

# Server city

**M**any small businesses are now realising the benefits networking can bring to their productivity. SMEs (small to medium enterprises) represent a huge proportion of UK businesses and an extremely lucrative and rapidly growing market to manufacturers.

While some small businesses are still content with a simple peer-to-peer network, the majority are looking to the benefits of a client/server environment where they can centralise all their major applications such as email, databases or intranets. With all your shared resources now in one location, everyone suffers if the system fails, so it's no longer enough to be content with just using a PC as a server. Continued business operations depend on total reliability so nothing less than a purpose-built machine will do.

The small-business market will be split between those looking for their first server and companies wanting to upgrade to something more substantial. With this in mind we invited 10 manufacturers to submit a server that had the muscle to cope with up to 100 users and a maximum price limit of £2,000 ex VAT. To spice things up we made no requests for particular specifications, but left it entirely up to each vendor to decide what they thought would be suitable for the target market. The tight price restriction would require some juggling with components – would faster processors or more memory be a better bet than a RAID controller or more hard-disk storage? It was their call. Our challenge produced some interesting results, so turn the page to find out more.

**Many small businesses are looking to client/server environments to satisfy their networking needs, so we challenged 10 server manufacturers to come up with products to suit this growing market.**





## contents

- 204** Compaq ML350
- 205** Dan Dantum RAID/PP Server
- 207** Dell PowerEdge 2400
- 208** evesham.com SE3200
- 210** HP NetServer LC2000
- 211** IBM NetFinity 5100
- 212** Mesh 700L
- 213** Choosing your infrastructure
- 214** NAS and SAN explained
- 215** NEC Direct Express 5800/120Ld
- 217** Toshiba Magnia 3030
- 218** Viglen CX1
- 219** Performance results  
How we did the tests
- 220** Features table
- 222** Editor's Choice

• *PCs tested and reviewed by Dave Mitchell*

## Compaq ML350



**FOR MANY YEARS** Compaq has been content to use the same chassis for its small-business and workgroup ProLiant servers that, although offering a unique modular assembly and excellent build quality, are looking somewhat dated. The ML350 is one of a new range of servers from Compaq that heralds a completely new design. Gone are the separate boards for processors and memory, replaced by a single main board, which produces a much tidier interior.

The ML350 on review came equipped with a single PIII 600EB processor but it does support dual processors up to 866MHz. The processor slots are located at the top of the motherboard with four DIMM sockets below them. The basic configuration comes with a single

128MB PC133 module that can be upgraded to 2GB. Compaq is yet another server vendor that has handed the job of core logic duties to ServerWorks. So the 'Intel inside' sticker literally only refers to the processors.

SCSI services plus network and graphics adaptors are all integrated, although the arrangement is most peculiar as Compaq has placed them all on a single, full-length daughterboard occupying the top PCI slot. Here, you have a Compaq NC3163 dual-speed network adaptor sitting alongside an ATI 3D Rage IIC PCI graphics chipset, so both monitor and network ports are on the same backplate. The hard disk subsystem is handled by a

Symbios 53C896 chipset that provides dual Wide-Ultra2 SCSI channels with support for up to 15 devices each and both connectors are located on the edge of the daughterboard. Coined a 'Server

Feature Board' by Compaq, it's not the most elegant solution, but this arrangement does have its advantages, as it would be a simple job to upgrade network, graphics and SCSI services in one fell swoop by installing new cards as Compaq makes them available.

Although the ML350 uses a similar internal design to HP's LC2000 it offers far fewer features. Cooling is limited to a single fan mounted on the rear panel, whereas the LC2000 uses no fewer than four in a single hot-swap assembly. Furthermore, the ML350 only comes with a single power unit, while many other vendors offer multiple redundant

supplies. Storage capabilities are more modest than most, with the ML350 using a small cage mounted at the front with room for four fixed hard disks. Two 9.1GB Compaq-branded Fujitsu hard disks were supplied but total storage can be increased to a healthy 72.8GB using four 18.2GB versions instead. Compaq also offers an optional hot-plug bay as well.

Operating system installation is helped along by Compaq's SmartStart utility, supplied on a bootable CD-ROM. The process kicks off by storing some basic configuration details on a server profile disk and then offers a choice of operating systems. We found this was fully up to date with options, not only for Windows 2000 Server and Advanced Server, but also for NetWare 5.1. A fair amount of CD-ROM swapping is required but we had the ML350 up and running inside a couple of hours.

Server management comes courtesy of Compaq's Insight Manager. This provides plenty of information about processors, memory and disk drives, as well as detailed information on operating temperatures and voltages. In addition, the XE version now supports web-based management. The information gathered can be linked to an alert log so that any error messages detected will cause the software to send out warnings to support staff by network broadcast, email or pager. Compaq's ASR2 (automatic server recovery) can also be called into play as it will automatically reboot the server and activate a pager number if a critical failure is detected.

With the review system costing a reasonable £1,724, the ML350 looks good value. The arrangement for gathering graphics, network and SCSI services on a separate board may not appeal to everyone, but this server impressed in the performance stakes taking fourth place in both Ethernet and Fast Ethernet tests.

## HARDWARE SPECIFICATIONS

Motherboard: Compaq  
 Chipset: ServerWorks Entry ServerSet III LE  
 FSB speed (MHz): 133  
 Processor type/speed: Pentium III 600EB  
 No of processors: 1  
 Max processors: 2  
**STORAGE**  
 Hard disk: 2 x Fujitsu MAE3091LP  
 Total capacity (unformatted): 18.2GB  
 Controller type: Symbios 53C896  
 Software: Compaq SmartStart, Insight Manager, ASR

## DETAILS

**PRICE** £2,026 (£1,724 ex VAT)

**CONTACT** Compaq 0845 270 4000

[www.compaq.com](http://www.compaq.com)

**PROS** Combines top performance and value with good management facilities and innovative design

**CONS** Minimal internal cooling and no support for redundant power supplies

**OVERALL** A fine specification for the price that delivers good performance. Quality management features, but look elsewhere if you want hot-swap power supplies and cooling fans

**BUILD QUALITY** ★★  
**PERFORMANCE** ★★  
**VALUE FOR MONEY** ★★  
**OVERALL RATING** ★★

★★★★  
 ★★★★★  
 ★★★★★  
 ★★★★★

# Dan Dantum RAID/PP Server



128MB DIMMs leaving a couple of sockets spare for upgrades. Another point of note is that the MRH-S on 840 motherboards has had problems with ECC memory and a quick check in the Dantum's BIOS revealed this feature was disabled.

The PIIIDME is one of a family of four 840-based motherboards and, in terms of features, this is the weakest because it is the only one with no onboard SCSI. Instead you get two UltraDMA66 IDE channels that are not suited to server applications, purely because of the limited number of devices they can support. To overcome this, Dan has selected an Adaptec AAA-131U2 single-channel PCI RAID controller card. This was linked to a

**WITH THE DANTUM RAID/PP Server,** Dan has taken the same approach as Viglen by fitting a non-server-specific motherboard. However, the company has taken a bigger risk with the SuperMicro PIIIDME because this uses an Intel 840 chipset, which has had more than its fair share of troubles recently. Originally designed for expensive Rambus memory, the 840 was modified by Intel with a Memory Repeater Hub (MRH-S) allowing it to accept less costly SDRAM.

The PIIIDME offers a 133MHz FSB (front-side bus), but thanks to this modification it only has a 100MHz memory bus. Also, dual memory channels are designed to improve performance by interleaving, so memory modules must be installed in pairs. For the Dantum, Dan plumped for a pair of

triplet of 9.1GB Quantum Ultra160 hard disks and configured as RAID 1 mirror array with one of the drives standing in as a spare in case of failure. RAID 1 is designed for data protection, although

with three drives up for grabs Dan could just as easily have configured them for RAID 5, which combines increased performance and fault tolerance.

Array creation requires the server to be booted from Adaptec's configuration floppy, after which

it can be managed and monitored from the operating system using the bundled CI/O software. We tested the array by cutting the power to one of the mirrored pair and, sure enough, the server started squawking loudly. The CI/O software then cut in and rebuilt the array in nine minutes using the spare drive, during which

time the server continued to function normally.

The Genie chassis looks a good choice as it's well built and offers plenty of room for expansion. Dan filled all four front 5.25in bays with three holding lockable UniStor hot-swap disk carriers, each with dedicated cooling fans and status indicators. A Toshiba IDE CD-ROM drive fills the fourth bay, but the Seagate TapeStor SCSI tape drive in the spare 3.5in bay looks more of a token gesture as its low backup speeds and native 4GB capacity are really only suited to PC backup.

The interior is reasonably tidy, with only the ribbon cables for the disk drives running across the motherboard. Up above is a massive internal disk cage with its own cooling fan and room for five more hard disks. Dual processors are supported and the Dantum is supplied with a single PIII 700MHz chip. Combining this with the healthy portion of memory undoubtedly gave Dan second place in both Ethernet benchtests (see performance results graphs later in the group test) although we would have expected it to be much closer on the heels of the Mesh 700L.

The only PCI slot in use is taken up by the RAID controller leaving two 64bit and three 32bit PCI slots free. One integrated component that has no place on a server is the sound chip linked to audio and MIDI ports on the rear panel. This is rather a waste but, as long as Dan is not charging you for the privilege, you can always ignore it.

The Dantum does offer a good specification for the price, but it comes in for the same criticisms as Viglen's system, mainly due to the choice of motherboard. The PIIIDME is not designed for servers, there are still issues surrounding the 840 chipset and general server management and monitoring tools are also particularly weak.

**HARDWARE SPECIFICATIONS**  
 Motherboard: SuperMicro  
 Chipset: Intel 840  
 FSB speed (MHz): 133  
 Processor type/speed: Pentium III 700  
 No of processors: 1  
 Max processors: 2  
**STORAGE**  
 Hard disk: 3 x Quantum Atlas IV  
 Total capacity (unformatted): 9.1GB (mirror + spare)  
 Controller type: Adaptec AAA-130U2  
 Software: Veritas Backup Exec

**DETAILS**  
**PRICE** £2,148 (£1,828 ex VAT)  
**CONTACT** Dan 0870 444 7020  
[www.dan.co.uk](http://www.dan.co.uk)  
**PROS** Quality Adaptec RAID controller with three hard disks and plenty of memory  
**CONS** Motherboard not designed specifically for servers; lack of integrated SCSI controller; and tape drive has insufficient capacity and speed for server backup  
**OVERALL** Although the RAID controller provides excellent levels of fault tolerance, this system would benefit hugely from a server-specific motherboard. The chassis offers good expansion potential, but management tools are almost non-existent

**BUILD QUALITY** ★★  
**PERFORMANCE** ★★★  
**VALUE FOR MONEY** ★★  
**OVERALL RATING** ★★



# Dell PowerEdge 2400



didn't think the server market was ready for. The ServerWorks chipset allows vendors to implement less costly PC133 SDRAM.

Dell also pioneered the tool-free design, so maintenance and upgrades can be carried out without needing a screwdriver. Thumbscrews are used throughout the 2400 and expansion cards are held in place using small plastic clips. With the side cover removed, you'll find a well-designed interior allowing upgrades to be carried out swiftly, so reducing server downtime. Dual-processor slots are mounted at the top of the motherboard and covered with a large plastic duct to direct the air flow where it's needed most. The

after storage and is placed in a large cage, accessible from the front, which supports six 1in or four 1.6in hard disks. Dell only offers active backplanes for the storage cage and these are fitted with their own Adaptec SCSI chipset and support hot-plug drives. Note that installing the RAID key will automatically disable the 7890 chipset. A pair of 9.1GB Quantum Atlas V drives were fitted and configured in a RAID 1 mirrored array, although these Ultra160 drives will be of limited value as the RAID controller cannot utilise the higher speeds.

The 2400 offers the best expansion slot options with no fewer than five 33MHz, 64bit PCI slots. A single ISA slot shares a mounting plate with one of them while an extra 32bit PCI slot is located at the base. Standard systems come with a single power supply but an optional distribution board can be fitted, allowing a pair of hot-swap supplies to be added to the recipe.

Dell offers a comprehensive range of server management and monitoring tools. A full array of sensors on the motherboard means administrators can keep in touch with operating voltages, temperatures and fan activity. An optional Dell Remote Assistant card equipped with its own processor and modem allows the server to be monitored and managed remotely. The RAID controller comes with its own array management utility that can also be used to look after remote systems. Local diagnostics are dealt with by Dell's OpenManage Resolution Assistant and a bootable Server Assistant CD-ROM ensures your chosen OS is installed without any problems.

Performance results for the 2400 were average, although faster processors and more memory would have remedied this. Even so, the 2400 does offer a lot of server for your money, and the integrated RAID controller is particularly impressive.

**THE POWEREDGE 2400** is Dell's top server product for small to medium-sized businesses and took over from the highly successful PowerEdge 2300 last year. The 2400 still uses the same large black chassis borne by its predecessor, but offers a greatly improved specification. Dell was one of the first server companies to drop Intel in favour of ServerWorks for core logic duties. The 2400 uses an Entry ServerSet III LE chipset that allowed Dell to claim it as the very first server on the market to offer a 133MHz front-side bus (FSB). This move was obviously a smart one as many other vendors including Hewlett-Packard and Compaq have followed suit. One of the main reasons for not implementing Intel's 840 chipset at the time was that it supported the more expensive Rambus memory that Dell

review model came fitted with a single 600MHz chip teamed up with 128MB of memory occupying one of the four DIMM slots alongside.

A unique feature is Dell's integrated PERC/2i RAID controller built around an embedded 100MHz Intel 80960RX processor. A separate DIMM socket sits alongside for cache memory and the controller is activated by purchasing a special hardware key and inserting it in a slot next to the memory modules. The RAID option was enabled on the review system and supported by 64MB of cache memory. For non-RAID operations, two SCSI chipsets are provided with an embedded Adaptec AIC-7880H servicing the 40-speed CD-ROM drive and two spare 5.25in bays. An AIC-7890 Ultra2 chipset looks

**HARDWARE SPECIFICATIONS**  
 Motherboard: Dell  
 Chipset: ServerWorks Entry ServerSet III LE  
 FSB speed (MHz): 133  
 Processor type/speed: Pentium III 600  
 No of processors: 1  
 Max processors: 2  
**STORAGE**  
 Hard disk: 2 x Quantum Atlas V  
 Total capacity (unformatted): 9.1GB (mirrored pair)  
 Controller type: Dell PERC 2/Si  
 Software: Server & Resolution Assistant

**DETAILS**

**PRICE** £2,349 (£1,999 ex VAT)  
**CONTACT** Dell 0870 152 4850  
[www.dell.co.uk](http://www.dell.co.uk)

**PROS** Very well designed and built with plenty of management and monitoring tools. Good fault tolerance provided by integrated RAID controller and hot-swap drive bay  
**CONS** Average performance and supplied Ultra160 drives of limited value  
**OVERALL** Easy to install and manage with a fine specification for the price. Good levels of fault tolerance on offer and the high levels of component integration leave plenty of room for expansion

**BUILD QUALITY** ★★★★★  
**PERFORMANCE** ★★★★★  
**VALUE FOR MONEY** ★★★★★  
**OVERALL RATING** ★★★★★



## evesham.com SE3200



**ALONG WITH TOSHIBA** and Mesh, evesham.com is sufficiently impressed with Intel's L440GX+ server motherboard that it has included it in its small-business server range. However, instead of using an Intel chassis as well it has opted to clothe the board in a box from Taiwanese-based In Win Developments. No, we haven't heard of this company either, but suffice to say that the IW-2000 chassis actually looks a better bet than the Intel alternative that is used by Mesh.

Build quality is as good as the Astor II but the extra depth of the SE3200 allows it to offer a better designed and laid out interior. A large hot-swap disk cage at the front has room for up to six 1in hard disks and evesham.com generously supplied a pair of 18.2GB Fujitsu Ultra2 drives held in sturdy metal carriers. Up

uses a single plug socket so there's nothing to stop the server being unplugged and shut down accidentally.

There's more room to manoeuvre inside because the disk cage doesn't foul the motherboard, so all components are in the clear.

above are three 5.25in bays with two home to an LG 40-speed IDE CD-ROM drive and a very useful OnStream ID30 tape drive. This is a better backup option than the HP T20 and DAT DDS-3 drives supplied elsewhere because, although it only offers a modest backup transfer rate of 60Mbytes/min, the sturdy cartridges have a high native capacity of 15GB, making the ID30 more suitable for high-capacity backup.

Physical security is better than on the Mesh server, since the front door can be locked to deny access to the hard disks, 5.25in bays and power and reset buttons. Dual power supplies provide limited fault tolerance as they are fitted in a special carrier that

Normal SCSI services are looked after by an Adaptec AIC-7896N chipset, but evesham.com has fitted an Adaptec ARO-1130 RAID controller card. This uses the special RAIDport III slot and effectively upgrades the

embedded SCSI chipset to perform as a RAID controller.

A single slot supports up to 64MB of EDO cache memory, although evesham.com only supplied the minimum 2MB. With the RAID card linked to the disk cage backplane, the review system had the Fujitsu drives configured as a RAID 1 mirrored pair.

As they're perfect copies of each other, if one fails the system will continue uninterrupted using the other drive.

Monitoring is provided by Intel's Server Control, which gathers plenty of information about operating temperatures, cooling fan status and voltages from the motherboard sensors and displays it in an intuitive interface. Alert notification is extensive so you can configure Server Control to send a broadcast message if it spots a problem. In the event of a severe error or failure you can, for example, set it to close down the operating system and initiate a hardware reset or switch the server off completely.

Both the Adaptec RAID controller and embedded Intel network adaptor can be monitored and you can also keep an eye on other servers on the same network with the agent software installed. Adaptec provides a dedicated utility for managing the RAID controller as well, which offers an email option for notification of errors. The L440GX+ motherboard also offers a useful feature called PEP (Platform Event Paging) that is implemented in the BIOS. Should any significant system events occur frequently, the server can be configured to automatically call a pager using an external modem connected to one of the COM ports.

The SE3200 impressed in the benchtest stakes with SYSmark recording a respectable third place overall. Clearly, the L440GX+ motherboard is a speedy performer, although the differences between all the PIII 600MHz-endowed systems was relatively small. Even though the Mesh 700L stands out from the crowd for its higher specification, evesham.com's SE3200 looks a smarter long-term bet as the chassis is better designed and the RAID controller will pay dividends if you're running mission-critical applications.

## HARDWARE SPECIFICATIONS

Motherboard: Intel  
Chipset: Intel 440GX  
FSB speed (MHz): 100  
Processor type/speed: Pentium III 600E  
No of processors: 1  
Max processors: 2

## STORAGE

Hard disk: 2 x Fujitsu MAE3182LC  
Total capacity (unformatted): 18.2GB (mirrored pair)  
Controller type: Adaptec ARO-1130  
Software: Intel Server Control, OnStream Echo

## DETAILS

**PRICE** £2,349 (£1,999 ex VAT)

**CONTACT** evesham.com  
0800 038 0800 [www.evesham.com](http://www.evesham.com)

**PROS** A solid server-specific Intel motherboard teamed up with a substantially better chassis than the Mesh's Astor. Good overall performance; tape drive included; and the Adaptec RAID controller is a worthy addition

**CONS** Local management and monitoring not as good as some

**OVERALL** A balanced specification that provides good performance and plenty of fault tolerance. Good choice of backup tape drive and all housed in a well-designed chassis

**BUILD QUALITY**  
**PERFORMANCE**  
**VALUE FOR MONEY**  
**OVERALL RATING**



★★★★

★★★★

★★★★

★★★★

★★★★

★★★★

★★★★

★★★★

★★★★

★★★★

★★★★

★★★★

★★★★

## Hewlett-Packard NetServer LC2000



**LAUNCHED AT THE** beginning of this year, the LC2000 is firmly aimed at small to medium-sized businesses, being as it is a replacement for HP's aging NetServer LC3. It's one of the largest servers on review and offers superb build quality and a completely revamped design. Dell may have pioneered the tool-free design, but HP caught on quickly as you can tell from this server. You don't need a screwdriver to remove or add any components because everything is secured using thumbscrews.

Three 5.25in bays sit behind the lockable front panel and are partnered by a large hot-swap disk cage beneath with room for up to six 1in hard disks. HP offers the least amount of storage for your money, though, as the review system only came supplied with a

single 9.1GB HP-branded Seagate hard disk.

Internally, the LC2000 displays some excellent design concepts. Behind the disk cage is a full-height assembly holding no fewer than four cooling fans. In the event of a failure the entire module can be released with a single thumbscrew and pulled out for swift replacement without having to power down the server. The only downside is the LC2000 is easily the noisiest server here.

HP's motherboard occupies the main part of the chassis and the processor slots are mounted next to the lower two fans for maximum cooling and are protected by a large metal cage. Both connectors for the Symbios Ultra2 SCSI

chipset, along with floppy and IDE channels, are located at the top of the board, so the ribbon cables can be routed underneath the top cover and kept well away from the motherboard.

One power supply comes as standard, but this can be teamed up with an optional second supply for increased fault tolerance, and the units are easily removed from the rear of the chassis.

Alas, the asking price for the review model we received only includes a

single PIII 533MHz processor but the LC2000 does support speeds up to 800MHz. The poorer processing power undoubtedly had an impact in the benchtest, as a glance at the performance charts later in this group test shows HP lurking down in the basement for both tests. However, the tests show clearly the effects different

components have on network performance, so a faster processor would undoubtedly have made an improvement. HP is another vendor that has dropped Intel in favour of ServerWorks with the LC2000 sporting the Entry ServerSet III LE core logic chipset which supports up to 4GB of PC133 SDRAM memory. Four DIMM sockets sit above the processors, with one holding a 128MB module.

Supplied on a bootable CD-ROM, HP's NetServer Navigator provides plenty of installation assistance while HP's Local TopTools for Servers offers a web-based interface for viewing server status and configuration. It provides a tidy row of tabbed folders so you can easily browse through CPU, memory and storage utilisation, view an event log and print reports on system status and configuration changes.

A new feature is Remote Administration (RA), which uses a dedicated serial port link for monitoring hardware on the motherboard. Local access to the server is via a null-modem cable or you can call in from a remote location using a modem link. RA allows the server to be controlled independently of the operating system and you can view statistics such as operating temperatures and voltages. If a fault is identified, RA can be configured to call a pager number from a predefined list.

Although Hewlett-Packard's LC2000 server offers less hardware for your money, in terms of build quality and design the machine is nothing less than a standard setter. Management tools are also particularly good, while redundancy and expansion potential are excellent. The performance issues mentioned in the review can easily be remedied with a higher specification so, if these features are important to you, then this system should definitely be on your shopping list.

## HARDWARE SPECIFICATIONS

Motherboard: Hewlett-Packard  
Chipset: ServerWorks Entry ServerSet III LE  
FSB speed (MHz): 133  
Processor type/speed: Pentium III 533  
No of processors: 1  
Max processors: 2  
**STORAGE**  
Hard disk: Seagate ST39102LC  
Total capacity (unformatted): 9.1GB  
Controller type: Symbios 53C897  
Software: NetServer Navigator, HP TopTools

## DETAILS

**PRICE** £2,089 (£1,777 ex VAT)

**CONTACT** Hewlett-Packard  
0990 474747 [www.hp.com](http://www.hp.com)

**PROS** Exemplary build quality and internal design; good expansion and fault tolerance, plus a host of remote management tools

**CONS** Weak specification resulting in low performance; very noisy cooling fans; only one year on-site warranty

**OVERALL** A modest specification for the price but superb build and expansion potential makes the LC2000 a good choice as a long-term investment

**BUILD QUALITY** ★★★★★  
**PERFORMANCE** ★★★★★  
**VALUE FOR MONEY** ★★★★★  
**OVERALL RATING** ★★★★★



## IBM NetFinity 5100



**THE NETFINITY 5100** is one of a range of four servers from IBM that are aimed at budget-conscious businesses looking for a good combination of price and performance. Clothed in IBM's trademark black chassis, the 5100 is available in standard tower or rack-mount versions – we looked at the latter for this review. Standing at 5U, or 8.75in high, up to eight units can be placed in an industry-standard 42U high rack assembly. As

we've come to expect from IBM, build quality is among the best and its tool-free design enables swift upgrades and maintenance.

For first-time installation, IBM provides its ServerGuide bootable CD-ROM. No operating system had been installed prior to delivery so we called upon this utility for assistance and found it very easy to use. It begins with a system scan and then loads the most appropriate drivers before installing your chosen network operating system.

You also get plenty of other utilities including a driver disk and book factory, online help and a System Information Tool that gives you the lowdown on installed hardware. IBM's NetFinity Manager software links up with an

integrated Advanced System Management processor on the motherboard to provide detailed management and monitoring facilities. Although we found the Service Manager

interface rather clunky, it does provide plenty of useful information. You can monitor system health, run hardware and software inventories and stay ahead of hard-disk failures with a Predictive Failure Analysis tool. Many of these features can be extended to remote

systems running the NetFinity Client. Full alerting is provided, although this was complex to set up. However, if a problem is detected, the software can send a warning message, dial a pager or execute a program.

The front panel is endowed with a useful LED status display showing power and system status, the number of processors installed, network speed and activity, plus fault notification. The latter indicator ties in neatly with an LED panel on the motherboard called a 'light path indicator'. This shows any error conditions identified with the various system components, making it easy to locate the problem area. Below this is a large hot-swap disk cage with room for up to six 1in hard disks. Along with HP,

IBM was the least generous in the storage stakes as it only supplied a single 9.1GB IBM Ultra2 hard disk. It did get top marks for power redundancy capacity, though, as the 5100 has room for up to three compact hot-swappable power supplies at the rear that are easily released with a simple clip and lever mechanism.

Flick down the small lever at the front and the top panel slides back to reveal a spacious and well-designed interior. All connectors are arranged around the edge keeping cable-related mayhem to a minimum. There are no surprises in the core logic department as ServerWorks (formerly Reliance Computer Corporation) gets the job with its Entry ServerSet III LE offering a 133MHz FSB and full support for PC133 SDRAM. IBM is a long-time supporter of the ServerWorks chipsets, having implemented it in its servers for a number of years now. An integrated Adaptec AIC-7899G chipset offers support for Ultra160 drives but, as with NEC, IBM chose to fit an Ultra2 drive to keep within our price limit. A single PIII 667MHz module fills one of the processor slots but Intel doesn't get the networking job as this is handled by an integrated AMD PCnet server adaptor. Add the 128MB of PC133 memory and you would expect a reasonable performance from the 5100. However, we were disappointed to see it lounging down in ninth place for the Ethernet test, although this did improve noticeably for the Fast Ethernet test. The network card can often be a bottleneck when under heavy load, so we added an Intel Pro100+ PCI server adaptor and reran the Fast Ethernet test. This clawed back only a few seconds but enough to raise the 5100 to fifth place.

### HARDWARE SPECIFICATIONS

Motherboard: IBM  
Chipset: ServerWorks Entry ServerSet III LE  
FSB speed (MHz): 133  
Processor type/speed: Pentium III 667  
No of processors: 1  
Max processors: 2  
**STORAGE**  
Hard disk: IBM DNES-309170Y  
Total capacity (unformatted): 9.1GB  
Controller type: Adaptec AIC-7899G  
Software: ServerGuide, NetFinity Manager

### DETAILS

**PRICE** £2,290 (£1,949 ex VAT)

**CONTACT** IBM 0990 727 272

[www.ibm.com](http://www.ibm.com)

**PROS** Exemplary build quality and design.

A wide array of management and monitoring software, plus a good specification that includes an Ultra160 SCSI chipset

**CONS** Single 9.1GB Ultra2 hard disk; average performance. Management software is not the easiest to use and could do with updating

**OVERALL** A quality rack-mount server with good internal design and specification. Performance was not the best, but the 5100 can be easily upgraded with a wide range of options

**BUILD QUALITY**  
**PERFORMANCE**  
**VALUE FOR MONEY**  
**OVERALL RATING**

★★★★  
★★  
★★★  
★★★





## Mesh 700L



removed without powering the server down.

As with the Magnia, one PCI slot supports a RAID controller, although in this case it'll be Adaptec's ARO range of PCI cards. Only two 5.25in. bays are provided and both were occupied by a Teac CD-ROM drive and an HP SureStore T20 tape drive. The latter offers transfer rates similar to the DAT DDS-3 tape drives supplied by NEC and Viglen, but the Travan TR-5 based cartridge's native capacity of 10GB is already being stretched by the supplied 18GB hard disk.

Chassis security is rudimentary. The side panel and hard-disk door need to be padlocked shut, although an intrusion switch can be fitted and

**INSTEAD OF** producing a server using a variety of off-the shelf components, Mesh has taken the simple expedient of sourcing not only the motherboard, but also the entire chassis from Intel.

The 700L comes clothed in Intel's Astor II server chassis, equipped with the same L440GX+ server motherboard as found in Toshiba's Magnia 3030. Since both components are specifically designed for servers, the 700L is very much up to the task at hand.

The Astor has a comparatively small chassis but offers plenty of room for expansion as it has a large hot-swap drive bay at the front, with room for five 1in high hard disks. One carrier was fitted with an 18.2GB Quantum Atlas Ultra2 drive and, once more drives are added, an LED status display alongside shows when they can be safely

linked to the management software. If the chassis is breached for any reason, the software can be configured to lock the keyboard or even power the server down.

Internally, Mesh's 700L offers far less room than the Magnia 3030, mainly due to the depth the hard-disk cage extends into the chassis. A pair of large cooling fans are fitted to the rear and the entire assembly completely obscures access to the IDE

connectors. The single Ultra2 channel offered by the embedded Adaptec AIC-7896N chipset looks after the hard-disk cage while the Ultra Wide channel is linked to the tape drive.

Installation assistance is not provided by Mesh because the company's servers are generally configured with the required network

operating system before they are dispatched to the customer. However, benchtesting the 700L got off to a poor start as we were unable to network the server. The diagnostics tab on Intel's ProSet utility showed the adaptor drivers for the embedded Pro100+ chipset had failed to load and it was only after some extensive investigation that we found networking had been disabled in the Windows NT hardware profile. A bad slip-up on Mesh's part but, with this tick-box unchecked, the server proceeded to behave itself and promptly posted the best scores for the entire performance test. The 700L may only have a 100MHz FSB and PC100 memory, but the pair of PIII 700MHz processors and 256MB of memory clearly had a significant impact.

As you'd expect, management is well catered for with Intel's Server Control software, although Mesh forgot to include this so we had to borrow the copy supplied by Toshiba. Software agents can be installed to other Intel-based servers on the network allowing them to be monitored and controlled remotely from a single console. The server can also be accessed independently of the operating system as the 440GX+ board allows COM2 to act as an emergency management port (EMP). Console software for Windows 95/98 provides access either via a direct serial cable link or remotely over a modem and with this in action you can reset the server, power it off and on or view the motherboard sensor data.

There's no doubt that Mesh is offering a lot for your money, making the 700L a good choice for small businesses that happen to be on a tight budget. However, if you're prepared to sacrifice some memory and the second processor, you could choose HP's LC2000, for example, which offers far superior build, design and expansion potential.

## HARDWARE SPECIFICATIONS

Motherboard: Intel  
Chipset: Intel 440GX  
FSB speed (MHz): 100  
Processor type/speed: Pentium III 700  
No of processors: 2  
Max processors: 2

## STORAGE

Hard disk: Quantum Atlas 10K  
Total capacity (unformatted): 18.2GB  
Controller type: Adaptec AIC-7896N  
Software: Intel Server Control, Stac Replica Backup

## DETAILS

**PRICE** £2,231 (£1,899 ex VAT)

**CONTACT** Mesh 020 8208 4706

[www.meshplc.co.uk](http://www.meshplc.co.uk)

**PROS** Top performance for a low price; dual processors; 256MB of memory and plenty of storage

**CONS** Restrictive internal design; sloppy configuration prior to delivery

**OVERALL** A budget-priced server with a fine specification that delivers excellent network performance. Room for future expansion although internal design is cluttered

**BUILD QUALITY**  
**PERFORMANCE**  
**VALUE FOR MONEY**  
**OVERALL RATING**

★★  
★★★★  
★★★★  
★★★

# NEC Direct Express5800/120Ld



offering native transfer rates of around 60Mbytes/min. However, considering the server's storage potential the 12GB, native capacity of the DDS-3 format will be insufficient for all but the most basic of backups. You have two choices for hard-disk storage: you either use the basic fixed disk cage underneath the expansion bays with room for four 1.6in drives, or the hot-swap cage supplied with the review model, which has room for six 1in drives. Our review unit had two slots filled holding a pair of 9.1GB Seagate Ultra2 drives enclosed in solid carriers. NEC also offers optional Mylex RAID controllers should you wish to add fault tolerance

120Ld supports dual processors at speeds up to 733MHz. No surprises in the core logic department as ServerWorks makes yet another appearance with its Entry ServerSet III LE chipset. Along with a 133MHz FSB it offers support for up to 4GB of SDRAM. Four DIMM sockets are sited alongside the processor slots, of which one is fitted with a 128MB module. Integrated graphics and network adaptors keep all the expansion slots free, so you have a choice of three 64bit PCI, three 32bit PCI slots and a single ISA slot.

SCSI services are particularly well catered for with the integrated Ultra160 Adaptec AIC-7899G chipset. One channel is connected to the disk cage backplane while the second is routed through to the rear panel for external devices. Alas, the high SCSI transfer rates on tap had no impact in the performance tests as NEC could only supply 80Mbytes/sec Ultra2 drives for the price. Of all the servers equipped with 600MHz processors, the 120Ld came out as the slowest in both Ethernet and Fast Ethernet tests (see performance graphs).

Server configuration and NOS (network operating system) installation is aided by NEC's Express Builder utility supplied on a bootable CD-ROM. This provides an intuitive menu system to get your server up and running with the minimum of fuss. Plenty of quality management tools are provided by the EsmPro Suite, which uses the embedded sensors on the motherboard to keep track of voltages, temperatures and fan operation. Other servers and workstations can be monitored remotely with the appropriate agent software installed and the server's COM2 serial port doubles up as an EMP (emergency management port) allowing the server to be controlled directly from another system or remotely via a modem connection.

**ALTHOUGH NEC IS** a comparative newcomer to the server marketplace, the company has managed to build up an impressive range of products. However, earlier entry-level server products from NEC failed to impress because they were built around non-server-specific motherboards and had more in common with PCs. Not so with the Express5800/120Ld, though, as it offers a fine list of features for the price and they're all housed in a purpose-built chassis.

Physical security is good as the lockable front door bars access to the power switch, front bays and thumbscrews for the side panels. Three 5.25in bays are available with one occupied by an LG 40-speed IDE CD-ROM drive and a second is home to an Archive Python DAT DDS-3 drive

to your storage options. Good build quality doesn't extend to the side panels as these are comparatively flimsy and difficult to replace once removed. Internal design is

more impressive, though, as the 120Ld uses a similar layout to HP's LC2000. The drive bay assembly is positioned in a dedicated section at the front and partnered by a pair of large cooling fans. These are held in position by a single screw so they are relatively easy to

remove and replace in the event of a failure but, unlike the LC2000, the server must be powered down first. NEC's well-designed motherboard takes up the lion's share of the interior, with the pair of processor slots mounted at the top next to another large cooling fan. The review model came supplied with a single PIII 600EB module, but the

**HARDWARE SPECIFICATIONS**  
 Motherboard: NEC  
 Chipset: ServerWorks Entry ServerSet III LE  
 FSB speed (MHz): 133  
 Processor type/speed: Pentium III 600EB  
 No of processors: 1  
 Max processors: 2  
**STORAGE**  
 Hard disk: 2 x Seagate ST39175LC  
 Total capacity (unformatted): 18.2GB  
 Controller type: Adaptec AIC-7899G  
 Software: Express Builder, EsmPro Suite

**DETAILS**  
**PRICE** £2,349 (£1,999 ex VAT)  
**CONTACT** NEC 0870 010 6322  
[www.neccomp.com](http://www.neccomp.com)  
**PROS** Good internal design with high expansion potential; Ultra160 SCSI chipset and an abundance of management tools  
**CONS** Comparatively poor performance; build quality not as good as many other manufacturers; supplied tape drive of limited value  
**OVERALL** A good choice as a first server with plenty of room to grow with demand, although it's let down by a below par performance

**BUILD QUALITY** ★★  
**PERFORMANCE** ★★  
**VALUE FOR MONEY** ★★  
**OVERALL RATING** ★★



## Toshiba Magnia 3030



simple plastic locking panel on the front of the unit. The front door is separated into two parts so you can secure the drive bays and leave the three 5.25in bays open or, alternatively, lock the whole lot away from wandering fingers. Power redundancy is also an option as the chassis has room for a second hot-swap supply at the rear.

When we removed the side panel the first thing we noted was that Toshiba doesn't actually manufacture its own motherboards, but uses the same Intel L440GX+ server board as Mesh and evesham.com. Although it only provides a 100MHz FSB and support for 2GB of PC100 SDRAM, it's clear that choosing the right

hardware specification will deliver good network performance. Even though the Magnia 3030 only came equipped with a single PIII 600 processor and 128MB of memory, it still put in a very creditable

performance in both the SYSmark tests we carried out (see performance results later in the group test).

Processor cooling is high on the agenda as both slots are hidden behind a large metal fan cage that pulls air directly across the modules and shunts it out

the back. Upgrade manoeuvres won't be hindered for long, though, because the unit is only held in place by two thumbscrews and can be removed within seconds.

Both the drive bay and power supply assembly are partnered with two fans each, but even so the 3030 was surprisingly quiet during operation. An

integrated Adaptec AIC-7896N chipset deals with storage and provides Ultra2 and Ultra Wide channels with the former connected to the disk cage backplane. Two IDE channels are also on offer with one servicing a 40-speed CD-ROM drive.

Graphics are handled by a simple but effective Cirrus Logic chipset, while network duties are, of course, handled by an integrated Intel Pro100+ chipset. This arrangement leaves all expansion slots free and a RAID array is a distinct possibility since one of the PCI slots can support optional AMI single or dual-channel RAID controller cards.

Toshiba failed to carry out our request for a pre-installed operating system, but at least this lapse gave us an opportunity to use its Server Setup utility. Booting the server from the supplied floppy disk and CD-ROM takes you to an intuitive menu system where you can create driver disks, install a utility partition and load your chosen operating system. Once you've supplied all the necessary information, the setup utility gets on with the job, requiring little further operator intervention, but Toshiba ensures there's plenty of help to hand throughout this process if you need it. As with the Mesh server, management comes courtesy of Intel's LANdesk Server Manager Utility. This keeps an eye on areas such as processor and chassis temperatures, along with operating voltages, and can be configured to send network messages and even shut the server down automatically if a fault is detected.

Comparing the Magnia 3030 with Mesh's well-endowed 700L shows the Toshiba alternative to be a more costly choice because you get far less hardware for your money. However, overall build quality and internal design are far better and the performance is quite respectable.

**TOSHIBA STARTED** producing servers at the beginning of 1999, but it was only at the end of the year that it decided the time was right to make an assault on the UK market. The 3030 is the latest member of the Magnia family and is aimed directly at the workgroup and small to medium enterprises business sector. Initial impressions are good as the Magnia 3030 looks well built and offers plenty of expansion potential, allowing the system to grow with your business.

A hot-swap disk cage with room for six 1in hard disks is located at the front. The review model came equipped with a brace of 9.1GB Ultra2 IBM hard disks, but filling the unit with 18.2GB drives would provide a huge 109GB of storage capacity. The drives are held in sturdy metal carriers that are kept in place by a

### HARDWARE SPECIFICATIONS

Motherboard: Intel  
Chipset: Intel 440GX  
FSB speed (MHz): 100  
Processor type/speed: Pentium III 600E  
No of processors: 1  
Max processors: 2

### STORAGE

Hard disk: 2 x IBM DNES 309170Y  
Total capacity (unformatted): 18.2GB  
Controller type: Adaptec AIC-7896N  
Software: Server Setup, Intel Server Control

## DETAILS

**PRICE** £2,256 (£1,920 ex VAT)

**CONTACT** Toshiba 01932 828 828

[www.toshiba.co.uk](http://www.toshiba.co.uk)

**PROS** Good build quality; plenty of internal cooling; big-name brand

**CONS** Intel motherboard only has a 100MHz FSB and the Mesh alternative offers more hardware for less cash

**OVERALL** Comparatively expensive, but a promising entry into the server market from Toshiba. Uses the same motherboard as Mesh, but has a far better internal design with tool-free maintenance

**BUILD QUALITY** ★★★  
**PERFORMANCE** ★★★  
**VALUE FOR MONEY** ★★  
**OVERALL RATING** ★★★

★★★  
★★★  
★★  
★★★



## Viglen CX1



**PRIOR TO THE RELEASE** of the CX-1 in 1999, Viglen had always insisted on using Intel motherboards in its servers, but this time around it has opted for a SuperMicro board. The P6DBU

motherboard does offer plenty of useful features, but it's getting on a bit now and is not specifically designed for server applications. Consequently this server's expansion potential, internal design and management options are somewhat

restricted. The unit comes bundled with Intel's LANdesk Client Manager software that is aimed at administering other networked PCs. However, to see what's going on locally you need to install the client software, which cannot co-exist with the administrator utility. The LANdesk client can access some of the motherboard sensors, but it pales

into insignificance when compared with the software supplied by companies such as Dell, Compaq and Hewlett-Packard. Viglen also pre-installed Computer Associates' UniCenter TNG management software, but this is a complex product that's pitched more at enterprises than the small-business market.

The CX-1 comes enclosed in a compact chassis but inside you'll find that the poor design and limited space will severely hamper upgrades and maintenance. Two processor sockets are provided with one holding a PIII 650MHz chip. The server comes with 128MB of SDRAM memory and three DIMM sockets are left free for further expansion, but reaching them will be difficult as the hard disk and floppy drive cage is mounted directly in front of the sockets and blocks access completely. In fact, it is so close it's actually resting against the installed memory module. Inside the cage you'll find a single 9.1GB Fujitsu Ultra2 hard disk with room for two more drives. Up above are three 5.25in bays with one holding a 40-speed CD-ROM drive and the second home to an HP DAT DDS-3 SCSI tape drive. The

tape drive is partnered by a copy of Veritas' Backup Exec for Windows NT/2000/NetWare that includes the intelligent disaster recovery option.

Access to the interior of the server requires the entire shell to be removed. You cannot secure the shell in place, so physical security is at a minimum. However, an intrusion detection

microswitch is located inside and this will notify you if the case has been removed – provided you have loaded up the supplied Super Doctor and LANdesk Client Manager software utilities. Also, there's no protection for the power and re-set switches at the front.

Integration is another casualty on the SuperMicro board as the only embedded chipsets are an Adaptec AIC-7890AB and AIC-3860Q which, between them, offer Ultra2, Ultra Wide and Narrow SCSI connectors. It's also worth noting that these are all located behind the hard-disk cage as well. However, Viglen does get a pat on the back for fitting a pair of Intel Pro100+ PCI network adaptor cards. Using the latest onboard 82559 chipset these cards support adaptor teaming and adaptive load balancing, so you can add fault tolerance to your network connection – if one card fails, all network traffic will be switched to the other. Using only one network card for the benchtest delivered an average performance with the CX-1 taking sixth place in the Fast Ethernet benchtests. Adaptor teaming should improve performance and we tried running the Fast Ethernet benchtest with both cards connected to the dual-speed switch, but saw no significant improvements.

Communications are well catered for as you can take advantage of fast Internet access using the Eicon Diva Pro PCI ISDN card that comes with a copy of RVS-COM Lite for fax and voicemail applications. Viglen also included an external 3Com 56K voice modem as well. Two PCI slots are still available with one supporting Adaptec's ARO1130 RAID controller cards, but the two ISA slots at the base will be of limited value.

The CX1 is let down mainly by its use of a non-server-specific motherboard and a chassis that is more suited to a desktop PC. Viglen does bundle plenty of extras but, at £1,999, the CX1 still doesn't offer great value.

## HARDWARE SPECIFICATIONS

Motherboard: Supermicro  
 Chipset: Intel 440BX  
 FSB speed (MHz): 100  
 Processor type/speed: Pentium III 650  
 No of processors: 1  
 Max processors: 2  
**STORAGE**  
 Hard disk: Fujitsu MAE3091LP  
 Total capacity (unformatted): 9.1GB  
 Controller type: Adaptec AIC-7890AB  
 Software: Intel Client Manager, Veritas Backup Exec  
 Hard disk: Fujitsu MAE3091LP

## DETAILS

**PRICE** £2,349 (£1,999 ex VAT)  
**CONTACT** Viglen 020 8758 7000  
[www.viglen.co.uk](http://www.viglen.co.uk)

**PROS** Plenty of useful extras including dual network adaptors, a tape drive partnered with good backup software and an ISDN card

**CONS** Limited expansion potential and awful internal design will make upgrades and maintenance a nightmare

**OVERALL** A PC-based motherboard and chassis masquerading as a server. The CX1 will do the job and Viglen does include plenty of extras, but there are far better bargains on offer elsewhere in this group test

**BUILD QUALITY** ★  
**PERFORMANCE** ★★  
**VALUE FOR MONEY** ★★★  
**OVERALL RATING** ★★★

## Choosing the right network infrastructure

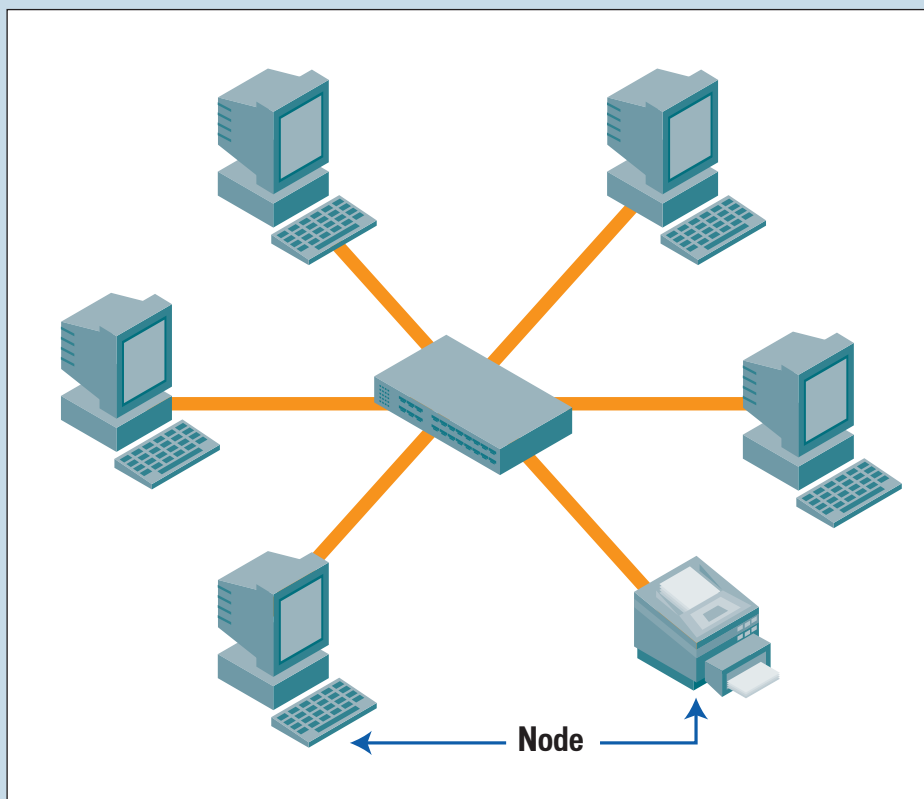
Getting your new server up and running and on the network is only a small part of the big picture – you also need to consider carefully what type of networking infrastructure will suit your company best. It goes without saying that all users will be connected over Ethernet, but the key to choosing the right networking products is understanding the needs of your business and its potential for expansion.

The most common form of network connection is over UTP (unshielded twisted pair) cable or 10BaseT with each user linked to a hub. This device creates a star topology where the hub is the central point with all connections radiating outwards. If a cable fails, only that link is affected and all others continue to function normally. The specifications of 10BaseT dictate that cable lengths are limited to 100m, but you can go beyond this by adding more hubs. Called cascading, one port on each hub is used to connect two devices together, although this also has a limit as end-stations cannot be separated by more than four hubs or five wiring segments.

Most small businesses indulging mainly in file and printer sharing will find 10Mbps/sec Ethernet provides all the bandwidth they need. However, the amount and variety of data being shunted around many of today's networks can easily soak this up so the next option is Fast Ethernet.

Fundamentally, this is no different to standard Ethernet and uses the same method of collision detection, although bit timings – the time taken for each bit of information to be transmitted – are reduced by a factor of 10 for a 10-fold increase in performance to 100Mbps/sec.

One of the biggest issues with Ethernet networks is that maximum throughput will never be reached. Ethernet is a connectionless service over shared media – when data is transmitted it is sent to every other node on the network and only one packet of data can be



on the wire at any one time. If two packets are transmitted at the same time they will collide so each station must back off for a random period and re-transmit. Unfortunately, as more data is transmitted, collisions increase and eventually the network reaches a stage called thrashing where no data is actually reaching its destination.

An Ethernet switch can reduce these effects as it reads the addresses contained in each data frame's header and only sends them to the port where that device is connected. By creating a virtual connection between the stations the switch is segmenting the network into

smaller collision domains. Implementing a switch doesn't mean your hubs have to go as they can be linked directly to the switch ports allowing groups of users to receive a dedicated 10 or 100Mbps/sec pipeline from the switch.

Switches also support full duplex mode which transmits and receives data on separate wire pairs so collisions on this cable length won't occur. All the servers on review have dual-speed network adaptors that support this so you could easily create a high-speed 200Mbps/sec pipeline for improved user access. You'll also need a switch if you want to use multiple network cards in your server to take

*Top: An Ethernet network using a star topology  
Left: Gigabit switches are still very expensive*

advantage of adaptor teaming and fault-tolerant links.

Network speed can be increased further, but the next step is not suited to small businesses due to high costs. Gigabit Ethernet offers a massive speed increase to 1000Mbps/sec and is aimed at backbone or large server farm connections. Originally designed to run over long-distance fibre-optic links, the latest Gigabit specification now allows it to utilise standard Category 5 copper cabling making it ideal for high-speed server links.

There are plenty of dual-speed switches on the market now with optional Gigabit uplink modules and vendors such as 3Com and Intel offer Gigabit PCI server cards, although you can expect to pay upwards of £500 for a single fibre-based card – around a quarter the cost of your new server.

Intel 01793 431155  
3Com 0800 225252

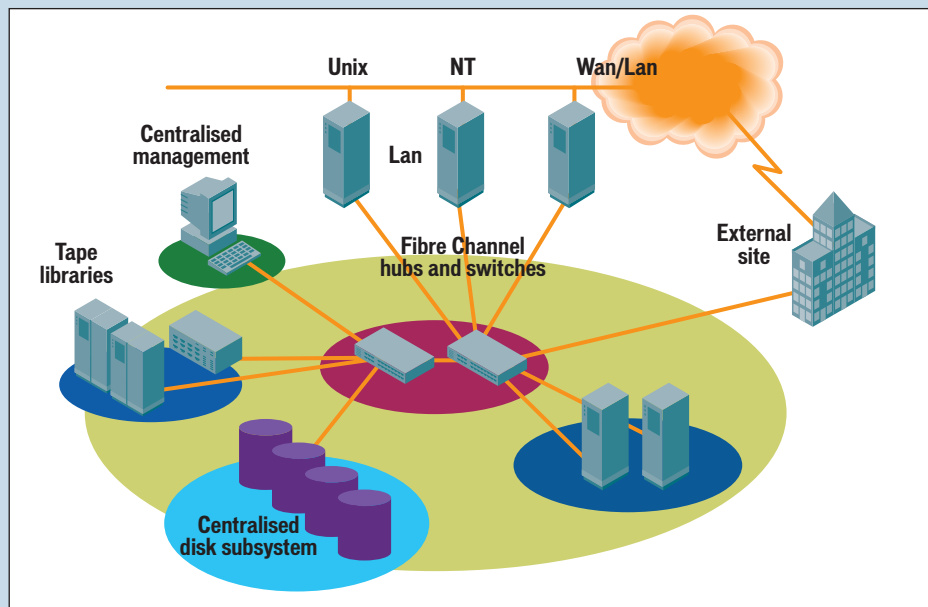
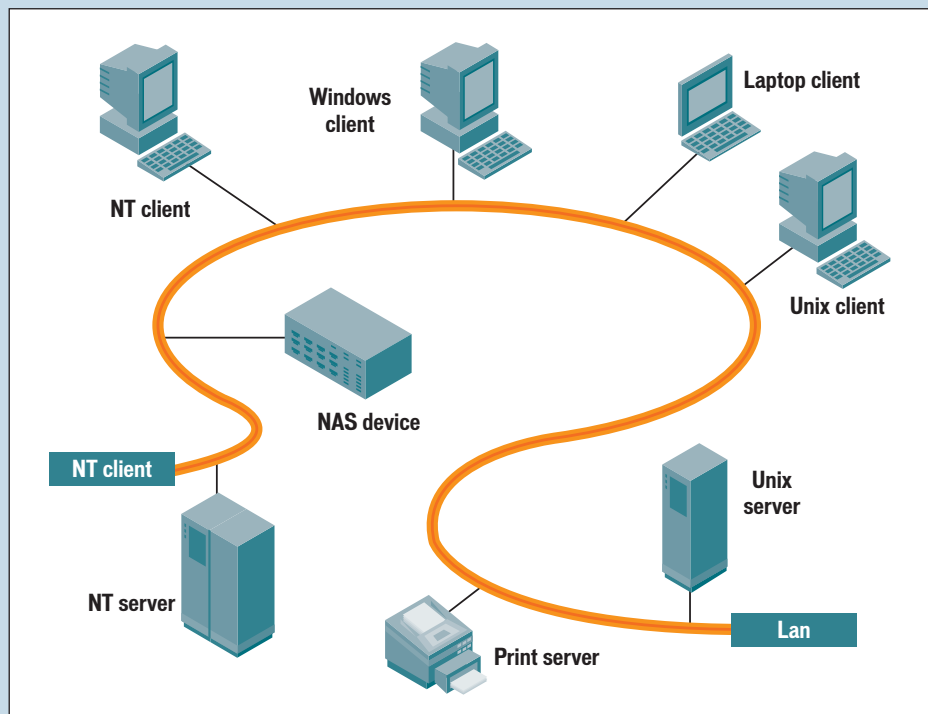
## NAS and SAN: what's the difference?

The increasing number and variety of network applications is fuelling a data explosion. To keep up with this demand, administrators must upgrade server storage, which will involve scheduling out-of-hours maintenance periods, powering down the server, installing and configuring new disks and then hoping it all comes back up safely. Both SAN (Storage Area Networks) and NAS (Network Attached Storage) are architectures aimed at relieving this pressure on servers. However, although they may sound similar they are totally different technologies. A small business is more likely to be interested in the NAS appliance so we'll look at this first.

NAS comprises drive arrays that connect directly to the network and appear to users as large hard disks. The array is contained within a dedicated system box that has its own control hardware and OS and generally has a web browser interface for management and configuration from a networked workstation. NAS appliances are designed to overcome the storage crisis as they can be plugged straight into the network as required without affecting servers and key services – as storage demands increase you just add more boxes.

Hard disk manufacturers, Quantum and Maxtor, have their own solutions with the Snap! Server and MaxAttach devices. The Snap! Server comes in 15GB, 30GB, 60GB, and 120GB models with the two- and four-drive 2000 and 4000 versions offering RAID 0 and 1 mirroring and striping. Maxtor's alternatives are the MaxAttach 3000 and 4000, with the latter offering up to 160GB of storage and both support RAID levels 0 and 1. In both cases you just plug the appliances in, connect them to the network and configure them using a web browser.

The SAN concept aims to place all storage devices on a separate, dedicated network. Taking hard-disk arrays and tape libraries away from



Top: NAS appliances can be easily added directly onto the network as required

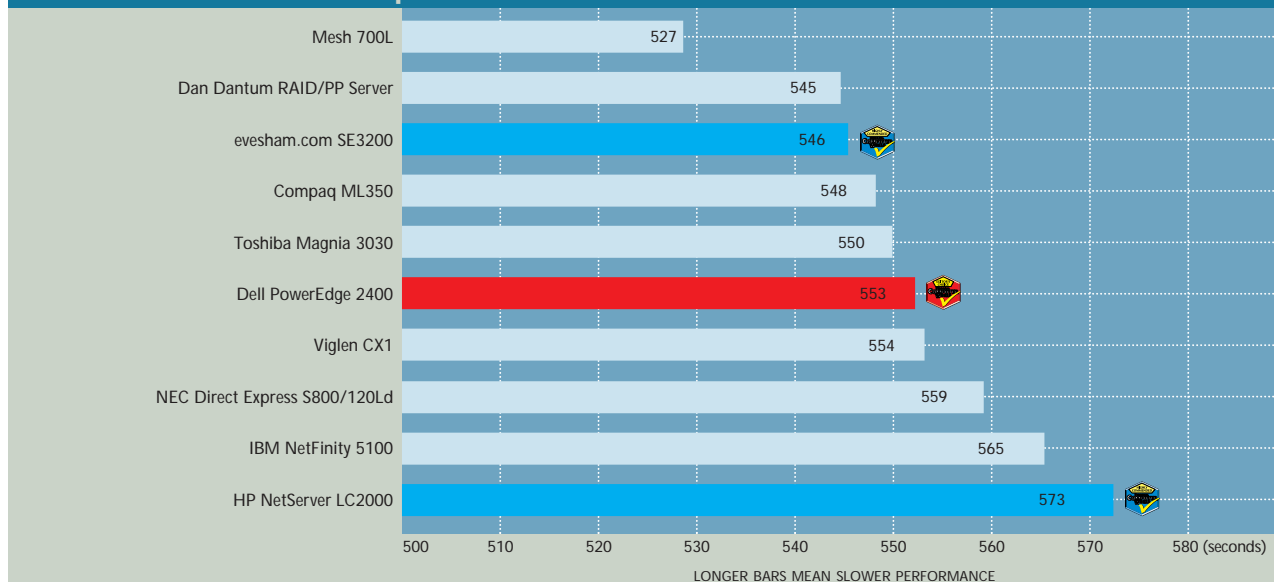
Above: The SAN separates all storage devices from servers and places them on a dedicated network

servers and placing them on the SAN frees up resources as the servers no longer need to control them. SAN devices become a shared resource accessible to all servers on the main network. This allows data to be managed more efficiently and, as with NAS appliances, more storage can be added without impacting general operations. A big advantage of the SAN is that

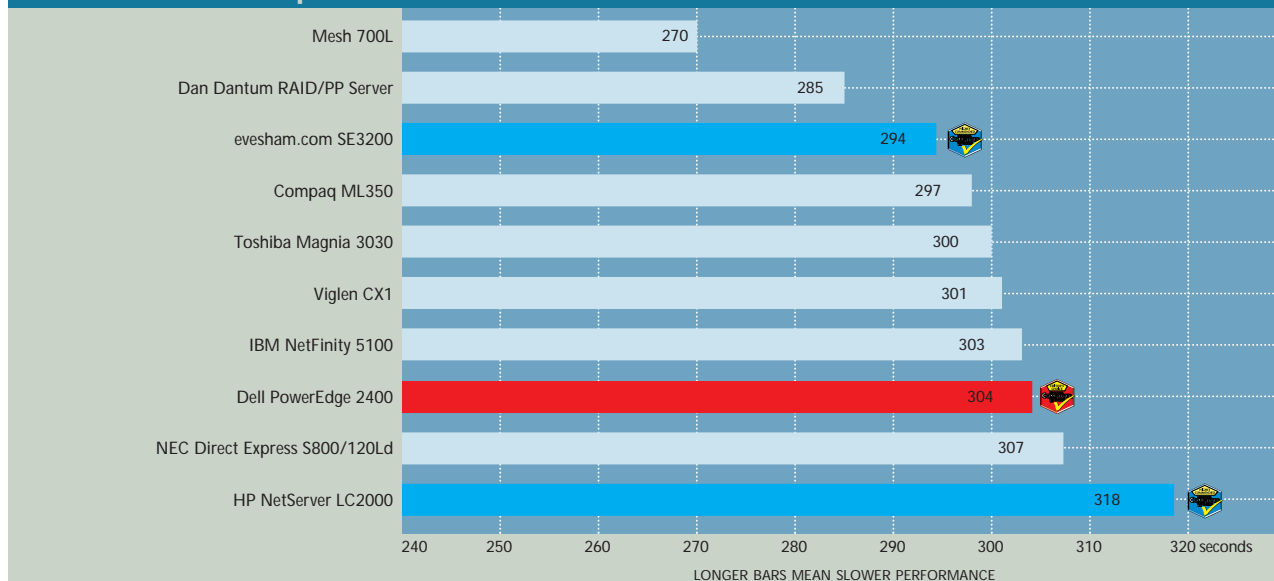
storage devices can be placed in separate data centres away from the main building. Mirroring of mission-critical data to a secondary site can easily be done too, so in the event of a failure at the primary site, data recovery is virtually instantaneous. Fibre Channel is an increasingly popular method of connecting SAN devices together. It supports up to 127 devices

with 100Mbytes/sec transfer rates and distances of up to 30m for copper and 10km for fibre. The SAN network is controlled by Fibre Channel switches that are, in turn, linked to the network servers using SCSI-to-Fibre Channel adaptors. The SAN is an ideal solution for large networks as it scales easily and frees up vital server resources for increased performance.

### Standard Ethernet performance



### Fast Ethernet performance



### How we did the tests

In an average office a server will be dealing with many different types of requests, from file and printer sharing through to complex database queries. BAPCo's SYSmark for File Servers measures network performance by loading a suite of nine applications on the server and running them simultaneously from multiple client PCs attached over a network. The suite is designed to cover a wide range of business activities such as email, word processing, graphics design and database queries. Each server had Windows NT Server 4 installed with Service Pack 6a applied. SYSmark includes tools for creating user names for each client and setting up network shares on the server's hard disk.

The client workstations do not

require any software other than DOS and Microsoft's client re-director, as each application in the test suite is loaded from the server before being run locally. A small batch file is also created on each client that assigns a unique number to each workstation. This determines which application in the suite it will start first and creates a more realistic test scenario as the server will be forced to cope with multiple requests for different applications and their associated data. A control workstation monitors each client and notifies the tester when all workstations are logged in and synchronised. It then issues simultaneous 'go' commands to each client causing them to start running the benchtest.

As each application loads onto the client it runs predefined instructions from a macro or a script created with Microsoft's Test utility. A complete report is then produced showing the times each client took to complete the test suite.

As all clients and servers had dual-speed network cards we ran SYSmark across standard 10Mbps/sec Ethernet and 100Mbps/sec Fast Ethernet to give a clear indication of the benefits of the higher network speeds. After these tests the clients and test server were reconnected to an Intel Express 510T dual-speed Ethernet switch so each had a 200Mbps/sec full duplex link. The run times were reduced by almost 50 per cent in some cases.




### Table of features



| MANUFACTURER                    | COMPAQ                                    | DAN                      | DELL  | EVESHAM.COM                           |
|---------------------------------|---|--------------------------|---|---------------------------------------|
| PRODUCT                         | ML350                                     | DANTUM<br>RAID/PP SERVER | POWEREDGE 2400                                  | SE3200                                |
| Price inc VAT (ex VAT)          | £2,026 (£1,724)                           | £2,148 (£1,828)          | £2,349 (£1,999)                                 | £2,349 (£1,999)                       |
| Telephone                       | 0845 270 4000                             | 0870 444 7020            | 0870 152 4850                                   | 0800 038 0800                         |
| <b>CHASSIS</b>                  |   |                          |   |                                       |
| h x w x d (mm)                  | 467 x 212 x 670                           | 541 x 225 x 464          | 442 x 260 x 600                                 | 425 x 220 x 570                       |
| PSU rating (Watts)              | 300                                       | 250                      | 330   | 337                                   |
| Standard/max PSUs               | 1/1                                       | 1/1                      | 1/2   | 2/2                                   |
| <b>HARDWARE SPECS</b>           |   |                          |   |                                       |
| Motherboard                     | Compaq                                    | SuperMicro               | Dell  | Intel                                 |
| Chipset                         | ServerWorks Entry<br>ServerSet III LE     | Intel 840                | ServerWorks Entry<br>ServerSet III LE           | Intel 440GX                           |
| FSB speed (MHz)                 | 133                                       | 133                      | 133   | 100                                   |
| Processor type/speed            | Pentium III 600EB                         | Pentium III 700          | Pentium III 600                                 | Pentium III 600E                      |
| No of processors/max processors | 1/2                                       | 1/2                      | 1/2   | 1/2                                   |
| <b>MEMORY</b>                   |   |                          |   |                                       |
| RAM fitted/maximum RAM          | 128MB/2GB                                 | 256MB/4GB                | 128MB/2GB                                       | 128MB/2GB                             |
| Free/total sockets              | 3/4                                       | 2/4                      | 3/4   | 3/4                                   |
| <b>STORAGE</b>                  |   |                          |   |                                       |
| Hard disk(s)                    | 2 x Fujitsu MAE3091LP                     | 3 x Quantum Atlas IV     | 2 x Quantum Atlas V                             | 2 x Fujitsu MAE3182LC                 |
| Total capacity (unformatted)    | 18.2GB                                    | 9.1GB (mirror + spare)   | 9.1GB (mirrored pair)                           | 18.2GB (mirrored pair)                |
| Controller type                 | Symbios 53C896                            | Adaptec AAA-130U2        | Dell PERC 2/Si                                  | Adaptec ARO-1130                      |
| Controller location             | PCI Card                                  | PCI Card                 | Motherboard                                     | PCI Card                              |
| Other controllers               | IDE (2)                                   | IDE (2)                  | Adaptec AIC-7890 (disabled)<br>Adaptec AIC-7880 | Adaptec AIC-7896N<br>IDE (2)          |
| <b>NETWORK INTERFACES</b>       |   |                          |   |                                       |
| Model                           | Compaq NC3163                             | Intel Pro100+            | Intel Pro100+                                   | Intel Pro100+                         |
| Location                        | PCI Card                                  | Motherboard              | Motherboard                                     | Motherboard                           |
| <b>SLOTS FREE/TOTAL</b>         |   |                          |   |                                       |
| 64bit PCI                       | 2/2                                       | 2/2                      | 5/5   | 2/2                                   |
| 32bit PCI                       | 3/4                                       | 3/4                      | 1/1   | 3/4                                   |
| ISA                             | 1/1                                       | 0/1                      | 1/1   | 1/1                                   |
| AGP                             | 0   | 0                        | 0   | 0                                     |
| <b>DRIVE BAYS FREE/TOTAL</b>    |   |                          |   |                                       |
| Front 5.25in                    | 2/3                                       | 0/4                      | 2/3   | 1/3                                   |
| Front 3.25in                    | 2/4                                       | 0/2                      | 4/6   | 4/6                                   |
| Internal 5.25in                 | 0/0                                       | 0                        | 0/0   | 0                                     |
| Internal 3.25in                 | 0/0                                       | 5/5                      | 0/0   | 0                                     |
| <b>ADDITIONAL PERIPHERALS</b>   |   |                          |   |                                       |
| CD-ROM                          | Compaq CDR-8435                           | Toshiba XM-6502B         | NEC 466   | LG CRD-8400                           |
| Tape device                     | x   | Seagate TapeStor 8GB     | x   | OnStream DI30                         |
| Other                           | x   | x                        | x   | x                                     |
| Graphics adaptor                | ATI 3D Rage IIC PCI                       | ATI Xpert XL             | ATI 3D Rage IIC AGP                             | Cirrus Logic GD5480                   |
| Location                        | PCI Card                                  | AGP Card                 | Motherboard                                     | Motherboard                           |
| Video memory                    | 4MB                                       | 8MB                      | 4MB   | 2MB                                   |
| Monitor included                | x   | x                        | x   | ✓                                     |
| Keyboard/mouse                  | ✓/✓                                       | ✓/✓                      | ✓/✓   | ✓/✓                                   |
| Software supplied               | Compaq SmartStart<br>Insight Manager, ASR | Veritas Backup Exec      | Server Assistant<br>Resolution Assistant        | Intel Server Control<br>OnStream Echo |



|  |                          |                      |                          |                        |                                  |  |
|---|--------------------------|----------------------|--------------------------|------------------------|----------------------------------|--|
| <b>HEWLETT-PACKARD</b>  | <b>IBM</b>               | <b>MESH</b>          | <b>NEC DIRECT</b>        | <b>TOSHIBA</b>         | <b>VIGLEN</b>                    |  |
| <b>NETSERVER</b>  | <b>NETFINITY 5100</b>    | <b>700L</b>          | <b>EXPRESS</b>           | <b>MAGNIA 3030</b>     | <b>CX1</b>                       |  |
| <b>LC2000</b>   |                          |                      | <b>5800/120LD</b>        |                        |                                  |  |
| £2,089 (£1,777)   | £2,290 (£1,949)          | £2,231 (£1,899)      | £2,349 (£1,999)          | £2,256 (£1,920)        | £2,349 (£1,999)                  |  |
| 0990 474 747  | 0990 727 272             | 020 8208 4706        | 0870 010 6322            | 01932 828 828          | 020 8758 7000                    |  |
| 453 x 215 x 695   | 215 x 426 x 627          | 488 x 210 x 455      | 450 x 220 x 650          | 440 x 220 x 620        | 493 x 195 x 430                  |  |
| 349   | 250                      | 300                  | 300                      | 300                    | 300                              |  |
| 1/2   | 1/3                      | 1/1                  | 1/1                      | 1/2                    | 1/1                              |  |
| Hewlett-Packard   | IBM                      | Intel                | NEC                      | Intel                  | Supermicro                       |  |
| ServerWorks Entry   | ServerWorks Entry        | Intel 440GX          | ServerWorks Entry        | Intel 440GX            | Intel 440BX                      |  |
| ServerSet III LE  | ServerSet III LE         |                      | ServerSet III LE         |                        |                                  |  |
| 133   | 133                      | 100                  | 133                      | 100                    | 100                              |  |
| Pentium III 533   | Pentium III 667          | Pentium III 700      | Pentium III 600EB        | Pentium III 600E       | Pentium III 650                  |  |
| 1/2   | 1/2                      | 2/2                  | 1/2                      | 1/2                    | 1/2                              |  |
| 128MB/4GB   | 128MB/4GB                | 256MB/2GB            | 128MB/4GB                | 128MB/2GB              | 128MB/1GB                        |  |
| 3/4   | 3/4                      | 3/4                  | 3/4                      | 3/4                    | 3/4                              |  |
| Seagate ST39102LC   | IBM DNES-309170Y         | Quantum Atlas 10K    | 2 x Seagate ST39175LC    | 2 x IBM DNES 309170Y   | Fujitsu MAE3091LP                |  |
| 9.1GB   | 9.1GB                    | 18.2GB               | 18.2GB                   | 18.2GB                 | 9.1GB                            |  |
| Symbios 53C897  | Adaptec AIC-7899G        | Adaptec AIC-7896N    | Adaptec AIC-7899G        | Adaptec AIC-7896N      | Adaptec AIC-7890AB               |  |
| Motherboard   | Motherboard              | Motherboard          | Motherboard              | Motherboard            | Motherboard                      |  |
| IDE (1)   | IDE (1)                  | IDE (2)              | IDE (1)                  | IDE (2)                | IDE (2)                          |  |
| HP NetServer 10/100TX   | AMD PCnet Server Adaptor | Intel Pro100+        | Intel Pro100+            | Intel Pro100+          | 2 x Intel Pro100+ Server Adaptor |  |
| Motherboard   | Motherboard              | Motherboard          | Motherboard              | Motherboard            | PCI Cards                        |  |
| 2/2   | 3/3                      | 2/2                  | 3/3                      | 2/2                    | 0                                |  |
| 4/4   | 2/2                      | 4/4                  | 4/4                      | 4/4                    | 2/5                              |  |
| 0   | 0                        | 1/1                  | 1/1                      | 1/1                    | 2/2                              |  |
| 0   | 0                        | 0                    | 0                        | 0                      | 0/1                              |  |
| 2/3   | 2/3                      | 4/5                  | 2/3                      | 2/3                    | 1/3                              |  |
| 5/6   | 5/6                      | 0/2                  | 4/6                      | 4/6                    | 1/2                              |  |
| 0   | 0                        | 0                    | 0                        | 0                      | 0                                |  |
| 0   | 0                        | 2/2                  | 0                        | 0                      | 2/3                              |  |
| Hitachi CDR-8435  | LG CRD-8400B             | Teac CD-532E         | LG CRD-8401B             | ON Technology LTN-403L | Sony CDU4811                     |  |
| x   | x                        | HP SureStore T20     | Archive Python DAT DDS-3 | x                      | HP DAT DDS-3                     |  |
| x   | x                        | x                    | x                        | x                      | Eicon Diva ISDN card             |  |
|   |                          |                      |                          |                        | 3Com 56K modem                   |  |
| ATI 3D Rage IIC AGP   | S3 Savage4 Pro           | Cirrus Logic GD5480  | ATI 3D Rage IIC PCI      | Cirrus Logic GD5480    | ATI Xpert98 Pro                  |  |
| Motherboard   | Motherboard              | Motherboard          | Motherboard              | Motherboard            | AGP Card                         |  |
| 2MB   | 8MB                      | 2MB                  | 4MB                      | 2MB                    | 8MB                              |  |
| x   | x                        | x                    | x                        | x                      | ✓                                |  |
| ✓/✓   | ✓/✓                      | ✓/✓                  | ✓/✓                      | ✓/✓                    | ✓/✓                              |  |
| NetServer Navigator   | ServerGuide              | Intel Server Control | Express Builder          | Server Setup           | Intel Client Manager             |  |
| HP TopTools   | NetFINITY Manager        | Stac Replica Backup  | EsmPro                   | Intel Server Control   | Veritas Backup Exec              |  |



# Editor's Choice

The ideal small-business server needs to satisfy a wide range of requirements. Performance is always an important consideration, but there are many other factors that need to be taken into account. A server can represent a considerable financial outlay to companies on a strict budget, so it should be designed with high levels of upgrade potential. The average PC may only last a couple of years, but servers can, and should, last well beyond this to maximise your investment. Increasing online storage or adding extra processors and more memory to improve performance must be simple tasks that can be carried out easily to reduce downtime.

With your company depending on one system to provide all its networked services, reliability is paramount. Redundant power supplies, RAID arrays – even adequate cooling – all play their part in ensuring the server does its job without interruption. You need to keep a close eye on general operations and have advance warning of impending doom, so decent management software is a must, while good security keeps the curious, or worse, at bay.

## The winners

Choosing the best was a tough decision as there were a lot of very high-quality servers in this group test. There has to be a winner though so, after considerable debate, the **Editor's Choice** award goes to Dell's PowerEdge 2400 as it delivered on all counts. It came in for review with a

reasonably beefy Pentium III 600MHz processor, but there's still potential to add a second processor thanks to its dual motherboard. More memory can easily be added and, when the time comes, the totally tool-free design will ensure the server is back in business with the minimum of delay.

The server's internal design is exemplary and it's worth noting that Dell has had a big influence in this crucial area, with many other manufacturers now using similar concepts in their servers. Placing all the connectors on the edge of the motherboard right next to the devices they're servicing makes for a tidy interior and keeps ribbon cable clutter to a minimum.

Hard-disk storage is well-catered for with a six-disk capacity drive cage and a hot-swap backplane now a standard feature in the 2400. The drives are fitted in sturdy carriers that are easy to remove and replace as required. Power redundancy is an option, while server management and monitoring tools are in abundance. The icing on the cake was the integrated RAID controller chipset providing extra storage fault tolerance, ensuring the server won't let your business down. Overall, the PowerEdge 2400 is a well-focused system that fitted our requirements perfectly.

The first of our **Highly Commended** awards goes to Hewlett-Packard's mighty NetServer LC2000. Some may see this as a strange choice as the single Pentium III 533MHz processor was the slowest of the lot, resulting in a less than

impressive performance. However, the price of the LC2000 was one of the lowest, so HP could have added more hardware and still stayed within our price limit. What impressed us most was the build quality, as this was easily the best of the rest. Clearly, a lot of thought has gone into the design as the chassis and its internal layout is superb. HP has gone with the flow and fitted the ServerSet III LE chipset that offers a 133MHz FSB and support for up to 4GB of SDRAM memory. There's plenty of room to grow with demand as the LC2000 also has a hard-disk cage with capacity for up to six drives and an optional hot-swap backplane can be fitted as well.

Our second **Highly Commended** award goes to evesham.com with its SE3200. Intel's 440GX+ motherboard gets the system off to a good start as it's specifically designed for servers and comes with plenty of management and monitoring facilities. Performance was particularly good, with evesham.com securing a solid third place overall and yet there is still plenty of room for expansion. The large six-drive disk bay can keep up with future storage demands and evesham.com even managed to supply a pair of 18.2GB Ultra2 hard disks and team them up with an Adaptec PCI RAID controller card. Creating a server from off-the-shelf components can be tough as it's easy to get the recipe wrong. However, the SE3200 shows how it can be done with a fine balance of components brought together in a decent chassis.



*Dell's PowerEdge delivered on all counts, including extra storage fault tolerance*



*The low price of HP's NetServer impressed, as did its internal design*



*evesham.com's server offered good performance and room for expansion*