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Nik Rawlinson
DEPUTY EDITOR

Boxing is the key to success

Have you ever wondered why non-essential software comes in such big boxes? Something like Windows – software you actually *need* (Linux arguments aside) – arrives in a box no more than 2in thick. When it comes bundled with a PC, you get just a shrink-wrapped manual and disc. Of course, if you've been following the news, you'll know that Microsoft looks set to stop supplying CDs for bundled distribution with PCs, and all you'll get in the future is the OS installed on the hard drive and some form of BIOS-locked recovery CD (see *PCW*, January 2000, p24). This is something of a self-defeating move. By

geeky, about having a row of software boxes on a shelf. You'll never need them again, but the vast majority of us are too materialistic to throw them away. It's for this reason that I just don't believe it when people say that MP3 will render the CD obsolete and products like Microsoft Reader (www.microsoft.com/reader) will replace the book. Microsoft claims that the integrated 'ClearType' technology 'approximates the printed page', but the printed page is so much more than just ink on paper.

Not only do you lose the feeling of ownership when your book exists only as binary digits stored in flash memory, but the inhuman and clinical feel of technology is not what I'd want to be

You lose the feeling of ownership when your book exists as binary digits stored in flash memory

withholding the media, the company is encouraging more people to acquire 'pirated' copies of the OS in case they need it in the future. Surely by bundling the original media, Microsoft ensures that the majority of copies in circulation have been paid for at some time, even if it was by the vendor and not the end user.

But I digress. Back to the boxes, because while something vital may come with minimal packaging, something entirely trivial – a clip-art collection, let's say – will often arrive in bloated packaging, out of which fall countless cards and leaflets and, if you hunt really hard, a solitary CD. Have you ever asked yourself why something that costs £30 and isn't essential to your system, should be packaged with so much pomp?

If you have, then you have answered your own question. You don't *need* the clip-art collection, so the vendors have to convince you that you *want* it, and if it was just a shrink-wrapped disc, the chances are you wouldn't be prepared to pay that much for it.

There is something inherently satisfying, although at the same time

reading in bed on a cold wintery night. No more will books be described as 'a real page turner'. Somehow 'compulsive scroller' or 'real screen refresher' just doesn't have the same ring. Of course, it's not all bad. If you're a commuter you'd be more than happy to see the demise of the broadsheet terrorist – that breed of business traveller who sits in the middle seat of a block of three and plays origami with the morning news. Shrinking him down to a PDA and some font-smoothing software would no doubt stifle acts of commuter rage.

But there's also the technology angle. While for most of us downloading a book or encoding an album to MP3 comes as second nature, it's still far easier to wander into a shop and buy the real thing. You don't have to switch off a book at the end of a chapter, it has instant-on without any need to suspend to RAM, it works in poor light, it even works without batteries. The idea of an electronic future is tempting, but I doubt it'll ever be enough to entice me to give up my physical, tangible books and CDs... no matter how fat the packaging.

	<p>VNU European Labs</p>
<p>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 both Windows 98 and NT are the SYSmark tests from BAPCo. In all our performance graphs, larger bars mean better scores.</p>	

<p>ratings</p>	
<p>★★★★★ ★★★★★ ★★★★ ★★★ ★</p>	<p>EXCELLENT VERY GOOD AVERAGE BELOW AVERAGE POOR</p>



Dell Dimension XPS B800r

This is no over-clocked pretender, but **the real 800MHz deal** – yours, if you have deep enough pockets.

This is the first true 800MHz Pentium III-based PC we have seen. It is easy to over-clock a 750MHz processor so that it runs at the same speed, but hindered by a slower bus it will not achieve the sort of results you can expect from the real thing. In this instance, the 820 chipset Intel motherboard plays host to two memory slots, one of which is filled by a 128MB RDRAM module, easily recognised by its blue metallic shell. The single spare slot is occupied by the necessary blanker. Together, the processor and memory helped the B800r score a respectable 155 in our SYSmark 2000 benchmark.

Dell has a well-earned reputation for building sturdy machines fit for business or home use, and this example sits well at the higher end of the family. The processor and memory already discussed are complemented by a Dell-branded GeForce 256 graphics card with 32MB on-board. We are already familiar with this card in the pages of *PCW*, but for those who have not come across it before, it handles all transform, lighting and triangle setup on a single chip at a rate of 10 million polygons a second, freeing up the processor to get on with more important tasks – great for the gamer and no doubt responsible for the impressive score of 4,099 it achieved in 3D Mark 2000.

The hard drive is a 7,200rpm Seagate Barracuda running through an ATA-66 interface and with a formatted capacity of 26.5GB – plenty to keep all but the

most fanatical of serial installers happy for months to come. The removable storage drives, however, are both SCSI-based devices. DVD entertainment comes courtesy of Samsung, while Sony is responsible for the CD-RW. We were glad to see that Dell had included a blank CD-RW disc in the packaging, so we could get burning right away.

Sound is more than capably taken care of by a SoundBlaster Live! Value card, sending its output through a pair of Harmon Kardon speakers. This is linked to the Dell-branded V.90 modem to handle voice transmission, which is where the pre-installed Phone Tools will come in handy. Other bundled software included Adaptec Easy CD and Direct CD, McAfee VirusScan and Microsoft Office, as well as the utility software that comes with the Creative sound card.

The interior of the machine was not the tidiest we have seen. A variety of ribbon cables had not been clipped back and the audio cable linking the DVD drive and sound card was dragged across the system interior. That said, none of this was serious enough to impede the home-upgrade enthusiast. Black ducting funnelled air from the outside world directly onto the processor's heat sink – this is a good idea often seen in high-end machines.

As far as storage expansion is concerned, you'll find two free 3.5in bays with external access and one inside that can only sensibly be used for hard drives. The incumbent drive is mounted

vertically, keeping the body of the system case vacant. Of the five PCI slots, three remain free, and sticking firmly to the PC99 standard you'll see that there is no way of plugging an ISA card into the motherboard. This should not be a problem, though – apart from the realm of home networking where they are still going strong, they are becoming decidedly rare these days.

In all, this is a well-specified and built machine with enough components to impress even the most demanding of buyers. Those things about which we have complained here are small and of little significance.

NIK RAWLINSON

DETAILS

★★★★★

PRICE £2,231.33 (£1,899 ex VAT)

CONTACT Dell 0870 152 4699

www.dell.co.uk

PROS Well specced, good performance

CONS Anything we put in here would just be nit-picking

OVERALL Definitely one for consideration



PERFORMANCE RESULTS



SYSmark 2000



3DMark 2000



Carrera Lynx W533

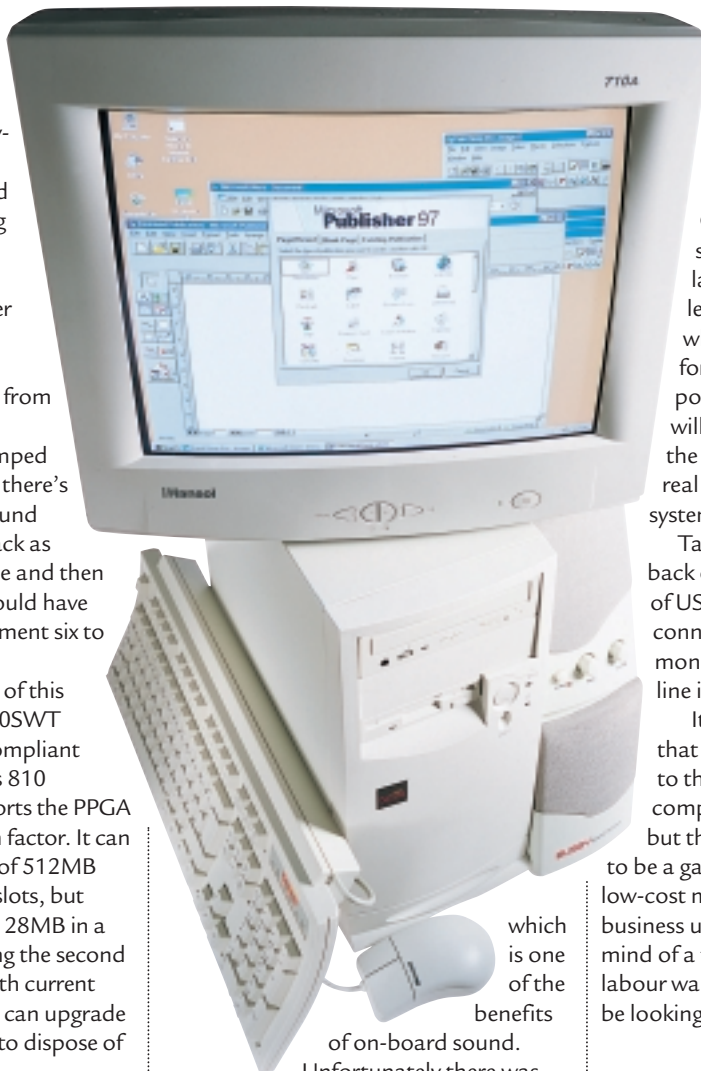
Still waiting for a powerful system with well-chosen components for an affordable price? It's arrived.

It won't be long before you'll have fewer than half a dozen components inside an entry-level PC, and that will include the drives. More and more components are being integrated onto the motherboard, making machines easier and cheaper for system integrators to construct. There are other benefits too, as can be seen from this Lynx – the case is small enough to fit on even a cramped desk, and when you open it there's plenty of room to move around inside. There's a cash payback as well – take a look at the price and then think how much less you would have got for this sort of an investment six to 12 months back.

The basic building block of this machine is a Supermicro 370SWT motherboard. This PC99-compliant MicroATX board uses Intel's 810 'Whitney' chipset and supports the PPGA 'Socket 370' processor form factor. It can accommodate a maximum of 512MB SDRAM in its two memory slots, but Carrera supplied an ample 128MB in a single PC100 module, leaving the second slot free. This means that with current memory configurations you can upgrade to 384MB without needing to dispose of what you already have.

The motherboard, sporting a 533MHz Celeron CPU, has built-in 3D/2D accelerated graphics that can support a 1,024 x 768 resolution in 24bit colour. It drives its output to a Hansol 710A monitor. Its sibling, the 710P, earned itself a 'recommended' award in our February issue. The principal difference here is that while the 710P had a 0.25mm dot pitch the 710A is slightly fatter at 0.27mm. They share a 16in viewable diagonal.

The graphics chipset also supports PAL and NTSC TV-out, and it's good to see Carrera taking advantage of this feature with a blanking plate sporting composite and S-Video connections at the back of the PC. The pay-off is the loss of one of the PCI slots – it's still vacant, it just doesn't have external access. Fortunately, two other slots remain free,



which is one of the benefits

of on-board sound.

Unfortunately there was no audio cable linking the Panasonic DVD drive to the motherboard, but we can only assume that this was a one-off oversight on Carrera's part. The drive is equivalent to a 32-speed CD-ROM.

There is one free external 5.25in drive bay, suitable for adding an internal Zip drive or CD-RW, but no internal bays left vacant, so if you want a larger hard drive you'll have to either swap out what you already have or sacrifice your external bay. The pre-installed drive is an IBM DeskStar with a formatted capacity of 12.6GB, and this is mounted vertically to leave as much free space within the system case as possible.

This pays off in the form of an exceptionally tidy system interior – possibly the tidiest we have ever seen, so if you ever open it up to slot in some more memory you won't have to battle

through a tangle of wires and will probably have the job done in five minutes.

External communications are catered for in the form of an AMR modem from M-G Communication, a V.90 device supporting 14.4K faxing. The lack of bulky internal cards leads to lower heat generation, which in turn means less need for fans. This cuts down on power consumption, but this will be of little importance to the home user, for whom the real benefit will be a quieter system overall.

Taking a quick peek around the back of the case you'll find a couple of USB ports, two PS/2 connections, parallel, serial and monitor ports and, for audio, mic, line in and line out sockets.

It's a neat little bundle at a price that makes it serious competition to the iMac. We couldn't get it to complete our 3D Mark 2000 test, but then this was never really going to be a games machine. If you need a low-cost machine primarily for serious business use, backed up by the peace of mind of a two-year on-site parts and labour warranty then you really ought to be looking at Carrera.

NIK RAWLINSON

DETAILS

★★★★★

PRICE £821.33 (£699 ex VAT)

CONTACT Carrera 020 8307 2800

www.carrera.co.uk

PROS Unbeatable price, on-site warranty

CONS CD-audio cable missing in this instance

OVERALL A missing CD audio cable almost cost Carrera a star. It would have cost it some time and money too, had this machine been sent to a customer who would no doubt have taken advantage of the on-site warranty right away. Otherwise, an excellent machine that is almost impossible to fault



PERFORMANCE RESULTS

0 100 200 300 400



SYMark 2000





Armari R8-S2000

Quantity is quality when it comes to CPUs. Two PIIIs and top components make this system high class.

The term 'high-performance workstation' is commonly used to describe anything running Windows NT with a top-of-the-range processor and fast hard disk. Fortunately recent months have seen new types of memory, shiny chipsets, ever-faster I/O and, of course, with Windows 2000, a brand new workstation OS. With its track record for picking the latest and most interesting components, trust Armari then to submit its R8-2000 Workstation for review – a PC with more than a few neat tricks up its sleeve.

Some of the brand new bits pave the way for future high-performance workstations, but we'll start with the sheer muscle. The R8-2000 houses not one, but two Intel Pentium III processors, running at 733MHz each on a 133MHz front-side bus. The 733MHz CPU is one of Intel's 'Coppermine' chips, made using its finer 0.18micron process. Compared to the older 0.25micron process, used on Pentium IIIs up to 600MHz, the newer process allows faster speeds and lower power consumption, all while generating less heat and boasting a higher yield. (Note that Intel also makes a Coppermine version of the 600MHz Pentium III, labelled with an E).

The finer process also allowed Intel to

take the Level 2 cache out of the CPU cartridge and integrate it directly onto the processor die. An on-die cache runs at the same speed as the CPU, compared to the half-speed cache on 0.25micron chips. Intel may have halved the Level 2 cache size from 512KB to 256KB, but running this smaller cache at full speed results in better overall performance.

Handling Armari's two CPUs is Windows NT4/SP5 with a free upgrade to Windows 2000. A pair of 128MB PC100 SDRAM DIMMs give a total system memory of 256MB, while a huge 27.3GB IBM DeskStar 7, 200rpm UDMA66 hard disk provides plenty of storage. The top two drive bays house a Pioneer 10-speed DVD-ROM drive (40-speed CD) and an AOpen CD-rewriter (six-speed write, four-speed rewrite, 20-speed read). CD-rewriters that also read DVD discs are now available, but keeping them as separate drives allows you to easily duplicate CDs.

Finally, a Guillemot 3D Prophet DDR-DVI AGP 4X graphics card burns through games with its blinding nVIDIA GeForce 256 processor. More on that later, but first let's look at the most exciting component in the entire system: the motherboard.

The Supermicro PIIIDME Armari has

chosen is the first motherboard we've tested that uses Intel's new 840 chipset, designed for servers and high-performance workstations. There's been so much press about Intel's entry-level 810 and memory-challenged 820 chipsets that the 840 has tragically been ignored by many. That's a shame as it offers many features that could make it the chipset of choice for demanding users.

Like the other 800-series chipsets, the 840 employs a modular design, based on three core components and several optional extras. Most important, and physically largest is the 82840 Memory Controller Hub that provides support for AGP 2X/4X graphics cards, multiple PCI segments and, uniquely, dual RDRAM memory channels, more of which in a moment.

The 82801 I/O controller hub sorts out the 32bit PCI bus, UDMA66 IDE controllers and USB ports, while the 82802 Firmware Hub stores system and video BIOS, along with providing Intel's Random Number Generator that comes up with figures to help with stronger encryption and security.

The 840 chipset was designed to only use a new type of memory – RDRAM – that offers higher performance than conventional SDRAM. During its design,

it was thought that RDRAM would be readily available at the time of the new chipset's launch, but as anyone who's followed memory knows, it has been a turbulent ride. RDRAM is now available, but costing around three times that of SDRAM, it simply doesn't result in competitively priced systems.

Motherboard manufacturers and system integrators claimed their customers wanted an SDRAM option, so

two of them running simultaneously results in 50 per cent higher performance overall – think of it as not PC200, but rather PC150. While not supplying quite the same level of performance as RDRAM, this 50 per cent higher speed than on a BX chipset delivers the required bandwidth to support the 1Gbyte/sec transfers that AGP 4X demands, while keeping memory costs down. The Supermicro board has four

With Windows NT or 2000, dual-CPU systems will benefit any day-to-day tasks

Intel came up with a solution that would allow 800-series chipsets to use SDRAM. Called the Memory Translator Hub (MTH), it translates the RDRAM protocol into SDRAM-based signals, allowing motherboard manufacturers to fit DIMM slots for conventional memory. Some boards come with both RDRAM and SDRAM slots (although you can't use both types simultaneously), but Supermicro's PIIDME motherboard features DIMM slots for SDRAM only.

Sadly, Intel's MTH only supports 100MHz SDRAM, and not the faster 133MHz variety that is becoming increasingly common in VIA-based chipset solutions. Rather more sinister, using 100MHz SDRAM with the 800 chipset, MTH actually results in lower memory performance than putting it in a motherboard with an older Intel BX chipset. Intel readily admits this is the case and estimates a drop in memory performance of around five per cent. Armari, however, believes it's closer to 25 per cent, based on results using the Wstream memory benchmarking software (www.cs.virginia.edu/stream/). Most people, though, believe the additional benefits of the new chipset outweigh its lower SDRAM performance.

The most exciting benefit, that is only available on the 840 chipset, is support for dual RDRAM memory channels. Normally the RDRAM channel operates at 1.6Gbytes/sec, but using a pair simultaneously effectively doubles your memory bandwidth to 3.2Gbytes/sec. Supermicro has done the right thing, and rather than fit just one MTH for SDRAM support, it has popped one on each RDRAM channel. This means the SDRAM memory bandwidth is doubled.

Armari reckons that, although each SDRAM channel operates at about 75 per cent of that on a BX chipset, having

DIMM slots, supporting up to 4GB of PC100 SDRAM.

The 840 chipset also offers support for 64bit PCI with the optional 82806 64bit PCI Controller Hub. Supermicro has fitted this to the PIIDME motherboard, which supports a pair of 64bit PCI slots, running at 33 or 66MHz. Supermicro also does a version of the PIIDME with the latest Adaptec Ultra 160 SCSI on-board. This reassuringly runs on the 64bit PCI bus and features on-board Ultra 160-LVD, Ultra Wide and 50-pin Ultra connectors.

It seems almost boring now to list the more conventional motherboard components, but for the record, there's a pair of UDMA66 channels, four 32bit PCI slots, one AGP 2X/4X slot, and all the usual ATX ports, along with the welcome inclusion of 10/100 Ethernet. Finally, the heat-sinked 840 components are turned 45 degrees to cater for precise track routing – the fact they look like pretty diamonds is an unexpected bonus.

Only one PCI slot is occupied, and that's with a Creative Labs SoundBlaster Live! 1024. The SB Live cards support positional 3D audio using EAX with four-channel output, and Armari has catered for this by supplying Cambridge SoundWorks PCWorks FourPoint surround speaker system – see *Hands On, Hardware* for more on positional audio.

We were pleased to see the excellent Iiyama VisionMaster Pro 450 19in monitor, with its natural flat Mitsubishi Diamondtron NF tube, plus support for extremely high flicker-free resolutions – 1,600 x 1,200 at 90Hz or 1,280 x 1,024 at 110Hz. A Logitech cordless keyboard and mouse complete a great package.

So, who would benefit from a dual-CPU system such as this? Armari cites those involved in rendering 3D graphics. However, with Windows NT or 2000 behind the scenes, dual-CPU systems will

benefit any day-to-day tasks, such as farming out print jobs to one chip while leaving the other free for applications – in general, dual-CPU systems just feel so much more responsive, and are recommended over a single faster CPU.

Using industry standard benchmarks for dual-processor testing, Linpack results showed that the Armari could perform burst processing at a rate of 238.7mflops in single-processor mode, rising to 460.5mflops when the load was split across both processors. Linpack provides a more accurate example of how the machine would perform under normal circumstances, with 184.9mflops in single-processor mode, and 313mflops in dual. In both instances these results show that in terms of raw speed the dual-processor configuration truly does run twice as fast as the single.

With a Dual Data Rate GeForce 256 graphics card we couldn't help but fire up Quake III Arena. Using the same demo as in December's group test, we measured 83.6fps at 1,024 x 768 in 16bit colour. Activating Quake Arena's SMP mode (r_smp 1 at the console) woke our second CPU and raised the score to 87.3fps; the second CPU really comes into its own during intensive battles though. Compare these impressive numbers to December's highest score of 62.2fps for an Asus AGP-V3800 Deluxe under a 600MHz PIII.

The R8-S2000 is a cracking machine for developers, renderers, or anyone who fancies an unbelievably responsive system. The build quality and choice of components from Armari are, as usual, superb – and the 840 chipset in particular looks like it could beat at the heart of this year's highest-performing PCs.

GORDON LAING

DETAILS

★★★★★

PRICE £2,799 (£3,288.83 inc VAT)

CONTACT Armari 020 8993 4111

www.armari.com

PROS Keeping costs down with SDRAM while still benefiting from the 840 chipset's dual memory channels

CONS No RDRAM memory upgrade path – but does it matter?

OVERALL Supremely responsive system with innovative components

PERFORMANCE RESULTS



SYMark 2000



Toshiba Equium 2000

A novel PC, standing somewhere between a desktop and notebook, proves that **style can be bought**.

The iMac made a statement by standing out from the crowd, but it was a love-it-or-hate-it machine. Toshiba's latest release, the Equium 2000, however, while similarly trend-bucking, can't fail but appeal to everyone who sees it – as far as looks are concerned, anyway.

The sleek 'L' shaped stand hides an entire PC, fronted

occasional flicker aside, was pleasant to use for extended periods. It is controlled by an ATi Rage 128 VR chipset with 8MB of RAM.

The hub of the machine is a 466MHz Celeron processor, backed up by 64MB of RAM. There is a spare slot to add more memory at a later date, but to get to it you'll need to remove a small backplate. This may be a daunting prospect for the novice, but it's still less than you might need to remove if you had instead opted for a regular desktop PC. The hard drive, however, proved more difficult to access, so if you think you might need more than the supplied 6GB any time soon, perhaps this is not the best PC for you.

Toshiba has a good reputation in the notebook market and so the Equium 2000 is a logical addition to its product line – a number of notebook components are used in its construction. In the side of the stand you'll find a couple of PC Card slots. It's a shame that they are positioned so high because it means that any trailing wires will stick out of the side of the unit, that could be somewhat unsightly – positioning them lower down would have been preferable. Another area where wires are somewhat fiddly is around the back. The power and USB keyboard cables must be inserted upside down and then twisted around so that they are pointing through a small cover which can be put across them. While this is unlikely to cause any damage as long as you are not constantly connecting and disconnecting them, we're sure there could have been a better way to have achieved a similar result.

Another notebook-esque addition is the 'SelectBay' that sits behind a flip-down front cover. This slim slot will take either a floppy or 24-speed Teac CD-ROM drive, both of which are supplied. A lever at the back of the unit will hold them securely in place. A small window

in this cover gives you access to the IrDA port, which is a welcome addition to what is, ultimately, a desktop machine. Unfortunately, the Equium 2000 was unable to complete the SYSmark 2000 benchmark, but did achieve 163 in SYSmark 98. This is not comparable with the other scores in this issue, and puts it around the same level as the 466MHz Gateway Profile 2 (PCW, Feb 2000, p78).

External connectivity is provided for in the shape of USB and an Intel 10/100 Ethernet controller. There are ports for headphones, mic and line in and, although there are a couple of internal speakers, you might want to consider investing in an external set if you're at all serious about your music. The two USB ports are in place of any other peripheral connectors, so if you have only a parallel printer it's worth bearing this in mind before making a purchase.

At £1,775 ex VAT you're paying about what you would for a similarly specced notebook, so you really have to choose whether you want a flash desktop or a more portable machine. That said, it will look great in front-of-house situations such as office receptions, particularly as, in that sort of a situation, a network would be likely to handle any printing requirements, but may be less suited to the home user.

NIK RAWLINSON

by a rather impressive TFT display. All-in-one units such as this sit well with this kind of digital panel, as there is no need for a digital to analog to digital conversion process and less chance of any interference. Our test machine had an unfortunate glitch that caused the monitor to flicker, but that is likely to be a one-off problem that won't affect the units released to market. At 15in, it has a native resolution of 1,024 x 768 and, the

DETAILS

★★★★

PRICE £2,085.63 (£1,775 ex VAT)

CONTACT Toshiba 01932 828 828

www.toshiba.co.uk/computers/

PROS Attractive, good screen

CONS An average spec but nothing more

OVERALL If looks are important then the Equium would be a solid addition to any home or office, but would a notebook suit you better?

PERFORMANCE RESULTS



SYSmark 98



3DMark 2000: 862

Mesh Matrix 850 Maxx

The fastest conventionally cooled PC gives you a **whopping 850MHz** to throw around the desktop.

As has so often been the case of late, AMD has stolen the march on Intel this month.

As we go to press, the pinnacle of Intel's processor achievement is an 800MHz Pentium III (see review, p72). AMD, on the other hand, has squeezed an extra 50MHz out of the Athlon. Of course, it's been said before that clock speed alone is only one part of the computing speed equation, but with the Athlon and the Pentium III so closely matched in many tests, for those who need the fastest performance it's a key factor.

The processor isn't the only interesting part of the Matrix 850 Maxx. As the name suggests, it's fitted with ATI's newest power graphics card, the Rage Fury MAXX. Unable to come up with the architectural advances to match NVIDIA's transform and lighting geometry engine, the Fury MAXX resorts to brute force, with two graphics processors on-board, each with 32MB of memory to itself.

This is similar to the concept of a pair of 3dfx Voodoo2 cards running in SLI (scan line interleaving) mode, except each of the Fury MAXX's Rage 128 Pro chipsets calculates every other frame, rather than every other line of each frame. The MAXX drives a 19in Taxan ErgoVision 980TCO99 monitor, with Diamondtron NF flat-screen tube. At 1,280 x 1,024, this gives sharp, vibrant results, but can't provide enough definition at 1,600 x 1,200 to make this resolution comfortable.

Inside the Matrix is an Asus K7M motherboard, with AMD's 751 chipset. A 128MB SDRAM DIMM is fitted in one of its three DIMM sockets. Sensible enough for a Windows 98 machine, but for the potential buyer of this system it's likely that 256MB would be more appropriate, as an upgrade to Windows 2000 would be more than probable.

The hard drive is the 27GB variant of IBM's DeskStar 34GXP range. This is among the fastest of IBM's EIDE drives, with the data squeezed onto four platters, a spindle speed of 7,200rpm and a 2MB data buffer. The K7M has an AMR (audio-modem riser) slot that isn't used in this system, but Mesh has taken advantage of the consequent free blanking

plate and installed two extra USB ports, bringing the total to four.

Aside from the core components, the Matrix has peripherals aplenty. With the system out on the test bench, it's hard not to notice the Microsoft Intelli Explorer mouse, with silver finish and red LED tail light. And although it's large, there's no doubting that the optical sensing works better than conventional methods. A Microsoft Internet keyboard with dedicated application shortcut keys complements the shiny rodent.

The three 5.25in device bays are occupied by a Pioneer 10-speed DVD-ROM drive, Iomega ZipCD 650 CD-RW drive, and the Creative Live! Drive II, which is part of the SoundBlaster Live! Platinum fitted to the system. The Live! Drive will be supremely useful for the PC musician, but for other users its plethora of inputs and outputs will be overkill. There's nothing to stop you taking it out and using the drive bay for something else though: the sound card itself will work perfectly well without it.

A second extra peripheral that comes with the Platinum is the digital DIN connector, which sits in a blanking plate and consequently blocks the K7M's single shared PCI/ISA slot. Again, there's nothing to stop you removing it if needs be. With the SoundBlaster and a Diamond Supra 56K modem taking up two PCI slots, there are two free PCI slots left to use before you need to take out the digital DIN. A set of Labtec LCS-2514 speakers gives reasonable sound quality,

but lacks the centre

dialogue speaker necessary to take full advantage of Dolby Digital DVD soundtracks. Office applications are adequately catered for with Corel's WordPerfect Office 2000 suite.

In our SYSmark 2000 application benchmark suite, the Matrix 850 beats Dell's PIII 800 to become the fastest conventionally-cooled PC we've seen. The difference is marginal, though, and AMD needs to roll out Athlons with on-die Level 2 cache to keep its lead over Intel's Pentium III Coppermines secure.

DAVID FEARON



DETAILS

★★★★★

PRICE £2,349 (£1,999 ex VAT)

CONTACT Mesh 020 8208 4706

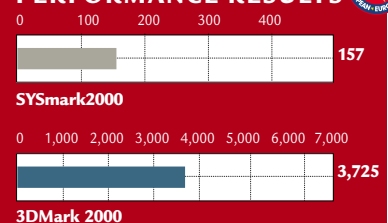
www.meshplc.co.uk

PROS Fast as you like, great peripherals

CONS You'll pay the usual price premium for cutting-edge technology, a GeForce-based graphics card is a better long-term bet

OVERALL AMD continues to provide the fastest performance available, and the Matrix 850 Maxx is a fine system overall

PERFORMANCE RESULTS



Atlas Meridian A850

AMD's fastest chip and great components make this a muscle-bound PC that exudes quality.

It seems like AMD Athlon 850 machines are like buses, you wait for ages for one to arrive and then two come along at once. It is good to note, however, that both the 850MHz Athlon systems featured this month are first-rate machines that make the most of AMD's fastest chip.

The Atlas Meridian A850 is an extremely well-specified machine, sporting just about everything you're likely to need from a high-end system. Every base is covered and you can use this machine for business or for playing the latest 3D games.

The motherboard sports three DIMM sockets, one of which is filled with the 128MB of system RAM. There are also three free PCI and two free ISA slots. The system case also has ample upgrade options with single external 5.25in and 3.5in bays free. There's also a spare internal 3.5in bay for a second hard disk.

Every base is covered and you can use this machine for business or the latest 3D games

That said, you shouldn't need to change the hard disk too soon as the IBM Deskstar currently installed has an impressive 22GB capacity. The secondary EIDE channel is full to capacity with a 10-speed Pioneer DVD-ROM drive and a Mitsumi CD-RW drive both connected to it. The latter is a good inclusion, allowing you to safely archive and back up data to cheap media. You can also put together music compilations from your CD collection (as long as you own the originals of course).

Filling the AGP slot is a very impressive graphics card, the Hercules 3D Prophet DDR-DVI. This is a very fast card that takes advantage of Double Data Rate memory for improved performance. As such, it turned in a

3DMark 2000 score of 4,465 compared to 3,725 on the Mesh. The Prophet also has the added advantage of a DVI connector. This new port allows you to connect the machine to a correspondingly equipped LCD flat panel digitally. This produces far better image quality, since the signal isn't being changed to analog, sent down a cable, and then switched back to digital again.

Even if you don't rush out and buy a digital flat panel, you won't be disappointed with the monitor that Atlas

has supplied. The Mitsubishi Diamond Pro 900u is a fine example of a CRT display. The tube is Mitsubishi's own 19in natural flat Dimondtron model and it produces a flat image with little reflection. The focus and colour purity are also impressive and you can happily work for hours at a resolution of 1,280 x 1,024 without any chance of eye strain.

Taking care of sound is an Aureal Vortex 2 card. This is not as fully featured as a SoundBlaster Live! Platinum but will suit most users' needs. The A3D standard produces great positional audio effects for games and the 850MHz CPU should keep things running smoothly when it's employed. If you want to record digitally from your PC, there's an optical digital output on the card. The Diamond Pro-

Media speakers are reasonable, but we would have liked to have seen a surround setup to take advantage of the Aureal card.

Diamond is also responsible for the modem. The Diamond SupraExpress is V.90 compatible and comes with a splitter jack so it can share the same socket as your phone.

The keyboard is a fairly standard affair with a reasonable typing action, while the

wheel mouse worked well enough, although a Microsoft version would have been better.

Rounding off the package is a copy of Lotus SmartSuite Millennium, providing the machine with full office productivity straight out of the box.

Atlas has demonstrated exactly how to showcase a new processor. The Meridian A850 is fast and well featured, but it's also affordable. Even though £1,795 is a lot of money, you're getting a lot of high-quality components.

If you're after the latest that AMD has to offer, the Meridian A850 should be at the top of your list.

RIYAD EMERAN

DETAILS

★★★★★

PRICE £2,109.12 (£1,795 ex VAT)

CONTACT Atlas 07000 285 275

www.atlasplc.com

PROS Fast, excellent graphics card and monitor

CONS No surround speakers

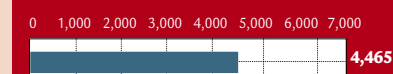
OVERALL A fabulous power system at a great price



PERFORMANCE RESULTS



SYSmark2000



3DMark 2000



Micron Millennia 750

If size and style aren't important to you but performance is, then the Millennia 750 could be for you.

The Micron Millennia 750 is an imposing machine in more ways than one. Our first impression of the PC was its sheer size – the case is huge and it comes with a 19in monitor, so you will need to have plenty of space to accommodate its bulk. But it's not just on the outside that this computer stands out from the crowd – it is one of the fastest systems on the market, too.

It is powered by an Intel processor – a 750MHz Pentium III, which runs at 100MHz front-side bus (FSB), ensuring it an impressive score in our SYSmark 2000 performance test. We had a bit more trouble with our 3DMark 2000 graphics benchmark, because the drivers installed for the 32MB GeForce 256 graphics card weren't the latest version. After installing the new drivers we were able to run the test without a problem and the Millennia managed a score of 4,017. This is an impressive result reflecting the PC's superior graphics performance.

The GeForce 256 card ensures high performance, even for the most demanding 3D games. Support for T&L future-proofs the card, and when the much anticipated games that can take advantage of this feature come onto the market you will see even better graphics performance on this PC.

This is not the only future-proofing feature you'll find inside the PC. Take the side off the beige and silver case and you will see a free socket on the motherboard for Intel's PIII Socket 370

bulk up the 128MB of PC100 SDRAM by filling up the two available DIMM slots, but one thing upgrade addicts should note is the

blue plastic flip-down cover inside the case that felt flimsy to the touch, so if you do spend a lot of time working in your PC this may not last too long.

While there is the opportunity to upgrade, the specification you get as standard isn't bad – alongside the generous allocation of RAM, super-fast processor and graphics card you also get a massive 20.5GB hard drive, eight-speed DVD-ROM drive and an Iomega Zip 250.

The 19in Diamondtron monitor easily lives up to the standards set by the rest of the PC. With a slot pitch of 0.25mm and a maximum resolution of 1,600 x 1,200, this screen is a pleasure

to work at, as long as you have the desk space to accommodate it. Unfortunately, the keyboard and mouse aren't quite as inspiring, as they are just standard models, although it is a Microsoft Intellimouse.

Although most users would be impressed by the specification of the PC, whether they would be as pleased with the styling is another matter. As well as its bulk, this PC has a silver trim that is

supposed to look futuristic, although we weren't particularly

enamoured of it. There is a flap that covers the drive bays that we weren't too happy with either – in our experience these just get in the way, and can break off with careless use.

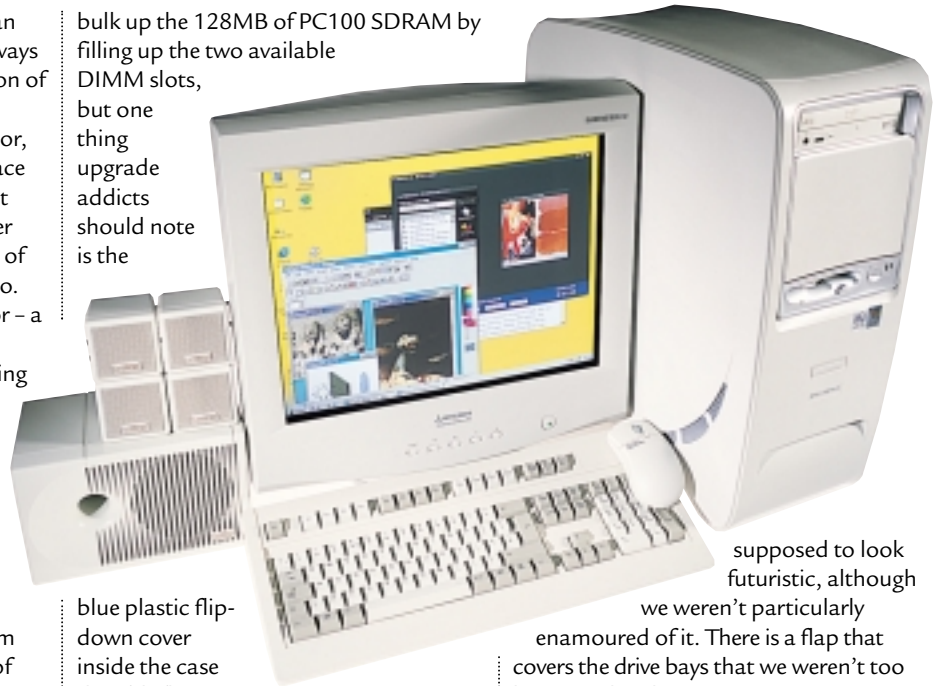
As well as an impressive hardware line-up, the Millennia sports a copy of Microsoft Office SBE. This is the premier office suite and rounds the package off well.

URSULA TOLAINI

The 19in Diamondtron monitor is a pleasure to work at, if you have enough desk space for it

Flip Chip, the Celeron-style chip that runs cooler (and potentially faster) than a conventional PIII. There is also scope to add extra cooling fans – one for the CPU and one for the PCI cards, so overclocking for speedier performance is a distinct possibility.

There is room to add extra devices into the four free bays – two 5.25in and two 3.5in, or cards into the three PCI and one shared PCI/ISA slots. You can



DETAILS

★★★★★

PRICE £1,938.75 (£1,650 ex VAT)

CONTACT Top PC 0113 242 2416

www.toppc.co.uk

PROS Fast performance, upgrade opportunities

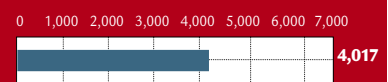
CONS Poor case design

OVERALL If you have the space to house the Millennia, and don't find the design too ugly, this PC is a state-of-the-art piece of kit that will speed through any application you throw at it

PERFORMANCE RESULTS



SYSmark 2000



3DMark 2000

Fujitsu PenCentra 130

If flimsy handhelds are **proving a headache** in the rough workplace, this tablet could be the

Despite the vast market lead that Palm and Psion have established in the palm-size and handheld PC markets, Microsoft is continuing to make inroads with its own Windows CE operating system. While the Palm range still dominates the consumer pocket PC market, Windows CE is rapidly gaining popularity in the more lucrative corporate market, where its similarity to the Windows desktop interface is favoured

as a means of cutting retraining costs for staff.

The PenCentra 130 is Fujitsu's first serious move into the CE market. It is a touch-sensitive tablet, measuring 22.86 x 15.24 x 3.30mm (or roughly two and a half times the size of the average colour CE pocket PC) and packs an 8in

SSTN or DSTN (on our review unit) colour display. Essentially, the PenCentra is a smaller, cut-down version of its big brother, the Windows 98-based Stylistic LT. OS storage is on a 24MB ROM, with user-accessible 16MB of SDRAM (upgradable to 48MB) and 8MB of battery backed-up storage (upgradable to 16MB).

Given its intended use (industrial rather than domestic), the first thing that strikes you about the PenCentra is the rugged build quality. The unit is absolutely solid, with the edges coated in stiff rubber for improved grip and to protect it from wear and tear. The normally fragile display is equally robust, and even the stylus is thick enough to withstand being dropped, crushed or thrown about (compared with most styluses that snap easily). Despite this, it still weighs in at just 0.9kg, and that's including the battery.

In operation, the PenCentra works much like a CE sub-notebook, although

minus the attached keyboard. It uses version 2.1 of CE, coupled with the handheld application set of Pocket Office (Word, Excel, Access, PowerPoint and Outlook), Internet Explorer, a selection of Fujitsu's own CE utilities coupled with an array of third-party software tools, including handwriting recognition tools and fax utilities.

The 131MHz MIPS CPU provides more than enough horsepower to drive the unit, although in tests it consistently

and headphone jacks, a PS/2 keyboard/mouse shared port, and an infrared interface.

There is sadly one screaming omission from the PenCentra, and that is a modem of any description. US and Canadian models feature a 56K V.90 modem, but nothing similar is included if you're buying it on the UK market.

However, what this device really needs is a wireless LAN interface. You can easily add one by means of a PC Card slot, but given the PenCentra's intended markets this should really be standard kit.

The interchangeable lithium-ion battery pack's life is estimated at 10 hours, however, in tests we consistently measured it at

nearer 13 hours,

which for a device with such a large colour screen is particularly impressive.

Overall, the PenCentra is an excellent device and one that we would struggle to fault. With the exception of the modem issue it effortlessly achieves what nearly all the

leading pocket PC manufacturers have yet to do – to create a pen-based embedded PC that can stand up to the wear and tear of an industrial environment. As good as most pocket PCs are, they are simply unable stand up to the rigours of non-domestic use quite like the PenCentra.

CHRIS GREEN



struggled to switch between multiple applications. A set of custom buttons along the left-hand edge of the screen allow quick access to screen controls, external mouse switching, volume control and three user-customisable buttons. The PenCentra also includes the now customary voice-record shortcut key.

Input is mainly stylus-based, using either handwriting recognition or point-and-click. Where heavy typing is necessary, you can resort to an external keyboard, and similarly where finer control is warranted, a mouse can also be used. The bundled docking station ensures a good working angle along with the necessary port replication.

There is no shortage of expansion capabilities on the PenCentra. Despite its compactness, it still manages to squeeze in two Type II PC Card slots with Compact Flash memory and peripheral support, a serial port (primarily for sync use), a USB port, microphone

DETAILS

★★★★★

PRICE £1,139.75 (£970 ex VAT)

CONTACT Fujitsu 020 8573 4444

www.fpsi.fujitsu.com

PROS Very light, large, clear screen, plenty of expansion ports

CONS No built-in modem or wireless comms device, poor audio playback

OVERALL In an industrial environment, the PenCentra is far more practical for entering and viewing data than a pocket PC or CE sub-notebook

Dell Inspiron 5000

Embracing the new SpeedStep technology Dell has produced a notebook that's difficult to fault.

Around seven years after we group-tested Intel's first mobile-optimised notebook chip (the 20MHz 386SL), the mobile Pentium III arrived. Reviewed in the December 1999 issue at 450MHz, it didn't quite match top-of-the-range desktop clock speeds as Intel first implied might happen. More disappointingly, the highly anticipated Geyserville power-saving technology was nowhere to be seen, which meant the mobile PIII was essentially the same as a mobile PII, only with 100MHz FSB, streaming extensions and slightly higher clock speeds.

Now, four months later, Geyserville has finally arrived. It's available in 600 and 650MHz flavours and now has a proper consumer name: SpeedStep. Dell's Inspiron 5000 is one of the first SpeedStep notebooks we've had the chance to test in the *Reviews* section, although you'll find a model from HP in this month's notebook group test.

The whole concept behind SpeedStep is to save power without overly compromising performance. Previously to double battery life, you had to halve the clock speed. Sure, a 600MHz notebook could last twice as long when running at 300MHz, but that's quite a performance hit. SpeedStep, however, saves power by being the first processor that can switch its operating voltage on-the-fly. Under mains power, the chip runs at 1.6V, but automatically switches in a split second to 1.35V when you pull the plug; returning the mains supply switches the voltage back up to 1.6V again, without the need for a system or even application restart.

The advantage of voltage switching is obvious to anyone who remembers their physics classes: Power is proportional to the square of voltage, which means even a small voltage drop results in a big power saving. Intel reckons the power consumption could drop by as much as 40 per cent while retaining 80 per cent of the original performance. In practice, both the 650 and 600MHz SpeedStep processors drop to a still respectable

500MHz clock speed in battery-saving mode, but consume just under half the power.

So does it work? In a word, yes. Windows or the user can tell it when to switch, whether in the absence of mains power, or for temporarily over-riding back to maximum performance for, say, demanding presentations on the move. The Inspiron 5000 behaved impeccably, running active applications and even uninterrupted video streams while we constantly connected and disconnected the power supply; disconnected you're looking at a maximum of three hours under a single battery.

Of course, the whole idea of a fast PIII notebook is to match or even replace your desktop PC, and the Inspiron 5000 delivers in spades. Our review model came with a 12GB hard disk, 128MB of RAM (expandable to 512MB using two SODIMMs), and a whopping 15in XGA display; Dell now offers a 15in SXGA+ TFT display option which supports 1,400 x 1,050 resolution. Admittedly both 15in screens overhang by 3mm on the sides and 8mm at the front, but their sheer real estate is vast and welcome to anyone replacing their desktop PC.

Graphics are supplied by an ATi Rage Mobility P chipset with 8MB of SGRAM. Optimised to save power, it's not bad if you're on the move, but this is one area

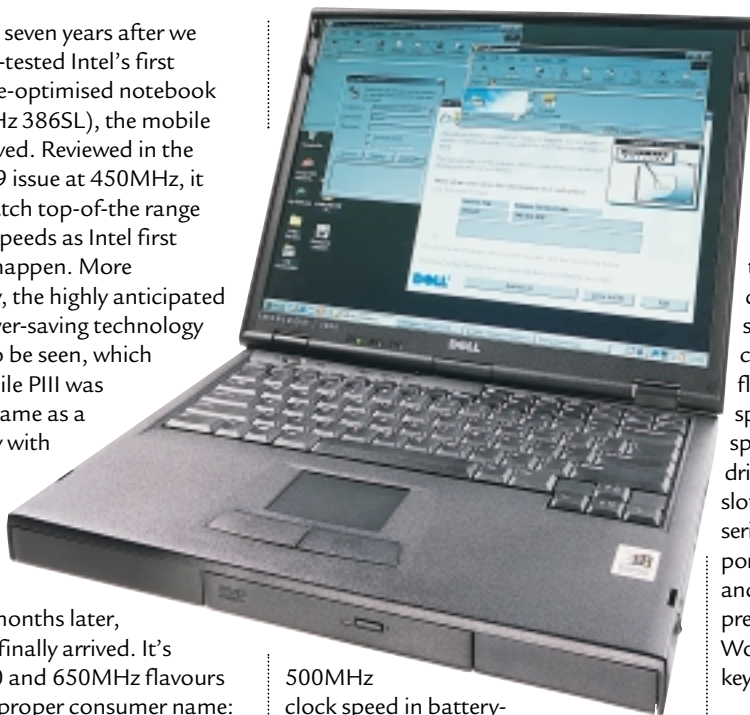
where a notebook will never replace the power-hungry 3D accelerators of desktop PCs – we measured Quake III Arena Demo2 at only 16.7fps in 16bit VGA and 8.2fps in XGA.

At the front-centre of the unit is Dell's media bay, which can take a second battery, CD or Zip drive, or in the case of our model, a six-speed DVD drive. DVD movie playback at full-screen, even under battery power or constant SpeedStep switching, was flawless; the side-mounted stereo speakers may be tinny, but impress with spatial imaging. On the left is a floppy drive and modem, while a pair of PC Card slots sit on the right. Round the back are serial, parallel, PS/2, USB, VGA and IR ports, along with a PCI docking connector and an S-Video output. Our model came pre-installed with Windows 98SE and Works Suite 2000, and the full-size keyboard was very comfortable to use.

The new Inspiron 5000 series has slimmed down to 40.4mm thick, even with the 15in display option. The unit's footprint is 324 x 259mm and it weighs 3.37kg with DVD and floppy drive.

Best of all, though, is the price. While perhaps not the most aspirational badge or sexiest design in the portable world, Dell has always sold top-of-the-range notebooks at highly competitive prices. Considering ours was fitted with Intel's latest and greatest mobile chip, accompanied by an impressive overall specification, Dell's asking price of £1,899 ex VAT sounds like a bit of a bargain.

GORDON LAING



DETAILS

★★★★★

PRICE £2,231 (£1,899 ex VAT)

CONTACT Dell 0870 907 5869

www.dell.co.uk

PROS Huge screen, great configuration

CONS Design not as sexy as some more expensive brands

OVERALL Bargain access to Intel's latest mobile chip

PERFORMANCE RESULTS

0 100 200 300 400



SYMark 2000



Hi-Grade UltiNote AS8400

A fast notebook that makes use of the **SpeedStep CPU**.

Intel's mobile Pentium III processors have to some extent been advancing more quickly than its desktop equivalents recently – the mobile PIII was the first to move to a 0.18micron fabrication process and bring the Level 2 cache on-die. Hi-Grade's UltiNote AS8400 is fitted with the latest evolution in mobile PIIIs – a 650MHz Pentium III SpeedStep CPU.

While running on mains power, the SpeedStep 650 runs at its full 650MHz. Switch to battery power and it automatically clocks itself down to 500MHz. Nothing too special there: desktop systems have been able to throttle back in power-saving mode for years. The clever bit is that as well as throttling back the clock rate, the SpeedStep system also reduces the processor's supply voltage from 1.6V down to 1.35V. Because power dissipation increases with the square of the supply voltage, that small reduction makes a big difference to the power consumed by the processor. Intel quotes that in maximum performance mode the CPU consumes 9.1W, reducing to 5.1W in battery mode. This made a 10-minute difference to its operational life: on batteries it lasted two hours with SpeedStep enabled, and one hour, 50 minutes with it turned off.

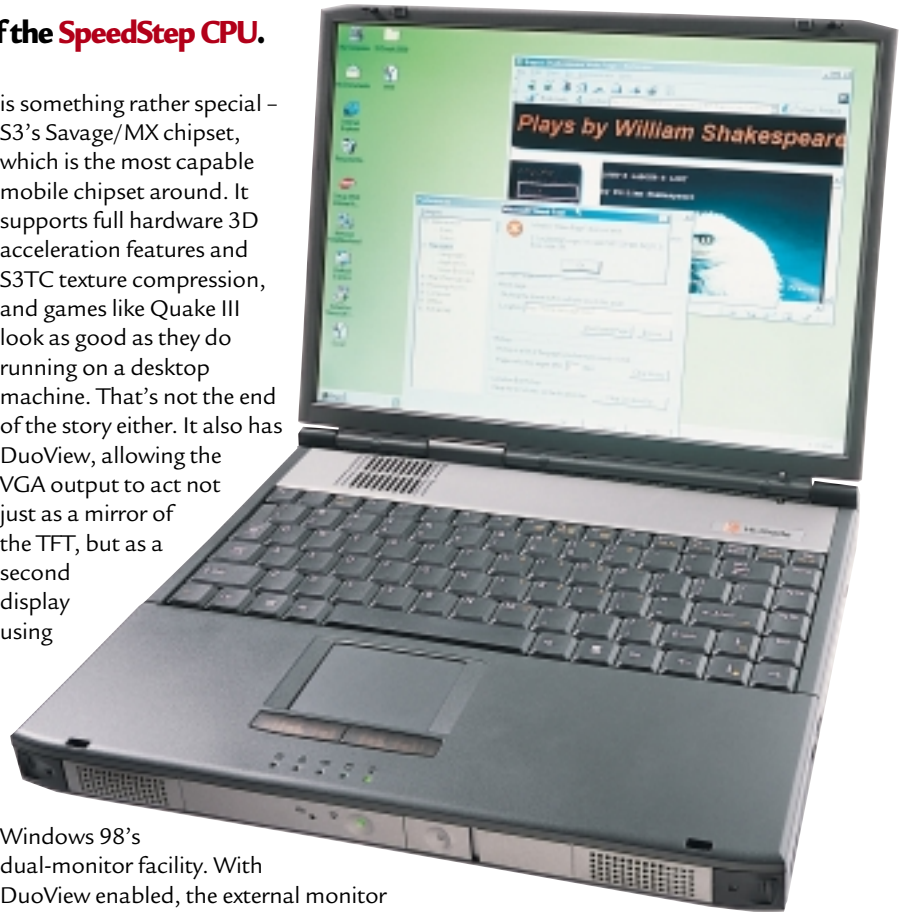
Open up the lid of the UltiNote and it looks distinctly ordinary at first sight – your standard high-end notebook with 14.1in TFT. But looking a little more closely reveals several features you don't see every day. The unit doesn't come with swappable floppy or DVD-ROM drives for the simple reason that there aren't any swappable devices. Both floppy and DVD-ROM are integrated into the right-hand side of the machine and are non-removable. The only part that can be removed in everyday use is the lithium-ion battery, which can't be swapped for other devices as it can with some notebooks. Not only are floppy and DVD-ROM drives integrated into the system, there's also an integrated combination 56K modem and 10/100BaseT network adaptor, both sharing a common RJ45 connector. Next to this, there are two USB ports as opposed to the more usual one.

The graphics adaptor in the UltiNote

is something rather special – S3's Savage/MX chipset, which is the most capable mobile chipset around. It supports full hardware 3D acceleration features and S3TC texture compression, and games like Quake III look as good as they do running on a desktop machine. That's not the end of the story either. It also has DuoView, allowing the VGA output to act not just as a mirror of the TFT, but as a second display using

Windows 98's dual-monitor facility. With DuoView enabled, the external monitor becomes an extension of the desktop, allowing you to run separate applications in each one – a PowerPoint presentation on an external CRT and your private accompanying notes on the LCD, for instance. The TFT screen itself is no better or worse than most of the competition, with a native resolution of 1,024 x 768 and pin-sharp clarity, but a less than perfect viewing angle that leads to an apparent brightness variation across the screen. Inside the case lurks 192MB of RAM and an IBM Travelstar hard disk of no less than 12GB in size.

With all of the hardware stuffed into the relatively compact case of the UltiNote – a reasonably slim 40mm high with the lid closed – the build quality has suffered rather. Pick the unit up and the case flexes noticeably, giving a feeling that this isn't a unit for the true road warrior. There's not too much room for the keyboard either, and it produces a rattly and fairly lifeless typing experience. The touchpad is, however, placed so that accidental-clicking syndrome from the heel of a hand brushing over it while typing isn't a problem.



The UltiNote is a most impressive beast as far as the density of technological innovations goes – we've rarely seen a notebook that packs so much hardware. The price, given the specs, is also remarkable. The 650MHz processor coupled with the Savage/MX makes it an easy match for many desktop systems performance-wise. The desktop, however, is probably the place to leave it for the most part – it just feels too flimsy to seriously rival IBM's or Sony's portables for those who are truly mobile, which renders the presence of the SpeedStep CPU something of a moot point.

DAVID FEARON

DETAILS

★★★★★

PRICE £2,272.45 (£1,934 ex VAT)

CONTACT Hi-Grade 020 8532 6123

www.higrade.com

PROS Full to bursting with top-notch hardware

CONS Build quality is poor and the keyboard is limp

OVERALL One of the fastest notebook we've seen, but not the most inspiring

Toshiba 2560 XDVD

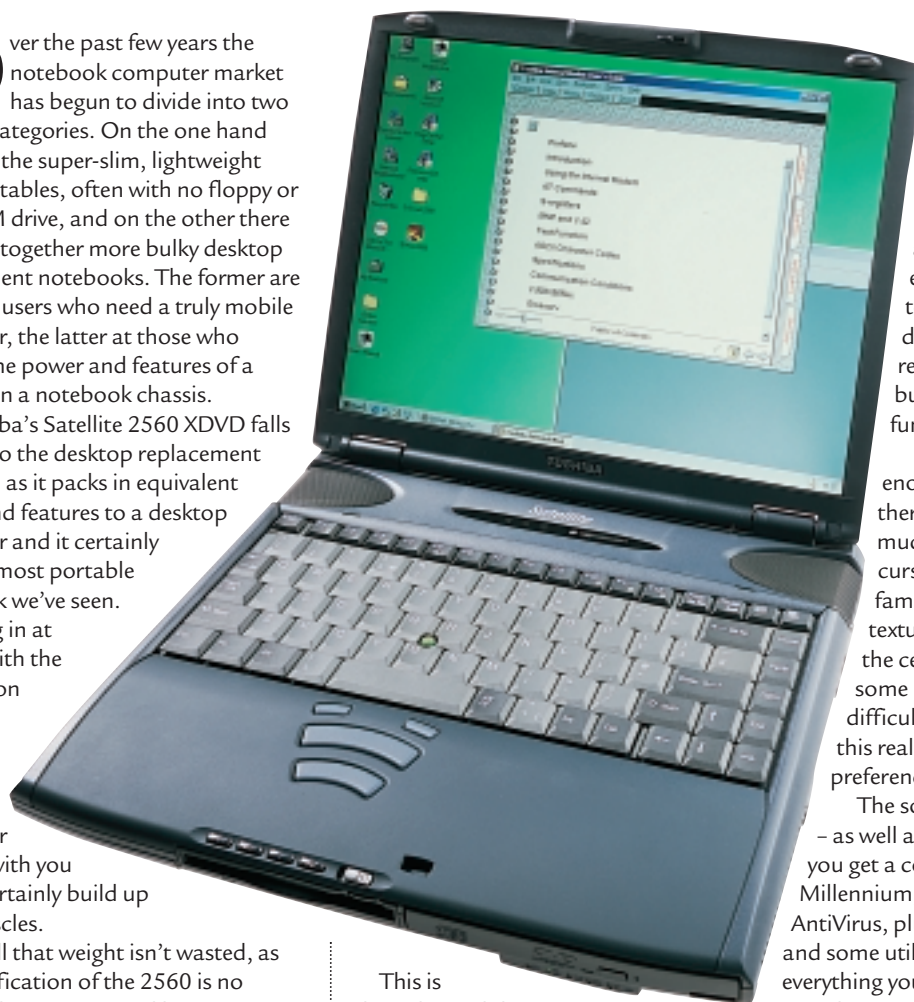
A heavyweight notebook that sports desktop specs and impressive DVD capabilities.

Over the past few years the notebook computer market has begun to divide into two distinct categories. On the one hand there are the super-slim, lightweight ultra-portables, often with no floppy or CD-ROM drive, and on the other there are the altogether more bulky desktop replacement notebooks. The former are aimed at users who need a truly mobile computer, the latter at those who require the power and features of a desktop in a notebook chassis.

Toshiba's Satellite 2560 XDVD falls firmly into the desktop replacement category, as it packs in equivalent power and features to a desktop computer and it certainly isn't the most portable notebook we've seen. Weighing in at 3.16kg with the lithium-ion battery fitted, carrying this computer around with you would certainly build up your muscles.

But all that weight isn't wasted, as the specification of the 2560 is no lightweight. It is powered by a 466MHz Celeron processor, which wouldn't shame a low-end desktop computer. It has 64MB of RAM and a 6.4GB hard drive which, while not generous, is sufficient for most users. This line-up helped it to turn in a SYSmark score of 77. Graphics are provided by a 2.5MB Trident graphics chipset. This amount of video memory isn't much by today's standards, but it is ample for most business tasks.

The most notable feature this notebook has copied from the desktop realm is a quad-speed DVD-ROM drive, which comes with all the software you need to watch movies. On most other portable computers we've seen, the DVD drive is little more than a gimmick that pushes up the price, as a TFT display is not the ideal medium to watch movies, and often the lack of power in a notebook means playback is jerky with lots of lost frames.



This is where the Toshiba stands out from the crowd, its 14.1in screen may still not be the best display on which to view a film, but if you are on a plane or in a hotel it will do. When we put it to the test, playback was flawless, even in full-screen mode. When we moved the cursor around the screen there was no deterioration in quality, and sound from the built-in speakers wasn't too bad either, although we did find that we couldn't push up the volume very high using the external controls.

If you aren't happy with the quality of movies on the notebook screen, then there is also the option to hook it up to your TV. This feature means that as well as a fully-featured PC you get a DVD player, which is worth remembering when you look at the price tag.

Alongside the volume controls, there are also buttons to control audio CDs, although not DVDs, as well as a quick

access Internet button that takes you directly online. The selector buttons also have an unusual layout that we've never seen before. There are four – one each for left and right clicking, plus two extra buttons that are set up to allow you to scroll up and down. If you prefer you can reprogram the scrolling buttons to perform other functions instead.

The keyboard is pleasant enough to use, although there's no way to create much of a typing slope. The cursor is controlled by the familiar Toshiba trackpoint, a textured green nipple located in the centre of the keyboard – some people find these devices difficult to get along with, but this really is a matter of personal preference.

The software bundle is generous – as well as a software DVD player you get a copy of Lotus SmartSuite Millennium, Quicken 99 Basic, Norton AntiVirus, plus a couple of other titles and some utilities. This means you have everything you need to get started straight out of the box – another thing to consider when you look at the cost of the 2560.

URSULA TOLAINI

DETAILS

★★★★★

PRICE £1,999 (£1,701.28 ex VAT)

CONTACT Toshiba 01932 828 828

www.toshiba.co.uk/computers

PROS Excellent DVD-playback quality, good performance

CONS Heavy, lack of video memory

OVERALL A good choice for a desktop replacement, it combines the features of a larger PC with top-quality DVD playback in a compact case

PERFORMANCE RESULTS



SYSmark 2000



ADI MicroScan G910

A no-frills **19in flat-screen monitor** with good resolution and great image quality.

The last of the big monitor suppliers to enter the world of flat-screen CRT monitors, ADI has launched the G910 to head up its range of Sony Trinitron FD-equipped displays.

The tube is a nominal 19in with an 18in viewable diagonal, so it should handle a resolution of 1,280 x 1,024 without any fuss. At this resolution, testing with a Matrox Millennium G400 graphics card, image quality is as good as we've come to expect from recent CRTs. Resolution is excellent, with stable electronics and vibrant colours from the aperture grille-based tube.

It is, however, less sharp than rivals equipped with Mitsubishi's Diamondtron



NF tube. There was also some noise on the image in our review sample. Taking the resolution up to 1,600 x 1,200 results in loss of definition, but it's usable. You can go up to 1,744 x 1,344 at 75Hz.

The 910 is a no-frills display: there's a single captive D-SUB video connector, and a gap in the base of the unit betrays the fact that a USB hub is an extra, costing £20 ex VAT. In the top of the screen bezel is a microphone, and a couple of screw-thread mountings at each side of the casing will accept optional speakers, too.

OSD controls are comprehensive,

with top and bottom extreme pincushion adjustments, plus vertical and horizontal linearity. In practice they weren't needed, with the unit delivering near perfect image geometry straight off the bat.

Overall, the G910 doesn't deliver anything ground-breaking, but it's a competent display for the money.

DAVID FEARON

DETAILS

★★★★★

PRICE £398.33 (£339 ex VAT)

CONTACT ADI 020 8327 1900

www.adimicroscan.com

PROS Great quality for a very reasonable price

CONS The tube isn't quite as sharp as Diamondtron NF variants, some signal noise

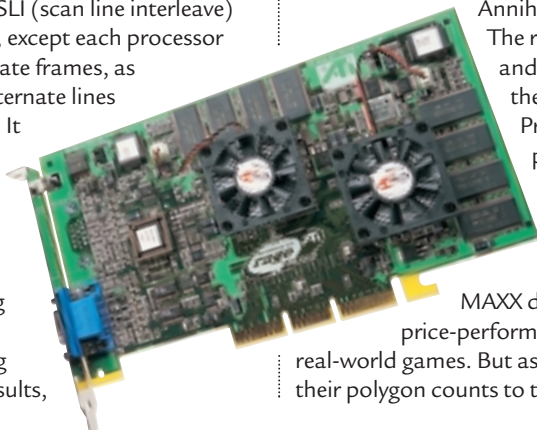
OVERALL The G910 isn't breathtaking, but it's a solid, good value display for those who need high resolutions

ATi Rage Fury MAXX

If you want a fast graphics card **at a reasonable price** this could be the one for you.

Unable to produce graphics silicon to catch up with nVidia's GeForce 256 and 3dfx's soon-to-be-unleashed Napalm graphics processors, ATi has come up with the Rage Fury MAXX. Like earlier Rage cards such as the Magnum, this features the Rage 128 Pro chipset, but there are two of them on-board, each with 32MB of SDRAM. The processors are employed in a fashion similar to 3dfx Voodoo 2s in SLI (scan line interleave) configuration, except each processor handles alternate frames, as opposed to alternate lines of each frame. It comes with ATi's DVD player software, but there's no accompanying TV output.

Comparing benchmark results,



the MAXX doesn't fare too well in 3DMark 2000. At 1,024 x 768 in 16bit colour it scored 2,598, as against the 4,574 of the Creative Annihilator Pro and the circa-4000 of both the Guillemot 3D Prophet and standard Annihilator. Switching to Quake III Arena gives a more encouraging performance: at 1,024 x 768 in 32bit colour it delivers 42fps in the standard timedemo 1 test, against the Annihilator Pro's 47fps and the Annihilator's 34fps.

The raw horsepower and bandwidth of the two Rage 128 Pros come into play when dealing with the high-quality 32bit textures. Currently, the MAXX delivers the best price-performance ratio for real-world games. But as developers up their polygon counts to take advantage

of nVidia's hardware transform and lighting – which the ATi can't support – the MAXX is likely to fall behind. But as an extremely fast card for a reasonable price, the MAXX certainly delivers.

DAVID FEARON

DETAILS

★★★★★

PRICE £187 (£159 ex VAT)

CONTACT ATi 01628 533 115

www.ati.com

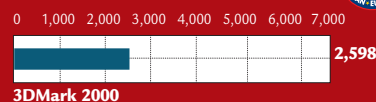
PROS Raw pixel-pushing power exceeds anything else at the price, 64MB memory

CONS No geometry processing capability

OVERALL If you need sheer speed but can't stretch to a DDR GeForce 256, buy a MAXX



PERFORMANCE RESULTS



Sony SDM-N50

With a supermodel figure and **the design wizardry only Sony can weave**, this monitor is magic.

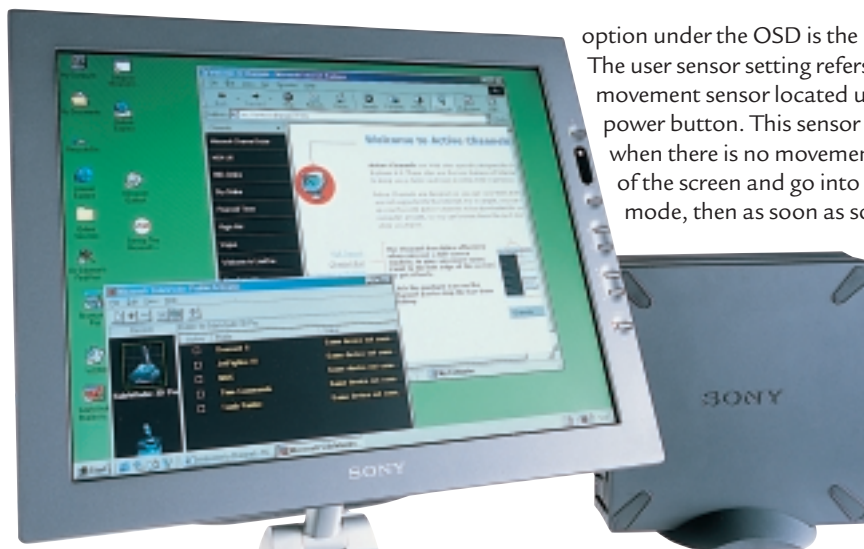
We've said it before and we'll say it again, no company can design products the way Sony can. Sony manages to take a product that's generally thought of as dull and turn it into a must-have item.

This time the magic design wand has been waved over a flat-panel monitor, and the results are nothing short of staggering. Without a doubt, the SDM-N50 is the most beautiful computer display ever constructed. That might seem like a strong statement, but you only have to take a look at this revolutionary monitor to see what we mean.

An average TFT display is about 9cm thick, but the SDM-N50 is an amazingly svelte 1.3cm thick. Not only is it thin, but it's easy to position, with the screen mounted on a multi-pivoted stand.

Breaking with the traditional beige plaguing most PC products, Sony has opted for a stylish grey and silver colour scheme, making its new baby even more of a style statement.

However, as thin and desirable as it is, what you see is not all you get. The SDM-N50 works in conjunction with what Sony calls the Media Engine. This square box of tricks sits between your PC and the screen. The Media Engine receives the power, video signal and sound and transmits it all to the screen



via a single cable. Of course, this means that the package isn't as small as you first think, but since the connection cable is two metres long it's easy for you to position the Media Engine out of the way and just have a single cable running to the screen. The Media Engine is capable of accepting two VGA inputs, which means you can connect two PCs to it and switch between them using the button on the screen fascia.

The adjustment controls are all located down the right-hand side of the display and the layout and usability is excellent. Without even entering the OSD you can adjust brightness, contrast and volume, and switch between input signals. Once you press the menu button you're presented with a comprehensive list of adjustments, including an ambient light sensor and a control to set the width of the stereo sound. However, the most impressive

option under the OSD is the user sensor. The user sensor setting refers to a small movement sensor located under the power button. This sensor will detect when there is no movement in front of the screen and go into power-save mode, then as soon as someone sits

in front of the screen it will switch on again. We know this is a gadget, but it's a good one.

The quality of the display itself is first rate. The colours are vibrant and the lighting is even across the surface. You also have the option of altering the backlight intensity under the OSD to suit your own preference. The optimal resolution of the display is 1,024 x 768, which is pretty standard for a 15in panel. There are stereo speakers mounted in the base of the stand, while a handy headphone socket nestles next to the main connection cable.

If you're considering buying an LCD flat panel because of the way they look, this is definitely the one to go for, but be prepared to pay a little extra for the privilege. If the extra expense doesn't put you off, you'll be buying the most beautiful and feature-packed LCD flat panel on the market.

RIYAD EMERAN

DETAILS

★★★★★

PRICE £1,173.82 (£999 ex VAT)

CONTACT Sony 0990 424 424

www.sony.co.uk

PROS Gorgeous, slim, feature-packed

CONS Relatively expensive

OVERALL The most stunning computer display ever to grace the offices of PCW. If you want a stylish desktop, then get one of these

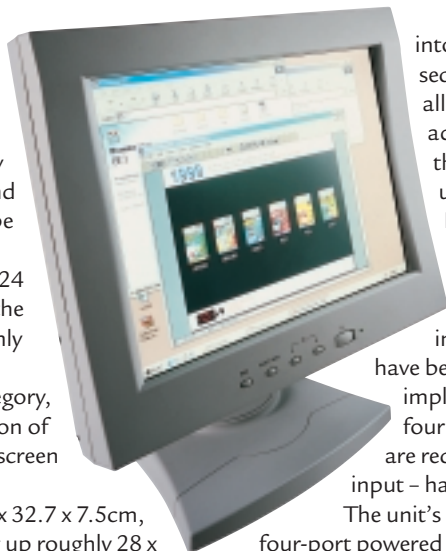


CTX Panoview PV751

This rotatable flat panel could make scrolling down long, thin web pages **a thing of the past**.

Flat panels are becoming increasingly common, and in a few years' time it is likely they will become the norm and CRT monitors will only be for those with big desks. Now that affordable 1,024 x 768 flat panels are on the market, this trend can only continue. The Panoview PV751 falls into this category, offering a native resolution of 1,024 x 768 on a 15.1in screen for £639 ex VAT.

The panel itself is 40 x 32.7 x 7.5cm, with the footprint taking up roughly 28 x 24cm of desktop real estate. The display is good, with uniform brightness and on our review unit there were no dead pixels. On the front bezel there are four menu keys and an off switch. The OSD is split



into three sections, covering all the necessary adjustments. At the rear of the unit you'll find a DC in and two D-SUB video connectors. The dual inputs could have been better implemented, as four button presses are required to switch input – hardly ideal.

The unit's stand houses a four-port powered USB hub and the grandly titled Cable Management Device, or 'hole to put the cables through'. The PV751 not only adjusts vertically and horizontally but can be rotated 90 degrees into a portrait position. To make

full use of this you'll need a copy of the Pivot software to electronically rotate the screen, otherwise you'll get neck ache.

Browsing the Internet or word processing naturally lend themselves to a longer thinner display, so it's just a shame the software isn't included as standard.

WILL HEAD

DETAILS

★★★★★

PRICE £750.83 (£639 ex VAT)

CONTACT CTX Europe 01923 810800

www.ctxeurope.com

PROS Very good product for the money, portrait facility

CONS Pivot software not included as standard, too many button presses to switch inputs

OVERALL Great value for money. It's a shame the Pivot software doesn't come as standard, but then maybe not everybody wants it



Toshiba SD-R1002

The best of both **CD** and **DVD** worlds.

The SD-R1002, more affectionately known as the Combo, is not only a CD-RW drive, but also a DVD-ROM in the same unit. Using an advanced, high-performance pick-up head that incorporates two laser diodes, it can read DVD and read and write a full 650MB CD-R or CD-RW in under 20 minutes. With a 2MB buffer, this should happen glitch-free. In terms of DVD-read speed, the Combo is billed as a four-speed, but in our tests it achieved 4.9. The full retail kit aims to provide a complete solution, and to this end everything you need to install and use the Combo is included. Cables, screws, a manual eject pin, CD-R and CD-RW media and even a CD-labelling pen.

Also included is an equally comprehensive software bundle. CD-writing software presents itself in the form of the competent VOB Instant CD. InterVideo WinDVD 2000 provides



software DVD decoding and, provided your PC is equipped with at least a Pentium II 350MHz processor, you can expect smooth movie playback. Other bonus software comprises the excellent VOB InstantMusic, with which you can create CD-quality tunes, and MusicMatch audio player, an easy-to-use CD and MP3 encoder and player. Other benefits of a combination drive are that it only takes up a single bay and EIDE connector, and installation is a doddle.

The results from our CD Tach benchmark showed a read rate of 15.7-speed, the average across the disc – not a bad result from a 24-speed rated

drive. Amazingly, the random access time came out as 83ms, which is actually faster than Toshiba's claim of 110ms. On average the DVD read was 3.2-speed – a little bit slower than we would have liked to have seen, but it's still fine for most of today's applications.

JIM MARTIN

DETAILS

★★★★★

PRICE £246 (£209.36 ex VAT)

CONTACT Toshiba 01932 828 828

www.toshiba.co.uk

PROS Easy to install, generous bundle

CONS A touch on the slow side

OVERALL The Combo is a long overdue product, so all credit to Toshiba for getting there first. Its performance isn't quite brilliant, but it's certainly up to the jobs that it was made for

Sony Mavica MVC-FD88

A floppy disk-based camera.

When your medium of choice is a floppy disk, you can't expect to buy a pocket-sized camera. That said, the FD88 is not overly heavy, and it does benefit from an inexhaustible supply of cheap media – the cost of ownership is far lower than that of CompactFlash or SmartMedia cameras. It's also highly versatile. The lens can be supplemented by a range of filters and external lenses to achieve the right result. It has an 8x zoom, upped to 16x when the digital zoom function is invoked.

It sports a 1.3 megapixel CCD for non-interpolated images at 1,280 x 960 resolution. The colours it produced were sharp and realistic. Even full-sized images using the 'fine' setting had only minimal noise and could put competitors' efforts to shame. In tests, a 1.44MB floppy held four 1,280 x 960 images at this setting, rising to 25 VGA snaps using the 'standard' setting. These are written to disk as quickly as some CompactFlash cameras, thanks to the new quad-speed drive. The only downside is that it's a bit noisy, but not unbearable. At the same time, it writes a small HTML file of hyperlinks to your images for use in a browser.

Full-sized images had only minimal noise and could put competitors' efforts to shame

There is no optical viewfinder, so you'll have to rely on the 2.5in LCD. We found this to have conservative power drain, as a single charge of the battery lasted us a couple of days. Sony estimates it should have enough stamina to last around two hours or for 1,200 shots. This is no doubt thanks to the 'Solar Window', a thin clear window that lets you use natural light rather than the backlight to illuminate your images. The Infolithium battery displays remaining usage time in the corner of the LCD.

The FD88 is also capable of MPEG1 recording. In our tests, it squeezed one minute three seconds at 160 x 112 resolution, dropping to 15 seconds when the resolution was increased to 320 x 240. The camera simultaneously records

sound, and as it can be set to record in five, 10 or 15-second blocks it doesn't matter if your finger slips off the shutter button during the process. A supplied AV cable will send recorded images and sound to an NTSC or PAL television.

There are a number of obvious advantages to using a floppy disk as the

recording medium. First, it requires no drivers, which makes it truly cross-platform, although if you're using it with an iMac you'll have to have an external drive. It is also ideal for beginners – just take it out of the box and away you go. No fiddling with downloads. There are also no cables, so it puts an end to clambering around behind your PC.

There are a few missed opportunities. The FD88 obviously has some internal memory, as it can copy disks or cache a 60-second MPEG file before writing it to disk, but there is no way of using this for storing images before writing to disk. If there was, you could have much shorter response times between consecutive photos. It's a shame, too, that there isn't a version using Sony's 200MB HiFD

floppy format with a bundled drive – it would push up the price, but it would also make this camera hard to beat in the sub-professional arena.

The Mavica is ideal for first-time users, but as many are now buying iMacs for their ease of use, it's a shame it doesn't include some way of getting your images into the fruity wonder without the need to invest in a floppy drive, especially as the packaging boasts Mac compatibility. Exposure and flash can all be handled by the camera, making it easy to get the pictures you want with little effort.

NIK RAWLINSON



DETAILS

★★★★★

PRICE £700 (£595.74 ex VAT)

CONTACT Sony 0990 424 424

www.sony.co.uk

PROS Cheap to run, conservative power drain, MPEG encoding, good image quality, good choice for beginners

CONS A couple of enhancements could have earned it a five-star rating

OVERALL A sensible choice for the less experienced user but it also has plenty to offer old hands

Handspring Visor Deluxe

At last, a handheld with **enough tricks up its sleeve** to really give the Palms a run for their money.

Despite the efforts of Microsoft to convince us otherwise, if you want really small, yet functional organisers, there's only one game in town – 3Com's Palm series. The company has a huge chunk of the market and there's a wide range of software that you can run on it, ranging from games to business applications.

The Handspring Visor is one of the first products to appear as a result of the licensing of the Palm OS by 3Com. Handspring itself was set up by the original creators of the Palm, so it has been a long-awaited product. But has the wait been worth it?

The Visor Deluxe looks pretty similar to a 3Com Palm IIIe, and it sports much the same features, although with 8MB of memory, compared to the 2MB on the similarly priced 3Com device. You can have it in graphite or, if you prefer, in a choice of four translucent colours.

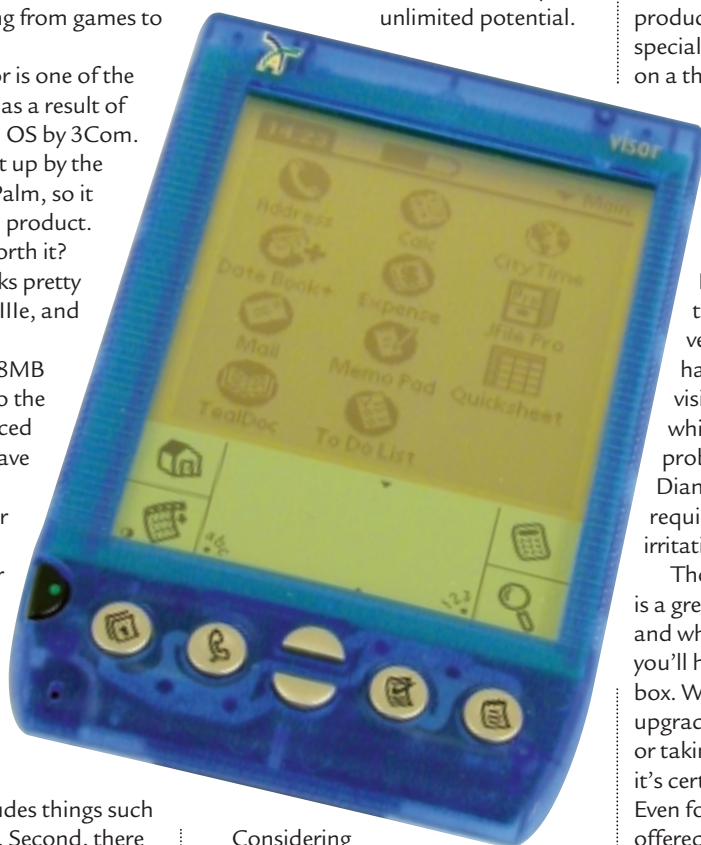
There are some other important differences, too. First, there's no built-in flash memory. That means that you can't upgrade from PalmOS 3.1H – although Handspring's customised version includes things such as Euro support anyway. Second, there are some differences in the applications. Handspring has added a better date book that will display ToDo items, and a world clock.

All this is small beer, however, compared to the really big changes. First, the Visor connects via USB. Anyone who has waited for lots of contacts to synchronise will appreciate the extra speed this gives you. Both Mac and PC software is included; as long as you have a USB port, you don't need to buy anything else. A serial cradle is available as an option if you don't have USB.

Important change number two is the Springboard. It's an expansion slot on the rear of the Visor covered by a plastic shield. Pop off the cover and slip in a Springboard module, and you have true Plug and Play – the modules include their own software and drivers. A flash memory

backup module, a Tiger Woods golf game and a modem are already available.

Other modules planned – from both Handspring and other vendors – include GPS receivers, pagers, and MP3 players. Just drop in a module and your Visor turns into a PDA with virtually unlimited potential.



Considering that it costs around the same as the Palm III, yet packs in so many more features, it's really no surprise that Handspring has been working very hard to keep up with the demand for the Visor.

It's not all sweetness and light, however. There are some things that may annoy or upset die-hard Palm supporters. Starting with one of the most trivial, the infrared port is on the side, instead of the end; it has to be like that, otherwise it could potentially be covered by some of the larger Springboard modules. But it means that if you want to use remote control software, you might find yourself having to hold the Visor at an odd angle.

More seriously, for those who have accumulated gadgets and gizmos, the port on the bottom of the Visor is not

compatible with either Palm III or Palm V models. Therefore, if you've bought a portable keyboard, or something like TDK's Global Pulse software and cable to link to your mobile phone, then you won't be able to use them with the Visor. However, given time, some of these products will be made compatible, with special Visor versions, but if you do rely on a third-party tool such as this, it's worth checking before you make the switch.

Another problem that we read about online and experienced with one program is software incompatibility. Frankly, the list of applications that actually have had problems is very small – and in many cases it has since been fixed, but it's worth visiting the VisorCentral website, which lists updates and known problems. One application – the Dianameter – locked up the Visor, requiring a reset. No data lost, but irritating nevertheless.

Those niggles aside, the Visor Deluxe is a great piece of kit. It feels well built, and whether you're a PC or Mac user, you'll have everything you need in the box. Whether you're considering upgrading from a 3Com Palm product, or taking the plunge with your first PDA, it's certainly worth a very serious look. Even forgetting about the flexibility offered by the Springboard slot, or the faster USB synchronisation, it's more than competition for the Palm III in value for money terms. Pricing is currently set in US dollars.

NIGEL WHITFIELD

DETAILS

★★★★★

PRICE \$249 (approx £155)

CONTACT Handspring 00 1 888 565 9393

www.handspring.com

PROS Great value for money. Lots of potential for expansion

CONS No flash memory for OS upgrades, some older Palm software may have compatibility problems

OVERALL A very worthy competitor to the 3Com products, the expansion slot promises to make it much more than a PDA

Adaptec 29160

An Ultra160 SCSI card boasting **a bandwidth of prairie-like proportions** and unique compatability.

Ultra160 SCSI marks an improvement for SCSI in two ways. First, it doubles the currently available channel bandwidth to a massive 160Mbytes/sec, and second, it's the first time that a new standard has been made that actually makes sense when compared to its bandwidth.

You may have already noticed Ultra160 hard drives on the market, but there was no sign of a host adaptor to use with them. That was until now. Adaptec is the first company to bring a card to market, and here we're reviewing the single-channel 29160.

On first appearance the card looks much like an Ultra2 LVD card – after all, the 68-pin connectors are common across both standards, as is the cabling. This means that upgrading the card requires a simple swap out of the old host adaptor.

Taking a closer look at the card itself we noticed a small anomaly. There were two 68-pin internal connectors on the card, but wasn't this supposed to be a

internal 68-pin connector and the internal 50-pin connector. As far as we're aware, this feature is unique to Adaptec and means that one card will suit all devices.

Next came the installation. The card is a 64bit PCI card, but don't worry if you don't have

perfectly at home inside a Windows 9x machine. However, once we rebooted we noticed a problem with one Ultra 160 hard drive – a Quantum Atlas IV. The SCSI BIOS picked it up on boot, but once we were in Windows NT the

drive couldn't be seen. In fact,

we had to recycle the power before the SCSI card could see the drive again. To

be fair to Adaptec, the fault lay with the firmware on the hard drive, and once we'd contacted

Quantum and got the latest firmware update, the drive worked perfectly.

The 29160 is a good card and it is reasonably priced. Before you go out and buy one, though, there's one question to be answered: do you really need the bandwidth that Ultra160 offers? In reality you're only ever going to notice the difference if you are streaming large files from multiple drives. If this isn't the case, and you don't have a lot of drives hanging off a single channel, then you may well be better off sticking with the card you have, as no hard drive can read data as quick as the available bandwidth on an Ultra160 channel.

On the other hand, if you need a SCSI card, then you may as well get the best you can, and this card is exactly that. Just don't be fooled into thinking that the performance of your computer will suddenly double.

DAVID LUDLOW

If you need a SCSI card, you may as well get the best, and this card is exactly that

single-channel card? Opening the manual gave us the answer.

The additional connector is for compatibility reasons. If you want to run Low Voltage Differential (LVD) devices (Ultra2, or Ultra160) at speeds greater than 40Mbytes/sec then these are the only devices that you can have attached to a channel. Adaptec has got around this through its SpeedFlex technology.

This basically means that two connectors are included for the channel, and electronically isolated, into primary and secondary segments. All LVD devices connect to the primary segment – on this card the first internal, and the external 68-pin connector – and other devices connect to the secondary segment – for this card it's the second

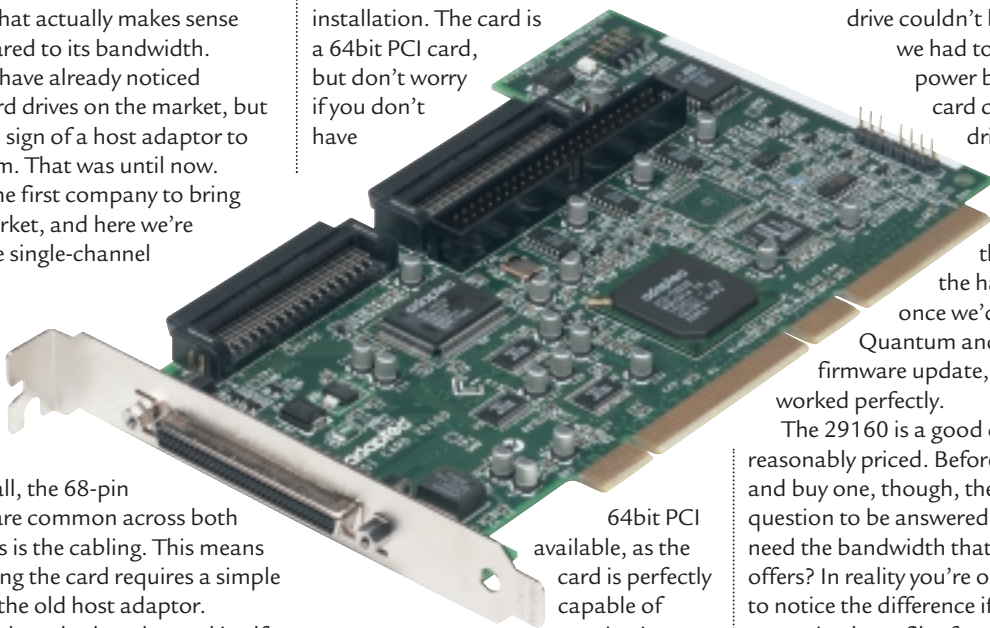
PCI, it would be a shame to pass it up.

From this point on the card acts just like any other Adaptec card that you may have seen. During the Power On Self Test (POST) the card displays any devices to which it is connected, and allows the user to enter the SCSI BIOS. The BIOS allowed us to change the boot priority of the card – after all, if you have two SCSI cards in your computer, you may not want to boot off this one. Also included as part of the BIOS are some tools to deal with hard drives, such as checking the disk media, and performing a low-level format.

Proceeding with the installation we booted into Windows NT and installed the drivers through the Windows Control Panel. We used NT, but the card is

64bit PCI available, as the card is perfectly capable of running in a

32bit slot instead, just in a slower 32bit mode. We decided that, as we had the option to plug it into a server with 64bit



DETAILS

★★★★

PRICE £259.99 (£221.27 ex VAT)

CONTACT Adaptec 01276 854500

www.adaptec-europe.com

PROS Well engineered, the fastest SCSI card available

CONS Some compatibility problems with older hardware

OVERALL Adaptec's usual quality for a SCSI card, although the additional bandwidth may be wasted on a lot of systems

Canon BJC-8200Photo

This printer may help solve the cost problem of getting photos **off the desktop and into the album.**

Digital photography is fast becoming the most popular way to capture images for posterity, but the problem it poses is how to get a hard copy of your pictures. The most convenient solution lies in a photo printer such as Canon's BJC-8200-Photo.

Unfortunately, it isn't that simple and you will soon discover that printing out photos at home doesn't come cheap. Canon has done its best to cut down on wastage by storing the six inks used by the BJC-8200Photo in separate tanks within the print head, so you don't have to replace the whole lot when one runs out. But at £10.56 per

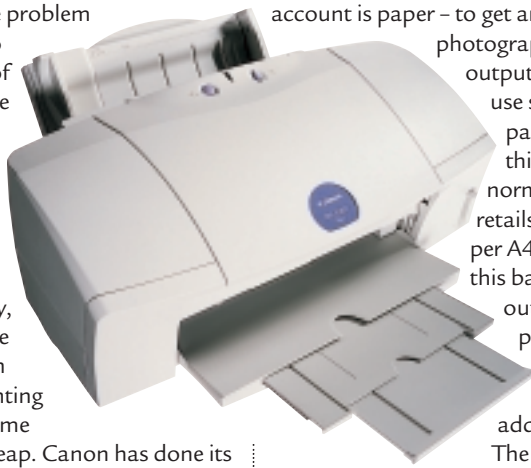
tank, if you do a lot of colour printing these still work out pretty dear.

The other cost you have to take into account is paper – to get anywhere near photographic quality output you have to use special glossy paper, which is thicker than normal, and this retails at around £1 per A4 sheet. On this basis, printing out 24 6 x 4in pictures will set you back £8, without adding ink costs. The other drawback with photo-quality printing is speed, as it is a slow business. However, we managed to print out 0.7ppm, which is faster than Canon's claimed 0.31ppm. Obviously

print speeds rise if you decrease quality, so you can churn out pages at over 2ppm for draft text or colour.

Output quality on photo paper was impressive, with realistic skin tones that are notoriously tricky for printers to reproduce. Our only complaint was that some colours looked a bit washed out.

URSULA TOLAINI



DETAILS

★★★★

PRICE £351 (£298.72 ex VAT)

CONTACT Canon 0121 680 8062

www.canon.co.uk

PROS Individual ink tanks cut down on wastage; good quality photo output

CONS Slightly washed-out colours, expensive consumables

OVERALL A better than average photo printer. If you feed it high-quality paper you get high-quality output back

Canon BJC-85

A mobile printer that **breaks the tradition** of rough and ready output quality while on the move.

The market for portable printers may be small, but if you really can't do without a printer when you are on the move, Canon's new model is designed to offer mobile, high-quality colour printing.

The printer comes with both parallel and USB connections, plus drivers for Mac and PC, making it one of the few options for Apple users who need a portable printer. It also has an IrDA port and Windows CE drivers so you can print from a PDA, too.

Print quality is usually something you have to sacrifice if you need to print while on the road, and if you use standard paper the BJC-85 does nothing to buck this trend. Text printing is fine, but on colour graphics the black ink ran into the coloured blocks in our test print and graphics suffered from banding.

If you're prepared to pay for Canon's special paper – £6 for 50 sheets and you can only print on one side – output is excellent. Images are pin-sharp at the 760 x 360dpi maximum resolution, the best we have seen from a portable printer and speed isn't bad at 2.8ppm for text.

At 1.4kg this isn't the lightest

portable printer you can find; Brother's MP-21C is lighter at 1kg. And while Brother's unit draws power from your notebook's battery, the BJC-85 needs an external power source – either the supplied AC adaptor or an external battery for £80 extra.

URSULA TOLAINI



DETAILS

★★★

PRICE £257 (£218.72 ex VAT)

CONTACT Canon 0121 680 8062

www.canon.co.uk

PROS High-quality printing on special paper, range of connection options

CONS External power supply necessary, printing costs

OVERALL If you have to have top-quality output when you are on the move, and you have the budget to cover the cost of consumables, the BJC-85 could be for you

HP LaserJet 3150

If you've ever wished for just one bieke box to meet **all your office requirements** – well it's arrived.

Externally, the 3150 looks just like any other fax machine. Paper is stored in an upright feed at the rear, while the output bin is located at the front. A numeric keypad and LCD display dominate the control panel, allowing faxes to be sent. In fact you could just leave it at this and use the 3150 as a standalone fax machine.

However, to take full advantage of its functions, you're going to want to get the device connected to your PC. The 3150 has a parallel port connection on the rear. HP uses a proprietary port design, so we were glad to see that it provides a suitable parallel cable as part of the bundle.

Our Windows 98 machine detected the new LaserJet at boot and prompted us to insert the driver CD. This not only gets the drivers installed, but also loads the JetSuite software. This is used to control the operation of the 3150 and perform some basic setup tasks. In our case this meant setting the correct time and date. While this operation can be done through the unit's hardware

sheet-fed, you are limited to scanning documents that will fit through the device mechanism. Its 300dpi optical resolution (600dpi with

faithfully, and remained a solid black colour. Graphics, on the other hand, were acceptable but nothing special. Our greyscale picture showed that the LaserJet 3150 had some trouble representing the variance of shades that the picture required for accurate representation. Some banding crept into the output, but the main points of the picture were still recognisable.

HP quotes a print speed of 6ppm. To check this

out, we took averages after timing the printing of a 50-page single-font Word document, and a 50-page Adobe Acrobat file,

combining graphics and text, and our results matched HP's boast.

The LaserJet 3150 is better than a lot of multi-function devices we have seen. It integrates well with the PC environment, providing the control software you need to get full functionality out of the device. The LaserJet lends itself well to being used as the only office printer, as the text quality is superb. We can forgive the graphics output, as this kind of printer wasn't designed to reproduce photo-quality images, and the greyscale output is fine for the occasional diagram. The scanner can't rival a dedicated flatbed scanner, after all it's sheet fed and only produces mono output. However, for scanning in the odd text document for OCR, or sending a fax, it'll do fine.

DAVID LUDLOW

Text quality was impressive. Even the smallest-sized text was reproduced faithfully

control panel we found it easier to change just a couple of dialog boxes through software.

While JetSuite will give you access to the fax, scan, and print options, we found that this wasn't necessarily the best way to work. The LaserJet 3150 installs a TWAIN driver, giving access to its scanner, meaning that packages such as PaintShop Pro can address it directly. The main problem we found with the whole setup is that, as the scanner is

interpolation) makes it suitable for OCR use, although as it's purely mono, you'll only get greyscale output.

For the fax, the LaserJet 3150 has a print to fax option, enabling you to fax any document from Windows-based applications. This option also allows the user to define an address book with

minimum effort. The only problem we encountered came when we wanted to pick a cover page, as the driver doesn't allow you to see which sheet you are choosing. This option is only available inside the JetSuite application, as is the option to design your own cover sheets.

We used a series of tests to check the quality of both graphics, and text, and also to look at the speed of the print engine. Text-quality was impressive. Even the smallest-sized text was reproduced



DETAILS

★★★★★

PRICE £581.63 (£495 ex VAT)

CONTACT Hewlett-Packard 0990 474 747

www.hp.com

PROS Good print quality; good integration with the PC

CONS Print to fax option could make cover sheet selection easier

OVERALL A worthy multi-function device that provides all the options for standard office use

Dreamweaver & Fireworks

The third versions of these packages work in sync like **Fred and Ginger**, making history together.

When Macromedia sends pre-release software to the press, it makes sure that it waits until the very last moment. In this way, previews can be expected to represent the finished product fairly closely, save for a little last-minute tweaking. That is as true in this case as any other, and so the final versions of both Dreamweaver 3, the web-authoring package, and Fireworks 3, the image-optimisation tool, are very similar to their beta predecessors.

The one thing at which no other package is able to beat Dreamweaver is table creation. Some users may initially prefer the graphical-drag method that mimics the version found in Microsoft Word, but Dreamweaver's simple on-screen form ensures that every parameter is in place from the word go. Manipulating the table from that point on is a simple matter of highlighting the appropriate cells, right clicking and selecting an action from the table menu. You never encounter an unexpected action, which may be a refreshing change if you have switched to Dreamweaver from another package.

If you are trying to decide whether or not it is worth upgrading to either of these packages from version 2, then the answer is a resounding 'yes'. The History palette alone makes an upgrade

The History palette keeps a list that can be rolled back, even back through saves

worthwhile. This tracks your every action, keeping a list that can be rolled back, even back through saves. This allows you to try out designs and even save them for viewing within a framed environment – which is not possible using a standard preview – and then undo any damage. A secondary History function is that it allows you to save the contents of the palette as a macro. Therefore, if you always perform the same set of functions to create a menu imagemap at the top of a page, for example, you can simply load them as a macro and cut out the repetitive work.

We reported in our preview that the



Dreamweaver: Easy to use, but it benefits from a large monitor

parameter adjustment bars in Fireworks had switched from their original vertical orientation to horizontal. This required the user to release their mouse click, reposition and then drag the slider from left to right. Fortunately, this has now reverted to the original vertical position, which offers far smoother operation.

Fireworks will also neatly trim text-box boundaries, eliminating unnecessary overlaps and making it easier to select image elements.

The only complaint we have with the suite as a whole is Dreamweaver's FTP functions, which at times can seem a little flaky. Working on a LAN with a permanent Internet connection, it was great to be able to simply click 'put' from the site files map and know that Dreamweaver would take care of logging on to the remote server and depositing the file in the correct sub-directory, but when transferring multiple files over a modem, we found it easier to use an external FTP package. A nice touch, though, is the option to upload all referenced files, so if your page includes a number of images, they will be

transferred, too. It's probably best not to set this as the default option – if you're working on an evolving site and uploading pages as they are completed, you'll also find yourself uploading your regular page furniture each time.

If you can't afford both packages then we'd recommend that you opt for Dreamweaver 3. However, the two are so well integrated – right-clicking on an image within Dreamweaver will

bring up the option to edit it in Fireworks 3 – that most users would benefit from investment in the studio combo-package.

NIK RAWLINSON

DETAILS

★★★★★



PRICE Dreamweaver 3 £269.08

(£229 ex VAT) or upgrade for £116.33 (£99 ex VAT); Fireworks 3 £163.33 (£139 ex VAT) or upgrade for £116.33 (£99 ex VAT);

Dreamweaver 3 Fireworks 3 Studio combo £351.33 (£299 ex VAT) or upgrade from both Dreamweaver 2 AND Fireworks 2 to Studio for £175.08 (£149 ex VAT) or upgrade from either Dreamweaver 2 OR Fireworks 2 to Studio for £210.33 (£179 ex VAT)

CONTACT Computers Unlimited

020 8358 5857 www.macromedia.com

SYSTEM REQUIREMENTS

Dreamweaver 3: Windows 9x/NT4, 120MHz or faster processor, 32MB of RAM, 20MB free hard-drive space, 256-colour monitor with a resolution of 800 x 600, CD ROM drive

Fireworks 3: Windows 9x/NT4 with Service Pack 3, 64MB of RAM, 640 x 480 display with 256 colours, 100MB free hard-drive space, Adobe Type Manager 4 or later with Type 1 fonts

PROS Excellent History function, good interaction between packages

CONS FTP a little quirky

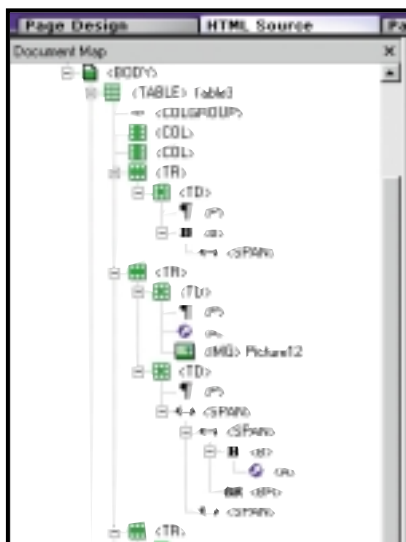
OVERALL Still the best web combo around

NetObjects Fusion 5

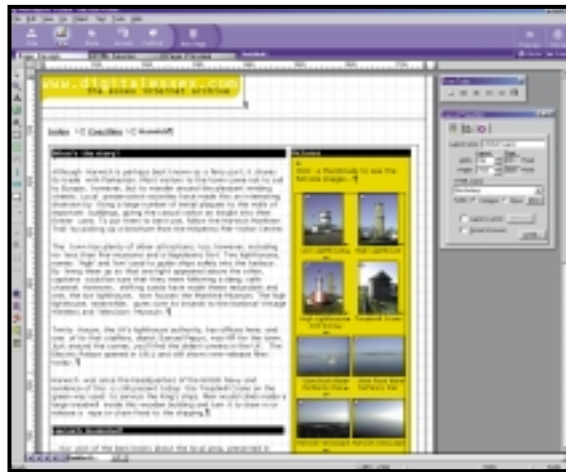
A competent web-authoring tool with a talent for self-publicity, that is suited to **business users**.

Codenamed Monaco, this is the latest incarnation of the highly successful Fusion web authoring tool. More popular with business users than home web authors, its border-and-page approach makes it easy to quickly create and update a set of uniform pages, although because of this, more creative users may find it slower to use than the likes of Macromedia Dreamweaver or Microsoft FrontPage.

Users of Fusion 4 will recognise the clean interface. In this version it has been slightly enhanced to give it a more rounded, 3D look, but you'll find many of the old functions in their original locations. However, at times we found the package cumbersome. Switching from the page-design view to the raw HTML source mode should be instantaneous, but this relatively simple procedure in Fusion 5 took so long that it made us wonder if our test machine had crashed. Once switched, however, the mode offers a number of innovative features that, when you get used to using them, will probably turn out to be something you cannot do without. First, there is a Document Map. This looks like the familiar Windows Explorer, in that tags are presented in a hierarchy with



Fusion's Document Map allows the site's structure to be changed on-the-fly



Fusion's page layout view has a clean interface, and has been slightly enhanced to give it a more rounded, 3D look

embedded tags inset on small branches. Used in conjunction with the HTML code itself, this makes navigating the page quick and easy.

The source code is presented in sections. Fusion separates out the individual sections of the page into shaded boxes, so a long paragraph, for example, will be in a box of its own. This can often be collapsed, so that you can see more of the tags at once without being distracted by the content. To help you remember what it is that the collapsed sections contain, the last line of the previous section will contain an opening tag, and the first line of the following section a closing tag, giving you a clear indication of the contents.

Pages in the site structure view are colour-coded, so that you can immediately see which child pages are linked to a common mother page, without having to follow the directory tree back to the source. By simply clicking and dragging on one of these pages you can easily reorder your site and all links will be automatically updated, which is a real time-saver, especially considering this can even be done with completed pages, so there is no need to open them and recode.

Fusion works on a whole-site basis, so even if you have not finished your design you can see that your links are working. It also means that when you close the site and everything is compacted into a neat directory you can

be sure that you won't accidentally delete an individual file and break your navigation. One thing we didn't like was the way that it added a NetObjects Fusion logo to every page it creates. This can be deleted, but we thought it somewhat cheeky – a word processor doesn't stamp an advert for itself on every page!

The polygon drawing tool is a useful feature that other software houses would do well to emulate. This allows you to draw directly onto your page. Once complete, the polygon is saved as a GIF file that is then referenced from within the HTML. Inserting a table is also simple – just define where it should sit and then how

many columns and rows it contains. However, if you specify the table should have no borders they even disappear within the page design mode, which can make placing the cell contents fiddly.

Form designing is well thought out. When you specify a form area you are automatically given the option to create the form within a table. As many users opt for this to produce a neater layout, it is good thinking by NetObjects.

Fusion 5 will appeal to business users and those who need to maintain a strict house style. Its use of styles and a site map that allows restructuring on-the-fly set it aside from the crowd, but it might be less suitable for smaller-scale users.

NIK RAWLINSON

DETAILS

★★★★

PRICE £240.88 (£205 ex VAT)

CONTACT NetObjects 0800 029 9851

www.netobjects.co.uk

SYSTEM REQUIREMENTS 133MHz

processor, Windows 9x/NT4, 50MB free hard-drive space, 32MB of RAM, 800 x 600

resolution display with 256 colours

PROS Excellent site map features, quickly implemented 'styles'

CONS Stamping NetObjects logo on pages, sometimes cumbersome

OVERALL A good choice for large businesses, but there are more suitable alternatives for those working on a smaller scale

Novell NetWare 5.1

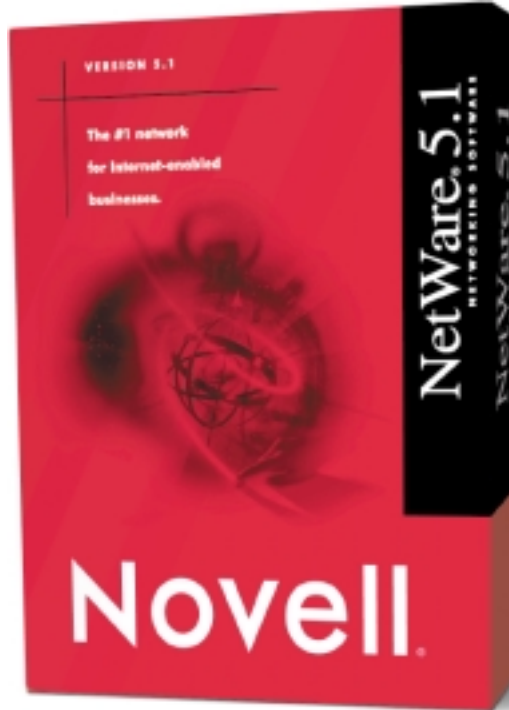
All the functionality of the previous incarnations, **plus some added extras** to help with ecommerce.

Novell has a well-earned reputation for making reliable products. This is built on the fact that NetWare servers are superb at file and print sharing. In fact, there are still people out there running NetWare 3.12 on 386 machines without any trouble at all. All of this has left Novell in a situation where it is difficult for the company to reposition itself for today's market, something that NetWare 5.1 is ready to achieve. With ebusiness starting to make a big impact on all kinds of markets, the infrastructure to support the front end is a lucrative business, and this is where Novell is hoping to move in with 5.1.

Essentially, this new release is simply NetWare 5, bundled with additional products for information sharing, such as FTP and the web.

Taking a look at the specifications, we decided to install our review product on an Intel 733MHz, 820-based machine. NetWare 5.1 requires a higher-specced machine than you may be used to. For a standard install of the operating system, Novell recommends 128MB of RAM to get you started. If you decide to use the application server, you're looking at 512MB instead. But before we knock Novell for requiring large amounts of RAM, let's just think how much a Windows NT Server would need to perform a similar job – around 1GB.

Our installation began in the same



Giving up the 820 machine as a lost cause, we moved over onto a more traditional Pentium II machine and began the install process from there. This time we were successful as the network card was automatically detected. We could now continue to the Novell Directory Services (NDS) part of the install.

If you're not familiar with NDS then you don't know what you're missing. NDS is what makes NetWare a dream to manage. It's best to think of it as a central database where all administration tasks are stored. All users are stored in NDS, as are other objects such as servers. This database then acts as a single point of administration, so jobs such as moving users from one group to another is an easy task. A similar operation in NT – moving a user between domains – requires a visit to two

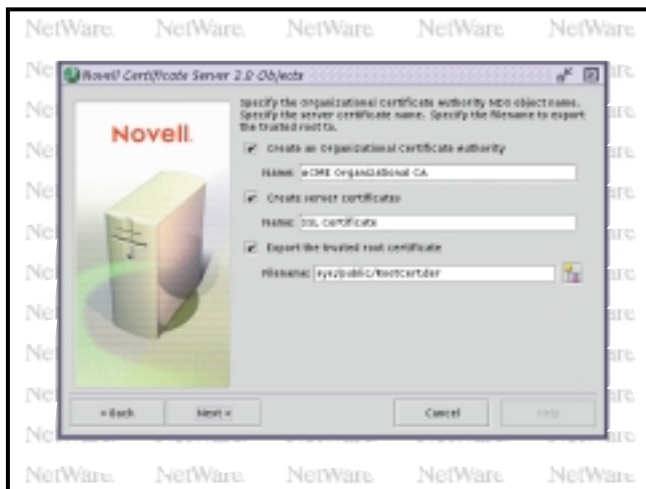
separate machines.

As NDS is so important to NetWare, the installation of a server requires that the machine is registered with NDS. While those familiar with NDS may think that the screens to do this look exactly the same as for NetWare 5, there is a subtle difference. The back end to NDS has been replaced with NDS 8, or edirectory. This is an updated version of NDS that allows more objects – users, printers, servers – to be stored inside, and searching through this data is also quicker. NDS 8 therefore provides the backbone for storing the additional information required when creating an ebusiness site. As we were installing a single server, we decided to create a brand new tree to put it into, but we could just as easily have put it into an existing tree.

The next stage of the installation process showed the first signs of something new, this time through the licensing scheme. In addition to needing a licence for the user part of the software, another licence is needed for cryptography. Parts of NetWare 5.1 require that secure connections can be made to the server, through technology such as SSL. Both licences should be provided on discs when you buy the

way as any other NetWare server, by creating a DOS partition from which the server would boot, and then running the install procedure from the setup CD. This took us to the familiar hardware detection screens. Unfortunately, we ran into a problem almost immediately when the software tried to detect our network card, with the installer reporting that it couldn't find one. We tried to pick the card manually from a list, but this just resulted in crashing the machine. Deciding that it might be a driver

problem, we logged onto the Internet and downloaded the latest drivers for our card. Trying the installation again, however, just caused the machine to crash in the same way. We couldn't skip the network card installation, as NetWare requires one to be installed in order to work.



Prepping the server to provide secure connections

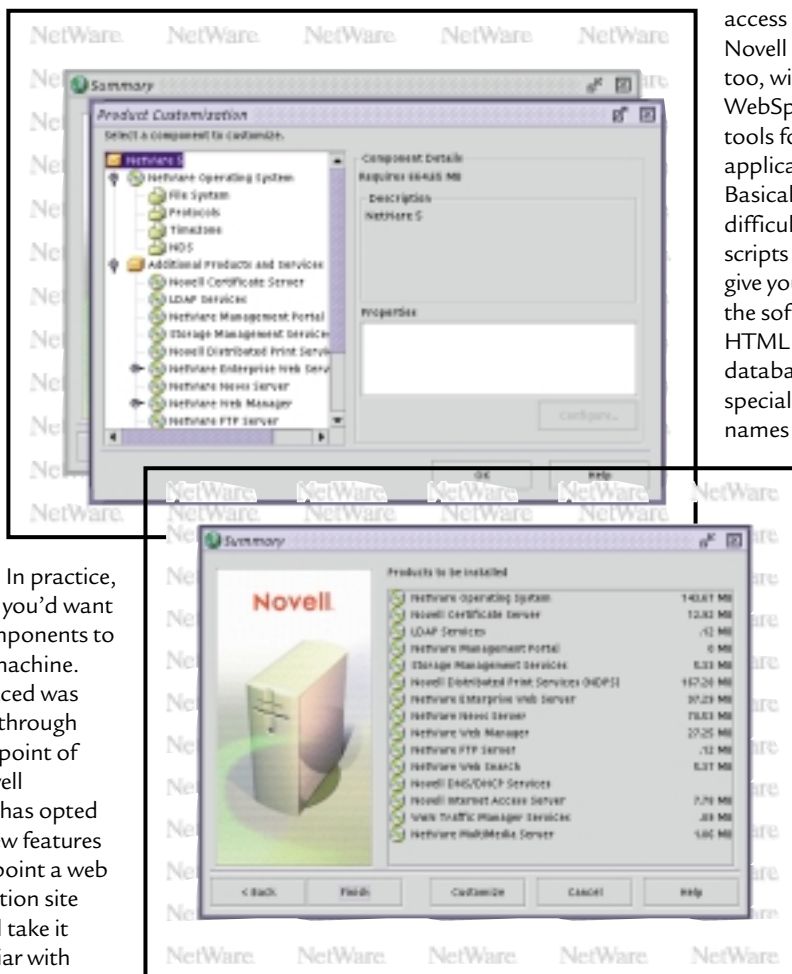
package. From this point onwards installation is just a matter of picking which packages you want to install, and a few options associated with each. Installing the web server, for example, allows you to choose which IP port administration will work on.

Once we had the server up and running it was time to see what it could offer us. We'd picked the full installation and so had all the packages available. In practice, though, the odds are that you'd want to split up the various components to reduce strain on a single machine.

The first surprise we faced was that management wasn't through Console One, the default point of administration for all Novell products. Instead, Novell has opted for management of the new features to be web-based. Simply point a web browser at the administration site running on the server, and take it from there. If you're familiar with administering a Netscape Enterprise server, then these screens will look familiar, as Novell licensed the technology from Netscape.

We found accessing the management information particularly easy. It may not be quite as flexible as a custom application for some operations, but it does allow administration from anywhere. In addition to providing web-based management for just the additional components of NetWare 5.1, Novell has also put in additional tools for dealing with the NetWare environment. It's now possible to manage NDS over the web as well. Granted, the web interface reduces how much you can actually do, but for simple tasks such as creating new users it's fine. The same comments go for the management portal that, while it may give access to the NetWare server directly, is not the easiest of tools to get to grips with, and certainly not ideal for large, complex tasks.

We decided to start with the FTP server, which provides a couple of useful extras. Instead of simply telling the software which directory serves as the root for FTP connections, we opted to make a user's home directory the root.



Top: Customising applications in NetWare 5.1

Bottom: Choosing installation options is easy using menus

Now, whenever a user logs on they'll get a view of all their own files, which is great for letting people get access to their work while they're off site. Thanks to NDS, FTP file permissions still depend on what the user has access to, so they only see what they're supposed to see. A similar feature appears in the web server that allows users to log in and see a page that they've set up.

At some time you may want to run multiple websites, each with a different domain name – but not necessarily running on a different machine. Novell has accounted for this with two methods: hardware and software virtual servers. A hardware virtual server allows the machine to have multiple IP addresses – one for each site, while a software virtual server resolves which website to display through the URL. The option any administrator chooses really depends on the local infrastructure.

While these products give access to the information you have on your servers, there's still the question of how you go about presenting and providing

access to that information. Novell has thought of this, too, with the bundling of IBM WebSphere. This is a suite of tools for building and serving applications over the web. Basically it performs that difficult job of creating the scripts to perform jobs. To give you an example, we used the software to create an HTML page to query a database. It was nothing special, it just retrieved some names based on the search string, but we managed to get it up and running very quickly. WebSphere won't make it look very pretty, but once you've got the script out of the way it's just a matter of performing a quick redesign on the web pages.

Overall, we were very impressed with NetWare 5.1. It still offers the same quality of file and print sharing that it always did, but now

it can help share that data to a wider platform. Perhaps the biggest change comes from the implementation of NDS 8. This is the part of NetWare that you may be least aware of, but it's the part of the software that makes everything work so well together.

DAVID LUDLOW

DETAILS

★★★★★

PRICE Starts at £987.72 (£840.62 ex VAT) for server with five-user licence

CONTACT Novell 01344 724 100

www.novell.com

SYSTEM REQUIREMENTS Pentium or higher processor, 1.3GB recommended free hard-disk space, 256MB of RAM recommended (512MB for WebSphere)

PROS Tight integration, good management, all you need to get up and running

CONS Some hardware issues on installation

OVERALL All the good points of NetWare 5, with superb ebusiness functionality



Cakewalk Pro Audio 9

A MIDI sequencer that uses innovative **WavePipe technology** to reduce the inherent latency of PCs.

Cakewalk is the odd one out in the MIDI sequencing world. While the two other major sequencers, Cubase and Logic, started out on the Atari ST, Cakewalk has always been a PC product, with its origins stretching right back to the days of DOS.

The last time we looked at Cakewalk was in February 1999, and back then it was in its eighth incarnation. This time around the changes are, on the surface, less drastic. However, if you take a look under the hood, the software has had some major enhancements – most notably the addition of the WavePipe sound card driver technology, but more on that later.

The main arrange window in Cakewalk is pretty similar to those of the other major sequencing packages, track parameters are on the left with colour-coded MIDI and audio data on the right. If anything, Cakewalk's main arrange window is a little less friendly on the eyes than its competition – it's certainly not as impressive as Cubase's brushed-metal look. The interface was upgraded substantially in the last version of the software, but it still lags behind the competition in terms of clarity and usability. Everything is there in its place, but it's not always as immediate as you'd expect.

That said, there are some neat touches. You can insert audio and MIDI effects on a track directly from the main arrange window, instead of having to call up the console's virtual mix window. This really is a time-saving shortcut, as it allows you to quickly try out how an effect is going to sound in the mix. You still have to use the console for assigning auxiliary effects, though.

Speaking of effects, Cakewalk is the only sequencer that has MIDI plug-in effects that are used in the same way as audio ones. This is another bonus, as you don't have to learn a new complex system to create MIDI effects such as delays – compared to the logical edit in Cubase it's a godsend. It's a pity then, that developers seem to be shying away



The console virtual mix view has to be used for assigning auxiliary effects

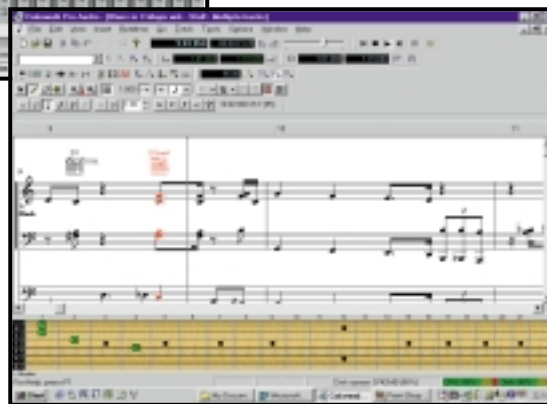
from Cakewalk's MIDI plug-in standard.

This release ships with a style enhancer MIDI plug-in from Russian company Ntonyx, that can be used to alter the feel of your music. You could, for example, place a reggae style on a MIDI rock guitar line! Also included as a MIDI effect is Session Drummer. This is a compositional aid for creating, yes you guessed it, rhythm tracks. Simply insert the plug-in on a MIDI track, select the

aid, you really are going to have to do some serious editing on the results if you want your drum tracks to stand out from the crowd.

Unfortunately, other than these two MIDI plug-ins there's not much else out there for the format.

On the audio side, Cakewalk has generously thrown in a cut-

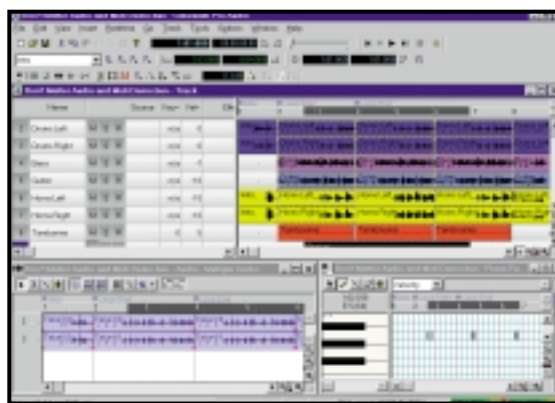


Guitarists will appreciate the new fretboard display

down version of the AmpSim plug-in, that can be used to simulate the sound of classic guitar amps. This was previously included in the special edition

Cakewalk Guitar Studio product. It really does sound good when applied to guitar lines and will be appreciated by amateur producers everywhere, as it's notoriously difficult to record an authentic-sounding electric guitar track in a bedroom studio – as millions of feeble-sounding demo tapes testify. Even though this is a cut-down version of AmpSim, there are still plenty of options on offer for altering the tone and body of the resulting sound.

This isn't the only guitarist-friendly element stolen from Guitar Studio. Towards the bottom of the notation window, guitarists will find a guitar neck that displays notes and chords during playback. There's even a facility to export tracks in ASCII guitar tablature format, and Cakewalk has also added an instrument tuner.



The main arrange page in Cakewalk is functional rather than stylish

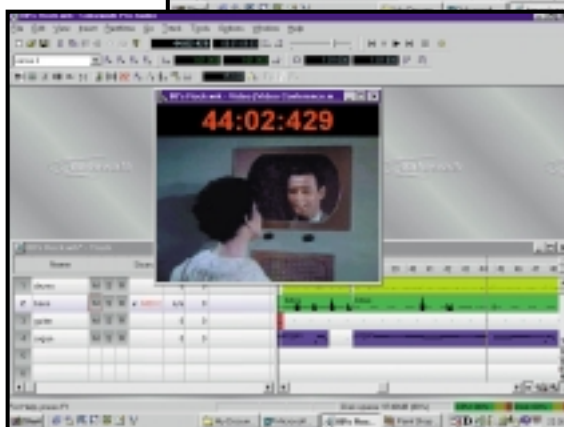
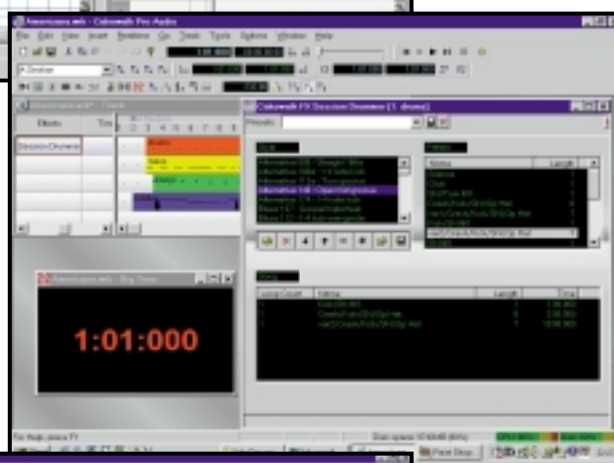
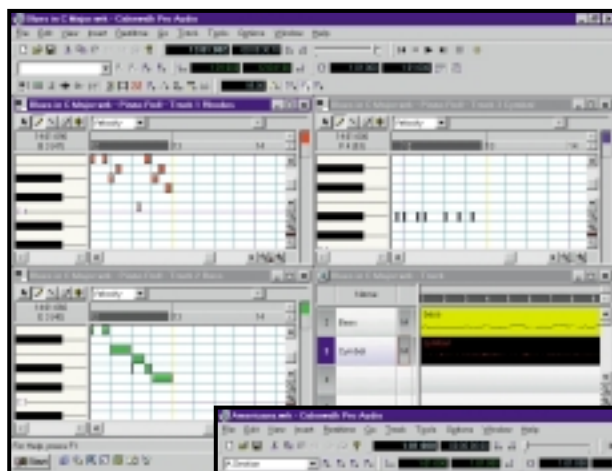
style and the plug-in will create a drum track to fit your music. You can then edit the results as you would any other MIDI track. It works well as a tool for creating fairly accomplished guide tracks to play along to but, as with any compositional

The biggest change between version 8 and this latest release is the inclusion of WavePipe. Unlike an OS such as BeOS, Windows was not originally designed to handle audio processing in real time and, as a result, fetching audio from the input of a sound card, processing it and then returning it to the sound card's output introduces latency – a gap between playing a note into the computer and hearing it come out the other end. This makes it very hard to correctly monitor signals that are being recorded. Steinberg developed the ASIO driver format for sound cards to try to limit the problem, and other manufacturers, such as Emagic, have licensed this technology, but Cakewalk has decided to take a different route.

ASIO depends on manufacturers writing special drivers for their card, and most professional sound cards now come with these drivers, but consumer cards do not. Cakewalk promised that its WavePipe technology would work with the standard MME sound card drivers that come with every card, yet still manage to reduce latency.

So has it delivered? Well, yes and no. We tested the software on a 500MHz Celeron PC with both a cheap sound card based on Creative's AudioPCI chipset and a high-end Event Darla. On the Darla, WavePipe drastically reduced the latency to 44ms, but using the AudioPCI card the lowest we could get was 186ms – which is good for such a cheap card, but not quite as impressive as we had hoped. So it seems WavePipe depends a lot on both the quality of the drivers and the type of hardware used in the card. That said, if you're using a consumer card, you'll probably get much better results with Cakewalk than with one of the competing sequencers. It may be worth trying out a demo version to see how your card performs.

Another significant addition is



Top: Multiple tracks can now be edited simultaneously with the piano roll editor
Middle: Session drummer is one of the few MIDI plug-ins available
Bottom: It allows frame-accurate syncing of video to audio

AudioX. This is an additional sound card driver standard, but this time it's a driver designed to interface with those cards that have extra DSP horse power on-board for handling hardware mixing and effects processing. AudioX allows the special features of these cards to be controlled from within a sequencer, rather than having to use special standalone editing software. Currently, only the DSP Factory from Yamaha and the Sonorus STUDI/O cards come with these drivers, but seeing as Steinberg and

Emagic have announced support for AudioX, other sound card manufacturers should soon follow.

As far as MIDI is concerned, the only major update is that the piano roll editor has been upgraded to allow it to operate on multiple tracks at the same time. It even has the ability to intelligently control which tracks to hide and select.

Cakewalk is also now Internet-friendly. Finished tracks can be exported as MP3 (via the bundled Fraunhofer codec), RealSystems G2 or Windows

Media Advanced Streaming files. Those working with video files will be pleased to hear that the AVI, MPEG and QuickTime movie formats are supported, allowing you to open the files, edit the existing audio or create new audio and then save them as AVIs. Frame-accurate syncing of video-to-audio and

the improved video and audio scrubbing, will help those who work on scoring video or multimedia projects.

Cakewalk is a very stable and capable platform for sequencing. What it lacks in style, it makes up for in its solid construction – the software performs well, even under the pressure of simultaneously playing back heaps of audio and MIDI tracks. The addition of WavePipe has gone a long way towards closing the latency gap between Cakewalk and sequencers that use ASIO technology. At this price there's little to beat it.

NIALL MAGENNIS

DETAILS

★★★★★

PRICE £279 (£237.45 ex VAT)

CONTACT Et Cetera 01706 228039

www.etcetera.co.uk

SYSTEM REQUIREMENTS Windows 9x, 200MHz processor (300MHz recommended) 64MB of RAM (128MB recommended), 78MB free hard-drive space,

PROS Very stable, WavePipe works well, good features for guitarists, cheaper than competitors

CONS No VST support for effects and native instruments, interface could be more appealing

OVERALL A very stable sequencing platform that doesn't skimp on features, ideal if you're using a consumer sound card

