browser understands the Mime type. In Netscape Navigator you can configure this through the Edit, Preferences, Navigator, Applications dialog (screenshot 3). Internet Explorer, on the other hand, bases its decision primarily on registered file types in Windows. There is an API function called FindMimeFromData which runs though an elaborate set of rules to determine the Mime type, taking into account the data itself, the type proposed by the web server, and the information in the registry at HKEY_CLASSES_ROOT. Clearly this is also influenced by what is installed on the computer. It's no use identifying a WordPerfect document if WordPerfect is not installed.

Reader Darren Scourfield has a Mime problem. He placed some Excel files on his Freeserve site and found that, although Internet Explorer opened them correctly, in Navigator they filled the browser with rubbish. Darren contacted Freeserve and explained that while Word documents were correctly delivered at Content-Type 'application/msword', Excel spreadsheets were being sent as 'text/plain'. IE treats this as an ambiguous description and overrules it, but Navigator does not.

Freeserve told Darren: 'This must be a Netscape issue as IE works perfectly. We do not provide any support for that browser.' On the contrary, it is a web-server configuration issue that only Freeserve can resolve.
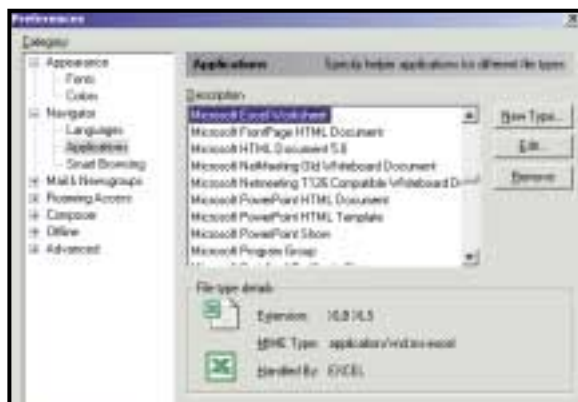
Screenshot 3
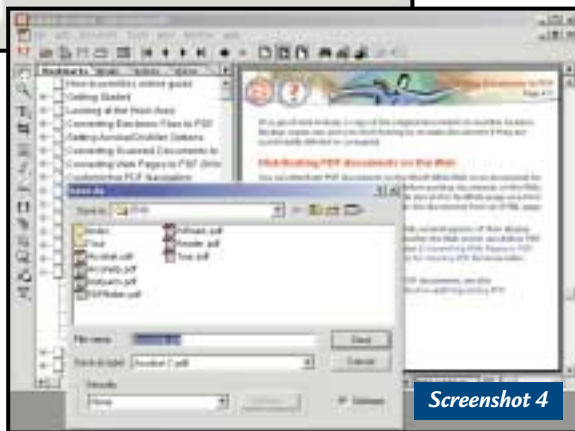
Screenshot 4

Top: Netscape Navigator's Applications dialog lets you configure the way the browser handles different Mime types
Above: Don't forget to check Optimize when saving Acrobat files for smaller, faster web documents

Acrobat on the web

Alex Godden writes with a similar query about Adobe Acrobat PDF files, asking: 'How do I get these files on and access them?' PDF files should be delivered with a Mime type of 'application/PDF'. In your HTML you can either link a .pdf file directly, with an <a> hyperlink, or embed it in the page using the <object> tag in IE, or the <embed> tag in Navigator. Using <object> (but not <embed>) means you can access the .pdf from script, which enables features such as a Print button on the web page. Another tip for displaying .pdf files on web pages is to ensure that the document is optimised for the web. This is an option in Acrobat's Save As dialog (screenshot 4).

For the best results with PDF documents on the web, use the page-at-a-time feature, which displays the first pages before the whole document has downloaded. There are three requirements for this to work. First, the web server must support byte-serving, as indeed most do, or else you can use a Perl script that Adobe offers on its website.

Second, the PDF must be optimised as described above. Third, the browser must have the plug-in or ActiveX control for Acrobat installed. With the exception of the optimisation step, all this happens pretty much by default. All you need to do is to upload the .pdf files to the web server and link to them in your web pages.

The snag with all this is that PDFs viewed seamlessly in the browser are only saved as temporary files. If you later want to view the same PDF, there is no guarantee that it will still be there. In other words, you might end up downloading the same large PDF time and again, which is a waste of time. For this reason, a lot of people prefer to right-click a PDF link and choose Save As, which overrides the Mime type and downloads to disk as a file. A common question is how to enforce the Save As dialog, rather than having the PDF open in the browser. This is not particularly easy, but one possibility is to send a false content type, say 'application/octet-stream', which would normally raise a Save As dialog. This would mean either reconfiguring the server, or else sending the file from a script with full programmatic control over the header. This is arguably poor practice, and it is better simply to give clear instructions about how to right-click a link.

Mad for the Microdrive

Mark Whitehorn confirms his love of IBM's tiny drive, and sees the miracle of folding keyboards.

My initial evaluation of IBM's Microdrive was wildly enthusiastic, but a long-term view is often useful to gauge the true value of new technology and allows the early enthusiasms to be tempered by experience.

But I still love it! The Microdrive has proved to be fun and extremely useful. The main reason for this is the ease with which it can be moved between devices. Every piece of kit I've yet slotted it into has readily recognised it as well as the file system that it uses, be that a laptop, Pocket PC, Hewlett-Packard Jornada, Canon digital camera or various Psions.

This file system is the common denominator. It enables files to be shared but doesn't, of course, mean that the files themselves can be used on the different machines. For example, JPEGs appear to be universally recognised, although exchanging documents between a Psion and a Jornada is somewhat more problematical.

You can't, of course, read Word documents on a camera, but all devices can dump their files to the Microdrive and, where appropriate, these can be read by other devices.

of 1GB could be developed without any trouble, but IBM later pulled back from this stance, apparently on marketing grounds. This decision has been overturned recently and the latest story is that a 1GB Microdrive should be ready in the summer, not too long after you read

IBM's Microdrive can be moved between devices very easily

this article. It seemed to me a crazy notion to suppress a larger-capacity drive and I'm really delighted to hear of this change of heart.

IBM also recently announced technological advances that make it possible to increase current data density by about 100-fold. If you're interested in a really techy explanation, look at

IBM went all-out to achieve the small size, perfecting the mechanics of the tiny head...

When it launched the Microdrive, IBM went all-out to achieve the small size and concentrated on perfecting the mechanics of the tiny head, motor and platter. The data density on the platter was very conservative. Last November, one of the designers told me that a Microdrive with a storage capacity

www.sciencemag.org where, for a small fee, you can download a detailed scientific paper from Volume 287 dated 17 March 2000, page 1,989. In a nutshell, it's a new technique for laying down a regular grid of very small magnetisable particles. That should eventually give us 100GB of storage in a PDA.

Palmtop GPS

I know this isn't the first time I've waxed lyrical on the heavenly union between Global Positioning System (GPS) units and Psions, but the two go together so well that they form one of my favourite play things. Whenever I've mentioned the subject, a flurry of email arrives, due to the problems associated with first connecting and then persuading various combinations of kit to work together.

Up until now it has been the preserve of the confirmed gadget-head and tweaker because it often involves getting out the soldering iron to make up a cable.

Happily, Palmtop Software has produced a GPS unit that comes with everything you need to get up and running, so you don't need to reach for the soldering iron. The device works with the Psion 5, 5mx, 7 and netBook, as well as the Ericsson MC218. Palmtop's Route Planner Millennium (Europe) software is also included.

The GPS unit itself is a small, sleek, not-quite-square black box, about the size of a tape measure, with a connector that plugs into your car's lighter socket and another that plugs into the PDA. The unit has a magnetic pad so you can sit it on the roof of the car.

The major plus point of the Palmtop GPS is the ease with which it all works: you simply plug it in and away you go. It does have a few limitations, the first being that it won't work outside the car so you can't take it walking.

The anorak side of me wants to say that, given a 12v gel battery and a cigar lighter-type connector, you could wire it up so that it did work elsewhere. And then, of course, you could fit a resistor to drop the voltage down so that a separate feed could be used to

Screenshot 1

Screenshot 2

Screenshot 3

Screenshots 1-4:
A folding keyboard for
the Palm caught in the
act of unfolding

Screenshot 4

run the PDA, but that's getting back into the realms of amateur electronics, so I won't bother.

The satellite signal is still wobbled by the US Government and the effect of this, coupled with the vector graphics used in the mapping software, means that you can be driving along apparently several fields away from the road. But this problem isn't limited to the palmtop GPS. Off-roading of this sort doesn't bother me a jot – moving maps are simply great fun.

The current price is a steal at £169.99. For more details, check out the company's website at www.palmtopsoftware.com.

On the GPS theme, I heard from Dave Bagshaw (davidbagshaw@vodafone.net) regarding GPS equipment for yachts. He says that 'the GPS system had its own rollover date in August 1999, when the almanac week was set back to one from 1,023, I think. This has caused problems with older kit in the yacht-grade equipment.' Let's hope that all this resetting of almanacs is finished for a while.

Add on, plug in, roll up

I've been carping on recently about power supplies and this has led me to an interest in the selection of hardware gizmos that people also carry around. At a presentation given recently by Microsoft in Seattle, I sat next to an American journalist who had the new Palm 7 plugged into a foldable keyboard. Sitting there, in the presentation, he could take notes and, using the wireless capabilities of the device, file his story via email. I'm still working out whether it all looked cool or nerdy, but for those Palm users in the UK who fancy a

foldable keyboard, check out www. thinkoutside.com or www.palm.com as Palm is now also selling the keyboard under its own brand name. (see screenshots 1-4)

I have also just started seeing adverts for roll-up keyboards, but I presume these don't plug into PDAs – not yet anyway. I'll do some investigation and let you know – or if you already know, please drop me a line. The roll-your-own keyboard can be found for £50 at The Gadget Shop (01482 626 400).

Speed tests

I received an email from Brunel Merleau-Ponty (ponty@phullphatt.i12.com), who has been performing further research into Psion speed benchmarking, a hare which I started last December with the following results:

His old Organiser II XP, which is an earlier variant of the LZ, with only a 2 x 16cm display, a slower processor and a different display chip, crawled in with a despicable 978 seconds for the

screen test, and 611 for the processor.

He also pointed out that the test used floating-point variables, which really only test the quality of the floating-point unit (FPU) emulation rather than the CPU, as none of the Psions have dedicated FPUs. He ran the same tests with long integer variables. The screen write tests were much the same (just a couple of seconds faster), but the Series 5 blazed in with seven seconds and the Organiser II with 100 seconds on the processor test!

To save you looking up the original data it is shown in figure 1 below.

Playtime

Last month I raved about Shadowgate, a successful port of an old DOS game to the Pocket PC platform. Pocket PC is being touted as the Palm killer because of its graphics (ie games) and sound capabilities, but there are some satisfying

FIG 1			
Machine	**Write** **1,000 statements**	**Perform** **100,000 increments**	**Processor**
3	149	231	3.84MHz, 16bit
3a and 3c*	150	139	7.68MHz, 16bit
5	50	51	18.432MHz, 32bit
3mx	44	42	28MHz, 16bit
5mx	27	13	36MHz, 32bit
* The 3a and 3c performed identically. Since the screen and processor specs are identical for these two, this seems perfectly reasonable.			

Of chemistry, five fingers and Osaris

Periodic Table

One of the great joys of writing this column is the way in which the email I receive about it enriches my own life. For example, given a normal existence, I would never have received an email from a Mr Toast regarding the Periodic Table of Elements. You know, the big chart that hangs on the wall of every chemistry lab in every school in the land.

Mr Toast has computerised the Periodic Table and put it on to a Psion 5. The download (from http://mrtoast.home-page.com) is only 13K and the table works fine. It's even interactive; you can highlight an element and put up extra information about it. I thoroughly recommend it, so much so that it is on this month's CD-ROM to save you the download time.

But you don't care about that, do you? Just like me, you are more interested in knowing why the author uses the name Mr Toast. I didn't ask him, but I suspect the answer lies somewhere in his real name, Crispin Semmens.

Five-finger exercise

Ian Baker (macsales@imagian.demon.co.uk) wrote in on the topic of the Microwriter. He said: 'For those who liked the five-fingered keyboard, there is one available to connect to Macs and PCs. The Infogrip BAT uses different chords to the Agenda, but it is still a joy to use. If anybody is interested then contact me and I will put people in touch with the importers.'

Osaris

Simon Ramsay (simon_ramsay @mail.com) says he has recently bought an Osaris palmtop and would like to know whether there are any websites from which he can obtain any shareware or freeware for it.

I can't help with this one, but does anyone else out there think they can do better?

games available for existing PDAs.

One that appeals to me is a game I first mentioned in the November issue, No Man's Land for the Psion. It's a battle strategy game, but your first task is to sink oil wells to generate the revenue that you will spend on your army.

The ensuing conflict is controlled entirely from an overview of the battlefield, but that overview is unusual because what you see is what you get. In other words, what you see of the enemies' activities is determined by the landscape and by the intelligence you've gathered. Tanks can be sent in for reconnaissance, but when your troops move in the buildings may still be there but the enemy force may have decamped.

The game reminds me of my misspent youth, playing a board game called Tanks, which was designed by Lieutenant-General Sir Brian Horrocks. I wonder what his email handle would have been.

**Top: The armchair warrior strikes again in No Man's Land
Above: Great Ape, where the games hide**

The game is driven entirely with the pointer and I found it challenging, especially once past the first few levels. Visit www.greatape.com for details.

If you're the type who prefers a parlour game, there's an excellent five-pack available from Purple Software, containing Checkers (Draughts), Enigma (which is modelled on the Mastermind board game), HomeRun (a form of Patience), Theole (aka Reversi) and Yacht (aka Yahtzee). The latter is a game that should appeal to anyone interested in probabilities: five dice are rolled three times and you can choose not to re-roll any that have fallen to your liking.

This is where probabilities first come into play. Your aim is to get the highest possible score in 13 hands, but your scores must fit into pre-defined slots – and scoring your hands is the second manifestation of probabilities. Head over to www.purplesoft.com if we've whetted your appetite.

Safety first

Roger Gann has a round up of the defences you could and should employ to protect your network.

Over the past few columns I've looked at the threat posed to individual PCs connected to the Internet and the steps that can be taken to minimise the exposure to risks. This month I'm going to wind up my foray into security by looking at network security in general.

Risk is increasing all the time and companies now have less and less control over their networks, thanks to factors such as outsourcing and third-party service providers. But despite this, while the headlines might lead you to believe that assaults on your network originate from socially dysfunctional teenagers with too much spare time, the most recent computer crime statistics indicate that the majority of computer attacks are carried out by insiders – employees and associates of an organisation.

Back in the mainframe days, network security was simple – it meant locking the room the computer was in and only allowing authorised individuals in. The perimeter was easily drawn: it was the room enclosing the central computer.

Today, with networked PCs, the perimeter is less well defined. Connecting an enterprise network to the Internet made the perimeter even fuzzier. With the potential for modems on every desktop,

If it's constant updates on security alerts you're after, mosey over to www.bugnet.com

the network-security perimeter becomes even harder to discern. 'A crunchy shell around a soft, chewy centre' is a good analogy, but sadly, few enterprises today actually have a provably crunchy shell.

Many believe the proliferation of the Internet has spawned the current rash of attacks. Not so – some 74 per cent of these security breaches come from the inside, usually perpetrated by employees and competitors, according to the American Society for Information Security.

Nearly two-thirds of security breaches are accidents and not malicious.

The corporate network remains an easy target for the simple reason that so few have any sort of formal security policy: a recent Forrester Research report slammed extranet security, saying that 'firewalls are crude; passwords are a hack; DMZs (demilitarised zones) are a bear; and point products are a stop-gap'.

Given the business-critical nature of corporate information and the cost of security breaches, it's surprising that so many organisations, particularly small to medium-sized companies, have such poor network security. The lack of complete, multi-platform solutions capable of handling every variable on any given network is one factor, cost is another: spending on security is a cost centre, not a profit centre – after all, the best that can happen after you invest in expensive security is nothing.

However, few realise that reactive (rather than proactive) spending on security invariably works out more

Firewalls and the enterprise

As a breed, firewalls are being downsized and becoming more affordable to small to medium-sized networks. However, setting up a firewall still requires a strong technical understanding of the principles of TCP/IP and other networking protocols and technologies. Despite their initial complexity, most of the simpler firewall packages have preset security policies, but let you develop your own network security policies, as you grow more familiar with them.

The firewall market leader and collector of the most 'Best Buy' accolades is undoubtedly Check Point Software Technology's FireWall-1. This product originally employed 'stateful packet inspection' techniques, but its architecture has begun to incorporate aspects of proxy-based products. In cases where scanning a packet's data field is necessary, FireWall-1 passes the packets to a Content Security Server, which basically acts as a proxy. By using stateful

inspection and proxies in concert, FireWall-1 can take advantage of the former's speed and the latter's security. The software provides the best security and most flexible administration and monitoring in its class. Its event-logging capabilities are also first-class and no other firewall offers a true single point of management for multiple firewalls.
www.checkpoint.com/products/firewall-1/

But the market is awash with

good alternative firewall solutions, including:
Cisco Secure PIX Firewall
www.cisco.com/warp/public/cc/cisco/mkt/security/pix/
SAFEsuite from Internet Security Systems
www.iss.net
Gauntlet Firewall
www.nai.com
Sidewinder Security Server
www.securecomputing.com/index.cfm?skey=232
Raptor for Windows NT4
www.axent.com/AXENT/Products/RaptorFirewall

expensive, even allowing for the cost of the clean-up operation after the damage: it seems that companies have to suffer a significant breach of security before they take the issue seriously.

Effective network security is not a technology issue; it's a management one. Companies that consider information as an asset and not just a stock item in a data warehouse have a positive approach towards security. Good practice starts with companies identifying their security needs and establishing a formal security policy. Such a policy can't exist in a vacuum; it has to be all embracing, including things such as sexual

harassment or protection of intellectual property.

Once a security policy has been determined, it's important to make sure it's effective. Every organisation should also set up their own computer emergency response capability; create roles and responsibilities, points of contact and procedures to follow when a security incident occurs. HR has a role to play in security, too: experts say most security breaches can be avoided through training, by fostering a security-conscious culture within a company.

A complete enterprise-security solution must provide the ability to:
● Grant selective network access to authorised remote and corporate users
● Authenticate network users with strong authentication techniques before granting access to sensitive corporate data
● Ensure the privacy and integrity of communications over untrusted, public networks such as the Internet
● Provide content security at the gateway to screen malicious content, such as

Top 10 security threats

● Casual mistakes
● False sense of security
● Disgruntled employees
● Viruses

● Email
● Hackers
● Unauthorised modems
● Third party connections

● Portable PCs, which expose data in a public environment
● Dial-up connections

viruses and malevolent Java/ActiveX applets
● Detect network attacks and misuse in real time and respond automatically to defeat an attack
● Protect internal network addressing schemes and conserve IP addresses
● Ensure high availability to network resources and applications
● Deliver detailed logging and accounting information on all communication attempts

Left: Another must-visit website is Microsoft's, at **www.microsoft. com/security** *Below:* **www.icsa.net** *is a top online security resource, covering the whole spectrum of security issues*

Security components

No single network product offers a complete security solution – this typically derives from a combination of products. A firewall is often the first mechanism deployed (see previous columns). Mainly used to insulate networks from the outside world, some companies are now deploying firewalls at internal perimeters as well, to compartmentalise networks; after all, why should the HR and Finance departments be accessible to say Sales?

Content screening, courtesy of products such as MIMEsweeper, is becoming a popular feature in Internet firewalls. The traffic logs they generate can make for interesting reading – a

multinational customer of Content Technology recently monitored its email traffic over an eight-month period and typically found 600,000 emails per month contained some 'profanity' while a further 200,000 had binary attachments.

At the other end of the spectrum is anti-virus software, which is primarily a detection-and-response mechanism. This desktop software, even with less than complete coverage in an organisation, is extremely useful and effective in stopping the spread of computer viruses throughout an enterprise.

Another family of prevention-and-response systems is the class of products called intrusion-detection systems (IDSs). There are two types of IDSs: monitors and scanners. Monitors, or vulnerability checkers, are static analysis tools. They look for known problems such as bad passwords or missing security patches. They also can check for changes to important system or data files.

Scanners are dynamic analysis systems that look at events as they happen, and there are two types. Anomaly detectors detect the abnormal and misuse detectors detect 'bad' events.

Another security technology is application-level encryption. With this kind of encryption, users can lock documents stored on a computer disk or messages sent via email. Easily integrated into software, and assigned for use to individuals, encryption software provides individual accountability, enterprise-wide authority, and confidentiality.

Finally, don't forget, the most elementary security needn't cost money. Ensuring that users employ non-obvious and frequently changed passwords costs nothing and will deter most hackers. All network operating systems allow you to set access levels for users – so make sure access control is properly implemented.

CONTACTS

Roger Gann welcomes your comments on the Networks column. Contact him via the *PCW* editorial office or email **networks@pcw.co.uk**

PERSONAL COMPUTER WORLD BUYERS' CHARTER

MAIL ORDER PROTECTION SCHEME (MOPS)

When you order goods as a *private* individual reader from a UK supplier's advertisement in *Personal Computer World* and pay by post in advance of delivery to that Mail Order Advertiser, which subsequently ceases to trade and goes into Liquidation or Bankruptcy prior to delivery of such goods, you may, under the 'Buyers' Charter', qualify for compensation, providing:

1. You have not received the goods or had your money returned.
2. You have followed the *Personal Computer World* guidelines when placing your order (see overleaf).
3. You have taken all reasonable steps to effect delivery or refund.
4. You have retained irrefutable proof of purchase, for verification purposes:
a) A copy of the original advertisement from which the goods were ordered.
b) Comprehensive proof of payment.

GUIDELINES

Claims must be submitted so as to arrive 'NOT EARLIER THAN TWENTY-EIGHT DAYS AND NOT LATER THAN THREE MONTHS' from the official on-sale date of the magazine. Claims must be submitted to the Customer Services Manager IN WRITING, summarising the situation and lodged strictly within the time schedule stated. *Claims received outside this period will not qualify for consideration for compensation under the 'Buyers' Charter'.*

Once a supplier who has advertised in this magazine has become subject to either Liquidation or Bankruptcy proceedings and upon completion of all winding-up procedures, *Personal Computer World* guarantees to expeditiously process those *private* individual readers' claims made and submitted, in accordance with those procedures outlined, up to the following limits.

a) £2,000 in respect of any claim submitted by one Private Individual Reader.
b) £100,000 in respect of all advertisers so affected in any one year.

These sums define the Publisher's maximum liability under the scheme, and any additional payments above and beyond these thresholds will be entirely at the Publisher's discretion. As soon as legal confirmation that a state of liquidation or bankruptcy exists, the processing of claims will immediately commence. If, however, assets are available and the receiver/liquidator appointed confirms that an eventual payment will be made by way of a dividend, all claims under the 'Buyers' Charter' will be subject to reprocessing and will take into account any shortfall which may then exist. Payments under the scheme will also take into consideration the obligations and liabilities of other interested parties, such as credit card and/or insurance organisations, etc.

EXCEPTIONS

This guarantee only applies to advance postal payments made by *private individuals in direct response for goods itemised/illustrated in display advertisements*. It does not cover goods ordered from advertising Inserts or Cards, classified advertisements or MicroMart, or Catalogues obtained from, or supplied by, any advertiser regardless. *Similarly, protection does not exist in relation to purchases made as a result of reviews and/or editorial comment.*

The 'Buyers' Charter' is designed to safeguard the *PRIVATE individual reader*. It does not provide protection to any companies, societies, organisations, unincorporated bodies or any other commercially orientated outlet of any description. Neither is cover provided for orders placed from, or to, any overseas suppliers or for goods purchased for resale.

CAVEAT EMPTOR

Readers are reminded that the Mail Order Protection Scheme was solely implemented to provide protection to the private individual when goods are ordered 'Off the Page' and paid for by post. *It was not designed for, nor will it offer any protection, in the event whereby goods are purchased via the Internet.*

CREDIT CARD PROTECTION

Always pay by credit card when ordering goods valued in excess of £100, thereby ensuring maximum protection in the event that an advertiser ceases to trade prior to such goods actually being received.

DISCLAIMERS

Readers are reminded that the opinions expressed, and the results published in connection with reviews and/or laboratory test reports carried out on computing systems and/or related items, are confined to, and are representative of, only those goods as supplied *and should not be construed as a recommendation to purchase*. Whilst every precaution is taken to ensure that reliability and good business practices prevail, the Publisher cannot be held responsible for the overall trading activities of any supplier referred to, or advertising within, this publication.

HELPING HAND

Each month Anthony George, our customer services manager, gives advice on what to watch out for when buying computer equipment off-the-page.

The payment of a deposit – for goods which may be temporarily out of stock, for example – is normal procedure, but it is extremely important that the customer agrees beforehand with the supplier what will happen to the money should, for whatever reason, the sale fall through. If such an event occurs and the fault is with the supplier, they would obviously refund your deposit. If, on the other hand, you withdraw from the purchase, then legally, the deposit immediately becomes the property of the trader.

Contrary to popular belief, the trader is perfectly entitled to retain the money, especially in circumstances where a custom-made, or specific article is ordered and then subsequently rejected without good reason. Indeed, in such an event, the trader may also claim loss of profit in addition to the money deposited. However, for goodwill purposes, your deposit is usually refunded.

Deposits paid under a CREDIT AGREEMENT which was signed anywhere except at the trader's place of business are subject to specific rules, as previously explained in *PCW*'s September, October and November 1999 issues.

Liquidation/bankruptcy
When you pay a deposit for goods by any means other than a credit card and the company ceases to trade and becomes the subject of liquidation and/or bankruptcy before delivery takes place, your only course of action would be to claim from the appointed liquidators. This may not, however, apply to 'off-the-page' buying. Please refer to *PCW*'s Buyers' Charter, left, for further details.

In such circumstances, the customer is, regrettably, the last in a long line of creditors, which invariably include, banks, the Inland Revenue and the company's employees and so on, so the chances of securing the return of your money is very slim indeed. If, however, your deposit was over £100 but less than £30,000 you will be able to claim this from the credit card issuer.

I will deal with interest charges in next month's issue.

Anthony George, Customer Relations Department, VNU Business Publications, VNU House, 32-34 Broadwick Street, London W1A 2HG

Order form

Use this form when you order by phone, fax or post.

SUPPLIER'S DETAILS

COMPANY ....

SALESPERSON'S NAME ....

ADDRESS ....

....

....

.... POSTCODE ....

DATE OF TELEPHONE ORDER .... / .... / .... TIME ....

ORDER REFERENCE NUMBER (IF QUOTED) ....
DESPATCH REFERENCE NUMBER ....

CUSTOMER DETAILS

NAME ....

COMPANY ....

ADDRESS ....

....

....

.... POSTCODE ....

DATE OF TELEPHONE ORDER .... / .... / ....

ORDERED BY: ☐ TELEPHONE ☐ FAX ☐ POST

ADVERT APPEARED IN PCW:
ISSUE DATE .... **PAGE** ....

QUANTITY	DETAILS OF ORDER	UNIT COST £	TOTAL £

METHOD OF PAYMENT

☐ PERSONAL CHEQUE ☐ PURCHASE ORDER ☐ CREDIT CARD
☐ C.O.D ☐ DEBIT CARD ☐ OTHER (SPECIFY) ....

CARD COMPANY ....

ISSUE NUMBER (debit cards only) ....

START DATE .... / .... / .... EXPIRY DATE .... / .... / ....

CARD NUMBER .... / .... / .... / ....

SUB-TOTAL _____

DISCOUNT _____

CARRIAGE _____

SURCHARGES _____

VAT _____

TOTAL _____

SIGNED ....
DATE ..../............/...........
DAYTIME TELEPHONE NUMBER ....

DELIVERY ADDRESS ....
....
.... **POSTCODE** ....
AGREED DELIVERY DATE .... / .... / ....

Purchasing Guidelines

There are several steps you can take to help ensure that the buying process is smooth and trouble-free. We'd like to suggest these main guidelines:

● **KEEP RECORDS**
When you phone a supplier, make a note of the name of the person you speak to, and when. Note down any claims they make for the product in which you are interested, or any specifications they mention. If you are unsure that what they are offering is right for the task, then ask.

● **GET A FULL SPEC OF THE MACHINE**
Before you place an order for a machine, insist on being faxed or emailed a full specification, detailing all components and peripherals. Check what is included: for example,

when buying a printer, are all cables and cartridges bundled in? If you've used a review in a magazine to guide your decision, make sure that what is quoted matches what you have read. Sometimes, machine specifications can change from the model sent for review.

● **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.

● **USE CREDIT CARD PROTECTION**
When you place your order, use a credit card. The Consumer Credit Act ensures that credit card purchases between £100 and £30,000 are covered. Check the address to which the goods will be sent. Often, if you buy with a credit card you can only receive the goods at the address on the card. If you are buying over the Internet, make sure you are using a secure server, sometimes denoted by the prefix 'https'.

● **SET DELIVERY DATE AND CHECK WHAT IS DELIVERED**
This gives you some comeback if the goods are not delivered on time. When the goods arrive, check the packaging before you sign for them, to guard against damage in transit.

Faxback Service

Missed a feature or a review?
Try our 24-hour faxback service.

Updated every month, our easy-to-use Faxback service gives you instant access to a complete range of product reviews, features and workshops via your fax machine. To use the service, simply follow the instructions below. Calls are charged at 50p per minute at all times, with an average duration of four minutes.
Our service is available 24 hours a day, 365 days a year. (The faxback service is not available outside the UK).

1 From the choices below, select the article(s) you wish to receive. Note the number of pages in the article.

2 Using the handset on your fax machine, dial 09065 600632. If you do not have a handset, press the fax machine's On Hook or Telephone button, then enter 09065 600632 on the keypad.

3 There will be a vocal introduction to the Faxback service which will ask you to enter the code of the article(s) you require. The voice will then ask you to press the Start/Send button on your fax machine.

4 The article(s) you have requested will then come through your fax machine.

IMPORTANT INFORMATION

In order for the faxback service to function correctly, you must have your machine set to use tone dialling (you may find that you need to switch your machine from 'pulse' to 'tone').

Should you have any problems with the *Personal Computer World* faxback service, please call 0870 909 0113. This helpline is open from 9:00am to 5:30pm, Monday to Friday and calls are charged at the standard rate.

Other articles are available for faxback. For a full list please enter the code 2000 (3 pages).

Faxback Table

PCs and Notebooks	Issue	Pages	Code
PII *vs* PIII PCs	June-99	13	2011
Budget PCs	September-99	11	2013
Notebooks	September-99	8	2014
AMD Athlon PCs	October-99	10	2016
Ultimate home PCs	November-99	12	2017
Small business PCs	December-99	12	2018
Turbo PCs (11 compared)	March-00	11	2019
PCs for £999	February-00	13	2020
Hardware Group Tests	Issue	Pages	Code
3D graphics cards	June-99	6	2119
PDAs and handhelds	July-99	10	2120
Communications hardware	August-99	11	2121
Inkjet printers (budget, small business and photo)	October-99	11	2122
Scanners	November-99	8	2123
Monitors (17in and 19in CRT)	November-99	5	2124
Graphics cards (21 cards compared)	December-99	15	2125
Digital cameras (22 cameras compared)	January-00	15	2126
Best of 1999 PCs – 11 *PCW* winners fight it out	January-00	11	2127
Laser printers	February-00	12	2128
Motherboards (30 models compared)	March-00	17	2129
Hard drives	April-00	10	2130

PCW Faxback number: 09065 600632

Faxback Table (cont'd)

SOFTWARE GROUP TESTS	ISSUE	PAGES	CODE
20 Top Utilities	October-99	8	2221
Accounting software	November-99	9	2222
Web editors (10 packages compared)	December-99	9	2223
Image-editing software	January-00	11	2224
Speech recognition (4 packages compared)	January-00	5	2225
DTP	March-00	10	2227
Databases	February-00	12	2228
Visual programming tools	April-00	9	2229
HANDS ON	**ISSUE**	**PAGES**	**CODE**
Linux part 1	January-99	3	2313
Linux part 2	February-99	3	2314
Linux part 3	March-99	3	2315
Website construction part 1	March-99	3	2316
Website construction part 2	May-99	3	2320
Website construction part 3	June-99	3	2322
Multiple boot	July-99	2	2323
Setting up a webcam	December-99	2	2326
DIY dual-Celeron PC	January-00	3	2329
Calculating loan interest	February-00	2	2331
Programming with Perl	February-00	3	2333
Web development – displaying live data using ASP	February-00	2	2334
Publishing data without an online database	May-00	2	2335
The new brood of digicams	May-00	3	2336
SMALL BUSINESS WORKSHOPS	**ISSUE**	**PAGES**	**CODE**
Building a small network	September-98	5	2402
Ecommerce for small business	October-98	5	2403
Building your own web server	November-98	6	2404
Hubs and network starter kits	February-99	4	2407
Firewalls and net protection	March-99	3	2408
IT training for your small business	April-99	4	2409
Backup solutions for your small business	May-99	4	2410
Building a five-user network	September-99	5	2412
Setting up an email server	October-99	5	2413
Remote working	October-99	5	2414
Be a millionaire on the web	February-00	4	2417
All-in-ones vs phone, fax & modem	February-00	3	2418
Ecommerce – setting up your business on the web	March-00	7	2419
50 website tips	April-00	6	2420
WAP workshop	May-00	4	2421
GENERAL FEATURES	**ISSUE**	**PAGES**	**CODE**
Office 2000	June-99	5	2519
Anti-virus	August-99	5	2521
Memory	August-99	2	2522
Upgrading	December-99	6	2524
Windows 2000	February-00	5	2525

PCW Faxback number: 09065 600632

The PCW Bookshop

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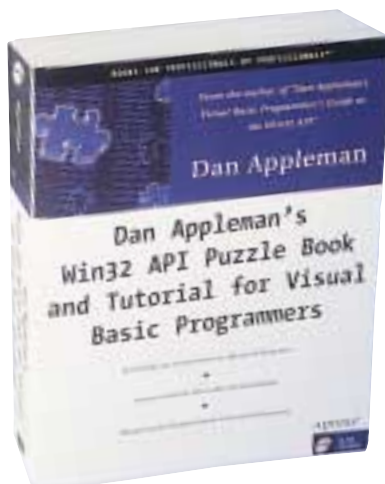
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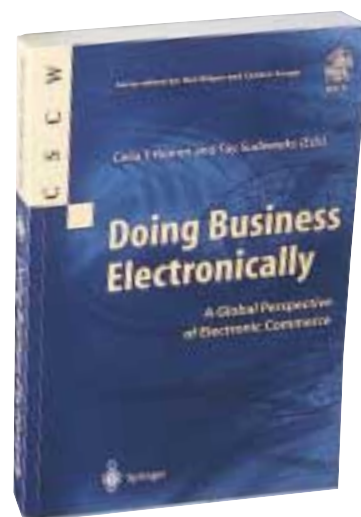
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Edited by Celia T Romm & Fay Sudweeks; 208pp
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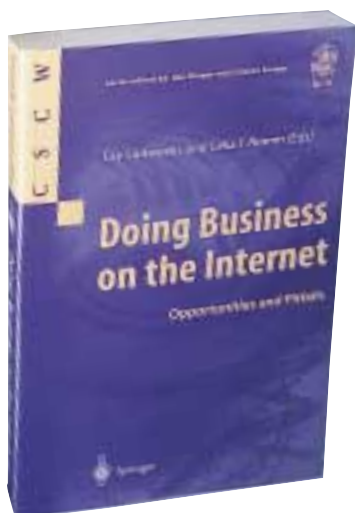
Doing Business on the Internet

This covers all the major aspects of electronic commerce – general, commercial, social and cultural – addressing issues such as the implications of real-time transactions for financial institutions; integrity and security; and how networked communities can benefit from global collaborative systems.
Edited by Fay Sudweeks & Celia T Romm; 296pp
RRP £35
PCW reader price £31.50
PCW subscriber price £28.35
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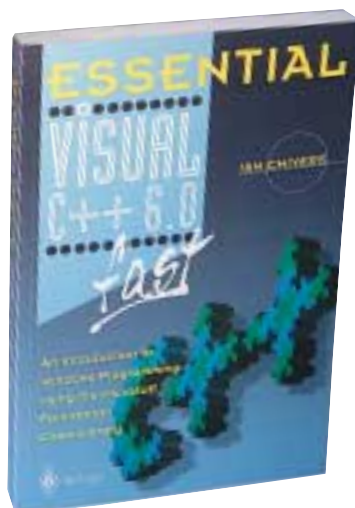
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Author: Ian Chivers; 224pp
RRP £14.95
PCW reader price £13.46
PCW subscriber price £12.11
  ORDER REF SPR04

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A complete introduction to Java 2, this book will show you how to take advantage of Java 2's new features (such as the abstract windowing toolkit and the swing classes) for creating graphical user interfaces. It is designed for professional developers or students who need to learn the maximum in the minimum time.
Author: John Cowell; 256pp
RRP £14.95
PCW reader price £13.46
PCW subscriber price £12.11
  ORDER REF SPR05

Directory of Product Suppliers

LEISURE LINES

contents

Grand Prix 3

One of the best driving simulations is to get a follow-up. Grand Prix 3 will be the latest in Geoff Crammond's successful series of games. It is a fully licensed product, and we have been told to expect real teams, drivers, tracks and races. Unlike EA Sports' latest offering, though, it will concentrate on the 1998 season, as opposed to the current one.

Driving a Formula One car isn't as easy as popping down to your local newsagent – controlling the speed and direction of the cars is a lot more difficult than it looks on the television. Luckily, there are a number of driving aids included in the product that'll help those who just want to drive and not worry about spinning off the track.

We're expecting the game to be a polished simulation and a completely new physics system is promised. You'll be able to make adjustments to your car, changing things such as the springs, dampers and ride height, all of which affect the way the car performs.

The menu system has been overhauled to make it easier to access the different areas of the game. Realistic weather effects are present, so expect rain and wind alongside glorious sunshine.

LAN support for four people and above will be built in, along with direct serial link. It doesn't look like you will need a 3D accelerator to run the game, although there will be a large benefit if you have one. We'll have a full review as soon as we get the final code.
www.grandprixgames.com

JASON JENKINS

Vampire: The Masquerade

The next few months should see the release of a new RPG game, Vampire: The Masquerade – Redemption. This title will use Nihilistic software's Nod engine, allowing the scenes to be rendered in full 3D. It uses the White Wolf role-playing system and plenty of strong back-story is promised. This started life as a board game and the developers are hoping they will be able to recapture the success of that for the PC.

You will play Christof – a vampire who is forced by his nature to feed on the blood of humans. You'll need to employ stealth tactics, though, for if too many mortals discover your identity, you'll be killed. However, you're not on your own, and as the story unfolds over a period of 800 years in four different cities, you'll get to meet fellow vampires. They will help you to fight off the mortals, as well as solve the numerous puzzles that will come your way.

At this stage, it is not entirely clear whether the developers are going to try to translate the gameplay exactly from the board game to the PC, or try to make it accessible to those who have not played the board version before.

Multiplayer support is promised to be something to write home about – the storyteller mode allows one player to create an entire adventure and host it for a group of players to saunter through. Keep a look out for more in a future issue, and while you are waiting, take a look at www.activision.com.

JASON JENKINS

The Devil Inside

A great mix of gun-toting and game show adds a new twist to this blow-'em-to-bits shooter.

Here we go again – a blood and guts gore fest to entertain the gaming masses. Ultra-violent shoot-'em-ups seem to be all the rage these days and the strange thing is that almost all of them – from Kingpin and System Shock 2 to Half Life and Soldier of Fortune – are excellent. Perhaps it says something about the nature of what we find entertaining. No matter – The Devil Inside is a worthy addition to the genre, as it features not just extreme nastiness, but also a splendidly constructed storyline.

It goes something like this: you play a man called Dave who likes to run around in the dark with a gun investigating paranormal goings on. What you don't know when you start off is that Dave has a penchant for cross-dressing – give him enough skin-tight leather and he turns into his female counterpart, Deva.

Deva is actually a foxy little devil of sorts and has all manner of mystical powers, but we'll leave them for you to discover. The twist in the tail is that the action takes place against a backdrop provided by a futuristic game show à la *The Running Man* (which inspired the French developers of this game), featuring a roving cameraman and links from a splendidly cheesy, crimpolene-clad, studio-based host. The various threads of the story all come together well and impart a certain frisson of excitement to each new development in the game. A pat on the back has to go to crazy Frenchman Hubert Chardot for the contributions from his Alone-In-The-Dark-warped mind.

Anyway, let's put the light, yet filling, entrée that is the plot to one side and sample the delights of the hard-core action of the stodgy main course. The first thing most gamers will notice is that the minimum specs listed on the box will barely get this off the ground. We were only able to get it running smoother than Michael Johnson by using a Pentium III 750MHz with a stonking great chunk of a 3D graphics card inside. You won't need that much power to play, but be warned.

The effort is worth it, as right from the off the graphics are sumptuous indeed. The lavish visuals reflect the game's French heritage – The Devil Inside harks from a long tradition of graphical adventures that have previously tended towards the cerebral side of the genre.

Animation of the characters (and there are dozens of zombies and spooks for you to hang out with) is equally detailed, as are the splattery bits. As shameful as it is to admit, blowing arms and legs off the festering undead can be rather satisfying. Sick? Maybe. Fun? Without a doubt. Even the studio audience seems to get a kick out of it, judging by the crowd noises.

The show unfolds from a Croft-esque third-person perspective, which can be irritating, especially when running round corners or negotiating tricky locales. Most action fans prefer the first-person style of Quake and its siblings, however, adjusting only takes a little time. Some of the gameplay can feel very linear, as you rush from one task to the next, but when it's this much fun, who cares? One final negative comment concerns the controls, which somehow feel odd and restricting, particularly because you have to press a key twice simply to make our protagonist run forward.

In spite of the negative aspects of The Devil Inside, there are plenty of great moments that will keep players hooked – just wait until you get the chance to fish around in the toilet bowl for an important clue, for example. The gender-bending transformation into Deva is almost worth the price of the ticket alone, while there's always something surprising around the corner ready to carve itself a slice of Homo Sapien sashimi. This one's a keeper – get it before the Powers That Be force us all to play 'nice' games.

J MARK LYTLE

DETAILS

★★★★★

PRICE £39.99 inc VAT
CONTACT Cryo Interactive 01926 315 552
www.devil-inside.com
SYSTEM REQUIREMENTS Pentium II 266 (Pentium III recommended), 32MB of RAM (64MB recommended), Direct X-compatible 3D graphics card, Windows 95/98

RECOMMENDED
PERSONAL COMPUTER WORLD

Messiah

Gory detail, violent action and the ability to possess your enemy. What more could you want?

From the people who brought you Earthworm Jim and MDK, Shiny Entertainment's next installment is the long-awaited Messiah. It's been in development for some years, but despite this it requires a lot of downloading to make it work properly. Once patched up you're ready to literally fly into Bob's world, where this endearing winged cherub has to clean up a futuristic, but sinful Earthly and lunar wasteland. Satan has taken control and it's your mission to save humanity from destruction.

Messiah is a game both gory in detail and violent in action, but it's terribly addictive. Some may say it's blasphemous in nature, particularly considering that the angelic lead has the ability to possess beings, including the odd rat here and there.

However, most gamers will probably be more interested in the gameplay that we found kept us glued to our keyboard. At first glance, you may be forgiven for thinking that Messiah is a traditional third-person shooter, and at times it is, but there are also a lot of puzzles to solve. Bob's ability to possess other beings adds a new dimension to the action and makes a welcome alternative from the usual gun-wielding commando scenario.

There are four major locations: The Metropolis, The Second City, Orbit and Dark Side of the Moon – all of which are split into five levels. Some levels are trickier than others, with puzzles that can be solved in a variety of ways, and this is where your innate ability to possess all things organic comes in handy. Some tasks can only be completed if you have possessed the relevant being, whether it be a nuclear technician, corrupt cop or even a suspender-clad prostitute. So don't be reckless. Kill everything in sight and you may find that you're trapped in that level. If you start shooting indiscriminately, you'll find yourself in severe trouble – cops will come rushing from all corners and gun you down.

Graphics are splendid. The maps are exceptionally well rendered, with the movements of the characters fluid and lifelike. Messiah is one of the first games to use Real-time Deformation and Tessellation (RT-DAT) technology. The Real-Time Deformation component creates a more realistic wire-frame membrane that deforms and creases in all the right places. The tessellation part of the engine actively adds and subtracts polygons depending on the complexity of the scene. The idea is to keep the speed of the game at a more constant level.

The AI (artificial intelligence) of the other computer-controlled characters is also very impressive, especially when they become accustomed to your possessing antics. Once this happens, you'll find the enemy deciding to employ such avoidance tactics as ducking and circling behind you. Messiah comes with a separate audio CD containing tracks courtesy of Fear Factory, which adds something to the overall atmosphere and gives you the opportunity to really get immersed in the gameplay.

Unfortunately, it's not all good news. The shipping version is full of bugs, many of which will have been fixed by the time you read this. You'll need to download a large patch from Shiny's website, though, so if you're one of those people who can't stand the thought of mucking around to get a new game to work, then this isn't for you.

Shiny claims it will eradicate all the problems that US gamers have experienced so far. You'll also almost certainly need to upgrade your graphics card drivers to work with the new engine as well, but this is par for the course with many of today's PC games.

Messiah will keep you more than entertained for the duration. With an unusual take on the standard single-player game, along with its excellent graphics and soundtrack, Messiah is a game worthy of five stars. The fact that we had to spend a long time downloading a large patch and new graphics card drivers though, means that we had to deduct a star. But if you don't mind this, it's well worth a play.

JALAL WERFALLI

DETAILS
★★★★

PRICE £34.99 inc VAT
CONTACT Interplay 020 7551 0000
www.messiah.com
SYSTEM REQUIREMENTS Pentium 233 (Pentium II/350 recommended), 16MB of RAM (96MB recommended), 16MB OpenGL or DirectX-compatible graphics card, DirectX-compatible sound card, Windows 95/98

Dogs of War

Use your resources wisely and you'll be rewarded with this high action, strategy game.

First impressions of Dogs of War are something along the lines of Play Mobile meets Jurassic Park. The opening video sequence contains figures, alarmingly similar to the aforementioned children's toys, running stiffly across an apocalyptic backdrop, pursued by roaring dinosaur-like creatures – the stuff of children's nightmares. However, this initial impression is soon stifled when the game is played. The repeated presence of the 'mission failed' screen quickly reveals that this 3D strategy game requires careful control if you're not to be killed – repeatedly.

The interface for Dogs of War is initially tricky to grasp. The reason for this is the versatile nature of the in-game views, a feature that highlights the title's exceptional graphics. The camera can occupy any 3D position over the landscape, as well as locking onto a third-person view for direct control of specific units during the action.

Movement of the camera is a little cumbersome, with the rotation and tilt controlled by the arrow and shift keys, and the zoom controlled either by clicking the mouse on the zoom icons, or through the keypad's plus and minus keys. A more intuitive camera movement and zoom mechanism, perhaps completely mouse driven as in Homeworld, would have been better. Nonetheless, once you get used to the interface, Dogs of War becomes a lot more appealing as you endeavour to put an end to the wholesale slaughter that your tiny soldiers have had to endure.

The background to the game isn't dissimilar to others in the genre: warring factions battle for dominance on a planet devoid of anything resembling peace. But Dogs of War tries hard not to be defined by the standard norms. There are two opposing forces on the war-torn planet, but there's an additional race as well. The Mantai are an indigenous reptilian species, with characteristics that allow them to fulfil military roles. They're not unlike the alien bugs from Starship Troopers: flying reptiles, armoured or flame-throwing reptiles, and so on. The bonus is that once the human missions are completed there's the option of playing as the Mantai. So if controlling an army of reptilian military analogues is your thing, then this may be the game for you.

Another aspect that breaks the mould of the genre is the removal of resource harvesting as a dominant element of the gameplay. Instead of harvesting resources to make credits to build units, Dogs of War employs a system similar to the campaigns of the Close Combat series. You have an initial number of troops who are with you through the campaign (assuming you don't get them killed), and these progress in rank as the game progresses. At the start of each mission the available weaponry appears in the 'staging area', to which further units can be added from the armoury, based on the credits you have accrued and the availability of weapons. Before the battle commences, you decide on the force you'll use. This ultimately translates into a more realistic battle because when you lose a helicopter it's lost for the rest of the mission and you can't just build another.

Dogs of War grows on you the more you play it. The interface may deter a lot of people, but if you're prepared to persist, the game is both challenging and enjoyable. It's not the most immediately playable game, but features such as the direct control option make it a diverse and interesting action/strategy game. It's just a shame about the initial interface learning problems – without these, it would have easily earned five stars.

SCOTT MONTGOMERY

RS: Urban Operations

If you liked Rogue Spear, the multi-player mode could be enough to keep you interested.

It's inevitable that a well-received game will have the mission pack add-on sooner or later. Rogue Spear is the latest game to have exactly this, with Urban Operations.

Its real worth will depend on how much you enjoyed Rogue Spear. Mission packs never stray far from the original concept and the single-player level only offers five additional missions, with very few new weapons to choose from. This is clearly territory for the home commando dying to play any new missions.

The new missions all involve close combat in highly populated areas, such as the London Underground. This gives a slight twist to the formula, with your team protecting innocent bystanders as well as shooting terrorists. In practice,

this tends to mean that the innocents get shot a lot and the mission immediately fails. Annoying to say the least. The old problems are still there, with some points in the game incredibly difficult to pass, as a lone terrorist, unfairly in a strong position, can easily wipe out your team.

Where Urban Operations, like Rogue Spear, scores well, is with the multi-player side of the game. In addition to the new

single-player missions, some Rainbow Six – precursor to Rogue Spear – maps have been thrown in, with eight new multiplayer maps. In addition to this, a new multi-player mode – team defence – has also been included. If anything, this makes the mission pack worth picking up, as the new options will spark some new interest in the game.

It's not a groundbreaking pack by any means, but for lovers of the original formula it is well worth a look.

DAVID LUDLOW

DETAILS
★★★

PRICE £19.99 inc VAT
CONTACT Take 2 Interactive 01753 854 444
www.roguespear.com
SYSTEM REQUIREMENTS Pentium 233, 32MB of RAM (64MB recommended), 3D graphics card, Windows 95/98

Euro 2000

If you really must have another football game, then they don't come better than this.

When we received this latest football title from EA Sports, our first thoughts were, does the world really need another football game? EA Sports seems to think it does, and after playing the game we were forced to agree.

Euro 2000 is impressive both in its playability and its attention to detail. For the novice player there's an excellent training section that tutors you through the basic moving, tackling and shooting manoeuvres. But there are also more

advanced moves available, which you'll want to learn when the basic ones are mastered. Thankfully, only the basics are required to start playing the game. Although be warned, once you've played a bit you'll be itching to get to grips with the 360-degree spin dodge.

The detail throughout the game is meticulous: from multiple-player shadows on the pitch cast by floodlights, to scenes of players stretching legs to stop cramps during extra time. The lighting is especially good, with evening games having a night-time feel. The movement of the players is fluid and detailed. Players can trip while tackling or being tackled and their bodies visibly tense up as they sprint towards the ball. The level of realism even highlights the less palatable aspects of football with the inclusion of the 'harmful tackle' – frightening, albeit accurate.

Overall, Euro 2000 is a playable and enjoyable title. If it's a realistic football game you're looking for then this is the one for you. It is also as accurate and up to date as a football game can be expected to be. The question you need to ask yourself is, do I really need another football game on my shelf? If the answer is yes then Euro 2000 is a great choice.

SCOTT MONTGOMERY

DETAILS
★★★★★

PRICE £34.99 inc VAT
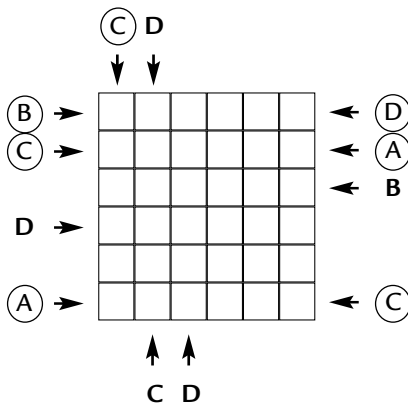**CONTACT** EA Sports 01932 450134
www.ea.com
SYSTEM REQUIREMENTS Pentium 200MMX (Pentium II/300 recommended), 32MB of RAM (64MB recommended), 2MB video card (8MB or greater Direct 3D-compatible Video Accelerator recommended), Direct X 7-compatible sound card, Windows 95/98

ABC, easy as 1-2-3

Each row and column in the grid below originally contained one A, one B, one C, one D and two blank squares. Each bold letter refers to the first of the four letters encountered while travelling in the direction of the arrow, while each circled letter refers to the second of the four letters encountered when travelling in the direction of the arrow. Can you complete the original grid?

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 (July 2000), VNU House, 32-34 Broadwick Street, London W1A 2HG, or by email to: letters@pcw.co.uk. Answers should not arrive any later than 20 June 2000. Please note that we DO NOT open attachments.

April's Prize Puzzle answer

The 'Legal wranglings' puzzle prompted an enthusiastic response. To recap, the puzzle involved two law students, uniquely named Jim James and Bob Roberts.
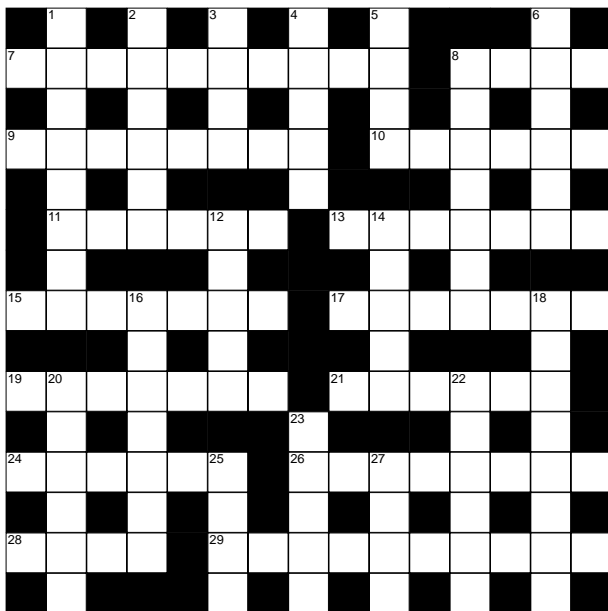
James had loaned his friend Roberts £5,000, to be repaid when Roberts won his first case. But Roberts never took a case until James took him to court over the money. Yet both lawyers remained confident they couldn't lose. How could this be?

Bart Cuffe of Swindon, Wiltshire, correctly identified the solution. From Robert's point of view, if he loses the case, then according to the original arrangement, he will not have to pay back the money. If he wins, then the court will still rule that he does not have to repay anything.

From James' perspective, if he loses the case, then Roberts will have won his first case and will have to pay back the money. If James wins, then the court will order Roberts to repay the money.

Congratulations Mr Cuffe, your prize is on its way.

prize crossword

ACROSS
7 Allowing for simultaneous sending and receiving (4-6)
8 A ____wall protects a system from other systems (4)
9 Started again (8)
10 Defined part of a disk (6)
11 Join a file to another (6)
13 Fixed amounts of storage on a disk (7)
15 Work out the code (7)
17 A jump from one site to another (3, 4)
19 Partial internal stores for data (7)
21 Communications protocol and Muppet! (6)
24 Software box requiring an answer (6)
26 The second T of HTTP (8)
28 Microsoft's WP package (4)
29 The largest computers (10)

DOWN
1 Good at maths (8)
2 Nearly (6)
3 Iron decay (4)
4 Woodland clearing (5)
5 Choppers (4)
6 Slot (6)
8 Based on real life (7)
12 Frolic (5)
14 Atmospheric layer (5)
16 Gave away in a draw (7)
18 Chatted (8)
20 Agreement (6)
22 Lose (6)
23 Remove clothes (5)
25 Sports match (4)
27 ____ Romeo, make of car (4)
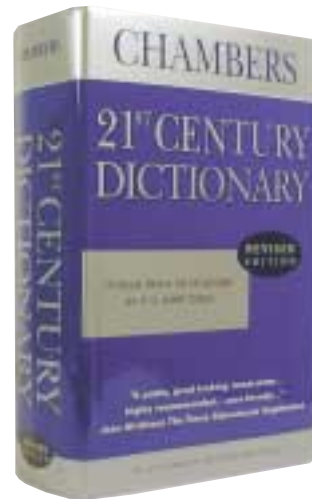
Each month, one lucky *PCW* Crossword entrant wins a copy of the *Chambers 21st Century Dictionary*. The winner of May's crossword puzzle is: Oliver Jolley from Lancashire.
This time, it could be you. Send your completed crossword to:
'*PCW* July – Prize Crossword',
VNU House,
32-34 Broadwick Street,
London W1A 2HG,
to arrive no later than
20 June 2000.
• *Please state clearly on your entry if you do not wish to receive promotional material from other companies.*

Solutions to June's crossword

ACROSS: 7 Bytes 8 Read 9 Port 11 Sector 12 Explorer 13 Java 15 Bug 16 Erase 19 Scanner 20 Default 23 Pixel 25 OCR 26 BIOS 28 Netscape 30 Scroll 32 Mail 33 Boot 34 Table

DOWN: 1 Hype 2 Restrain 3 Revenge 4 Adapt 5 Uproar 6 True 10 Grabbed 14 ASCII 17 Salvo 18 Heiress 21 Arboreal 22 Boredom 24 Easily 27 Lambs 29 Edam 31 Lily

WIN Packard Bell Spirit PC or ATi graphics card

This month, award-winning PC manufacturer Packard Bell is offering one lucky *PCW* reader the chance to win the stylish Spirit PC, worth £1,999. Packard Bell's new concept in PC design combines stylish looks with pure computing power. Based on an Intel Pentium lll processor, this 500MHz PC has an S3 Savage 4 AGP graphics chip, a USB hub and an eight-speed DVD drive. All Packard Bell PCs have free, unlimited access to the Internet (excluding dial-up), email for life and a built-in 56K modem. And let's not forget the PC's sleek and stylish NXT technology flat postcard speakers and a stunning 15in TFT digital flat-panel display, which is in keeping with the sophisticated design of the PC. The winner will also gain peace of

mind with Packard Bell's 12-month on-site warranty.

Three runners-up will also each receive an ATi All-in-Wonder 128 graphic card. This highly rated graphics card is perfect for anyone wanting a multimedia board. Powered by the Rage 128 chip, the card boasts a TV tuner, video in and out, MPEG-2 encoding, not to mention 3D acceleration.

■ *For a chance to win either of these great prizes, just answer the question below and follow the 'How to enter' instructions opposite.*
What speed is the Spirit PC's modem?

1) 28.8K
2) 33.6K
3) 56K

How to enter

Fill in the coupon and send it to the following address by 30 June 2000:
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, Packard Bell and ATi. *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 July 2000 competition entry form

Name:

Email address:

Daytime telephone number:

Address:

Answer: What speed is the Spirit PC's modem? ....

• *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* ❐

The world of microcomputing, in praise of Windows 3.0 and some long-forgotten browsers.

20 YEARS AGO **July 1980**

Twenty years ago Derrick Daines began the first of a series of articles designed to bring the world of microcomputing to the uninitiated. The aim, with the aid of Venn diagrams and problems that involved sorting through various toy bricks, was to encourage children to think logically and ultimately develop their understanding of logic gates. Now with talk of spinach diodes in this month's *Futures* replacing such technology, it seems that today's kids no longer have an excuse to avoid their greens.

This month's benchtest looked at the British designed Acorn Atom, although Mike Dennis was disappointed with its styling. The five-page article revealed that at the heart of the machine was a 6502 CPU clocked to a whopping 1MHz. Memory came with a standard 2KB of RAM, expandable to 12KB, while the ROM chips could be upped from 4KB to 16KB, adding floating support to the built-in BASIC. High-resolution graphics, capable of 256 x 192 in two colours or 128 x 192 in four colours, were dealt with by the 6KB 6847 video controller. Mike concluded the machine was destined for the educational field as it appeared to be good value, attracting impecunious education authorities. To reassure those not convinced, Acorn also ran a series of ads claiming there was 'no need to worry that your investment will be overtaken by new technology'.

On a lighter note the entrants for this month's competitions will be relieved to know that they are far better off today – the prize for the *Leisure Lines* competition back then was a bundle of 20 13amp mains plugs.

15 YEARS AGO **July 1985**

Rolling back the years we find another candidate for the *Retro* page – the Commodore 128. Peter Worlock had the task of putting it through its paces in the benchtest. Lurking inside he found two processors – a 7510 and a Z80 for running CP/M, 64K of ROM and two 64K banks of RAM. Although the machine seemed good on paper the market was becoming a tough place. Unfortunately, sales of the C128 fell short of the 64's due to growing demand for multi-tasking and graphics.

Martin Banks' column this month concentrated on the emergence of the GUI that we all know and love (or know, at least) that started out life as a research project at the infamous Xerox labs in Palo Alto. Apple learned a lot from Xerox and put it to work on the Lisa and then the Mac.

To keep PC users happy there was GEM (Graphical Environment Manager) from Digital Research. Not to be outdone, Microsoft was furiously working on Windows while IBM was pinning its hopes on Topview. The main difference at the time was that GEM was available while the others were still vapourware. This didn't stop Martin stating that 'according to Bill Gates, Windows is going to be the greatest graphical thing since sliced bread'. The rest, as they say, is history.

Chip Chat centred on the news of a parallel processing machine called the Butterfly, a prime candidate for one of Gordon Laing's home hardware projects. Containing 128 8MHz 68000 chips it was destined for use by the military.

10 YEARS AGO **July 1990**

A small child eating a mouse (of the computer variety) graced the cover in July 1990 in reference to the release of Windows 3.0, purported to be 'Child's Play'. Guy Swarbrick took an in-depth look at the GUI set to revolutionise computing. The results were promising, especially given the lacklustre response that previous incarnations had received. Finally there was software support as well, with 52 applications on show at launch. In closing, Guy came to the conclusion that Windows 3.0 was here to stay. 'If you currently prefer the GEM interface to Windows, you really should take a look at Windows 3.0. It does everything GEM does and, for the most part, it does it better,' he said.

We also scooped an exclusive on a couple of super-fast 20MHz 386 SX systems. Dell and Mitac were the contenders with the Dell just edging ahead at the final hurdle, although the top spec machine did come in at a massive £5,199 ex VAT.

Viruses may be on everyone's minds this month due to the amorous attachments currently doing the rounds, but back in 1990 Stirling University researchers thought differently about such things. When compiling a database about Human Computer Interaction they struck upon the idea that they could employ the techniques used by viruses to allow the database to propagate new information autonomously. This technique meant that the database was kept up to date for all users. The interface to the database was based around a new system called Hypertext, the spread of which could also be described as virus-like.

5 YEARS AGO **July 1995**

Pentium Notebooks were the cover stars in 1995 as Simon Rockman looked at six of the best. NEC was cream of the crop, mainly down to its 800 x 600 SVGA LCD screen. The hard drive may have only stretched to 810MB with a Pentium processor running at a measly 75MHz, but on the whole it impressed. The price, however, seems large even by today's standards. Mobile users are used to paying a premium, but at £5,445 you need deep pockets as well.

At a time when quad-speed CD-ROM drives were the norm, Gordon Laing had the chance to get his mits on a six-speed model from Plextor. The SCSI drive was available as either an internal or external unit, although no SCSI card was included in the £420 package (£571 for the external version). The conclusion: 'It's official – the fastest CD-ROM drive we have ever tested. If you feel the need for speed this must be your only choice.'

We also did a round-up of web browsers, encompassing a massive seven for the review. It just goes to show the impact that the web has had, but unfortunately, of the seven browsers reviewed (Mosaic, Cello, Netscape, Internet Works, WinWeb, Spry Air Mosaic, Quarterdeck Mosaic) only two remain – Netscape and Mosiac (in the form of Internet Explorer). Although there are still alternative browsers, the majority use one of the big two.

WILL HEAD AND JALAL WERFALLI

Amstrad CPC

The late, great Arnold was a hit in the playground, with its neat graphics and explosion sounds.

By 1984 kids in the playground had yet another platform to fight over as the Speccy and Commodore were joined by Arnold. But, unlike its rivals, the Amstrad CPC was never marketed as a serious computer platform. Instead, Alan Sugar had cut to the chase and realised it was games that were selling the 8bit machines, not word processors (though he would return to that arena with the PCW).

The CPC got the nickname Arnold from an anagram of Roland, as in Roland Perry, one of the men who oversaw the development of the CPC.

Despite arriving late on the 8bit scene, the CPC proved extremely popular, gaining a large user base in a relatively short space of time. There were a number of reasons for this. For one, the CPC464 had a built-in tape deck which was very reliable, something that other 8bit machines couldn't boast. More importantly, though, was the fact that it shipped with a monitor, either colour or green screen, which meant that you didn't have to be disturbed by your dad mid-game when he wanted to watch the footie on TV.

Also, from its first day of release there was already software available for the platform, something unheard of in the 8bit days. Amstrad had sent prototype machines to 50 software houses well before the machine's launch – a business practice that is now common in the console industry, but Amstrad did it first with the CPC. This canny move also allowed Amstrad to bundle a bunch of games with the unit, which appealed to mums and pops who liked the fact that they were getting a complete package.

While Amstrad never really marketed the 464 at serious users, the hardware under the hood was not to be sniffed at. At the heart of the machine was a Zilog Z80A CPU beating at 3.3MHz. This was backed up by 64KB of RAM. The graphics were also pretty neat for the time. You got a palette of 27 colours (three intensities of red, green and blue) and three screen modes: mode 0 offered 160 x 200 with 16 colours, mode 1 had a resolution of 320 x 200 with four colours and the high-res mode 2 offered a massive 640 x 200 with just two colours.

Sound was much better than on the

The Arnold's graphics were groudbreaking for the time, boasting a 27-colour palette

spectrum, thanks to the General Instruments AY-3-8912 chip, though it wasn't really a patch on the C64's SID chip. Nevertheless, you did get three tone channels each with an eight octave range. For those all-important explosion sounds there was also an additional noise channel. Sound was in stereo, but this was really just achieved by setting each of the tone channels to either left, right or centre settings.

Expansion was taken care of by the 7bit printer port, which could be used with Amstrad's own dot matrix printer, or via the Edge connector, which was later home to a whole range of devices from a memory expansion pack to a speech synthesiser.

The 464 was followed by the short-lived CPC664 which added a 3in disk drive, but it was with the CPC6128 that Amstrad started to target more serious users. The CPC6128 did away with the brightly coloured keys, in favour of a more sober, all grey keyboard. Also, as its name implies, it upped the RAM to 128KB. This was a bit of a fudge, as the Z80 could only address 64KB at a time – you had to switch between the two blocks to use the extra memory.

The CPC6128 also shipped with a copy of the CPM operating system (the CPC could run CPM due to the Z80, of course) and the disk drive made it a much better proposition for businesses and serious users.

But really the CPC range will be best remembered as a gaming machine and it was home to some real classics such as Paul Shirely's Spindizzy, a cross between marble madness and an isometric adventure game, which still oozes playability even today. Sorcery+, which managed to get two of the CPC's graphics modes onto the screen at the same time, was great fun and one of the few games to truly take advantage of the CPC6128's disk drive.

Other classics include Highway Encounter, LightForce and Starfox 3D. Unfortunately, the CPC also suffered horribly from the dreaded Speccy port. Because both machines used the Z80 processor it was easy for games companies to do a quick and dirty port from the Spectrum version of the game, which failed to take advantage of the CPC's extra colours and higher-resolution modes.

Amstrad added to the range at a later date with the 464+, 6128+ and the ill-fated GX400 games console. Graphics hardware had been improved, but really by this stage the company was flogging a dead horse as the 8bit era had been superseded by 16bit beasts like the Atari ST and Amiga.

NIALL MAGENNIS