Network Computing

For IT By IT

SMALL SERVER
BONANZA

We tested five inexpensive, reliable boxes aimed at small businesses, remote offices and workgroups. HP struck gold with its feature-rich, expandable ProLiant ML330

The small realty-management company that rents space to NETWORK COMPUTING's Green Bay, Wis., Real-World Labs® and NWC Inc. has seven in-office employees and seven computers—with one small server that, shall we say, is not the speediest horse on the track. We got to thinking about this and decided to find out the state-of-the-art of servers sought by the budget-conscious small business or enterprise looking to equip remote offices or workgroups.

We set a price limit of $1,000, with the caveat that the server would be expandable to include a tape drive in the future. Note that this price was *without* an OS.

Microsoft Windows Server 2000 costs around $800 and is a constant across the board. We understand that $800 for an OS makes many small-business owners hyperventilate, and we sympathize; while the exorbitant cost of licenses isn't

BY STEVEN J. SCHUCHART JR.

the focus of this article, keep in mind that you may be able to move licenses off old servers.

The alternative is Linux. While we're sure there are ambitious VARs out there ready to slap it on anyone's servers, most small businesses simply don't have the technical chops to deal with Linux.

We also specifically requested machines in a tower or desktop format; most small businesses don't have racks and don't need them.

We invited Acer America, Dell, Gateway, Hewlett-Packard Co., IBM, Lantech PC Systems, MPC Computers LLC (formerly MicronPC), Promicro Systems, Polywell Computers, Sun Microsystems and Toshiba America to meet our challenge. The response was phenomenal, but only five of the vendors—Lantech, Gateway, IBM, Dell and the redoubtable HP—offered servers for less than our price cap.

If you're a small business looking for a reliable server, or a big business seeking a little server for an outlying office, have we got some boxes for you.

Per our request, we received midtower machines; the largest was the white-box unit from Lantech. All were light and easy to move.

In evaluating systems for this review, we considered many factors. We wanted these machines to be viable for at least three years. Small businesses don't have the capital for a replacement cycle any shorter than that—and frankly, we expect users to keep them until the machines
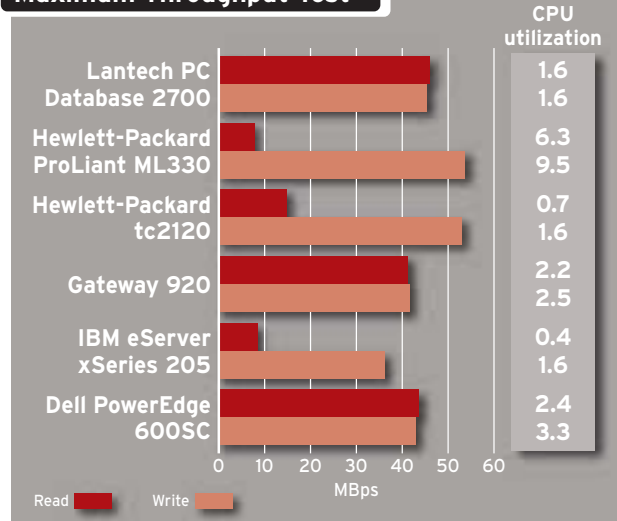
Executive Summary

WANTED: SERVERS UNDER $1K

If it's been three years or so since you checked out low-priced servers, it's time to go shopping. Many top-tier vendors have made strides in providing reliable, compatible, manageable machines with service options that will let small business owners or IT folks with remote offices or workgroups sleep soundly at night.

We put out a call for servers with street prices under $1,000 (not including OS). We specified that the machine will serve as a file/print server for an office of 10 people, and asked that submissions be expandable with additional RAID storage and a tape backup. Hard drives must offer a minimum 30 GB of storage, the system must include a CD-ROM drive, memory capacities can be no less than 128 MB, and all entries must have at least one 10/100 network port.

We must admit we were unsure what would show up on our doorstep, but we needn't have worried: The systems we received from Dell, Gateway, Hewlett-Packard, IBM and Lantech PC exceeded our expectations. After a battery of performance tests and rating systems on expandability, warranty options, management/configuration, features/ options and, of course, price, we pegged HP's ProLiant ML330 as the shiniest jewel in the group.

Maximum Throughput Test

	CPU utilization
Lantech PC Database 2700	1.6 / 1.6
Hewlett-Packard ProLiant ML330	6.3 / 9.5
Hewlett-Packard tc2120	0.7 / 1.6
Gateway 920	2.2 / 2.5
IBM eServer xSeries 205	0.4 / 1.6
Dell PowerEdge 600SC	2.4 / 3.3

Read / Write — MBps

drop dead. Little businesses don't grow into big businesses without being thrifty with hardware.

Other key factors that define "real" servers are reliability, compatibility, manageability and serviceability. Until recently, big-name vendors have found it impossible to cover all these bases and maintain a low price. The white box largely filled that bill.

However, a variety of problems plague white-box servers. The biggest headache is caused by software vendors, which are understandably loath to admit there might be bugs in their products. So when you run into a problem and call the software company, it will ask what kind of server you have. When you say, "I don't know, it doesn't have a tag," or "Frog Station PC Systems," it will breathe a sigh of relief and blame your hardware. Call your white-box maker, and you'll be told that there's nothing wrong with your hardware and that you should call the software vendor.

At the end of the day, your systems are still down and nobody wants to take responsibility. (For more on life with white boxes, see "Send in the Clones?" at *www.nwc.com/1308/1308f4.html*.)

Chips Matter

The system's chipset largely decides the features of a given motherboard. We saw two chipsets in this review: the Intel 845E and the ServerWorks Grand Champion SL.

The Grand Champion SL's features make it superior to the Intel 845E. The 64-bit, 33-MHz bus on the Grand Champion SL gets a theoretical bandwidth of 254 MB per second, not counting command overhead and wait states, while the 32-bit, 33-MHz bus on the Intel 845 gets only a theoretical 127.2 MB per second, again not counting command overhead and wait states.

You should take into account other hardware considerations, such as environmental control systems, beyond chipset and motherboard features. A system must be engineered to compensate for being jammed into a small, hot closet, lest it should suffer premature hard-

ware failure. That means making sure there's enough venting in the case, and enough fans on critical components.

Let's talk about the fans. Believe it or not, there are features that extend the life of this equipment. Ball-bearing fans, at a minimum, are essential. Many "bargain" servers use cheap sleeve-bearing fans, which have a much shorter MTBF (mean time between failures), especially in environments with a lot of dust. Since you probably won't find dustless servers aside from those that have come fresh from the factory, we were pleased that all the systems we received contained ball-bearing fans.
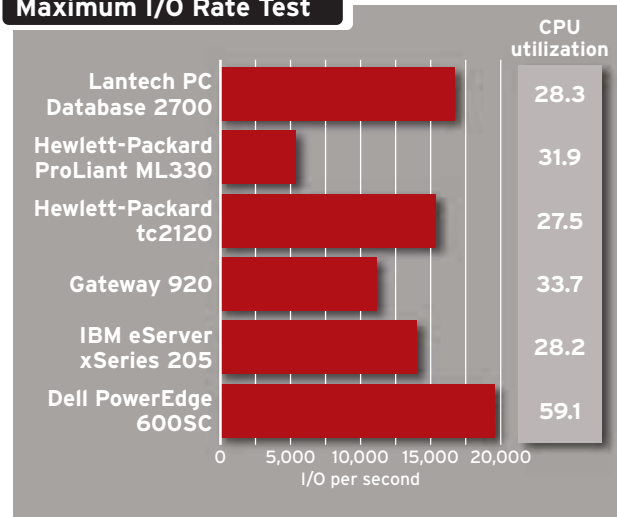
SCSI vs. ATA

For pure performance, SCSI is still king. However, SCSI is also expensive up front and on a per-gigabyte basis. For machines in the sub-$1,000 price class, we recommend ATA (IDE)-based hard-disk subsystems—the price per gigabyte and lack of up-front costs make ATA the best deal. Go SCSI only if you need the performance premium it offers.

Another interesting thing we learned during our hard-disk testing is that some manufacturers (IBM and HP among the vendors in our review) turn off write caching on their server-class hardware, even on ATA systems. When you're looking at the write performance of these servers, this may seem like a huge disadvantage—but the truth is that it makes good sense. If you lose power during a cached writing operation, you will lose not only that data, but possibly all the data on a given disk. Though data loss is possible with or without write cache enabled, the chances of disaster increase enormously with write caching on because the "crash death" window is much bigger. This risk can be mitigated by a UPS, but we find the approach sensible even in light of the performance penalty. Designing on the side of caution is wise in the server space.

We liked all the machines we received for this review, and a couple are fantastic deals to boot. Take the Dell 600SC and the Gateway 920: Both were able performers

Maximum I/O Rate Test

	I/O per second	CPU utilization
Lantech PC Database 2700		28.3
Hewlett-Packard ProLiant ML330		31.9
Hewlett-Packard tc2120		27.5
Gateway 920		33.7
IBM eServer xSeries 205		28.2
Dell PowerEdge 600SC		59.1

I/O per second axis: 0, 5,000, 10,000, 15,000, 20,000

and included small tape drives, anticipating a future need and still staying within our price, Gateway by more than $100. We wouldn't hesitate to recommend either one.

The HP tc2120 is a strong contender, sporting a SCSI drive system. The IBM eServer xSeries and Lantech Database 2700 use an older motherboard chipset, meaning they have only 32-bit, 33-MHz buses, making them less competitive in the long run. At the end of the day, an on-board RAID card, a Xeon processor and the ability to add a second Xeon made HP's ProLiant ML330 the winner of this review.

At first blush, our performance charts may not seem to support this pick: The ML330 had the worst write-test numbers while maintaining the highest CPU utilization. Although it fared better in the read test, it still had the highest utilization. And it didn't distinguish itself in either the "Maximum I/O Rate Test" (see chart above) or the "NWC Generalized Custom Test" (see chart, page 6).

The reality is that the ML330 struggles in write tests because the write caching is turned off and it has IDE disks. Reactivate write caching on the ATA RAID con-

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	Hewlett-Packard ProLiant ML330	Hewlett-Packard tc2120	Dell PowerEdge 600SC	Gateway 920	IBM eServer xSeries 205	Lantech PC Database 2700
DESIGN (20%)	4.5	3.5	3.5	3.5	3	3
MANAGEMENT (20%)	4	4	3.5	3	3.5	2
PERFORMANCE (15%)	4	4.5	4	4	4.5	4.5
PRICE (15%)	4	5	4	4.5	4	4
SCALABILITY/EXPANDABILITY (15%)	4	3.5	3.5	3.5	2	2.5
WARRANTY (15%)	4	4	4.5	4	5	2
TOTAL SCORE (100%)	4.10	4.05	3.80	3.70	3.63	2.95
	B+	B+	B	B	B-	C

A≥4.3, B≥3.5, C≥2.5, D≥1.5, F<1.5 A-C GRADES INCLUDE + OR - IN THEIR RANGES. TOTAL SCORES AND WEIGHTED SCORES ARE BASED ON A SCALE OF 0-5.

DESIGN includes considerations such as choice of chipset, SCSI versus ATA, case accessibility and the decision to turn off write caching.
WARRANTY Small businesses without on-site IT should consider purchasing a warranty in line with the cost of having the server down for an extended period.

Customize the results of this report card using the Interactive Report Card®, a Java applet at www.nwc.com.

troller, as we did during testing, and it beats most of the machines in the test. Performance is also related to the processor, and the Xeon will outperform all the Pentium 4s in the other machines. Processor selection and expandability were key criteria, outweighing performance.

All prices are as configured for this test; in many cases you can acquire the units for less money sans some bells and whistles.

Hewlett-Packard ProLiant ML330 **We enjoyed our time with the ProLiant ML330.** This small mid-tower server, which incorporates an Intel Xeon processor at 2.4 GHz, is not just the only system in this review to use a Xeon processor; it is also the only dual-processor-capable machine, sporting the capacity to add a second Xeon.

As configured for our tests, the ML330 included a 2.4-GHz Intel Xeon processor, 256 MB of RAM and a prodigious 160 GB of storage. The storage was set up as a RAID 0 array, which isn't the optimal configuration for a server. In a RAID 0 environment, if either 80-GB ATA hard disk fails, the entire array will be lost. The preferred configuration here would be to use RAID 1 mirroring to ensure that the loss of either drive won't cause us to lose data. That would give the system a capacity of 80 GB, which should be plenty for most small-office environments.

The ML330 uses the ServerWorks Grand Champion SL chipset for motherboard logic. It also has incorporated on the motherboard an ATA RAID controller, the LSI (Large-Scale Integration) MegaRAID IDEal. This RAID controller allows for ATA RAID Level 0 or Level 1. On the back, we found the normal complement of PS/2 connectors and VGA output. This machine also sports two USB 1.1 ports and a copper Gigabit Ethernet interface, all integrated into the motherboard. There are four 64-bit 33-MHz PCI slots, and we could expand memory up to 4 GB.

Our ML330 IOMeter testing yielded some interesting results. We ran the 64-KB linear read test followed by the 64-KB linear write test. While we expected to see a slight downturn in the write test, we instead saw a major downturn. After some investigation, we determined that this result is attributable to HP disabling the write caching. (See "Maximum Throughput Test" chart, page 2.)

Why, you ask, would we run performance tests with write caching off for one system and on for the rest? Because it's not always an option to turn write caching off. We want our tests to mirror a business's experience running the machine right out of the box. How many small offices even know what write caching is?

During Web testing, the ML330 performed very well, coming in second behind the Gateway 920. The difference stems from the extra 256 MB of memory the Gateway has over the ML330 in this configuration.

The cherry atop the ML330 sundae is the included ProLiant Foundation Essentials software pack. This contains the SmartStart OS installation software, making the installation of your OS of choice a breeze; Insite Manager 7 for enterprise-class monitoring and error notification; manage-

HOW WE TESTED SERVERS UNDER $1K

To test sub-$1K servers, we used Microsoft Windows 2000 SP3, a Cisco Catalyst 3550 12-port copper Gigabit Ethernet switch, an Avocent 2161 KVM, IOMeter Version 5.10.2003 and Spirent Web Avalanche.

We set up IOMETER with the following access patterns:
» Database test: 2-KB random I/Os with a mix of 67 percent reads and 33 percent writes, which represents a typical database workload.
» Maximum read throughput test: Transfer request size to 64 KB, the percent read/write distribution to 100 percent read and the percent random/sequential distribution to 100 percent sequential.

» Maximum write throughput test: Transfer request size to 64 KB, the percent read/write distribution to 100 percent write and the percent random/sequential distribution to 100 percent sequential.
» Maximum I/O rate test: Transfer request size to 512 bytes, the percent read/write distribution to 100 percent read, and the percent random/sequential distribution to 100 percent sequential.
» NWC generalized custom test: Transfer request sizes of 512 bytes with 33 percent access distribution, 2 KB with 34 percent access distribution and 64 KB with 33 percent access distribution. On the 512-byte segment, the percent read/write

distribution set to 100 percent read, and the percent random/sequential distribution set to 100 percent sequential. On the 2-KB segment, the percent read/write distribution set to 67 percent read 33 percent write, and the percent random/sequential to 100 percent random. On the 64-KB segment, the percent read/write distribution set to 100 percent read, and the percent random/sequential distribution to 100 percent read.

SPIRENT WEB AVALANCHE
The Web Avalanche was set up with 100 Caw users per second, with a maximum of 2,000 users. Files were 7 KB to 10 KB.

ment agents for a centralized Insite Manager installation; and ActiveUpdate for software and informational updates about the system.

The ML330 is available in a variety of configurations, including but not limited to SCSI, SCSI RAID, a second Intel Xeon processor and various tape-drive options. You can also upgrade the standard 9-to-5 on-site one-year warranty to three years for $199.

HP ProLiant ML330 G3, $999. Hewlett-Packard Co., (650) 857-5518, (800) 282-6672. *www.hp.com*

Hewlett-Packard tc2120 **We liked HP's second sub-**

B+ **mission, the tc2120,** overall and found it to be a good performer, especially with its SCSI hard-disk subsystem. It's also the least expensive entry, at a measly $829.

The tc2120 is a throwback to HP's premerger days: Designed by HP's former 32-bit group, it's one of the few true HP 32-bit products to survive the merger. That, frankly, concerns us: We feel that the ML330 is a more than adequate replacement for the tc2120, and we don't expect the tc line to be continued.

The system uses the same ServerWorks Grand Champion SL chipset used by the ML330, albeit with a different motherboard. The tc2120 sports an Intel Pentium 4 CPU at 2.53 GHz, with 256 MB of RAM. Storage is provided by a 36-GB SCSI drive and an IDE CD-ROM. Connectivity is via a copper Gigabit Ethernet port, two USB 1.2 ports, a standard serial port and a parallel port. The main board has five 64-bit, 33-MHz slots—the most in our review. The power supply is rated for 250 watts.

Testing of the tc2120 went well, largely courtesy of its SCSI subsystem. The product's read and write performance under IOMeter was very good, and the tc2120 scored the best in our NWC Custom IOMeter Test. In our Web tests using Spirent Communications' Web Avalanche, the tc2120 came in almost last, but it still posted a respectable score for a small Web server.

The tc2120 includes a one-year, on-site 9-to-5 warranty that can be upgraded to three years for $149.

HP tc2120, $829. Hewlett-Packard Co., (650) 857-5518, (800) 282-6672. *www.hp.com*

Dell PowerEdge 600SC **Dell has huge presence in the**

B **home market** and a burgeoning presence in the server space, thanks to its direct model and growing reseller program. We liked the PowerEdge 600SC, which is a virtual twin to the Gateway 920—the two machines share an almost identical motherboard, and both include small Travan TR-5 tape drives, but the Gateway 920's price is lower, and the 920 has more memory.

One big plus for Dell, and something we think small businesses should consider, is that Dell offers four-hour-response-time support as an option for the PowerEdge 600SC. For many, that could be a lifesaver.

The Dell PowerEdge 600SC comes with four 64-bit, 33-MHz slots and one 32-bit, 33-MHz slot. Connectivity consists of two USB 1.1 ports in the back, one standard serial port, a parallel port and a copper Gigabit Ethernet port. The motherboard chipset is the Grand Champion SL, and the unit is powered by a 250-watt power supply.

Included system software are Dell's excellent Open Man-

Features of Servers Under $1K

	Dell PowerEdge 600SC	Gateway 920	Hewlett-Packard ProLiant ML330	Hewlett-Packard tc2120	IBM eServer xSeries 205	Lantech PC Database 2700
Processor type	Intel Pentium 4	Intel Pentium 4	Intel Xeon	Intel Pentium 4	Intel Pentium 4	Intel Pentium 4
Processor speed	2.4 GHz	2.4 GHz	2.4 GHz	2.53 GHz	2.4 GHz	2.8 GHz
Memory	256 MB	512 MB	256 MB	256 MB	256 MB	512 MB
Maximum memory	4 GB	4 GB	4 GB	4 GB	2 GB	2 GB
Total hard-disk storage	80 GB	80 GB	160 GB	36 GB	36 GB	37 GB
Hard-disk interface	ATA	ATA	ATA	SCSI	SCSI	SCSI
Hard disks	2	1	2	1	1	1
Internal 3.5 bays for HD	4	3	2	2	3	6
32-bit PCI slots	1	1	0	0	5	3
64/33 PCI slots	4	4	4	5	0	0
64/66 PCI slots	0	0	0	0	0	0
AGP slots	0	0	0	0	1	1
Chipset	ServerWorks Grand Champion SL	ServerWorks Grand Champion SL	ServerWorks Grand Champion SL	ServerWorks Grand Champion SL	Intel 845E	Intel 845E
USB 1.1 slots	2	4	2	2	0	0
USB 2.0 slots	0	0	0	0	2	2
Serial ports	1	1	1	1	2	2
Parallel ports	1	1	1	1	1	1
10/100 NICs	0	0	0	0	0	2
10/100/1000 NICs	1	1	1	1	1	1
Power supply wattage	250	250	300	250	340	420

age for server management and Open Manage Server Assistant for OS installation. These packages are identical to those sold on Dell's full-fledged enterprise machines.

The PowerEdge 600SC exhibited only average performance in our testing. In some tests, such as I/O per second, the 600SC got the top mark, but at the expense of an almost 60 percent CPU utilization rate. On our Web testing with the Spirent, the Dell came in last; scores on other tests were respectable. The 600SC isn't a bad performer, but it doesn't dazzle.

Dell's warranty is a little more complicated than those of the other products. It comes with three years next-business-day on-site parts replacement and a one-year warranty on labor. You can upgrade from there, including the aforementioned four-hour on-site support and three years of labor coverage.
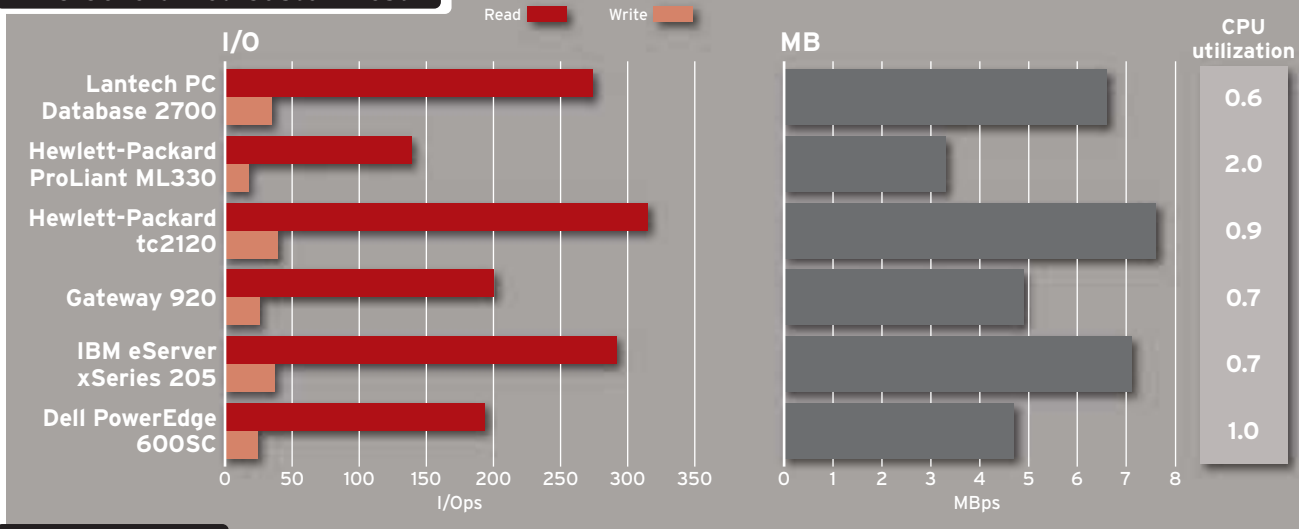
Gateway 920 **The 920 is a solid performer; the unit we**

B **received** even incorporated a small Travan tape drive with software. Recently, Gateway has been making strides in the server game, and the small-business market is the perfect place for the company with Holstein-patterned boxes to get its hoof in the door.
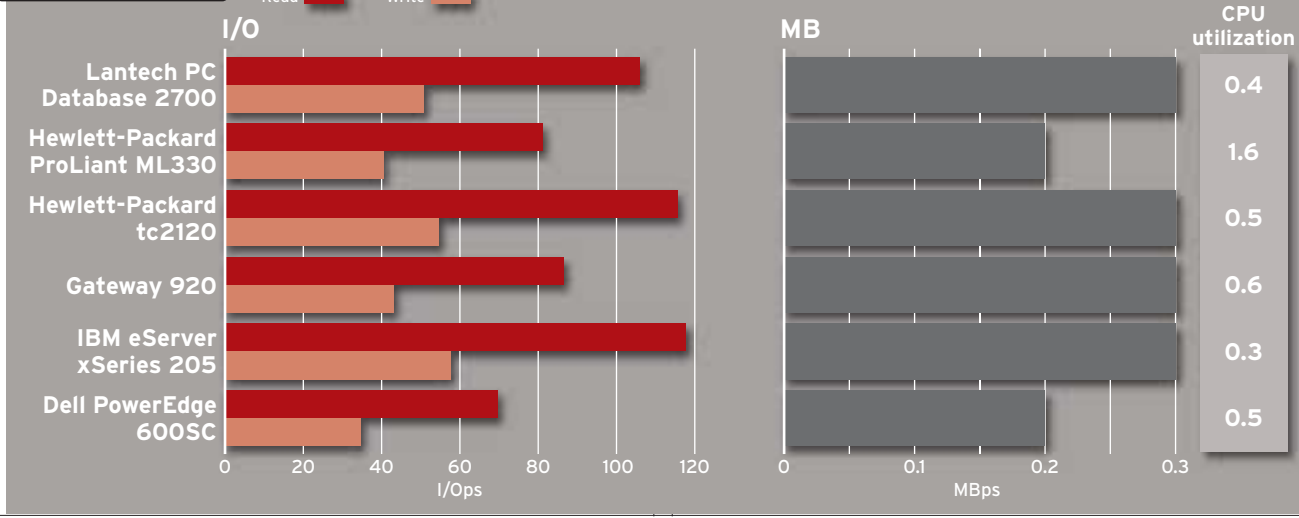
At $897 with a tape drive and 512 MB of RAM, the Gateway 920 provided many desirable features at an excellent price point. Hardwarewise, it's eclipsed only by the advanced processor and features of the HP ProLiant ML330. However, the included software was below par, which hurt its score.

The motherboard has four 64 bit, 33-MHz slots and one 32-bit, 33-MHz slot, and is powered by the ServerWorks Grand Champion SL chipset, like most of the machines in our review. For connectivity, it has two USB 1.1 ports, one standard serial port, one parallel port and a copper Gigabit Ethernet port. Storage is provided by an 80-GB ATA drive, a

NWC Generalized Custom Test

Read ▬ Write ▬

	I/O (I/Ops)	MB (MBps)	CPU utilization
Lantech PC Database 2700			0.6
Hewlett-Packard ProLiant ML330			2.0
Hewlett-Packard tc2120			0.9
Gateway 920			0.7
IBM eServer xSeries 205			0.7
Dell PowerEdge 600SC			1.0

Database Test

Read ▬ Write ▬

	I/O (I/Ops)	MB (MBps)	CPU utilization
Lantech PC Database 2700			0.4
Hewlett-Packard ProLiant ML330			1.6
Hewlett-Packard tc2120			0.5
Gateway 920			0.6
IBM eServer xSeries 205			0.3
Dell PowerEdge 600SC			0.5

CD-ROM drive and the aforementioned tape drive.

We particularly liked the 920's case; pushing apart two large thumb levers on the back of the unit causes the side case to pop off. The only system easier to access was the IBM eServer xSeries 205.

The 920 did pretty well in our testing, mostly thanks to the 512 MB of memory Gateway included. On our IOMeter tests, the Gateway didn't perform as well as the SCSI system, but that was expected. When it came to serving Web pages, however, the 920 shone, placing No. 1 in our Spirent tests. All in all, a decent performer.

The software story on the 920 isn't quite as good. Gateway is still trying its hand at the server game, and the DOS-based system-restore software on the Server Companion CD is a bit crude. However, to be fair, it did the job: We were able to install Windows 2000 Server without much trouble. Other utilities, including the ones to keep the hardware drivers up to date and manage the server, did the job but likewise could use some polish.

The Gateway 920 comes with a one-year on-site warranty that can be upgraded to three years, next-business-day on-site for $149.

Gateway 920, $897. Gateway, (800) 221 9616.
www.gateway.com

IBM eServer xSeries 205 We initially had a hard time

B- **with the** eIBM eServer xSeries 205. Our review machine came in DOA. The replacement for the original came in DOA. IBM even sent its local CE to the lab to take a look, as if we couldn't diagnose "it doesn't POST." We sent them both back, and it turns out that both machines had bad CPUs.

To be honest, CPU failure was the last problem that IBM or we expected. Intel CPUs simply don't fail often. After speaking with IBM engineers, we are confident that this situation was an anomaly. We even pumped the CE (whom we know from past job lives) for problems he's experienced with this model. He said he has seen nothing to indicate a pattern of failure.

Setting our initial problems aside, we found the 205 to be a good box, but not an excellent one. It sports a 2.4-GHz Intel Pentium 4 processor run by the Intel 845E chipset.

While the 845E is a good chipset, its AGP (accelerated graphics port) slot is superfluous in a server. It doesn't provide 64-bit slots—it's just plain less capable than the Server-Works Grand Champion SL that every machine but the 205 and the Lantech Database 2700 used.

Connectivity comes in the form of two USB 2.0 ports, two standard serial ports, a parallel port and a copper Gigabit Ethernet connection.

Performance of the 205 was middle of the road. Write caching is turned off, as it is on the two HP machines. The IBM won only the 2 KB database test; it turned in average numbers for the remainder.

The 205 came with IBM's usual suite of good management and OS installation software, IBM Director and IBM ServerGuide. Both of these polished programs allow for consistent systems management and OS installation.

The 205 comes with a one-year on-site next-business-day parts and labor warranty. You can purchase a number of warranty options, such as an extension of the basic warranty to three years for $149, or three-years' worth of four-hour response time during business hours for $348. There are more options for 24x7 support and various response times that rise in price from there. In summary, the service offering is impressive and complete.

eServer xSeries 205, $985. IBM, (888) SHOP-IBM.
www.ibm.com/server

Lantech Database 2700 Lantech submitted the only

C **white-box unit** for our review, and we were somewhat surprised to find that every other PC tested offered better value than the 2700. It's a good little machine, but for the price you can get a significantly smaller server with a much better warranty.

The 2700 uses an Intel server board and standard components. By far the largest machine in our review, the 2700 didn't fit on the wire rack shelving we use for testing and had to be laid on its side.

The 2700, like the IBM eSeries xServer 205, uses the Intel 845E chipset, putting it at considerable disadvantage when compared with machines sporting the ServerWorks Grand Champion SL. However, the Database 2700 was assembled with care: All the fans in the system are ball bearing, and the cabling is carefully routed.

Connectivity is provided by two USB 2.0 ports, two standard serial ports and a parallel port.

The Database 2700 has a plethora of Ethernet connectors. The main board has two Intel-based 10/100 ports, and in an expansion slot there is an Intel copper Gigabit Ethernet adapter. The motherboard, frankly, is short on slots. It has only three 32-bit, 33-MHz slots and an AGP slot.

One of the PCI slots is taken up by the Intel copper Gigabit Ethernet adapter, and another PCI slot is used by the LSI SCSI controller for the hard disk, leaving only one PCI slot open. Considering the huge amount of room for disk drive and other devices, the choice of that motherboard is puzzling.

The Database 2700, with its SCSI drive, performed nicely. It won the IOPS test and the 64-KB read test, in addition to placing well in Web testing.

The 2700 comes with a three-year parts and labor ship-in warranty, and free cross-shipping—meaning Lantech will ship you a replacement machine, secured by a credit card, before it gets your broken one back. You can upgrade to next-day on-site for $299.

Lantech Database 2700, $999. Lantech PC, (310) 306-5590, (866) 306-5590. *www.lantechpc.com* **NWC**