

BATTLE OF THE BOARDS

A PC is only as good as its motherboard.

Our lab tests of PCI Express models will help you find the right one—whether you're building a system from scratch or upgrading the machine you've got.

TECHIES AND PC GAMERS routinely soup up their systems to maximize performance and appearance. My own computer has been refurbished so many times that I ▶

BY JON L. JACOBI

PHOTOGRAPHS BY JOHN KUCZALA

can't even remember when I bought the case. But at the heart of every home-built PC or system rebuild is a motherboard, and choosing the right one can be difficult. Most of the boards are built around a small number of chip sets, resulting in similar designs that can be hard to differentiate. But the details of motherboard design—the connectors the board comes with, the firmware the manufacturer uses, and even the physical layout of components—are important considerations.

The details of board design are important to consider.

To help you find the best centerpiece for your machine, *PC World* road-tested 14 state-of-the-art boards for Athlon 64 and Pentium 4 CPUs. Thanks to Nvidia's NForce4 chip sets and some new competing chip sets from ATI and Via, PCI Express graphics technology is finally available on both AMD and Intel platforms. That let us select boards with all the technologies you'll need to keep your PC up-to-date: PCI Express (PCIe) graphics, Scalable Link Interface (SLI) graphics, 3-gigabits-per-

FEATURES COMPARISON

TEST Center

Athlon 64 and Pentium 4 Motherboards

PERFORMANCE NUMBERS WERE CLOSE, but the Athlon 64 boards come out ahead in price and features.

| | ATHLON 64 BOARD | Features and specifications ¹ | Performance ² | Bottom line | |
|------------------------|---|--|---|--|--|
| 1 | Asus A8N-SLI Deluxe \$185 (★★★★★) <i>find.pcworld.com/47196</i> | <ul style="list-style-type: none"> • Nvidia NForce4 SLI chip set • 2 PCIe x16, 2 PCIe x1, 3 PCI slots • 8 Serial ATA-300, 2 Parallel ATA-133 ports | <ul style="list-style-type: none"> • 4 USB 2.0, 1 FireWire ports • 2 gigabit LAN ports • RAID 0, 1, 0+, 5, 10 support | <ul style="list-style-type: none"> • WorldBench 5 score: 105 • Design: Very Good • Usability: Very Good | Power user's board packs almost every port you could want into a sensible layout; has exceptional documentation. |
| 2 | Asus A8V-E Deluxe \$145 (★★★★★) <i>find.pcworld.com/47184</i> | <ul style="list-style-type: none"> • Via K8T890 chip set • 1 PCIe x16, 2 PCIe x1, 3 PCI slots • 2 Serial ATA-150, 2 Parallel ATA-133 ports | <ul style="list-style-type: none"> • 4 USB 2.0, 1 FireWire ports • 1 gigabit LAN port; 802.11g • RAID 0, 1 support | <ul style="list-style-type: none"> • WorldBench 5 score: 102 • Design: Good • Usability: Very Good | Included wireless networking helps make this board, which uses Via's K8T890 chip set, an outstanding value for midrange PCs. |
| 3 | EpoX EP-9NPA+ Ultra \$150 (★★★★★) <i>find.pcworld.com/47186</i> | <ul style="list-style-type: none"> • Nvidia NForce4 Ultra chip set • 1 PCIe x16, 3 PCIe x1, 3 PCI slots • 4 Serial ATA-300, 2 Parallel ATA-133 ports | <ul style="list-style-type: none"> • 4 USB 2.0 ports³ • 1 gigabit LAN port • RAID 0, 1, 0+1 support | <ul style="list-style-type: none"> • WorldBench 5 score: 104 • Design: Very Good • Usability: Good | EpoX's NForce4 Ultra board performs well and has the basic features you need for a mainstream to high-end system. |
| 4 | MSI K8N Neo4 Platinum/SLI \$190 (★★★★★) <i>find.pcworld.com/47210</i> | <ul style="list-style-type: none"> • Nvidia NForce4 SLI chip set • 2 PCIe x16 SLI, 3 PCI slots • 6 Serial ATA-300, 2 Parallel ATA-133 ports | <ul style="list-style-type: none"> • 4 USB 2.0, 1 FireWire ports • 2 gigabit LAN ports • RAID 0, 1, 0+1 support | <ul style="list-style-type: none"> • WorldBench 5 score: 105 • Design: Good • Usability: Good | This was the fastest board we tested, as reflected in its great gaming scores, but it suffers a bit from a difficult component layout. |
| 5 | Gigabyte GA-K8NXP-SLI \$195 (★★★★★) <i>find.pcworld.com/47188</i> | <ul style="list-style-type: none"> • Nvidia NForce4 SLI chip set • 2 PCIe x16 SLI, 2 PCIe x1, 2 PCI slots • 4 Serial ATA-300, 4 Serial ATA-150, 2 Parallel ATA-133 ports | <ul style="list-style-type: none"> • 4 USB 2.0, 1 FireWire ports • 2 gigabit LAN ports; 802.11g • RAID 0, 1, 0+1 support | <ul style="list-style-type: none"> • WorldBench 5 score: 102 • Design: Very Good • Usability: Good | Gigabyte's capable SLI board is another good choice for power users, but it trails the Asus A8N-SLI Deluxe in performance. |
| PENTIUM 4 BOARD | | | | | |
| 1 | Asus P5AD2-E Premium \$225 (★★★★★) <i>find.pcworld.com/47202</i> | <ul style="list-style-type: none"> • Intel 925XE chip set • 1 PCIe x16, 2 PCIe x1, 3 PCI slots • 4 Serial ATA-300, 4 Serial ATA-150, 2 Parallel ATA-133, 1 Parallel ATA-100 ports | <ul style="list-style-type: none"> • 4 USB 2.0, 1 FireWire 800 ports • 1 gigabit, 1 10/100 LAN ports; 802.11g • RAID 0, 1, 0+, 5, 10 support | <ul style="list-style-type: none"> • WorldBench 5 score: 102 • Design: Very Good • Usability: Good | The P5AD2-E's overclocking controls aren't as precise as those on some other boards, but it's well-designed and has a fine manual. |
| 2 | Abit Fatal1ty AA8XE \$235 (★★★★★) <i>find.pcworld.com/47198</i> | <ul style="list-style-type: none"> • Intel 925XE chip set • 1 PCIe x16, 2 PCIe x1, 2 PCI slots • 4 Serial ATA-150, 1 Parallel ATA-100 ports | <ul style="list-style-type: none"> • 2 USB 2.0, 1 FireWire ports • 1 gigabit, 1 10/100 LAN ports • RAID 0, 1 support | <ul style="list-style-type: none"> • WorldBench 5 score: 100 • Design: Very Good • Usability: Very Good | The stylish and loaded Fatal1ty AA8XE is packed with extra cooling components and includes tons of overclocking options. |
| 3 | Intel D915PBL \$145 (★★★★★) <i>find.pcworld.com/47204</i> | <ul style="list-style-type: none"> • Intel 915P chip set • 1 PCIe x16, 2 PCIe x1, 4 PCI slots • 4 Serial ATA-150, 1 Parallel ATA-100 ports | <ul style="list-style-type: none"> • 4 USB 2.0, 1 FireWire ports • 1 gigabit LAN port • RAID 0, 1, 0+1 support | <ul style="list-style-type: none"> • WorldBench 5 score: 100 • Design: Good • Usability: Very Good | Midrange board doesn't have many overclocking options or special features, but it's a good mainstream value. |
| 4 | Gigabyte GA-8AENXP-D \$240 (★★★★★) <i>find.pcworld.com/47206</i> | <ul style="list-style-type: none"> • Intel 925XE chip set • 1 PCIe x16, 2 PCIe x1, 2 PCI slots • 8 Serial ATA-150, 1 Parallel ATA-100 ports | <ul style="list-style-type: none"> • 4 USB 2.0 ports³ • 2 gigabit LAN ports • RAID 0, 1, 0+1 support | <ul style="list-style-type: none"> • WorldBench 5 score: 101 • Design: Very Good • Usability: Good | Colorful, high-performance board has good documentation and comes with every cable and break-out connector you'll need. |
| 5 | DFI LANParty 925X-T2 \$210 (★★★★★) <i>find.pcworld.com/47208</i> | <ul style="list-style-type: none"> • Intel 925XE chip set • 1 PCIe x16, 2 PCIe x1, 3 PCI slots • 4 Serial ATA-150, 1 Parallel ATA-100 ports | <ul style="list-style-type: none"> • 6 USB 2.0 ports³ • 2 gigabit LAN ports • RAID 0, 1, 0+1 support | <ul style="list-style-type: none"> • WorldBench 5 score: 99 • Design: Good • Usability: Good | This colorful and full-featured board was designed for cases with side windows for showing off the components. |

¹ Features listings are not exhaustive. FireWire and USB port numbers refer only to externally accessible ports, except where noted. ² All motherboards were tested with the same peripheral components, including a 300GB SATA hard drive and a Leadtek WinFast PX6800 TDH PCI Express graphics card. AMD boards were tested with a 2.4-GHz Athlon 64 400+ processor and 1GB of DDR400 memory. Intel boards were tested with a 3.8-GHz Pentium 4 570J CPU and 1GB of 533-MHz DDR2 memory. ³ Includes headers for one or more FireWire ports.

second Serial ATA (SATA II), and gigabit ethernet.

To make sure that we evaluated all boards on an equal footing, we outfitted each one with the same supporting hardware whenever possible. We selected similarly priced CPUs—a 2.4-GHz Athlon 64 4000+ chip and a 3.8-GHz Pentium 4 570J CPU—for our test setups. All of the Athlon boards were tested with 1GB of DDR400 memory, while the Pentium 4 boards were configured with 1GB of 533-MHz DDR2. Newegg.com, a popular online store for PC gear, lent us the cases, power supplies, hard drives, and memory we used for testing.

The result was a field day for the PC World Test Center—it's not every day that we can get this granular with the guts of a PC. We didn't see large performance differences among the boards, but some patterns did emerge. The Athlon setups performed slightly better and had more features as a group than their P4 counterparts, and the average price of the Athlon boards was lower. Though we tested boards built around several different chip sets, our WorldBench 5 and gaming tests revealed no significant performance differences along those lines.

For most mainstream applications, any of the motherboards we tested will perform well enough, but if you want a closer look at the test results, consult our gaming and multitasking test reports on pages 102 and 110, respectively.

If you're ready to roll up your sleeves and get your hands dirty under your PC's hood, read on.

Athlon 64

OVERALL, THE ATHLON 64 boards impressed us with their clean layouts, rock-solid stability, and rich feature sets—especially the NForce4 units. On average, the Athlon motherboards are about \$35 cheaper than their Pentium 4 rivals—a prime consideration when it comes time to hit the parts store.

TIP>> All of the Athlon 64 boards we gathered for this roundup utilize AMD's latest socket 939. The company's 64-bit CPU comes in other pin-count flavors as well: socket 754 for less-expensive, single-memory-channel Athlon 64 processors, and socket 940 for the Athlon 64 FX-51 and AMD Opteron server CPUs. However, socket 939 is the best choice for mainstream machines.

An NForce4 SLI board, MSI's \$190 K8N Neo4 Platinum/SLI, turned in the best scores overall on our performance tests, with a great showing in WorldBench 5 and even better results in our gaming tests. NVidia's feature-rich NForce4 SLI chip

set was the centerpiece of this and several of the other SLI-equipped AMD motherboards in our roundup. We didn't test the SLI boards in their dual-graphics mode, which lets you dramatically boost performance in some games by installing a second graphics board. **TIP>>** For more on the performance benefits of SLI, see find.pcworld.com/47242.

Like other NForce4 boards, the K8N Neo4 Platinum/SLI offers an integrated gigabit ethernet port and SATA II support. The newer SATA standard raises the maximum transfer rate from 150 megabytes per second to 300 MBps. We haven't yet tested a SATA drive that supports the new standard, but SATA II support might prove to be a useful bit of future-proofing for when those drives arrive.

MSI's K8N Neo4 Platinum/SLI is sedately attractive, with dashes of color here and there, and has a generally logical and well-spaced layout. MSI's documentation is adequate, though it can be a little convoluted. The trio of Windows utilities that ships with the board—MSI Core, NVidia's NTune, and MSI Live Update 3—does a fine job of letting you monitor the hardware, overclock CPU and bus speeds, and update the system's BIOS and drivers.

Unfortunately, the MSI board was the only one on our features chart that lacked a PCIe x1 slot. There's a dearth of PCIe x1 cards right now—we found only a few modems and LAN cards—but not having the slot could eventually prove annoying. That and a couple of other design quirks kept us from giving the MSI board a higher star rating.

For example, like several of the other boards we tested, MSI's board has a few tall, easily bendable capacitors that sit uncomfortably close to the CPU socket. Those capacitors and other components around the CPU socket prevent the installation of some third-party heat sinks. **TIP>>** If you're buying a big heat sink for your CPU, check with the manufacturer to make sure it will fit your motherboard.

Another NForce4 SLI board, Asus's \$185 A8N-SLI Deluxe, took home our Best Buy on the Athlon side. It tied for the top spot in our WorldBench 5 tests, though it lagged a bit in the gaming trials. The board comes with a whopping eight SATA II connectors, two gigabit ethernet ports, and an unusually large software bundle that includes InterVideo's WinDVD Creator Suite (other Asus boards have this as well). Excellent documentation, along with the PC Probe monitoring software and Live Update BIOS updating software that accompany the other Asus boards, rounds out the deal.

The A8N shares an unusual feature with the ▶



Best BUY Asus's \$185 A8N-SLI Deluxe



Asus's \$145 A8V-E Deluxe



EpoX's \$150 EP-9NPA+ Ultra

other Asus boards in this review: spoken POST codes. POST codes are meant to help you diagnose problems with your PC, such as bad memory, or an improperly connected video card. Normally they're a series of beeps or a number on an integrated LED that you have to look up in your manual. But thanks to an integrated speech controller, the Asus boards use your system speaker to tell you in plain language what the problem is (or which stage of the boot process caused the problem).

The other Asus Athlon board we tested—the \$145 A8V-E Deluxe—used Via's new K8T890 chip set, which turned out to be an adequate performer, producing WorldBench 5 and gaming scores right in line with the competition. The A8V-E Deluxe fell a bit short of its NForce4 counterparts in terms of SATA and RAID support, offering only two SATA ports and RAID 0 and RAID 1. What the board lacks in drive support, however, it makes up for in networking, with an integrated 802.11g wireless adapter in addition to its gigabit ethernet port. It even includes a table-top external antenna.

We had no other complaints about the board—especially since it's nearly as fast as (and about \$50 cheaper than) its NForce4 rivals, and its layout was one of our favorites among the Athlon 64 products.



MSI's \$190 K8N Neo4 Platinum/SLI

The PCIe x16 slot is mounted in the second slot position, to eliminate interference with the DIMM slots and to make room for a PCIe x1 slot on the right. **TIP>>** Many high-end and midrange graphics boards use fans large enough to prevent you from installing an expansion card in the adjacent slot. Plan accordingly when you're shopping for components.

Not all the NForce boards were loaded SLI models. Epox's \$150 EP-9NPA+ Ultra uses the NForce4 Ultra chip set, which supports similar features but omits support for the second graphics board necessary for SLI. The EP-9NPA+ is the prototypical NForce4 Ultra board, implementing exactly what the chip set offers—quite a lot, but nothing more.

The board's performance was middle-of-the-road among the Athlon 64 motherboards in both WorldBench 5 and our gaming tests. You can optimize for more speed via its broad range of overclocking settings (in the PC setup program) and the speed and voltage settings (in the included NTune app).

The EP-9NPA+ Ultra features the cleanest layout of all the Athlon 64 boards, with three unobstructed PCIe x1 slots and no interference between components. While we would have liked a rear-panel FireWire port, the board came with two FireWire headers—a set of pins that lets you connect to ▶

TEST REPORT

Athlons Dominate Our Gaming Tests

TODAY'S GAMES are typically played at resolutions of 1024 by 768 pixels and higher, but at those resolutions, the graphics board's processor does the bulk of the work. We ran our frame-rate tests at 640 by 480 and at 800 by 600 in order to keep the workload on the motherboard, CPU, and RAM.

Thanks to a slightly faster CPU, the average for Athlon 64 motherboards was higher than the average for our tested Pentium 4 boards, by a significant 8 percent. The standout Athlon 64 board was the MSI K8N Neo4 Platinum/SLI which bested the average Athlon 64 board by nearly 7 percent.

The spread was narrower among Pentium 4 boards, where the slowest, Abit's Fatal1ty AA8XE (named after a successful pro gamer), finished a scant 4 percent behind the leader. But then, that board was meant to be overclocked, and we don't test overclockability since results can vary between different samples of a given board, and finding stable settings can be a time-consuming endeavor.

| ATHLON 64 BOARD | Doom 3 ¹ Faster | Far Cry ² Faster |
|---------------------------|-----------------------------------|------------------------------------|
| Asus A8N-SLI Deluxe | 103.0 | 135.0 |
| Asus A8V-E Deluxe | 102.7 | 129.6 |
| Epox EP-9NPA+ Ultra | 104.1 | 129.5 |
| Gigabyte GA-K8NXP-SLI | 103.4 | 127.5 |
| MSI K8N Neo4 Platinum/SLI | 109.6 | 142.7 |
| PENTIUM 4 BOARD | | |
| Abit Fatal1ty AA8XE | 88.7 | 126.5 |
| Asus P5AD2-E Premium | 88.2 | 128.7 |
| DFI LANParty 925X-T2 | 89.9 | 129.6 |
| Gigabyte GA-8AENXP-D | 91.0 | 133.0 |
| Intel D195PBL | 89.9 | 128.5 |

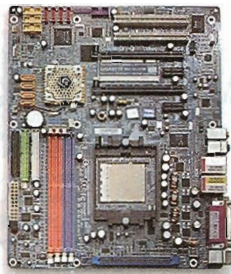
TEST CENTER ¹Results are in frames per second at 640-by-480-pixel resolution. Higher numbers are better. ²Results are in frames per second at 800-by-600-pixel resolution. Higher numbers are better.

a port built into your case or a rear port that fits on an included slot cover. **TIP>>** Many PC cases include easy-access USB or FireWire ports on the front panel. You'll need a motherboard that has the appropriate headers if you want to take advantage of these ports.

The Epox board's Magic Flash Internet BIOS utility worked well, and the preproduction user guide we received was concise and informative.

Rounding out our Athlon top five is Gigabyte's \$195 GA-K8NXP-SLI, the most expensive of the Athlon 64 boards we examined. It provides several extra features calculated to ease the pain of its high price, including a wireless 802.11g adapter and an extra RAID controller that adds four more SATA ports as well as support for introducing a second RAID array. Several of the motherboards we tested augment their SATA setups in this fashion.

The GA-K8NXP-SLI's performance wasn't impressive compared with that of the other Athlon boards we tested, but its build quality did show



Gigabyte's \$195 GA-K8NXP-SLI

some exceptional attention to detail. We particularly liked the four walled SATA ports (the other four ports were normal), which make for a bit firmer connection. Overclockers will also appreciate the numerous BIOS speed adjustments, the powerful EasyTune5 monitoring and overclocking software, and the beefy Voltage Regulator slot and module.

We tested two other Athlon boards, but they failed to make our chart. Chaintech's \$130 VNF4/ Ultra, another NForce4 Ultra board, performed well enough, but it was the only product we tested that lacked FireWire support completely, and its sparse documentation and poor labeling of components made setup more difficult than necessary.

MSI's \$135 RS480M2-IL just missed our chart as well. It was the only board we tested that carried ATI's PCIe Athlon 64 chip set, the Radeon Xpress 200. Designed to power inexpensive systems, the RS480M2-IL performed decently in most ways, especially in the gaming tests. However, it ▶

TECH PRIMER

New Motherboard Tech

SOME INCREDIBLY EXCITING technologies are in place or headed for a motherboard near you. Here are a few of them.

SLI

What it is: SLI, or Scalable Link Interface, is NVidia's interface for hooking up two PCIe x16 graphics cards in tandem.

Why you want it: It gives you exceptional performance at high resolutions in the games that support it.

What supports it: Currently, only motherboards based on NVidia's NForce4 SLI Athlon 64 chip set support SLI, but an Intel-based option should appear later this year. See find.pcworld.com/47506 for a list of compatible graphics boards.

Dual-Core/Multi-Core

What it is: Whatever the name, it's like having two processors on the same chip.

Why you want it: These chips provide smoother multitasking performance and promise to accelerate software that supports symmetrical multiprocessing.

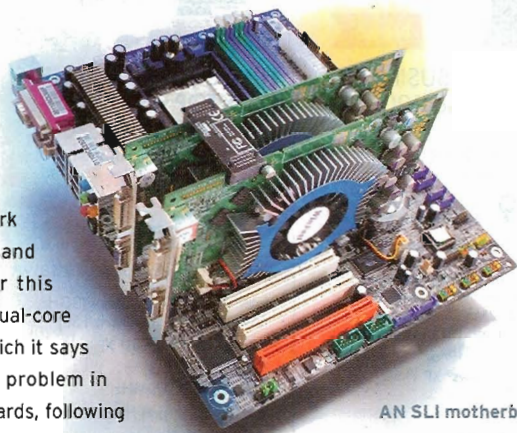
What supports it:

Intel is already shipping dual-core Pentium D chips designed to work with its coming 955X and 945G chip sets. Later this year AMD will ship its dual-core "Toledo" Athlon 64, which it says will operate without a problem in existing socket 939 boards, following a simple upgrade of the system's BIOS.

64-Bit CPUs

What they are: The 64-bit desktop CPUs, like AMD's Athlon 64 and Intel's impending EM64T Pentiums, add 64-bit-wide data paths and registers to an existing 32-bit architecture, to handle 32-bit and 64-bit software with equal aplomb.

Why you want it: New 64-bit software will allow bigger numbers, larger files, and more addressable memory. It should also run faster when it has been optimized to take advantage of the extra registers and wider data paths on 64-bit CPUs.



AN SLI motherboard can use two graphics boards to boost the speed of PC games.

What supports it: AMD's 64-bit Athlon 64 CPUs—and motherboards capable of supporting them—have been out on the market for more than a year now. Meanwhile, Intel's EMT64-enabled processors should be shipping by the time you read this. To run 64-bit software, you will also need to have a 64-bit OS such as Linux or Windows XP Professional X64; these OSs should be available in the second quarter of 2005. XP Pro X64 will run on either AMD's or Intel's 64-bit processors.

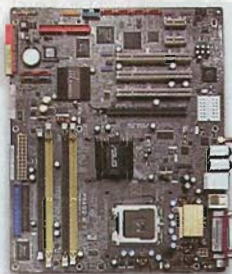
lagged in the disk-intensive sections of WorldBench 5, it felt a bit sluggish in our hands-on evaluation, and it lacked the PCIe x1 slots and gigabit ethernet ports included on the NForce4 boards.

Pentium 4

FEATURE FOR FEATURE, the Pentium 4 motherboards didn't quite stack up to their less-expensive Athlon 64 counterparts, and the P4 setups' performance lagged slightly behind that of the Athlons. Still, those differences were small, and many of the P4 boards offered an impressive package.

All of our Pentium 4 setups use Intel's new high-end socket LGA775, which already supports DDR2 memory and will support the upcoming dual-core Pentium 4 CPUs, as well as the 64-bit-enabled Pentiums discussed in this month's *News and Trends* section on page 20. (For more on dual-core Pentiums, see "New Motherboard Tech," on page 106.)

TIP>> *If you've built PCs before, socket LGA775 CPUs may surprise you initially because they have no pins. Don't worry—they aren't supposed to. Intel's new CPUs use little gold contacts on the bottom of the chip that press up against tiny metal balls in the socket.*



Asus's \$225 P5AD2-E Premium



Best BUY Abit's \$235 Fatal1ty AA8XE

Abit's \$235 Fatal1ty AA8XE easily won our "sexiest motherboard in the review" prize and narrowly edged Asus's \$225 P5AD2-E Premium for our P4 Best Buy. With its bright red color, sleek auxiliary fans and ducting, and numerous LEDs (on top and bottom), it's quite a sight—especially in the dark. Based on Intel's 925XE chip set, the board is packed with overclocking settings and features.

Time constraints prevented us from putting the board through its born-to-overclock paces, but at its default settings, the Fatal1ty turned in mediocre scores in both WorldBench 5 and our gaming tests. However, its extra fans for processor and memory cooling should help make up the difference.

Abit provides detailed, well-illustrated documentation for this board and includes its UGuru Windows software for overclocking and FlashMenu for updating the BIOS over the Internet. An on-board digital readout tells you exactly where you are in the boot process—a handy troubleshooting tool.

The most scattershot performance of the entire review was turned in by another 925XE board, Asus's \$225 P5AD2-E Premium. Though it was the fastest Pentium 4 board in our WorldBench 5 tests, it didn't distinguish itself in the gaming tests. Go figure. Nevertheless, its features are consis-

TEST REPORT

NForce4 Setups Perform Best in Multitasking

| ATHLON 64 BOARD | Chip set | Mozilla and Windows Media Encoder test |
|---------------------------|----------------------|--|
| Asus A8N-SLI Deluxe | NVidia NForce4 SLI | 597 |
| Asus A8V-E Deluxe | Via K8T890 | 629 |
| EpoX EP-9NPA+ Ultra | NVidia NForce4 Ultra | 610 |
| Gigabyte GA-K8NXP-SLI | NVidia NForce4 SLI | 611 |
| MSI K8N Neo4 Platinum/SLI | NVidia NForce4 SLI | 580 |
| PENTIUM 4 BOARD | | |
| Abit Fatal1ty AA8XE | Intel 925XE | 632 |
| Asus P5AD2-E Premium | Intel 925XE | 600 |
| DFI LANParty 925X-T2 | Intel 925XE | 632 |
| Gigabyte GA-8AENXP-D | Intel 925XE | 613 |
| Intel D195PBL | Intel 915P | 642 |

TEST CENTER Results are in seconds. Lower numbers are better.

WORLDBENCH 5 DOES a great job of measuring the performance of an entire PC system—not just a single component—on a wide range of common computing tasks. For this story, we kept all of the peripheral components the same, in order to isolate the motherboard's performance. We saw fairly uniform results on most sections of the test, except in the multitasking section, which features simultaneous Mozilla Web browsing and Windows Media Encoding. There we found more-significant differences, including an 8 percent spread between the first- and last-place Athlon boards, MSI's K8N Neo4 Platinum/SLI and Asus's A8V-E Deluxe. The Asus has a Via chip set, while the top finishers all have one of NVidia's NForce4 chip sets.

The Intel Pentium 4 boards also registered a 7 percent spread between the top-dog Asus P5AD2-E Premium and the tail-end Intel D195PBL in the multitasking section. Some 925XE-based boards ended up near the bottom of the pack as well.

tently excellent for a Pentium 4 board. Along with integrated 802.11g wireless, it offers two SATA RAID controllers as well as ATA-133 RAID. Asus added an IDE RAID controller to the Fatal1ty to augment the 925 and 915 chip sets' paltry single-channel ATA-100 implementation.

The P5AD2-E Premium has one layout quirk we aren't sure we like—an IDE connector that faces toward the front of the PC case, instead of straight up out of the board. That type of connector can allow for easier cable routing in some PC cases, but it can be hard to reach in others. Abit's Fatal1ty and a couple of boards from DFI also used this setup.

TIP» When you're putting your PC together, spend some extra time routing and tying cables out of the way of the airflow in your case. You'll achieve a cleaner look and keep as much air as possible flowing to cool your processor and sensitive components.

Asus's first-rate documentation, a large software bundle, and excellent Windows utilities put the finishing touches on a very nice package.

Gigabyte's \$240, feature-laden, 925XE-based GA-8AENXP-D warmed our hearts as the sole board in the roundup to offer 800-Mbps FireWire 800. Other neat touches include eight SATA ports, an additional RAID controller to augment the one in the 925XE chip set, and the company's DualBIOS, which provides a backup BIOS in case you interrupt a flash or screw up the settings in the main BIOS and can't boot. Gigabyte rounds out the package with an 802.11g wireless LAN adapter card and a solid voltage regulator module for stability.

Another strength of the GA-8AENXP-D is performance. The board edged out Intel's D915PBL for first-place in the P4 gaming tests and also beat it by a point in WorldBench 5. Add good documentation, a decent range of overclocking settings, and capable Windows-based tweaking utilities, and you have a very nice Pentium 4 setup—almost nice enough to make us forget its high-end street price.

We tested Intel's \$220 D925XECV2 and \$145



Intel's \$145 D915PBL



Gigabyte's \$240 GA-8AENXP-D



DFI's \$210 LANParty 925X-T2

D915PBL boards. The two differ primarily in their chip sets: The more expensive D925XECV2 uses Intel's 925XE, which supports a 1066-MHz front-side bus, while the other board's 915P chip set has a maximum bus speed of 800 MHz. But the performance difference between the two boards was tiny, making the less-expensive D915PBL a better value for most people and vaulting it onto our chart.

The Intel boards were the prototypes for the rest of the Pentium 4 crew in terms of I/O features, implementing what the 925 and 915 chip sets provide: one ATA-100 channel, RAID 0 and 1 on the four SATA ports, eight USB ports (four external), and a gigabit ethernet port. Their layout tends toward spaciousness, with easy-to-read labels, but the area around the PCIe x16 slot can get cramped.

Surprisingly enough, Intel provides decent overclocking tweaks, though they're called "burn in" settings in both the BIOS and the company's slick Windows-based Desktop Control Center. Annoyingly, the latter doesn't ship with the boards; before you can download the software, you must answer some intrusive questions at Intel's site. Intel is also the only vendor other than Asus to bundle non-utility software with its boards; InterVideo's Home Theater Silver and WinDVD Creator Suite and NTI's CD-Maker are the featured titles.

DFI's colorful \$210 LANParty 925X-T2 takes fifth place on our Pentium 4 chart, with unimpressive WorldBench 5 performance but decent results in our gaming tests. The 925X-T2 ships with a handy 5.25-inch, bay-mounted breakout box that puts a diagnostic LED up front and includes USB, FireWire, audio, and SATA ports. Our major gripe with DFI boards is their software: There are plenty of BIOS settings for overclocking, but no Windows-based utility, and the BIOS upgrade app lacks the helpful Internet connectivity found in utilities such as Asus's Live Update and Abit's FlashMenu.

A second DFI board, the \$155 UT LANParty 915P-T12, just missed our chart but offered an intriguing option: support for DDR and DDR2 memory. The 915P-T12 has two DDR2 slots and two DDR slots. Though you can't use both memory types at once, you might be able to start your new system off with DDR memory recycled from your old system, and then upgrade later. Unfortunately, the 915P-T12 was the only board to lack RAID support of any kind. That's a no-no in these days of inexpensive, superintegrated motherboards. ■

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RESOURCES

What's the Next Step?

ONCE YOU'VE got the perfect motherboard picked out, it's time to start finding components for your new or upgraded PC. For more advice on what to choose and how to put it all together, see "Your Ideal PC" at find.pcworld.com/47476. And for continuing coverage of all things related to PC building, see Tom Mainelli's *GeekTech* column at find.pcworld.com/47508.

The Dual Core Pentium Extreme Edition 840

BENCHMARK TESTS

High scores are best.

Resolution ►

Anti-aliasing/Anisotropic filtering

Processor

Graphics

BUSINESSAPPS

 MULTIMEDIA
APPS

 SYSmark 2004
Office Productivity

 SYSmark 2004
Internet Content
Creation

| | | | | |
|--|--------------------------------------|---------------------------|-----|-----|
| Pentium EE 840 Whitebox | Pentium Extreme Edition 840 (3.2GHz) | ATI Radeon X850 XT | 190 | 286 |
| Sony Vaio VCG-V520G* | Pentium 4 (3.2GHz) | nVidia GeForce FX Go5700 | 150 | 203 |
| Dell Dimension 8400* | Pentium 4 560 (3.6GHz) | ATI Radeon X800XT | 171 | 241 |
| Velocity Micro Gamers' Edge LX* | P4 Extreme Edition (3.466GHz) | nVidia GeForce 6800 Ultra | 213 | 245 |
| ABS Ultimate X6* | P4 Extreme Edition (3.73GHz) | ATI Radeon X850 XT | 199 | 250 |
| Alienware Area 51* | Pentium 4 570 (3.8GHz) | nVidia GeForce 6800 GT | 193 | 239 |
| Velocity Micro CineMagix S95 * | AMD Athlon 64 3800+ (2.4GHz) | ATI Radeon X800 | 167 | 212 |
| Falcon NW FragBox 2* | AMD Athlon 64 4000+ (2.4GHz) | nVidia GeForce 6800 GT OC | 182 | 217 |
| Polywell Poly 939N-FX55 * | AMD Athlon 64 FX-55 (2.6GHz) | nVidia GeForce 6800 Ultra | 217 | 237 |

* Reported for comparison

N/A1: The Sony PCG-V520G was not tested at this resolution.