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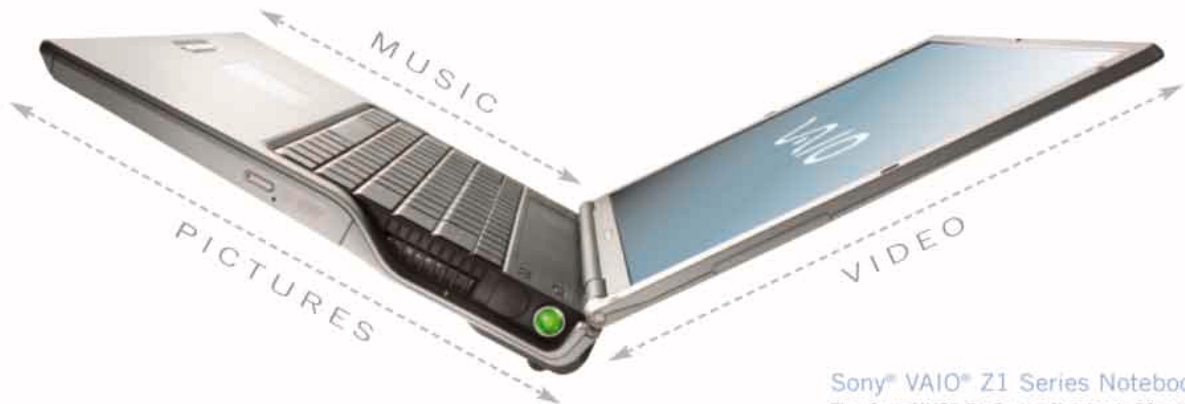
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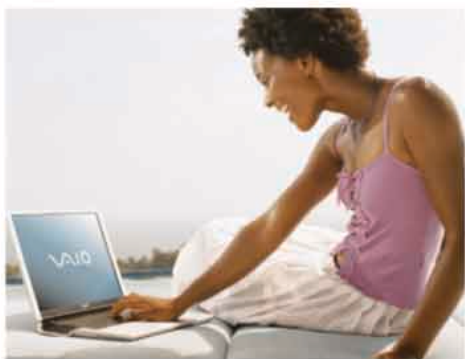
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SONY



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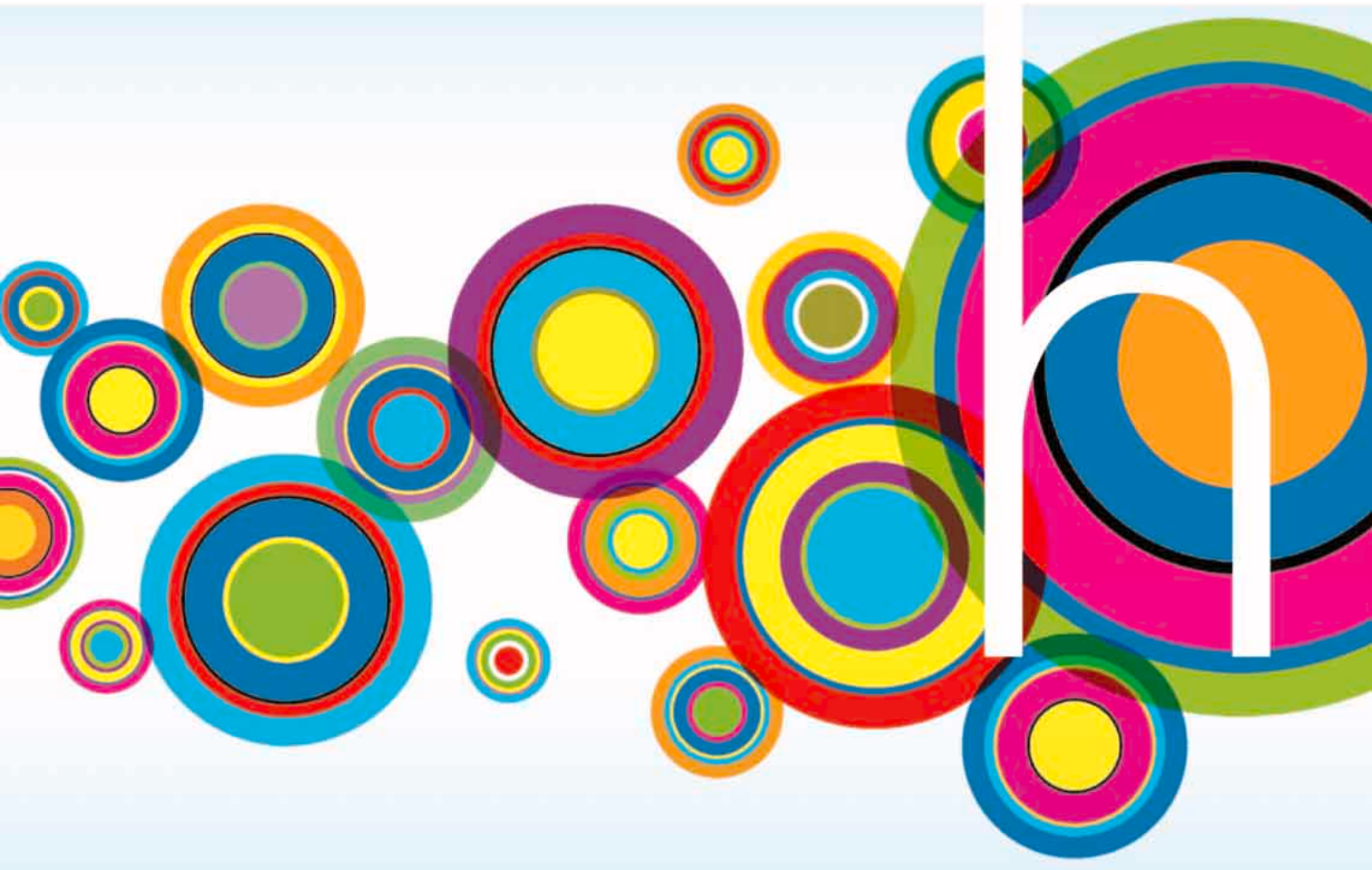
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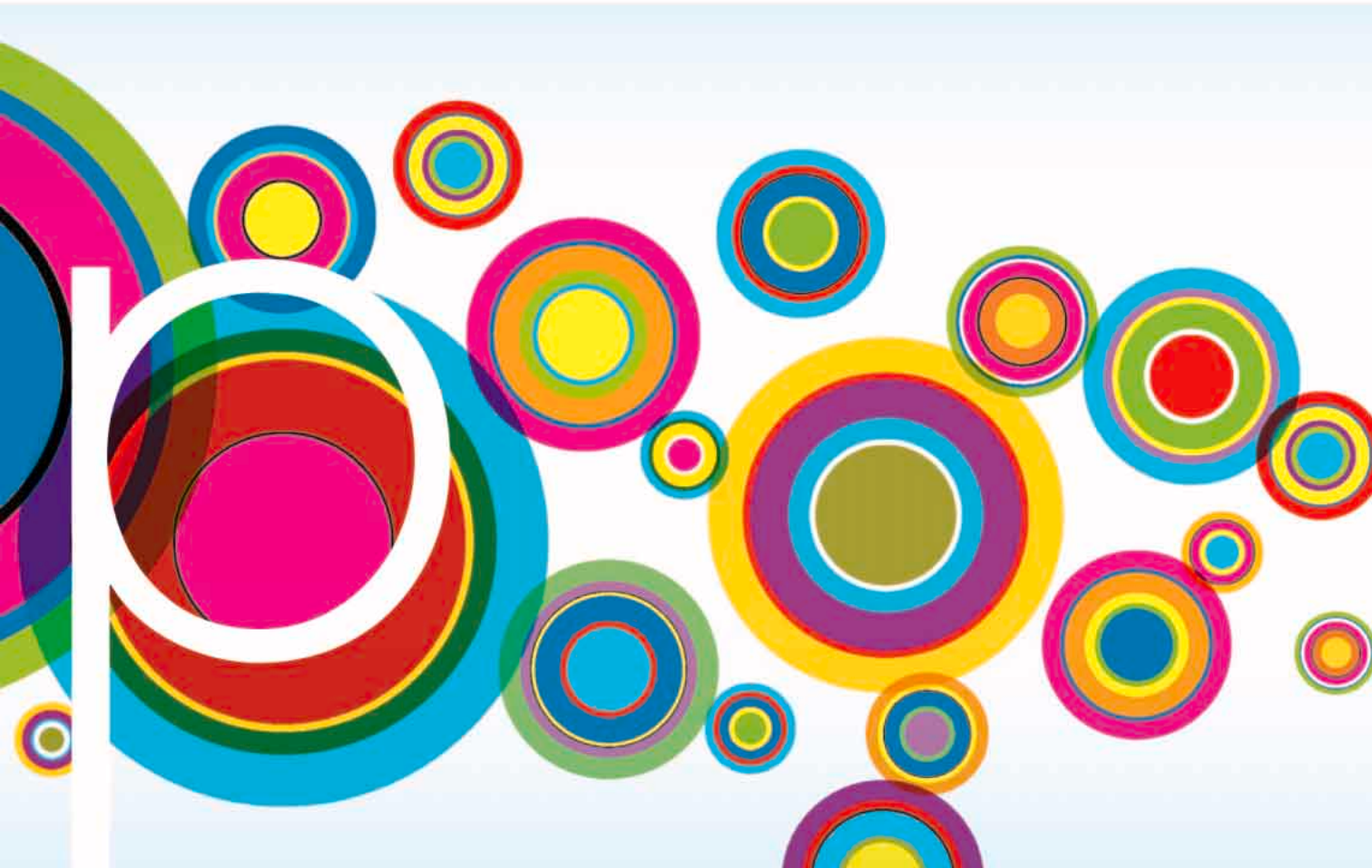
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Forward Thinking

THE TELECOM TRANSFORMATION

IT'S BEEN QUITE a month for the telecommunications business, with upheavals that portend massive changes in how we talk to one another and what information we access. Of course, the headlines I'm talking about are Cingular Wireless's purchase of AT&T Wireless and Comcast's offer to buy Disney.

Both of these deals are troubling, because they would further reduce competition as the worlds of telecommunications, information, and the Internet converge. As consumers, we're already limited to choosing one of two monopolies for high-speed Internet access—the local phone company or the local cable company. So the proposed combination of a content company and an access company is particularly worrisome. The prospect of Comcast acquiring Disney also reminds me of the Time Warner/AOL merger and the Fox/DirecTV deal, both combinations of distribution and content.

On the other hand, we are seeing signs that the cable and phone companies' duopoly over Internet access is ending. Satellite service remains an option



for some people, although its hefty price and latency make it viable only for those who can't get DSL or cable modems. And wireless Internet service is improving as 3G-like services are deployed more widely. I recently tried both Sprint and Verizon wireless cards again, and they keep getting better, at least in metropolitan areas. But wireless services are expensive (around \$80 a month) and still noticeably slower than other high-speed connections. Wi-Fi 802.11

hot spots are also an option and may really heat up when we have a faster wireless technology that covers a broader area. WiMAX is one such solution, but it's a way off.

Perhaps more important, in recent months we've seen the first significant deployments of Internet access to homes over power lines, in the Cincinnati area and in Virginia. The critics point out the technology's potential to disrupt communications on other frequencies, but the concept is important. I'm glad to see electric utilities finally getting into this business. More competition means more choices for consumers.

THE VOIP REVOLUTION

THE FEDERAL COMMUNICATIONS COMMISSION ruled recently that Free World Dialup, a broadband Voice over IP service, is an information service and therefore not subject to the regulations covering conventional phone service. Although the ruling covers only computer-to-computer voice communications, it's a step toward the transformation of communications.

We've been covering VoIP products for a decade, and the idea is finally reaching critical mass. Telecom provider Avaya has been talking about the concept for years, but most of its work has been with large, new installations. That's changing, as businesses of all sizes are starting to give VoIP serious consideration. The decision to revamp the way a business handles its voice calls is no small thing, but VoIP is the wave of the future.

Consumers moving to VoIP could launch the tech-

nology on a much larger scale. Still, obstacles lie ahead: We're not yet sure how regulations will apply to connections between computers and traditional phone service, and the FCC will almost certainly require VoIP providers to come up with some sort of 911 emergency services.

If these hurdles are cleared, VoIP could become the new standard for voice communications, but it will still be offered like a traditional phone service, where you pay for extras such as voice mail. Lots of providers are likely to enter this market, including both VoIP companies such as Vonage and your local cable and phone companies. Expect to see offerings combining local service, long-distance calling, and Internet access. Vonage currently has a \$15 basic plan with 500 minutes of local or long-distance calls a month, a \$25 plan with unlimited local calls and 500 minutes of long distance, and a \$35 unlimited package.



We're seeing signs that the cable and phone companies' duopoly over Internet access is ending.

Forward Thinking

MICHAEL J. MILLER

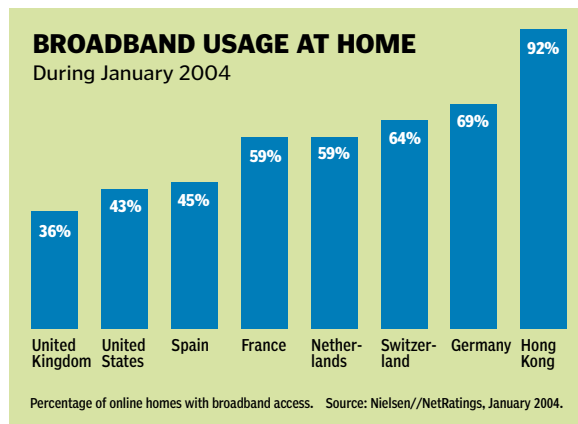
What's the key to the widespread use of VoIP? Standards. Everything will need to interoperate, with standards like Session Initiation Protocol (SIP) phones becoming important. Let's take this one step farther: VoIP could make voice service just another feature of

Internet connections, and it won't cost a cent. (That's just what Skype is already doing, and you can also do the same thing using the voice features of your instant-messaging program.) It's a radical idea but certainly a possibility for the future.

U.S. LAGS IN BROADBAND

BROADBAND PENETRATION AND speeds are both slower in the U.S. than in much of the rest of the world. According to Nielsen//NetRatings figures from January, 43 percent of U.S. households that are online have broadband connections. That lags behind most of Western Europe. And U.S. cable modems are slow compared with the superhigh-speed services delivered in many Asian countries.

Government policies are a large factor. There are reasonable arguments for either complete deregulation of Internet services or a government-mandated high-speed connection to every home. But we're mired in an in-between solution: A few regulated companies control access, but the current rules give them little incentive to invest in faster lines.



MICROSOFT'S TECHFEST 2004: YOUR LIFE, ON-SCREEN

I ALWAYS LOVE to see new stuff, so I was happy to spend some time a few weeks ago at Microsoft's annual TechFest, where the company's researchers show off their work to internal product teams. It's just research for now, but it's still an indication of where things might go.

Some of the more exciting demonstrations dealt with new ways of organizing all the things on your computer. Stuff I've Seen, a research project by Susan Dumais, is a new way of organizing all the e-mail, Web pages, documents, and other material that cross your computer screen. It is designed to run as a service under Windows, continually indexing all the information. It's similar to X1 Search, askSam, and the first version of Creo's Six Degrees, but it's designed more for research purposes.

Dumais is trying to find out how people can search without file folders. She talks about implicit queries, where your system might automatically pull up information that is relevant to the data already displayed on-screen. "The notion that you'll call up a separate search thing" will disappear in the next five to ten years, she predicts.

Another information organization project is Gordon Bell's MyLifeBits, in which the researcher is trying to put all his papers and photos on a computer to figure out how all the information can be used. This project stores every Web page he's seen and e-mail he's received in an attempt to represent what life would look like if it were all digital.

Sensecam is a new project that is like a "black-box

recorder for human beings." Here, a researcher carries around a camera with sensors on it throughout the day. The project is designed to provide a visual record of your whole day. Such a camera would create about a million images a year and might tie into the MyLifeBits project.

Several other projects are intended to make computer-based audio and video communications clearer. Researchers showed an air- and bone-conductive integrated microphone system designed to make speech recognition easier. The microphone near your mouth is supplemented by an additional mic that presses against the side of your head, picking up vibrations in the bone while you're talking. This helps filter out background noise, so a speech recognition program or the person on the other end of a conversation

hears what you are saying more clearly.

Another project that makes conversation clearer is called i2i. It is designed to improve video for instant messaging and uses a dual-camera setup that lets the computer do "smart framing," so you always appear in the center of the screen. According to researcher Antonio Criminisi, the technology includes eye gaze correction and has the ability to blur the background, to substitute a different background behind the speaker, or even to include 3D emoticons.



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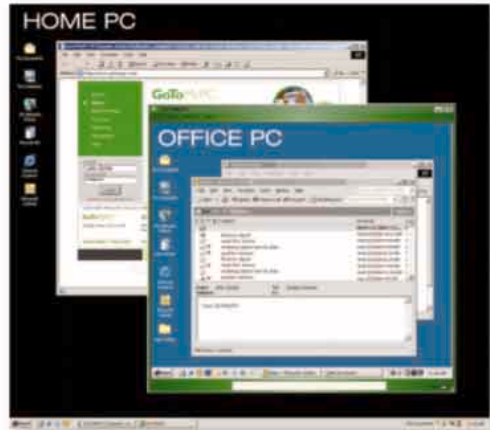
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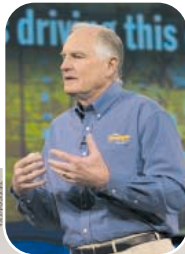
A PC at the Center?

Digital home movies from Intel

Intel is placing big bets on digital home technology. At the company's Intel Developer Forum (IDF) conference in San Francisco in February, Louis Burns, vice president and general manager of the company's desktop platforms group, said that digital home technologies point to "fundamental changes that will mean some companies that exist today won't in five years, while many new companies will become leaders." Toward that end, Intel has created a

focused on the PC as the heart of the digital home. "The PC players are obviously interested in making it the center of the home, but I see digital home technology staying fragmented," says Eric Marks, senior analyst at Web services firm AgilePath. "You basically have a limited, two-channel delivery model in most houses now, emphasizing PCs and TVs.

But there's room for all kinds of different devices and designs around homes, trafficking many kinds of content."



\$200 million fund for seeding innovative technologies.

At IDF, Burns demonstrated two prototype entertainment PCs, which may ship as early as this year. Code-named Sandow and Kessler (pictured), both systems are designed as central media hubs for the digital living room. They will connect wirelessly to other consumer electronics gadgets, run Microsoft's Media Center operating system, and incorporate Prescott Pentium 4 processors and a High Definition Audio subsystem codeveloped with Dolby.

Naysayers, though, find moves like Intel's—and Microsoft's recent ones—too

Also at IDF, Intel CEO Craig Barrett (in the photo above) announced that the company's two-way server processor, code-name Nocona and a member of the Xeon line, will add 64-bit extensions beginning in the second quarter. Analysts interpreted the move as threatening to AMD's line of 64-bit chips. Finally, Intel's Burns described the company's upcoming Alderwood and Grantsdale high-performance chipsets as "the most important chipset advances in a decade." Look for complete IDF coverage online at www.extremetech.com/idf.

—Sebastian Rupley

Phone Foibles

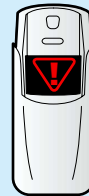
NOKIA HAS ADMITTED THAT SEVERAL of its Bluetooth-enabled phones are vulnerable to attack, which could give hackers access to calendar, contact, and message data. The problem revolves around how the Bluetooth wireless standard is used on the

PROBLEM NOKIA PHONES

These phone models are vulnerable to hacking:

6310 | 8910
6310i | 8910i

Source: Nokia, Feb 2004.



phones, which can allow hackers access to data by "pairing" over a Bluetooth connection. (See the table for models affected.)

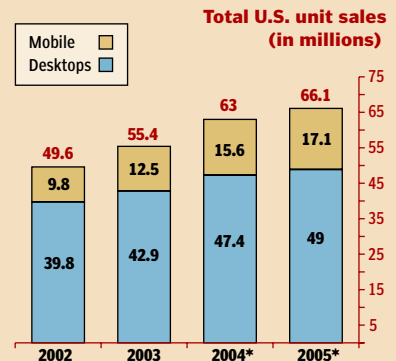
A blog site (www.bluestumbler.org), maintained by Adam Laurie, has been put into place to track news about the vulnerabilities. The site indicates that several Sony Ericsson phones are affected as well.

"We suggest two things," says Keith Nowak, a Nokia spokesperson. "You don't want to accept a pairing from somebody you don't know. And if you're at, say, a trade show where there might be a lot of other people with Bluetooth devices, it makes sense to turn Bluetooth off." —SR

Finally, Better Days for PCs

The PC market is showing signs of perking up. Americans will purchase 47.4 million desktop PCs in 2004, up 11 percent from 2003. The strongest sales growth is coming from the notebook PC market.

* Projected.
Source: Gartner, December 2003.



MUCH ADO ABOUT BLOGS

Blogs—Web logs with news, opinions, and other information—have been touted as a way to turn every Web user into a publisher, but only a tiny portion of Internet users maintain them, according to a survey of 2,515 adults from the Pew Internet & American Life Project. Researchers found that just 2 percent of Internet users reported maintaining a blog or online diary. 11 percent of Internet users said they visit blogs.

DVD DECISION

After months of laboring over what coding and decoding technologies will go into the next-generation DVD specification, HD DVD, the DVD Forum Steering Committee has chosen three separate codecs: VC-9, H.264, and MPEG-2. VC-9 is Microsoft's Windows Media 9 Series video codec, which David Coulter, a company spokesperson, claims "will ensure that Windows PCs, next-generation DVD systems, and other devices can seamlessly integrate video."

BYE-BYE BLUETOOTH?

Intel has announced the formation of the Wireless USB (WUSB) Promoter Group to move forward a WUSB protocol featuring ultrawide-band technology. Next year, look for add-in cards and connectors that let PCs communicate wirelessly with other devices.

Linux Notebooks

In a much awaited move for the Linux community, Lin-dows.com has announced a new version of its Linux operating system with support for portable computers based on the Intel Centrino platform. Although few observers see an immediate threat to Microsoft's operating system franchise, making Linux available on cost-effective notebooks has been a big request from PC makers. The first Centrino systems with Lin-dowsOS Laptop Edition will ship in the late-March-to-early-April time frame.

The new operating system is the first flavor of Linux to become available for notebooks



based on Centrino chips. Manufacturers will offer \$199 desktop PCs and \$799 notebook systems preloaded with Lin-dowsOS, says Michael Robertson, Lin-dows.com CEO.

How will users respond? "It seems clear there will be sectors of users who move to Linux-based systems, and most of those sales would have gone to Microsoft," says Dwight B. Davis, VP at research firm Summit Strategies.

Certain countries may respond favorably, says Davis. "The predisposition in some countries such as China and in parts of the European community is to look closely at Linux as a preferred operating system. There's more of that sentiment than I would have expected a couple of years ago." Time will tell whether that sentiment becomes more than a minor nuisance for Microsoft.—SR

Ready for Robocars?



DRIVERLESS CARS, SURE TO STYMIE road ragers (who do you flip off?), are heading for some surprising applications. On March 13, the Defense Advanced Research Projects Agency sponsored its Grand Challenge, an open-entry race between autonomous cars driving from Los Angeles to Las Vegas within 10 hours for a \$1 million prize. The results are at www.darpa.mil/grandchallenge.

These off-road vehicles typically have many on-board gadgets, including video cameras, radars, laser scanners, and GPS units. Many of the vehicles connect devices via Ethernet. The Grand Challenge didn't allow wireless communication.

The point of the race was to prove that robotic cars can do important jobs. As Chuck Thorpe,

a Carnegie Mellon professor and a leading expert on autonomous vehicles, explains, "It's like the importance of Lindbergh flying over the Atlantic. He didn't have a new plane, engine, or navigation system, but he had the vision to put it all together and the

guts to try it out."

Down the road, Thorpe sees myriad applications. The technology for driverless vehicles to, say, patrol the streets in Baghdad is ready. Search-and-rescue mobile vehicles with robotic snakes were almost shipped to Iran after the earthquake but they didn't get visas.

Currently, autonomous vehicles are clearing minefields and developing accurate maps of abandoned coal mines. The sky has potential, too. Autonomous helicopters will soon be able to search and rescue at sea on stormy nights, patrol hazardous waste sites, monitor high-pressure gas lines, and drop weapons precisely. But driverless cars on the streets? It'll be a while before Driver's Ed instructors preach "no eyes on the road."—Alexandra Robbins

Virus Spitfires

Is a virus writer just a lone wolf firing off malicious code? The authors of recent attacks don't appear to be. Text extracted by security firm Central Command from within the code of the big MyDoom, Bagle, and Netsky worms revealed authors responding directly to each other, which could be why virus variants are emerging so rapidly.

The following text was in the code of the Bagle "J" variant: "Hey, NetSky, off you b**ch, don't ruine our bussiness, wanna start a war?" The "F" variant of the Netsky worm countered, "Bagle - you are a looser!!!!"

Many more insult exchanges have appeared. Does the mud-slinging show only that virus writers are poor spellers? Not according to Central Command VP Steven Sundermeier. "It appears to be a war over power and seniority among these authors," he says. "The short period of time between releases is a direct attack on the response times of antivirus companies, a strain on IT professionals, and a financial strain on businesses." Virus writers don't need to work together to form what is, effectively, a gang.—SR

New Spam-Busting Schemes

The war on junk mail may get a boost from some new antispam strategies. Yahoo! and Microsoft are pushing ways to authenticate where e-mail messages originate to see if they're legitimate.

Yahoo!'s Domain Keys authentication software, available to developers later this year, seeks to authenticate the outbound domains of every e-mail message using unique embedded keys within message headers. The keys would be authenticated through comparison with public keys registered by the Internet's Domain Name System (DNS).

Microsoft's Caller ID for E-mail scheme, announced at February's RSA Security Conference (see the photo), also calls for domain authentication. Caller ID eyes the IP address of sending mail



servers, and senders have to post in the DNS the legitimate IP addresses of sending servers. Receiving mail servers can check the DNS to verify the proper IP addresses.

Both Yahoo! and Microsoft want to get infrastructure providers behind the new ideas, and one staunch supporter is

Sendmail, which is backing both proposed standards. The majority of Fortune 500 enterprises use Sendmail's technology on mail servers.

So how can Sendmail support both schemes? "Authentication is like the IDs you carry in your wallet," says Sendmail CEO Dave Anderson. "Just because you carry one kind in your wallet doesn't mean other kinds can't work. Authentication is not a winner-take-all game."—SR

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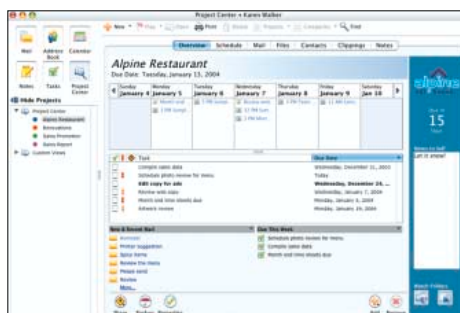
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Starts at \$2,195 list. Primera Technology, Inc., www.primera.com.



Mac Office to Get an Update

Windows-based PC users have been enjoying the improvements made to the Microsoft Office suite, and soon Mac users will be able to do the same. With spring will come



Microsoft Office 2004 for Mac.

One major new feature will be the Project Center, a central and shareable repository where you can view all the e-mails, files, contacts, meetings, and tasks related to a particular project. The Office Scrapbook will allow quick access to often-used items such as text blocks, logos, photos, and so on.—*JMB*

Standard edition: \$399 direct. Microsoft Corp., www.microsoft.com/mac.

Sharp Debuts Efficeon

Sharp will be the first PC maker to release a portable based on Transmeta's new Efficeon processor in the U.S. The **Sharp Actius MM20** will be a super slim 2-pound ultraportable with 512MB of RAM, a 10.4-inch screen, and a 20GB hard drive. Aimed at road-going pros, Sharp claims the MM20 will deliver 3 hours of runtime with the standard battery and 9 hours with the add-on battery.—*JMB*

Pricing not yet set. Sharp Systems of America, www.sharpsystems.com.

Capture Analog Video to DVD

The **Omega Super DVD QuikTouch Video Burner 8x** combines video-capture circuitry and a DVD+/-RW drive in one external box that connects to your PC via USB 2.0. Simply connect your analog camcorder or VCR to the unit's inputs, press the QuikTouch button, and push Play on your source. Your old VHS tapes are then automatically transferred to DVDs that can be played in almost any set-top DVD player.—*JMB*

\$359.95 list. Omega Corp., www.iomega.com.



Power to Burn

CyberLink Power2Go, a media creation utility, lets users copy discs and burn data, music, photo, and video CDs and DVDs. The integrated disc-authoring component will help you edit your home movies and create custom DVD menus.—*JMB*



\$59.95 direct.
CyberLink Corp.,
www.gocyberlink.com.

Handier Handycam

Sony has redesigned its MiniDV camcorders to be 25 percent smaller than the company's previous generation. Topping the line is the **Sony DCR-HC40 MiniDV Handycam**, which will feature a 10X optical zoom lens as well as a 1-megapixel image sensor for still shots.—*JMB*



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Use Your PC like a TiVo

THE MAGAZINE
WORLD'S LARGEST
COMPUTER-TESTING
FACILITY



BY KONSTANTINOS KARAGIANNIS

You know something is popular when people start using a trademarked noun as a verb: Xerox this, FedEx that, TiVo a show. Digital video recorders (DVRs) have achieved this status thanks to the leading set-top box brand, but there's more than one way to get your TV fix. • At the heart of every TiVo, RePlayTV, or other

living-room DVR is a hard drive like the one in your PC. Here we review three solutions (from ATI, Pinnacle Systems, and SnapStream) that let you turn an underutilized computer into a DVR, no hacking required. And there's more on the

horizon: Graphics chip giant nVidia is finishing up its latest Personal Cinema offering, and ADS Tech has a new build of its Instant TV product in the works. Neither product was ready in time for our test deadline, but we will revisit both in a future issue.

As with a Microsoft Windows XP Media Center Edition PC the solutions we tested provide free

channel-guide listings—a plus compared with the set-top recorders, which require a service fee. We tested in our labs with identical PCs, monitors, and video sources, and each solution revealed strengths and weaknesses after a workweek (five days and nights) of non-stop testing.

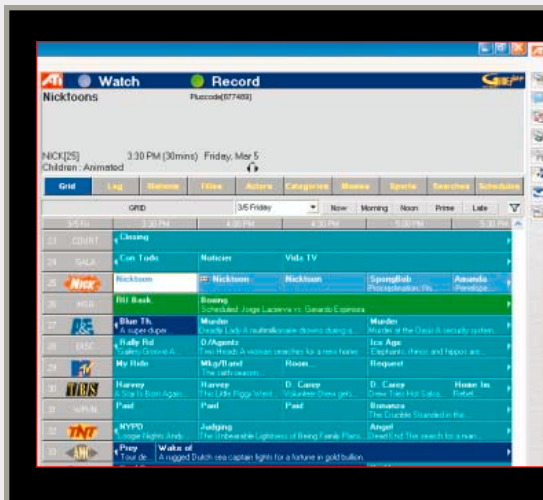
We found that all three PC-based solutions do well at paus-

ing live TV and recording shows. Also a plus: All the packages can output VCD-compliant MPEG-1 video as well as SVCD- or DVD-compliant MPEG-2. That means you can burn recorded files onto a CD or DVD for use in most DVD players.

TV image quality varied. None of the three solutions here can match the video output of a dedicated set-top DVR. The

Happauge TV tuner card we used in conjunction with the SnapStream software came the closest, and its images were as good as we've seen from the best Media Center PCs. The ATI card's output was a touch below that level but still on a par with most midrange Media Center PCs. TV images from the Pinnacle solution were noticeably soft and much like we saw from the first generation of Media Center PCs.

All shared one weakness: the inability to control an external cable- or satellite-TV tuner box. You either have to use the basic tuner each solution provides (which means forgoing any premium channels or services you rely on your descrambler to deliver), or try a third-party IR blaster or serial cable to connect your cable or satellite tuner box with the PC-based tuner. The bottom line: If you have more than basic cable, finding the right way to control your set-top tuner will require trial and error. For such users, a dedicated DVR may be the way to go.



The Gemstar guide bundled with the ATI solution provides short show descriptions.

Video quality from the ATI All-in-Wonder Pro 9600's integrated tuner is very good.

PHOTOGRAPH BY THOM O'CONNOR

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www.pcmag.com/firstlooks

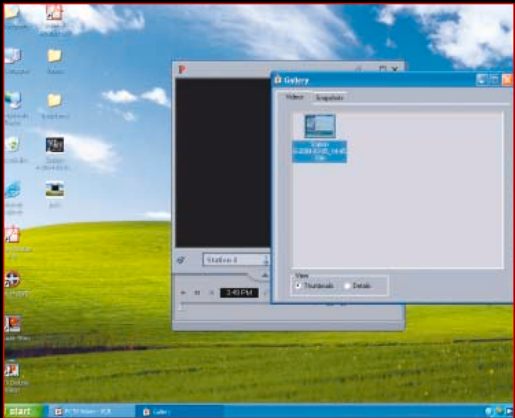
- 36 VoodooPC Envy m:855
- 38 HP Color LaserJet 9500hdn
- 38 Xerox Phaser 7750/DN
- 40 ZoEmail




- 40 Maximizer Enterprise 8
- 42 iRise Application Simulator 3.0
- 43 ASUS S5NE

WHAT THE RATINGS MEAN

- EXCELLENT
- VERY GOOD
- GOOD
- FAIR
- POOR





The Gallery window in Pinnacle's PCTV displays a thumbnail view of shows you've recorded.

Image quality from the Pinnacle PCTV Deluxe is a bit soft, with some noticeable artifacting.

ATI All-In-Wonder 9600 Pro

If you're in the market for a good video card anyway, you might want to consider the ATI All-In-Wonder 9600 Pro (AIW). It's a solid midrange graphics adapter and TV tuner/DVR in one.

ATI has been at the PC-based DVR game a long time, and gee-whiz features abound in the AIW software. You can capture the closed-captioning stream as a searchable text file or have the software alert you if a keyword pops up in a live feed. You can have live TV as your PC's wallpaper as you work in the foreground or even pause, rewind, and record FM radio on your PC.

The Gemstar TV listings guide shows a grid of small descriptions to the right and a live TV window in the upper left. To schedule a show for recording, just right-click its description and select Record. An option box will appear asking you to choose the quality in which you wish to record (VCD, SVCD, or DVD). Unlike with SnapStream's guide, however, you can't tell it

to record all the episodes of a particular show. Image quality on a connected TV is very good (though the Hauppauge Win TV PVR-350 tuner card we used in conjunction with the SnapStream software delivers a slightly better image).

We experienced no crashes during live or timed recording. The only slight glitch we found was that the Gemstar guide needs to be opened from the player applet's controls when you are watching a recording. Opening the guide from the ATI toolbar (which installs to the right of your desktop) while the player is active sometimes causes the system to hang.

While SnapStream's offering has a much more consumer-friendly look and feel, you do get a lot here for your money. If you want basic TV capabilities and don't need to control a tuner box, the AIW should suit you well.

ATI All-In-Wonder 9600 Pro

Direct price: \$249. Requires: 1-GHz CPU or better, 128MB RAM, 2GB of hard drive space per hour of recorded video, Microsoft Windows 98 or later. ATI Technologies Inc., www.ati.com.

●●●○○

Pinnacle PCTV Deluxe

We like the Pinnacle PCTV Deluxe in theory: a DVR in an external box that feeds video (via USB 1.1 or 2.0) to a laptop or desktop PC. But in our testing, we found some noticeable glitches and a mediocre software interface.

Not having to open your PC's case to install PCTV is a plus, but there is a trade-off: Image quality is acceptable but not as good as that provided by the two internal cards here. We saw some artifacting, and the image was rather soft overall. More irritating was the frames the PCTV dropped every 5 minutes or so while recording. Also, you'll be watching TV on your PC's monitor; no TV-out jacks are provided.

During our test period, the first device Pinnacle provided crashed five times, which meant that shows we had set to record overnight never got saved. A replacement unit ran fine, even when left on to record over a weekend. So it seems our initial

experience was an anomaly.

We found the software interface clumsier than with other DVRs. The PCTV Vision app looks like a gray, badly skinned version of Windows Media Player. An arrow at the bottom of the UI lets you reveal the hidden record functions—a strange thing to hide on a DVR.



You might prefer to use the included remote.

The software's Gallery window shows a status icon for shows currently being recorded, as well as thumbnail screens (with dates and times) of the shows you've already saved. You can play a show from the Gallery, delete it, or burn it to VCD, SVCD, or DVD—a welcome bit of integrated functionality.

You could use this feature to convert videotapes, too, as the PCTV unit contains S-Video and composite inputs.

You can use the TitanTV.com Web site as your show guide. The Record feature of that site is supported by Pinnacle's bundle, letting you click just on the shows you want to schedule. Alternatively, clicking on the clock icon in PCTV Vision invokes the Scheduler dialog. Here you can punch in start and stop, day and time, the channel, and a title you want to give to a recording.

If you want TV on an existing laptop, the PCTV might suffice. But for better hardware and

software, go with one of the others here.

Pinnacle PCTV Deluxe

Direct price: \$199. Requires: 700-MHz CPU or better (1-GHz recommended), 256MB RAM, 2GB of hard drive space per hour of recorded video, Microsoft Windows Me or later. Pinnacle Systems Inc., www.pinnaclesys.com.



SnapStream Beyond TV 3



If your PC already has a TV tuner card, then SnapStream Beyond TV 3 is the cheapest way to a robust DVR.

And even if you have to add a tuner card, the Beyond TV 3 software is still the way to go, consid-

ering how close it comes to the TiVo or Media Center PC experience. Forums on the company's Web site even have some useful hints for getting the software to control set-top tuners with additional cables that SnapStream offers (with the disclaimer that not all devices are supported).

The bundle's software has a terrific, slick-looking interface (called ViewScape) that does not resemble a standard Windows app—which is a good thing. While all the other offerings here look like PC media players with add-ons for channel guides and like, Beyond TV 3 features easy-to-read menus

that fade in and out. The channel guide is particularly stellar, letting you record all episodes of a show with a single click on the pop-up menu.

Beyond TV 3's SmartSkip feature lets you avoid commercials in shows you've recorded by marking chapter points at scene changes. It didn't miss a mark in our week of torture testing, and it was the only product to remain glitch-free over this period of time—a major plus if you want your DVR to record and do its job while you're away.

The server-like nature of the program is both liberating and impressive. You can easily log

TiVo's Near Twin

In the realm of digital video recorders (DVRs), ReplayTV is Avis to TiVo's Hertz: Both are proven companies offering similar goods.

ReplayTV has a solid product line in the new 5500 series, and the 5504 is a very good DVR that should interest those looking for progressive-scan output. But you'll need to add \$299—the cost of the lifetime service fee—to the \$150 selling price to get the true cost of the system, which is much less useful without the on-screen program guide. You'll also probably want more capacity than our test 5504's 40GB hard drive.

As with most DVRs, the 5504 looks like a set-top VCR or DVD player with nothing on the front save a power button and activity lights. The 5504 will take input from cable TV, satellite receivers, or both, and it converts the signal to compressed MPEG-2 files and stores them on the integrated hard drive. It then decompresses and outputs video (and photos) via coax, composite, S-Video, or component video. Programming information comes in automatically via broadband (Ethernet) or dial-up modem, and the unit can be adapted for Wi-Fi. The 40-button remote is fairly simple to use.

The 5504 is built around a 40GB hard drive good for 40, 20, or 13 hours of standard, medium, or high-quality recording, respectively. If you have multiple ReplayTVs (either the 5500 or 5000 series), you can stream video from one to the other via Ethernet. The 5504 also stores and plays JPEG photos. ReplayTV has a handy one-button 30-second skip feature (called QuickSkip) and the ability to skip within segments of a program, going beyond TiVo's offerings in this area.

Setup was a 15-minute breeze, thanks to a setup poster and clear wording on the back-panel jacks. Once the 5504 was up and running, we browsed the channel guide: We liked being able to mark our favorite shows for recording with a single press of a button. Setting up network capabilities took a bit more effort,

but once completed, we could control the 5504 from a remote Web browser and stream video from one unit to another.

At the lowest (standard) recording quality, images are a bit soft—on a par with VHS videotape—so stick with medium or high quality. (Quality was no better or worse than TiVo's, however.) Jumping programs or channels causes a lag of about a second, because everything, even pass-through live TV, is encoded and decoded first. The biggest performance issue is couched in the initial purchase: Did you get a big-enough hard drive?

ReplayTV and market leader TiVo have more in common than not. But how do other DVRs stack up against ReplayTV? TiVo has useful thumbs-up/thumbs-down keys, which help the DVR record shows it thinks you might like. TiVo

streams photos and music with a \$99 software upgrade; ReplayTV plays photos for free. Panasonic's DVD-RAM-based recorders have removable storage (and hard drives on some models) but use only VCR+ codes, not a program guide. If you watch mostly satellite, you'll get better quality with a combo receiver/DVR (it doesn't require an extra MPEG-2 decode/encode cycle), which ReplayTV doesn't make but TiVo does. Windows Media Center Edition PCs don't have the video quality (yet) of standalone DVRs, but the programming guides are free.

All in all, the ReplayTV 5500 series DVR is great for people who jump around a lot within programs. If you'll be doing a lot of recording, consider instead the 5516 (160GB, \$450). The earlier 5000 series, still available, has essentially the same features plus the ability to send videos anywhere via the Web. In the long run, ReplayTV may need to worry less about TiVo and more about PCs with free program guides.

ReplayTV 5504

Street price: \$150, plus \$12.95 monthly service fee or \$299 lifetime fee. ReplayTV, www.replaytv.com. ●●●●○



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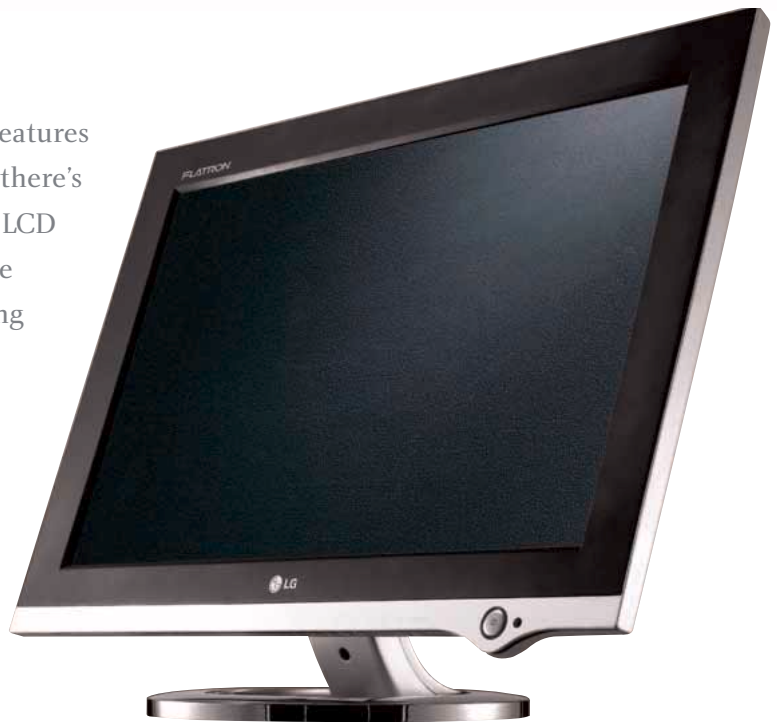
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into the program (assuming it's accessible in your network) and stream a recorded file. Also, you can log on via the Web to schedule a show to record, which is great for travelers or those who somehow seem to hear about shows only while at work.

In addition to streaming files, Beyond TV 3 let us make good-quality portable files using built-in DivX and Windows Media support. These were a cinch to transfer by network to a laptop for a train ride, and you can even make Pocket PC-friendly files. The only downside is that when saving to MPEG formats, you need to use a third-party burning app to make, say, an SVCD.

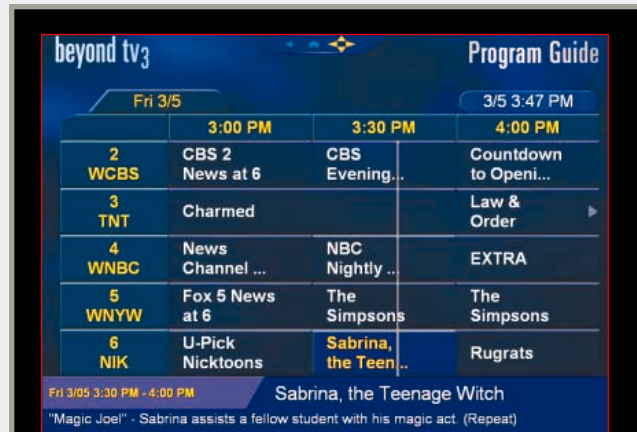
We tested Beyond TV 3 paired with the wonderful Hauppauge WinTV PVR-350 tuner card (\$199

direct, www.hauppauge.com). It outputs directly to a TV, and video quality is very good for a PC-based solution (the image quality is still shy of dedicated set-top boxes like TiVo).

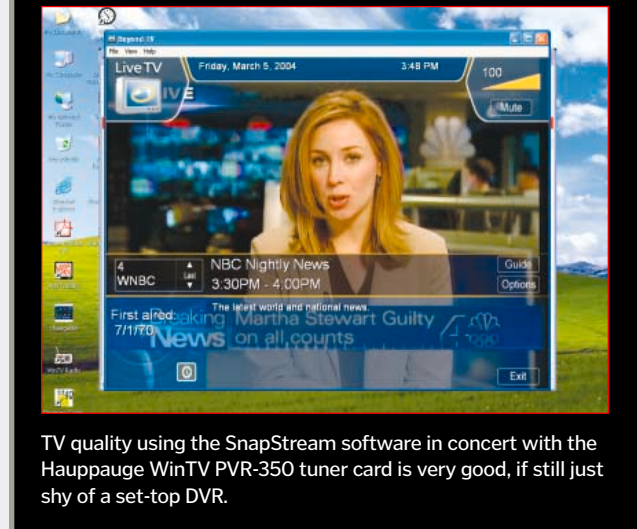
If you're looking for a PC-based DVR solution but don't want to buy a whole new Media Center PC, the SnapStream Beyond TV 3 is the way to go. Just be sure to pair it with a top-quality tuner card.

SnapStream Beyond TV 3

Direct price: \$59. Requires: 733-MHz CPU or better (1.4-GHz recommended), 128MB RAM (256MB recommended), 2GB of hard drive space per hour of recorded video, 16MB video card RAM (32MB recommended), TV tuner card with Windows Driver Model support, Microsoft Windows 98 or later. SnapStream Media Inc., www.snapstream.com. ●●●●○



SnapStream's Beyond TV 3 has a beautiful, inviting interface that rivals (and even surpasses) that of a set-top DVR.



TV quality using the SnapStream software in concert with the Hauppauge WinTV PVR-350 tuner card is very good, if still just shy of a set-top DVR.

Everybody Chat Now

BY SASCHA SEGAN

Macs and Windows machines inhabit the same homes, work in the same offices, and share the same documents. But until now, video chatting across platforms was a touch-and-go proposition. The new **AOL Instant Messenger 5.5** and **Apple iChat AV 2.1** (currently in public beta) promise to bring the two worlds together on video. But we found that cross-platform chatting can still prove difficult.

AIM 5.5 brings video chatting and multiple simultaneous log-ons to the leading IM platform. But this upgrade is a case of two steps forward, one step back. The new features have serious quirks, and AOL's ad-laden interface has become more annoying than ever.

As for video chatting, prepare to be underwhelmed by the 160-by-120 window with an even tinier picture-in-picture showing your own image. At best, we got 10 to 12 frames per second (fps) of video over both cable modem and direct 802.11b connections; we got a much more usable 20 fps with iChat AV using the same links. MSN Messenger's video chat features are also superior to those of AIM 5.5—as long as you don't need to go through a firewall. We couldn't get MSN's Videoconference mode to work at all through our firewall, and the service's Webcam mode did not deliver audio. AIM 5.5 did connect through our firewall, though video looked very blocky.

AIM 5.5's other major new feature is multiple screen-name log-ons, invaluable for people who like to separate business and pleasure. It's easy enough to manage up to eight buddy lists from the single AIM window, but the system for adding and removing screen names is slow and clunky.

Compared with AIM 5.5, iChat AV has few bells and whistles. You can't log on multiple screen names at once, and you don't get animated buddy icons, custom backgrounds, stock quotes, or games. What you do get is a much sleeker,



Apple iChat is a good video chat solution for Mac users, though it's hit-or-miss for Mac-to-PC connections.

less annoying interface and far superior video chat capabilities—at least when you're talking to another iChat user.

Between copies of iChat running on an iMac G4, a PowerBook G4, and a Power Mac G4 (all connected to the Internet via cable modems) we got effortless, seamless video connections running at a sharp 352-by-288 at 20 fps. We ran into trouble only when trying to connect iChat to AIM. Sometimes video chat requests from one side worked when requests from the other side didn't, even within the same LAN. When we did connect, video sent from the AIM side looked awful: pixilated and blocky compared with an iChat-to-iChat conversation.

All told, Macs have more powerful and flexible text IM clients than iChat AV does: Fire, Gaim, and Proteus all come to mind. But when it comes to video chatting, iChat leads the way.

AOL Instant Messenger 5.5
Free download. Requires: Microsoft Windows 98 or later (Windows XP needed for video). AOL Inc., www.aim.com. ●●○○○

Apple iChat AV 2.1 (beta)
Free download. Requires: Mac OS X 10.3. Apple Computer Inc., www.apple.com/ichat. ●●●○○

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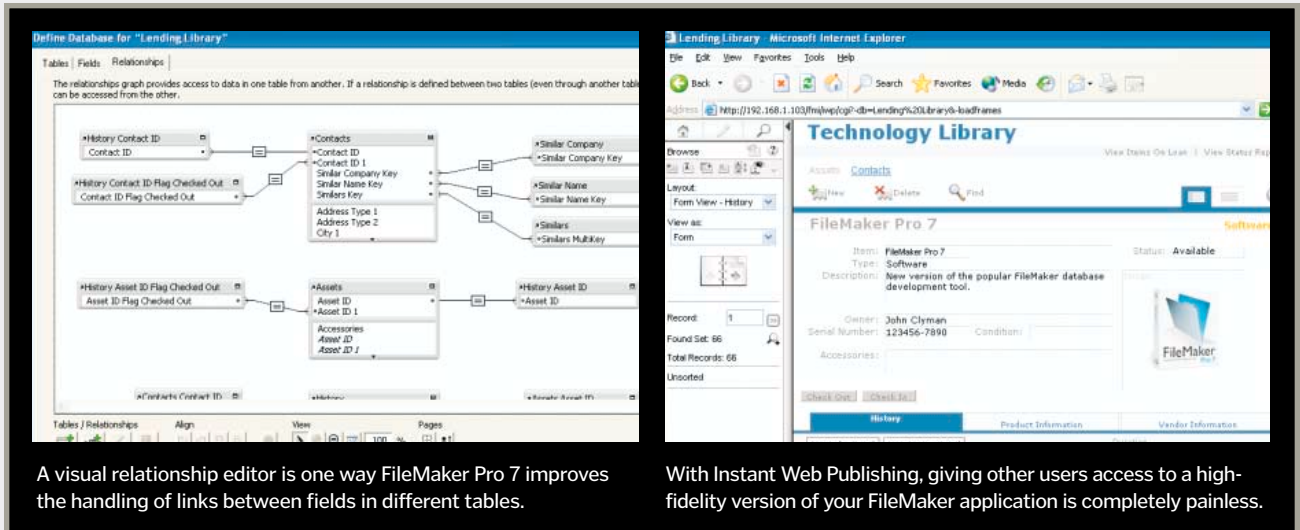


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A visual relationship editor is one way FileMaker Pro 7 improves the handling of links between fields in different tables.

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FileMaker Pro Still Tops in Databases

BY JOHN CLYMAN



FileMaker has long been a leader when it comes to making small-scale relational databases easy to develop, use, and deploy. **FileMaker Pro 7** builds further on this already strong foundation with improved capabilities for managing relationships, more sophisticated user-access controls, and other subtle improvements.

Compared with Microsoft Access, FileMaker retains a distinct edge in usability. Granted, Access has the advantage when it comes to implementing larger-scale applications that have heftier programmatic needs. But Version 7 extends FileMaker's appeal farther into the midrange database space.

Previous versions supported relationships between tables, but they seemed like an afterthought grafted onto a predominantly flat-file view of the database world (where each table was stored in its own file, and establishing relationships meant linking between separate files). FileMaker has revised its data storage so that a single file now encapsulates a full set of database tables and the relationships between them. If you open a database created in an earlier version, the program prompts

you to make a backup of the original and migrates the database to the new format.

The improved relationship support is especially evident in a slick new relationship editor that lets you visually create and manage links between fields in multiple tables. When you're creating on-screen forms and report layouts, you now have access to fields related by any number of links from a given table, instead of just one.

FileMaker's ease of use remains its signature feature. The program successfully hides much of the complexity that can daunt novice database users and be tedious even for experienced developers. For example, establishing validation rules when you create a field is extremely straightforward and doesn't require you to fuss with an expression editor, though one is available if you wish. Designing forms and reports, including embedded subreports (what FileMaker terms a *portal*) and complex summaries, is a breeze. Enhancements to the MDI (Multiple Document Interface) implementation mean you can create multiple windows onto a single database.

The software's four basic WYSIWYG modes—for browsing records, finding records by

example, laying out forms and reports, and previewing reports—haven't changed. Still, we were again impressed with how quickly we were able to build simple applications. Dozens of starter database templates (including some new ones that show off the improved relational capabilities) made it easy to adapt prebuilt functionality in our testing. Starting from scratch yielded rapid results, too.

FileMaker's new security model simplifies defining access privileges for users and groups while providing highly granular control if you need it. For example, you can define which individual fields in a table are editable, read-only, or entirely invisible for different users or categories of users.

FileMaker includes a scripting capability so you can add relatively complex behaviors to your database. With the included ScriptMaker tool, you progressively build a script by selecting from a list of actions and specifying their arguments in a manner somewhat like Access's macro builder, though with additional program-flow options such as if-then branching, loops, and recursion. Though this approach is simple and unimposing, it doesn't offer the same level of flexibility as Access's integrated

Visual Basic programming environment. FileMaker also lacks some of Access's other higher-end features, such as the ability to decouple the front-end GUI from the back-end database engine for scalability purposes.

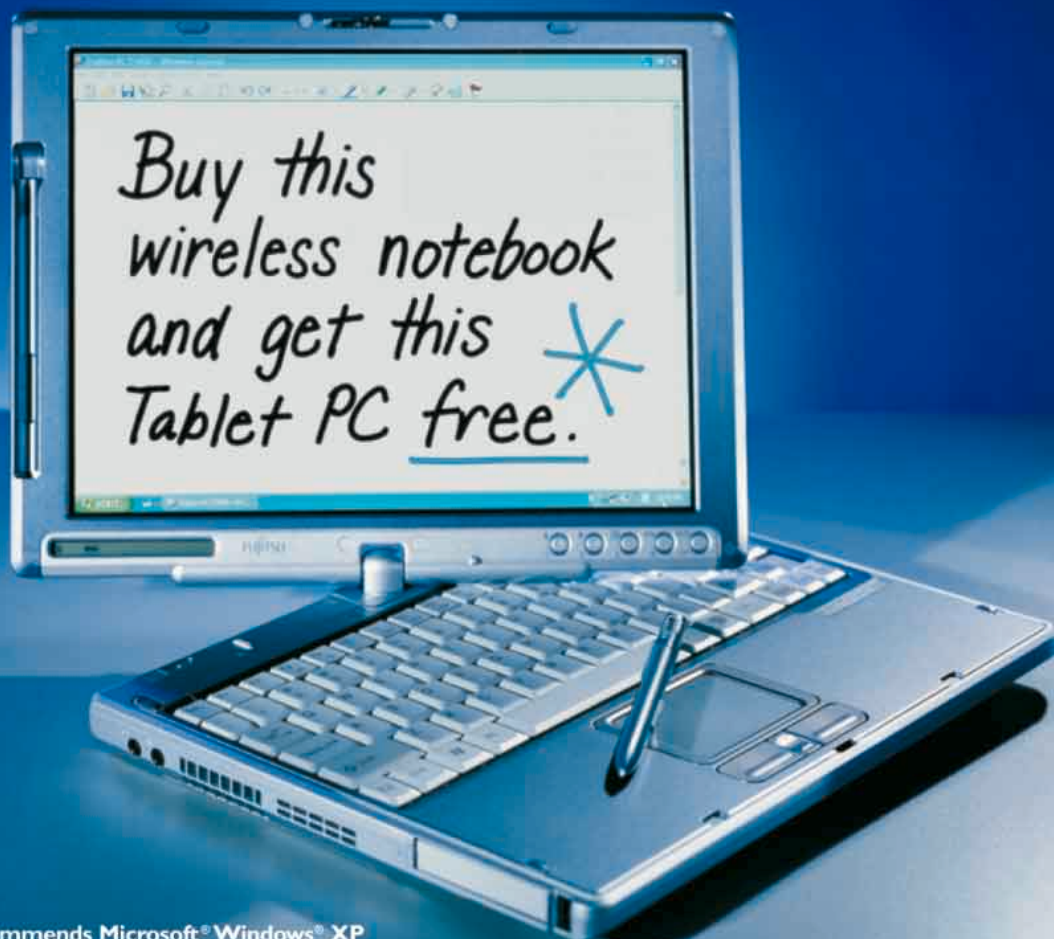
Up to five concurrent users can share a FileMaker file, or a user can deploy a database on the Web with a couple of clicks. We found the resulting Web applications maintained a generally high degree of fidelity to the original rich-client version, although some script commands are not available. We also encountered a few other limitations, such as the inability to insert an image into a field designed to accommodate it.

Both Mac and Windows versions are available. The company also has released a separate FileMaker Developer 7 version (\$499 list), which adds features such as script debugging. Additional flavors (one for mobile users, and one for serving databases to a larger number of simultaneous users) are in the works.

For rapid development of individual or workgroup database solutions, FileMaker Pro 7 is an outstanding choice. And for current FileMaker users, its dramatically improved relational capabilities make a strong argument for upgrading.

FileMaker Pro 7

\$299 list; upgrade, \$149. FileMaker Inc., www.filemaker.com. ●●●●●



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MOBILE
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Director: Now Better than Ever

BY RICHARD V. DRAGAN

Aimed at professional multimedia, Web, game, and even enterprise developers, **Macromedia Director MX 2004** adds polish and new reach to an already powerful multimedia authoring tool. This strong release features support for new media file types, better Flash integration, and several key user interface improvements.

Installing Director was effortless, thanks to a slick Flash-based installer that worked in seconds. The software runs on both Windows XP and Mac OS X (10.2.6 or later). Importantly, you can target content for both platforms no matter which development environment you choose. We tested on Windows and also looked at the Mac version.

One of Director's key strengths over the years has been its support for leading-edge multimedia types, which can be mixed and matched to create interactive Shockwave-ready presentations suitable for the Web, kiosks, and CDs. The

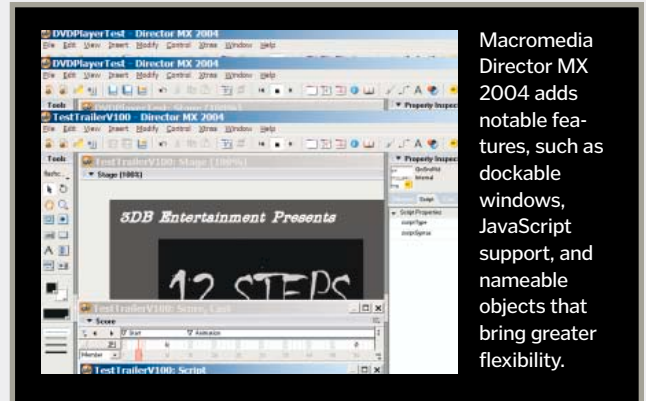
control different sources of multimedia (which are called *channels*). You also have command of controls and events for interacting with on-screen objects (*sprites*).

A significant enhancement in the new version is support for JavaScript (or ECMAScript) as well as its native Lingo. Both languages can be used interchangeably within the same project; just select the language for each script behavior within a project. This addition means that Web developers familiar with JavaScript can easily take on Director authoring painlessly. For complicated projects, you can now name channels and sprites (instead of numbering them). This is a huge win for working multimedia authors when facing last-minute changes, because you can move references to sprites within scripts without breaking code.

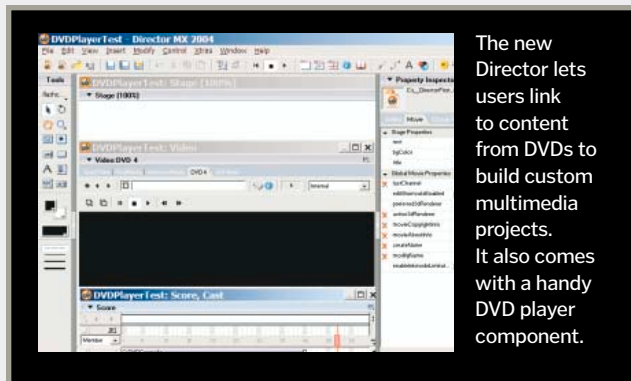
Other interface improvements include the ability to get better control of the look and feel of the workspace with dock-

For creating interactivity in multimedia apps, Director now supports half a dozen basic Flash MX 2004 controls directly, including common types like Edit Boxes, List Boxes, and Labels. With this capability, enterprise developers familiar

handy built-in player. Tapping cue points from DVD content to interact with Director content is trickier and requires a tool like Sound Forge to define them first. Working the other way around—showing DVD content in response to Director events—is downright simple, though. For example, you could have users interact with a DVD on their PC



Macromedia Director MX 2004 adds notable features, such as dockable windows, JavaScript support, and nameable objects that bring greater flexibility.



The new Director lets users link to content from DVDs to build custom multimedia projects. It also comes with a handy DVD player component.

new version adds support for Windows Media files (including WMV and WMA). In testing, we simulated creating a promotional trailer for a short film, mixing multimedia elements (voice-over, still images, and a clip for viewing), with basic interactivity for getting viewers to static content (filmmaker bios, contact information).

As in previous versions of the software, Director lets you

able windows and the ability to change the placement of the main movie viewer window. The overall personality of Director presents a winning and flexible console. That said, getting adept in the environment is still something that will take some time to accomplish. (Microsoft's Producer 2003, an add-on to PowerPoint, is definitely easier to use, though it's a lot less powerful.)

with form-based applications can work with them within Director. We created a registration page using this feature. It's not easy to resize these objects using Director, so enterprise-oriented developers will probably want to rely on Flash MX Studio instead for intensive forms-based development.

The new Director environment is smarter about editing and updating content links, especially when used in conjunction with Flash MX Studio. First, if you edit a Flash module outside of a Director project, it's automatically updated inside your Director project. Images from Fireworks MX 2004 (another Macromedia design tool) can also be directly imported.

Director has always excelled at providing a lot of choices for collecting different media types under one umbrella to create multimedia animations. Importing actual video content—whether from Windows Media, RealPlayer, or QuickTime—is well supported. The new release also lets you link to DVD content, though content is not editable. In testing, we had no trouble playing existing DVD clips using a

in response to a Web site, which suggests new possibilities for the Director platform.

When you are finished creating a project, the new Director affords excellent control of generating *projector* files, which can target both the Windows and Mac platforms, as well as different versions of the Shockwave player (Versions 8.5 and 10). Significantly for this new version, settings for deployment are now saved on a per-project basis, which means you can deploy to different versions of the player with ease.

Although there are lower-cost alternatives, Director is arguably the premiere package for multimedia authoring. Though it is still a challenging tool to use (and requires some training and practice to master), it offers a truly powerful multimedia authoring environment. The newest version delivers the slickest and most flexible user interface yet, one that will surely be an attractive upgrade option for existing Director customers.

Macromedia Director MX 2004

Direct price: \$1,199; upgrade, \$399.

Macromedia Inc.,

www.macromedia.com ●●●●●

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Athlon 64 FX-53: Added Velocity

BY KONSTANTINOS KARAGIANNIS



AMD wowed us last year with its Athlon 64 chips, which introduced 64-bit technology for the masses. The newest enthusiast-oriented spin of the chip, the Athlon 64 FX-53 (clocked at

2.4 GHz), managed to defeat the 3.4-GHz Pentium 4 Extreme Edition (EE) chip on nearly all tests (see this issue's story, "CPUs: The Road to Tomorrow," page 103). The best real-world implementation of the platform we've tested yet is the **Velocity Micro Vision FX**.

A metal door hides the excellent selection of optical drives: an 8X multiformat DVD±RW drive and a 16X DVD-ROM/48X CD-RW drive, along with a floppy disk drive. While the case lacks a windowed side panel, which some gamers

prefer, we appreciate the sound-dampening effect that comes with opacity.

Equipped with the FX-53 and 1GB of registered DDR400 SDRAM, the Vision FX turned in stellar numbers. Compared with the performance of the chips in our CPU story, the Vision FX's scores of 30.2 on Business Winstone 2004 and 37.3 on Multimedia Content Creation Winstone 2004 were record-breaking. The Vision FX's strong performance is no doubt helped along by the two 74GB 10,000-rpm SATA drives in a RAID 0 configuration (a 200GB UATA drive provides extra storage).

The 256MB nVidia GeForce FX 5950 Ultra card continues to prove it's no slouch either, helping the system turn in 5,098 on 3DMark03 at XGA resolution. You view the card's awesome images on an above-average 19-

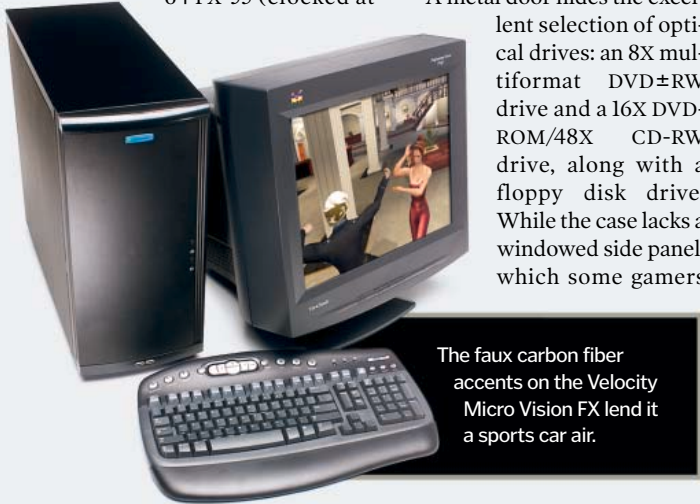
inch CRT: the ViewSonic P95F+. Audio is just as impressive, provided by an Audigy 2 ZS and pumped out of thunderous Creative GigaWorks S750 7.1 speakers. The software bundle includes the usable OpenOffice 1.1 suite, as well as the versatile Ulead Digital Creation Suite, which comprises MovieFactory 2 SE, PhotoImpact XL, and VideoStudio 7.

For this price, some might prefer to see an LCD (though the CRT is better for gaming), and we wouldn't mind a memory card slot. But those are the only nits we can pick.

Velocity Micro Vision FX

With 2.4-GHz Athlon 64 FX-53, 1GB registered DDR400 SDRAM, two 74GB 10,000-rpm SATA hard drives in a RAID 0 configuration, one 200GB 7,200-rpm UATA hard drive, 8X DVD±RW drive, 16X DVD-ROM/48X CD-RW drive, 256MB nVidia GeForce FX 5950 Ultra, 19-inch CRT, Microsoft Windows XP Professional, \$4,419 direct. Velocity Micro, www.velocitymicro.com.

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The faux carbon fiber accents on the Velocity Micro Vision FX lend it a sports car air.

Rage Against the Machine's Noise

BY JOEL SANTO DOMINGO

The **VoodooPC Rage f:50** is a high-powered tower loaded with everything you'd expect to find in a PC, except for one item: a fan. That makes this a nearly noiseless system, but peace and quiet comes at a price: \$5,000 direct.

Background noise in a typical office usually drowns out the whirring of a mainstream PC's one or two fans. But the multiple fans found in a serious gaming or multimedia system can make quite a racket in a studio or den. Whereas a typical gaming machine can produce 50dB of noise, the f:50 turns the volume down to 20dB.

The casters and handles might puzzle you initially, but try lifting the system and you'll understand: This is one heavy machine. Part of its weight comes from cooling fins on the outside that give it the

look of a serious piece of equipment, like an audiophile-grade stereo amplifier. Pipes channel heat away from the CPU, GPU, and hard drives, spreading it throughout the case; but even during a three-day nonstop test run, the computer ran flawlessly and the case never became too hot.

The 2.2-GHz Athlon 64 3400+ CPU and ATI Radeon 9800 XT graphics card are high-end gaming components. Along with the Creative GigaWorks S750 7.1 surround speakers and a 19-inch Iiyama E481SB LCD (with a 25-ms response time and a field of view exceeding 170 degrees), they make for an intense gaming experience. The Plextor 708a DVD±RW drive can burn DVD+Rs at a speedy 8X.

The f:50 scored right in line with current state-of-the-art PCs



The VoodooPC Rage f:50 relies on internal pipes and external fins to dissipate heat. This fanless design means near-silent operation.

on our performance tests. But this is not a tinkerer's PC: The internal heat piping really can get in the way if you're not careful. We recommend VoodooPC's upgrade assistance program if you want to change hardware such as the graphics card or hard drives. Gamers will love the f:50, of

course. But so too will content creators—graphic artists or music producers, for example—who'll find its near-silent performance worth a premium price.

VoodooPC Rage f:50

With 2.2-GHz Athlon 64 3400+, 1GB DDR400 SDRAM, dual 120GB hard drives (RAID 0), 8X DVD±RW drive, s ATI Radeon 9800 XT graphics card, 19-inch LCD, Microsoft Windows XP Pro, \$5,000 direct. VoodooPC, www.voodooopc.com.

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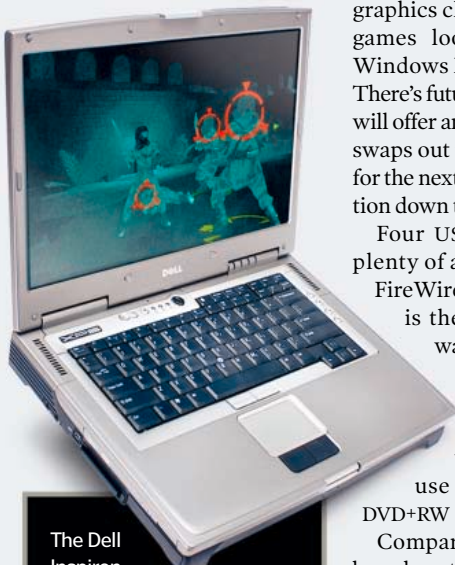
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Gaming Dynamos to Go

BY KONSTANTINOS KARAGIANNIS

Mobile CPUs and graphics chipsets have improved exponentially when it comes to handling mainstream productivity tasks, but gaming and content creation chores are still best handled by desktop chips. With their latest high-end notebook offerings, Dell and VoodooPC marry the two worlds, proving that when it comes to high-end PCs, you can take it with you.



The Dell Inspiron XPS features a top-shelf graphics engine and big screen ideal for gaming and multimedia.

DELL INSPIRON XPS

With the Dell Inspiron XPS, Dell has expanded its popular XPS gaming brand into the desktop replacement space. Based on a 3.4-GHz Pentium 4 chip (the Northwood iteration, not the newer Prescott), along with an 800-MHz front-side bus, this XPS brings true cutting-edge Intel power to the mobile world.

The two-tone case measures a massive 2.0 by 14.1 by 10.8 inches (HWD). The size is at least partly due to the spacious thermal design; at 9.4 pounds, the notebook

is actually lighter than it looks (we've had several 10-plus pounders tip our scales lately). Taking advantage of the space, Dell added a 5-watt subwoofer, and its effect on music and games is instantly noticeable.

More impressive still is what fills the top real estate: a brilliant 15.4-inch wide-screen LCD with a good 25-ms response time. The display has a native resolution of 1,920-by-1,200 (WUXGA), which is run handily by the new 128MB ATI Mobility Radeon 9700 graphics chip. High-frame-rate games look stellar, as does Windows Media 9 HD content. There's future-proofing, too: Dell will offer an upgrade service that swaps out the graphics adapter for the next-generation ATI solution down the road.

Four USB 2.0 ports enable plenty of add-ons, as does the FireWire port. Sonic MyDVD is the only notable software on the 60GB hard drive, but it's a well-rounded authoring package that will help you make use of the built-in 4X DVD+RW drive.

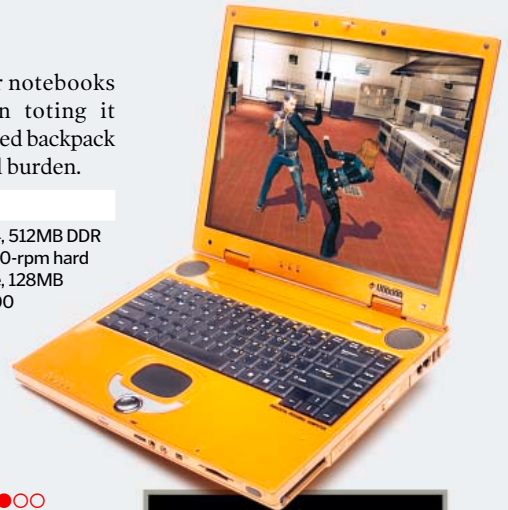
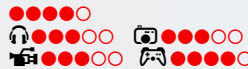
Compared with other Intel-based portables, the XPS pretty much takes top honors on our suite of performance tests, scoring about the same as a P4-based single-hard-drive desktop. We were particularly dazzled by the noticeable difference the new Mobility 9700 chip made on our 3D and gaming tests. Even its wireless throughput is impressive. Battery life (2 hours 11 minutes) is right in line with others in this class.

The Dell Inspiron XPS is a lot of machine. If you need it for high-end gaming or content

creation that other notebooks can't handle, then toting it around in the included backpack will seem a minimal burden.

Dell Inspiron XPS

With 3.4-GHz Pentium 4, 512MB DDR 400 SDRAM, 60GB 7,200-rpm hard drive, 4X DVD+RW drive, 128MB ATI Mobility Radeon 9700 graphics, 15.4-inch WUXGA LCD, Gigabit Ethernet, 802.11b/g wireless, Microsoft Windows XP Home, \$2,899 direct. Dell Inc., www.dell.com. OVERALL



The AMD Athlon 64 3400+ processor in the VoodooPC Envoy m:855 makes this one formidable portable.

VOODOOPC ENVY M:855

With its burnt-orange metallic paint, the VoodooPC Envoy m:855 demands attention—and deserves it. Driven by an AMD Athlon 64 3400+ desktop CPU and IGB of DDR400 SDRAM, the Envoy had an edge over the Dell XPS (and all other notebooks we've tested) on our Business Winstone and Multimedia Content Creation tests.

But the XPS's 802.11g wireless performance was noticeably better than the Envoy's, and gamers will have to give up some speed to those toting the XPS: The Envoy has the 128MB ATI Mobility Radeon 9600 GPU, not the 9700. That's not to say that gaming isn't still fun on the Envoy. The 15-inch 1,400-by-1,050 SXGA+ screen is bright and crisp. And VoodooPC, like Dell, does allow for field upgrades of the graphics adapter, so don't count it out.

The keyboard has a great solid feel, as does the scroll-enabled touch pad. While the Envoy is large at 1.7 by 13 by 11 inches (HWD) and weighs 8.4 pounds, its size is a little more "standard" than that of the one-pound-heavier XPS. Battery life (2:33) is on a par with most

desktop replacements. You'll want to use the machine on a table, since the underside of the chassis gets a little hot.

In addition to Windows XP Pro, the 60GB, 7,200-rpm hard drive comes loaded with Roxio Easy CD & DVD Creator 6 Platinum. That enables you to use the FireWire port and 4X DVD+RW drive for video work. PhotoSuite, part of the software bundle, nicely complements the built-in multicard reader for digital-photo enthusiasts. Four USB 2.0 ports provide I/O.

You can save money and gain some graphics performance with the Dell Inspiron XPS. But if you need a more maneuverable notebook that stands out in a crowd, the VoodooPC Envoy m: 855 is worth a look.

VoodooPC Envoy m:855

With AMD Athlon 64 3400+, 1GB DDR400 SDRAM, 60GB 7,200-rpm hard drive, 4X DVD+RW drive, 128MB ATI Mobility Radeon 9600 Pro graphics, 15-inch SXGA+ LCD, 10/100 Ethernet, 802.11b/g wireless, Microsoft Windows XP Professional, \$3,499 direct. VoodooPC, www.voodoo pc.com. OVERALL

PERFORMANCE TESTS

High scores are best. Bold type denotes first place.	Business Winstone 2004	Content Creation Winstone 2004	Business Winstone BatteryMark 2004 (hr:min)	3DMark 2003	Serious Sam (fps)	Average 802.11g throughput (Mbps)
				1,028 x 768 1,600 x 1,200	1,028 x 768 1,600 x 1,200	1 foot 60 feet 120 feet 160 feet
Dell Inspiron XPS	17.1	25.8	2:11	2,489 1,074	78 34	21.7 17.6 10.7 3.8
VoodooPC Envoy m:855	19.2	27.1	2:33	1,978 N/A	32 N/A	12.2 10.8 1.5 0

RED denotes Editors' Choice. N/A—Not applicable: The screen does not support this resolution.



Lighten Up.

It wasn't so long ago that if you wanted to bring your data with you, your hardware had to come too. Well, that's all in the past now thanks to the new SanDisk Cruzer™ Mini. At under half an ounce, the Cruzer Mini goes anywhere, and with up to 256MB of flash memory, it takes a lot with it. Hi-speed USB 2.0 compliant, SanDisk's Cruzer Mini lets you transfer data faster than ever before. And at less than 8mm thick, all it needs is a single USB slot. Just drag, drop, and go. It's all about convenience – no extra hardware, no worries.

So whether you're installing utilities or updating print drivers for the umpteenth time, you can take your files with you wherever you go – and you won't even need your dolly.



For more information on SanDisk Cruzer Mini, visit www.sandisk.com/pcmagazine

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HP, Xerox Go Head to Head with Color Lasers

BY M. DAVID STONE

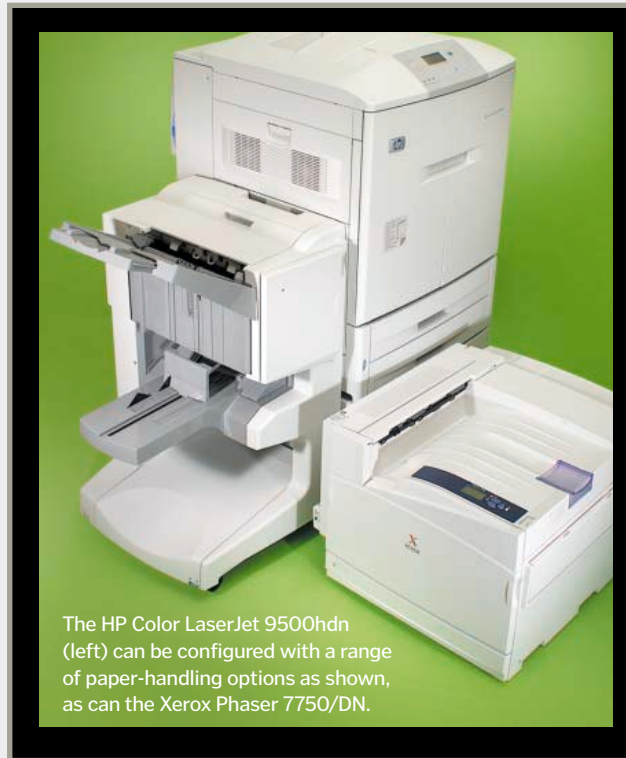
When a printer heavy-weight like Hewlett-Packard introduces a high-end color laser, we take notice. When a second heavy-weight like Xerox introduces its own printer shortly afterwards to compete with HP's entry, we can't resist comparing the two.

HP COLOR LASERJET 9500HDN

The HP Color LaserJet 9500hdn comes in two versions, the 9500n (\$6,800 street) and the 9500hdn (\$9,600), which we tested. The 9500hdn has duplexing, a hard disk, extra RAM, and a 2,000-sheet paper drawer for a hefty total input capacity of 3,100 sheets. With the 9500hdn only, you can add a finisher (for sorting and stapling) or other paper-handling options (\$1,810 to \$2,420), bringing the price of the package to five figures.

Physical setup of this copier-size printer is easy, thanks to thoughtful touches such as ramps packed in the shipping box to let you roll the printer off the shipping pallet on its own wheels. But don't confuse *easy* with *quick*. This is a big printer, with lots of packing materials and four sets of toner cartridges and drums to install. Set aside at least an hour for the task.

Thankfully, network setup is both easy and quick. HP's setup routine finds the printer on the network and handles virtually the entire setup automatically. For remote network administration, the printer includes the usual built-in Web page, and, of course, it works with HP's WebJet Admin, one of the most capable administration packages available.



The HP Color LaserJet 9500hdn (left) can be configured with a range of paper-handling options as shown, as can the Xerox Phaser 7750/DN.

Despite its 24-page-per-minute (ppm) rating for both color and monochrome, the 9500hdn proved a bit slow on our performance suite. It turned in a total time of 8 minutes 23 seconds with HP's recommended settings—much longer than the Xerox 7750/DN needed.

Output quality is impressive in most ways. Graphics were good to excellent, and 4-point text was easily readable in most of the fonts we tested. Photos would count as true photo quality, except that the toner is so thick in some places that the smoothness of the surface is changed, along with how well it reflects light. But photo output is more than good enough for business needs.

All told, we like the printer for

its output quality and ease of setup. It's just not the fastest printer in this price range.

HP Color LaserJet 9500hdn

Street price: \$9,600 as tested. Hewlett-Packard Co., www.hp.com.
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XEROX PHASER 7750/DN

The Xerox Phaser 7750/DN comes in four versions: the Phaser 7750/B (\$5,600); the 7750/DN (\$6,600), which adds a network card, duplexing, a hard disk, and more RAM; the 7750/GX (\$7,900), which adds more RAM and a 1,500-sheet paper draw; and the 7750/DXF (\$9,600), which adds a finisher and an upgrade to a 2,500-sheet paper drawer for a total input capacity of 3,150

sheets. We tested the 7750/DN.

Setup is easy—and fast compared with the 9500hdn. The 7750/DN has notably less packing material, and what's there is clearly marked with numbered tags indicating what to remove and in what order. It also helps that you need to install only four toner cartridges. We had the printer set up in under 20 minutes. As with the HP entry, network setup is almost fully automatic. It's as easy as the HP setup routine, if not easier. And Xerox has its own world-class remote administration package in CentreWare.

Performance is where the 7750/DN truly shines. Rated at 35 ppm, it has an advantage over the 24-ppm 9500hdn right out of the gate. But the 7750/DN had more of a lead than the engine difference would indicate. It needed just 4 minutes 32 seconds to complete our performance suite—nearly half the time of the HP.

Output quality was good to excellent: somewhat better than the 9500hdn's in some cases and not quite as good in others. At small font sizes, the 7750/DN's text was slightly less readable than the 9500hdn's. On the other hand, the 7750/DN does noticeably better on photos printed at the recommended performance settings.

Ultimately, both these printers are worthy contenders. The Xerox Phaser 7750/DN has significantly faster performance and, at the high end, offers more features dollar for dollar, making it a much better value and our clear choice.

Xerox Phaser 7750/DN

Street price: \$6,600 as tested. Xerox Corp., www.xerox.com/office.
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PERFORMANCE TESTS

Scores are in seconds except where otherwise indicated. Low scores are best. Bold type denotes first place.

	Adobe Acrobat 6.0			Microsoft Word 2003			Microsoft Excel 2003			Microsoft PowerPoint 2003	Total output time	
	2 pages, text and graphics	4 pages, text and graphics	4 pages, text and photos	2 pages, text and lines	2 pages; photos, text, and graphics	3 pages, text and graphics	1 page, text and table	1 page, charts and graphs	3 pages, charts and graphs	5 pages; charts, graphs, tables, text	4 pages, text and graphics	(min:sec)
HP Color LaserJet 9500hdn	71	71	64	25	31	28	21	21	52	35	32	8:23
Xerox Phaser 7750/DN	31	56	60	10	16	12	8	8	13	17	14	4:32

RED denotes Editors' Choice. We ran these tests using each vendor's recommended settings for general-purpose output.

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MSN Hotmail Extra Storage Weather Dating & Relationships MSN Messenger

ZoEmail Locks Out Spam

BY NEIL J. RUBENKING

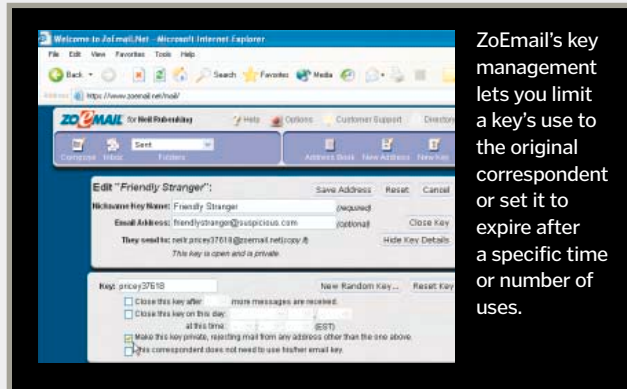
ZoEmail is a Web-based e-mail service that makes two ambitious promises: You'll never get spam, and you'll never miss valid mail. It accomplishes this feat using a mature and thorough implementation of the disposable e-mail address (DEA) concept. The service offers just about everything you'd expect in a stand-alone e-mail client: address book, spell-checking, user-defined folders, message rules, and even an option to insert foreign characters. But unlike other e-mail clients, ZoEmail really does keep spam out.

Where an ordinary e-mail address consists of a name and a domain, a ZoEmail address is built from a name, a key, and a domain. Each one of your correspondents automatically gets a different key, which can be generated at random or entered manually. Your friend might send messages to *yourname.bandana5264@zoemail.net*, while your spouse might message you at *yourname.darling@zoemail.net*. If you ever get unwanted mail, the key that was used reveals exactly where it came from. Key-management features let you close the tainted key or lock it so that it receives messages only from the original correspondent.

You can also create easy-to-remember general-purpose keys for distribution. For example, before a conference, make the conference name into a key and give out the keyed e-mail address. Every contact from that conference will initially arrive through that key.

Anyone sending to your e-mail address with no key, an invalid key, or a closed key will get a delivery failed message that includes a link to the ZoEmail directory. From the directory, the sender can get a personal key by entering a bot-defeating, hard-to-read password. This key is good for only two uses, and the sender is placed in a list of

pending requests rather than directly in your address book. If you don't respond or upgrade that key, the unknown source can send you two messages,



ZoEmail's key management lets you limit a key's use to the original correspondent or set it to expire after a specific time or number of uses.

Maximize Your SFA

BY HEATH H. HEREL

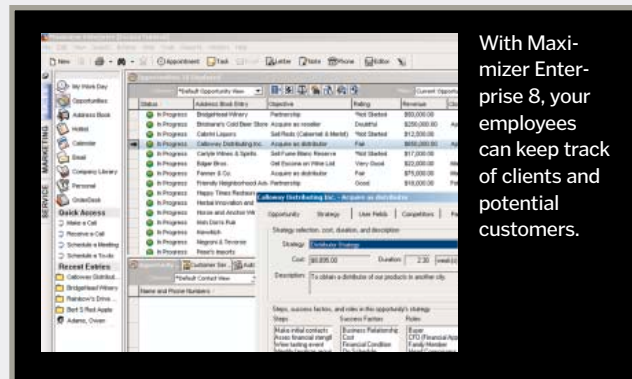
Maximizer has long been associated with first-rate sales-force automation (SFA) tools, and the release of **Maximizer Enterprise 8** shows that the company isn't content to rest on its laurels. This version builds on a solid foundation, adding capabilities that make an already good product even better.

Maximizer continues to improve installation, making that once-difficult task easier. This sets it apart from products like SalesLogix, which require outside assistance. Installing the server component takes minutes, and client installation is handled via the server. The Max-Exchange component lets you scale the installation up and out to remote servers and clients.

Contact management is at the heart of any SFA application, and Maximizer is no exception. Entering and maintaining contacts is extremely straightforward, and you can get all of the critical information on any contact into the database in no time. Strong

calendar and task list components tie all key customer-related activities together.

Maximizer provides a useful opportunity management feature to help you convert prospects into customers. Its ability to link a specific strategy to an entry helps you work the opportunity to conclusion by following a set of best practices. A prede-



With Maximizer Enterprise 8, your employees can keep track of clients and potential customers.

defined set of sales strategies is installed with Maximizer, and you can easily create new strategies specific to your company.

Maximizer also lets you hook into IIS upon installation, opening up a new suite of features via the Web. Using this integration and other provided tools, you can create portals for your employees, partners, and cus-

clients. The interface is as much like those of popular stand-alone clients as a Web-based service can be. In only a few places does it become awkward; for example, to enter your time zone, you must scan an alphabetical list. And every out-going e-mail carries a small text advertisement for ZoEmail at the bottom.

ZoEmail's approach to blocking spam through DEAs is both effective and easy to use. It never, ever misfiles valid mail as spam. The few very minor problems with the interface are considerably outweighed by the appeal of a spam-free in-box.

ZoEmail
 Direct price: With 12MB of storage, 99¢ a month; with 50MB storage, \$1.59 a month. ZoEmail LLC, www.zoemail.com. ●●●●●

tomers. eStore Manager can create a full-featured e-commerce site built on your existing Maximizer database. The integrated ordering system also handles off-line orders. The customer service module helps complete the cycle, giving you a way to track issues.

Maximizer's customizability is second to none, with a com-

pletely open architecture that's extremely well documented. Experienced developers will be able to use this to expand Maximizer to fit their organization's needs with little difficulty.

Maximizer Enterprise 8
 Direct price: \$699 per user (includes MaxExchange and portal licenses). Maximizer Software Inc., www.maximizer.com. ●●●●●

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Try Before You Build

BY RICHARD V. DRAGAN

Application development time is a precious commodity in most businesses, so any tool that can cut down on waste is welcome. **iRise Application Simulator** offers a better way for nontechnical business users to define (and refine) requirements for and prototypes of Web applications before programmers actually code them. This well-thought-out tool has many whiz-bang features and can surely help improve software quality and reduce costs, though its price (\$250,000 for five developer and 100 Web client licenses) will likely keep it out of the hands of many medium-size organizations.

The iRise solution comes in two Windows modules. The first, iRise Studio 3.0, allows business analysts to create prototypes of Web applications within an integrated development environment (IDE). The second component, iRise Server, installs a mini application server. This module can be used to publish mock-ups of applications for dozens of users to try. It also tracks requirements, defects, test cases, and other project information, all of which are accessible via a Web browser.

The iRise Studio module presents a well-designed console aimed at enabling ordinary business analysts (nonprogrammers) to create sample Web pages complete with basic flow and program logic (with simulated sample data). Recent offerings in the Java tool market (namely BEA WebLogic Workshop and IBM Rational Rapid Developer) have taken much of the complexity out of software development, but you still need to know how to code. We think iRise Studio does a fine job of letting noncoders define both the look and feel and the behavior of applications.

The design environment centers on a highly visual drag-and-drop interface for creating

pages. You lay out basic components on forms, while setting properties (colors, fonts, and so on) in a separate window. Another view lets you design the flow between pages, including conditional rules for logic. We used this feature to set up a log-on page that could test and check a password, then go to the appropriate page.

There is no script language here to master. Adding business logic is done by setting properties on nearly 60 types of Action objects, which include support for simple conditional testing, math, date, session information, and data operations. Pop-up menus make it easy to select the right object, though all this will take some practice to master. (Training is included in the price.)

Connecting pages can be a little tricky. We found that you needed to click with the left, then the right mouse buttons. Still, we found the IDE to be a very effective design environment. Although today's leading development tools (such as Microsoft Visual Studio .NET, BEA WebLogic Workshop, and Borland JBuilder X) support visual form design, they are still code-centric.

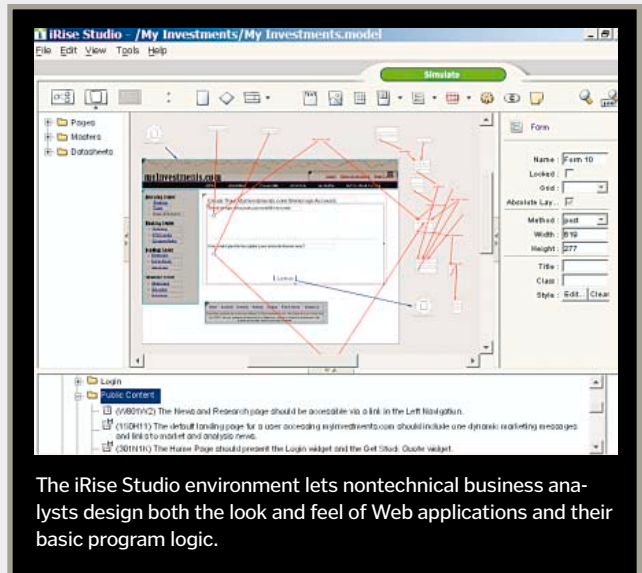
Other notable features include the ability to define reusable forms or components called masters (like log-on pages or navigation bars) that can be reused across Web applications. You can also define columns of sample data (which can be imported from a CSV) and incorporate these fields into your designs.

Significantly, each on-screen control can be tied to software requirements (and other design guidelines) that are defined in a separate panel. That is, you can track the written rules of a new software design and attach them to actual on-screen objects, making sure the user interface covers every requirement. Moreover, you can make sure that all features are justified by your requirement list.

As you create your mock-up project, you can publish it to the server at any time and run it in simulation mode. This mode shows your prototype to other users via the Web and gives them the ability—once you design in data fields—to save and retrieve simulated form data. This powerful visual prototyping is a truly winning feature. The price for iRise includes 100 client licenses, so participants in

requirements for a sample B2B e-commerce application.

An orphan report lets you identify which requirements have not been implemented. In addition to the module's reporting prowess, we especially like its ability to export the entire simulated application as a PDF or separate HTML files. Unlike traditional CASE tools, iRise does not attempt to generate code or UML for the actual coding phase.



The iRise Studio environment lets nontechnical business analysts design both the look and feel of Web applications and their basic program logic.

a project can get a walk-through of an entire design in simulcast mode—including the option to note missing, unclear, or incorrect features.

Developing prototypes of what your application will look like and how it will behave is just the beginning, as we found out when we turned to the Dashboard available within the iRise Web interface. First, you can view the requirements associated with each page or widget on-screen. (Just clicking on a numeric hyperlink brought us to the corresponding requirement.) Designated Web users can view or add requirements, flag defects, and test scenarios.

Better yet, the status information for each feature is readily available, including who has responsibility for each feature or defect. A solid set of seven reporting options allowed us to generate a complete list of re-

However, you can pass requirements to other tools, such as IBM's Rational RequisitePro and Borland Together ControlCenter, via plug-ins.

The ease of use and the nontechnical focus of iRise are admirable. If a picture speaks a thousand words, then a visual snapshot of what an application should look like—along with a clear set of requirements—should help any organization refine a design even before coding begins. Though it is expensive, iRise makes a strong case for a place in the large enterprise, as it is a valuable tool for streamlining software design and making sure that what gets built is what real business users actually need.

iRise Application Simulator 3.0

Direct price: \$250,000 (includes one server license, five Studio licenses, and 100 Web client licenses). iRise Inc., www.irise.com. ●●●●●

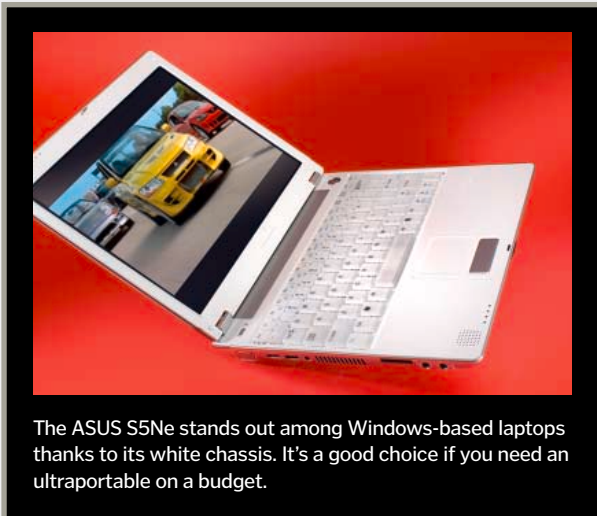
An Affordable Ultraportable

BY CISCO CHENG

With the prices of coveted ultraportable notebooks at the high end of the bang-for-the-buck scale, AsusTek is sneaking up on consumers with a cool looking, affordable alternative: the **ASUS S5Ne**. Though you won't be running high-end applications with this system, everyday tasks like word processing, answering e-mail, burning MP3s, and playing DVDs will work just fine.

At first glance, the S5Ne reminds us of a miniature Apple iBook. The full-size keyboard is very comfortable and easy to type on. We also appreciate the three USB 2.0 ports, FireWire port, and SD memory card slot. The bundle includes an external DVD-ROM/CD-RW drive (24X), and we were surprised at the crispness of the picture during DVD playback on the 12.1-inch screen.

The S5Ne houses Intel's Centrino solution, which includes a 1.0-GHz Pentium-M processor and 802.11b wireless chipset. Performance was in line with that of other ultraportables we've test-



The ASUS S5Ne stands out among Windows-based laptops thanks to its white chassis. It's a good choice if you need an ultraportable on a budget.

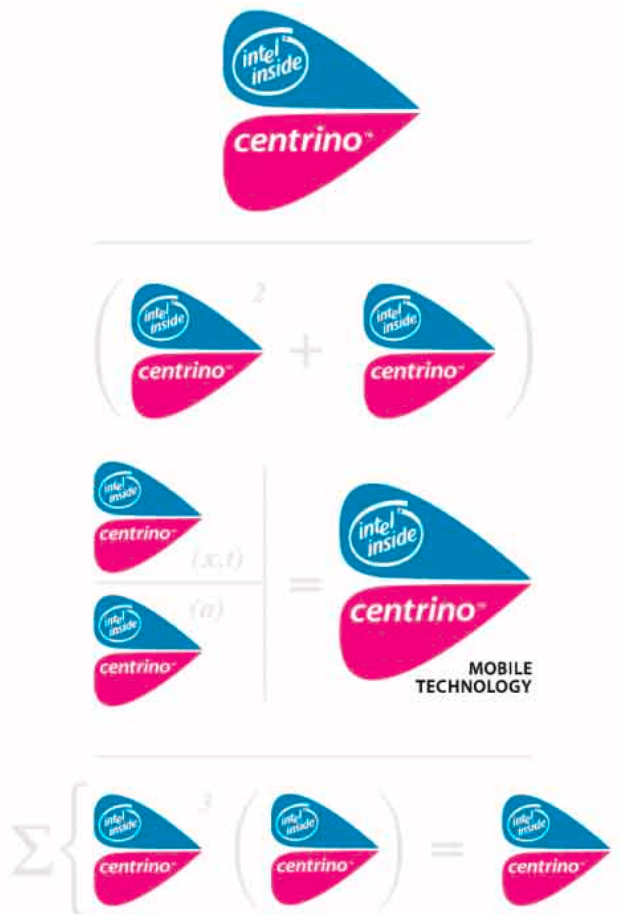
ed recently (such as the IBM ThinkPad X40). The unit should prove satisfactory for running multimedia and business applications (though we would opt to upgrade the memory from the standard 256MB to 512MB). Like others in this class, it is not the right choice for 3D gaming or content creation.

The S5Ne came up short on our BatteryMark test, however, delivering only 1 hour 42 minutes of runtime. The company sells a .7-pound extended battery (\$85), which delivered 3:27 of runtime. Our wireless tests also turned up below-average results: The S5Ne managed a transfer rate of only 2 Mbps near our access point; ideally, it should be about 5 Mbps.

At \$1,600 (street), the ASUS entry is one of the least expensive ultraportables around. A similarly equipped ThinkPad X40 would run you \$200 more, but it delivers much better battery life (2:26 on our tests; First Looks, March 16) and is a better machine all around. That said, if cost is a bigger priority than battery life, the ASUS S5Ne is one to consider.

ASUS S5NE

With 1.0-GHz Pentium-M, 256MB RAM, 40GB hard drive, external DVD-ROM/CD-RW drive, 12.1-inch LCD, Intel 802.11b wireless, Microsoft Windows XP Home Edition, \$1,600 street. AsusTek Computer Inc., www.asus.com. ●●●○○○



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FEEDBACK

“We shudder in our boots over the Patriot Act, but we happily surrender our freedoms and let content-filtering software decide what we can see on the Web.”



HUMAN VS. MACHINE

I JUST READ “DON’T GO THERE” (March 16, page 102), and I’ve got to say, Web content-filtering software is all wrong. Filtering software removes responsibility from a human being and assigns it to a machine; that machine’s ability is not up to the refined mental process of distinguishing varieties of content.

I teach in a fully networked public school, and I encourage my students to conduct research online. But my goals are thwarted every day by filtering software that does not understand the difference between a nude painting in a museum and pornographic material. I asked my students to research snakes, but they could not access Africa-related sites, because they’re classified under “travel.” I asked my students to research world religions, but they were blocked from accessing religious sites! The notion that a machine carries more influence over educational material than teachers do is galling.

We shudder in our boots over the Patriot Act, but we happily surrender our freedoms to content filters. Computers can only examine a string of characters, make a binary decision, and regurgitate the results. The role of the teacher or parent reaches far beyond.

HELEN LEIN

THE BLACKLIST BLUES

THANK GOODNESS FOR JOHN C. DVORAK’S reprimand of AT&T’s bulk mail and spam-blocking directories (March 16, page 53). I thought I was losing my mind, as did my correspondents, when I was suddenly blocked from sending and replying to their e-mails. But it wasn’t AT&T this time (I have an *att.net* address), it was AOL blocking my private communication with my friends. Yet another example of lazy programming and customer support. I agree with John! Dump ‘em both, and go with a smaller, more reliable ISP.

CARL LUSS

ONCE AGAIN, JOHN C. DVORAK injects some reality into the state of the telecommunications, IT, and service industry with his AT&T nightmare experience. Providing technical support for a small company, I experience similar scenarios on an almost daily basis when dealing with software support, ISPs, and telecommunications companies. Have these companies ever considered

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hiring all of the displaced American telemarketers as customer service reps?

MICHAEL MUMMA

THE BLAME GAME

IN THE MARCH 16 INSTALLMENT OF “Forward Thinking,” Michael J. Miller asks, “Who’s to blame for this latest virus attack?” Then he lists antivirus software makers before Microsoft! Do we blame the bug zapper when the house has no window screens? Microsoft churns out a buggy, vulnerable, and closed product, and you blame Norton and others as those who can’t do their jobs right! Since when did Microsoft open up its OS code so folks can truly tie in to write effective software?

ANDY NEWELL

READ THE FINE PRINT

AFTER READING ABOUT spyware-free peer-to-peer programs in “Spy Stoppers” (March 2, page 88), I downloaded and installed Ares. Ares, however, turned out to be anything but spyware-free. Ares comes with the NavExcel hijacker bundled, as I discovered when a program named NHUpdater.exe tried to access the Net through my firewall. Ad-aware and Spybot Search & Destroy both label this program malware. I’m not the only one to run into this problem either.

I’d recommend that in the future, when your writers attempt to recommend spyware-free products, they first install those products and immediately run the appropriate scanners.

ROBERT M. SCHROECK

Both Ares and Xolox technically include spyware in the install bundle, but you don’t have to select NavHelper (Ares) or the other add-on programs during installation. The spyware is bundled in the way extras and trial versions are bundled with all sorts of applications; you can simply uncheck the option to install them. We did this, and subsequent scans showed no spyware on our test system.—Ed.

Corrections and Amplifications

■ In our March 16 First Looks review of the Apple iLife ‘04 suite (page 38), we stated that the GarageBand component creates projects in AAC format. In fact, GarageBand outputs to uncompressed AI. You can use the suite’s iTunes module to convert to MP3 or AAC.

■ Several errors appear in our recent roundup of digital cameras (March 16, page 73). We omitted a byline for contributing editor Les Freed, who wrote reviews of the professional-model cameras. In the introduction we said, “...all but the Fujifilm... and the HP... use rechargeable batteries.” That should read, “...ship with rechargeable batteries.” Several models in the story can run on rechargeable batteries, available as an extra-cost option. Finally, in the HP PhotoSmart 945 review, the first paragraph states that the camera “comes with nonrechargeable lithium ion batteries.” It should read “lithium batteries.”

■ In the User to User item “Count Unique Names in Excel” (March 16, page 69), we instruct users to “Highlight the row containing the names....” That should read “Highlight the column containing the names....”



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ExtremeTech

Back Under the Shade Tree

Modern cars with complex engine management systems are the bane of shade-tree mechanics everywhere. The systems that used to be so accessible are now black boxes under computer control. Those lazy summer afternoons of tinkering and performing routine maintenance operations, such as changing points and plugs, are history.

I look back fondly on those days of checking things over, tightening a couple of screws, checking fuel and vacuum hoses, polishing the valve covers and air cleaner. I had all the tools that I needed: a dwell tachometer, a timing light, even a rudimentary exhaust gas analyzer. I felt the bond between man and machine acutely; I knew the sounds and smells and could diagnose most ills before they became serious.

On the other hand, today's car can run for 50,000 miles without so much as a tune-up. As with a sewing machine, you oil it periodically and it just runs. When something goes wrong, though, there's nothing you can do other than take it to the dealer or a trained mechanic with the proper diagnostic equipment. The problem is, your first inkling of trouble is usually the Check Engine light, and you have no way of knowing whether there's a serious failure in the engine control system or something as simple as a loose gas cap. You'll wind up paying the diagnostic fee either way. And while the vast majority of mechanics are honest, you have no way of verifying their findings. Those old diagnostic tools? Useless.

Now there's a glimmer of hope for the shade-tree mechanic, in the form of the AutoXray EZ-Scan 6000 (www.autoxray.com). This handheld device is the size of a home theater remote control, complete with an eight-line LCD. It comes with adapters that hook up to the on-board diagnostic and control systems of virtually all cars so equipped, plus an adapter that lets you transfer the data to your PC.

I've been testing the EZ-Scan 6000 on my own cars and my friends' cars, and while it's not exactly a return to yesteryear, it sweeps away the mystery behind the Check Engine light. And it can do considerably more. You tell it the year, make, and model, and it configures itself to the protocols. Unlike a number

of similar devices, the EZ-Scan has full-text explanations for most of its readings, and you can download updates through the PC link.

You know that your car's on-board computer stores the trouble codes that trigger the Check Engine light. But did you know that there's another class of error message, called *pending codes*, that you may never see?

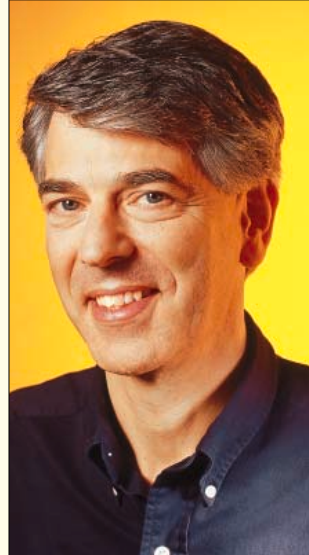
When your car misfires a number of times, it triggers a trouble code. If it misfires only two or three times, it may not turn on the light, but the computer stores the information anyway, pending more occurrences. Pending codes may be harbingers of trouble to come or just passing hiccups, but wouldn't you like to know what might be brewing in there? You can also clear trouble codes and turn off the Check Engine light if the problem is one you can fix. And you can build a permanent, long-term database of readings by just bringing the EZ-Scan into the house, connecting it with the provided cable and software, and downloading the readings to your PC.

With the EZ-Scan you can also run diagnostics that may be built into your car's engine management system or make such minor adjustments as may be allowed, as in idle speed.

When you find out that the EZ-Scan 6000 costs \$699 direct, you might experience sticker shock. But my old timing light, dwell tach, and exhaust analyzer were probably a \$150 investment to maintain cars that cost \$3,000 to \$5,000. So \$700 doesn't look so bad, relative to the price of today's cars. It's also a third of the cost of comparable competing systems.

The EZ-Scan is a diagnostic tool first and foremost; it doesn't have the incredible depth of, say, the Volkswagen-oriented VAG-Com (www.ross-tech.com), nor is it a hacking tool for souping up your car. But it's a terrific general-purpose, all-vehicle instrument that will be a godsend even to professional mechanics who don't want to invest thousands to pinpoint everyday problems. And whether you're industrious, meticulous, or just curious, you'll finally know what's going on behind that stupid light.

MORE ON THE WEB: You can contact Bill Machrone at bill_machrone@ziffdavis.com. For more ExtremeTech columns, go to www.pcmag.com/machrone.



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John C. Dvorak

Search Engine Mania

The Internet is getting to be more and more like Hollywood. Successful movies spawn numerous copycats, and this is now happening with search engines as well. Since Google is making money and is expected to bring in big bucks in a midyear IPO, suddenly search engines are the next big thing. But unlike in Hollywood—where the spin-offs, rip-offs, and clones are seldom as successful as the movie that spawned them—search engines just keep giving users better and better tools.

Google began with a unique page-ranking concept that determined page popularity by looking at the number of references from other sites. Before Google, the top engine was arguably AltaVista, which went south after Compaq bought Digital Equipment Corp., the company that maintained it. Before and after AltaVista, a slew of interim hotties came and went. The original progenitor was WebCrawler. Among the popular search engines was the still-popular Yahoo!, which took the directory approach and provided search as a secondary mechanism.

Yahoo! will probably be the only company unscathed in the upcoming battles, unless it chooses to associate itself with the looming mess. The biggest mess-maker will be Microsoft, which suddenly thinks this is somehow its business too. It intends to release a new search service using natural-language queries, much like Ask Jeeves. Ask Jeeves has never impressed me, and the company has invested years in this idea. What is Microsoft going to do differently?

Natural-language searching means that instead of typing “Dvorak writer magazine” to see which magazines I write for, you would type “What magazines does John C. Dvorak write for?” This eventually leads to “If John C. Dvorak writes for magazines, what are they, where are they, and does he have a phone number I can call?” Do this with Ask Jeeves and you get a “sponsored” link to a telephone directory CD-ROM that you can buy. Then there are two come-ons for magazine subscriptions and a link to “books by Dvorak.” This is followed by links to incredibly obscure blogs that mention Dvorak columns. Useless.

To see how poorly natural-language parsing works, use Google’s translation function. If compa-

nies can’t create decent machine translation, how can they use natural language for search queries? Still, Microsoft will do what it does best in areas outside its core competency: muddy the waters.

Not all is lost: A recent issue of MIT’s *Technology Review* details some of the new approaches to searching, including the unique clustering methodology employed by Mooter (www.mooter.com). Instead of a list of search results, you get clusters not dissimilar from those found at the quirky Kartoo (www.kartoo.com).

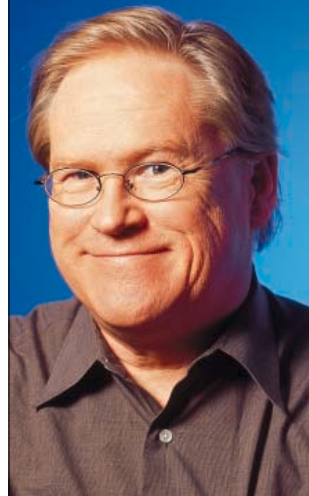
The search engine mentioned in the article—and one I’ve been toying with—is Teoma (www.teoma.com), ironically now owned by Ask Jeeves. It often outperforms Google in accuracy and in putting exactly what you want at the top of the results list. Some of this may have to do with Google’s abandonment of its ranking methodology because of the emergence of redundant cross-linking, which is something many outsiders blame on nearly 5 million slaphappy bloggers and their so-called blogrolls.

The continued advantage of Google over the competition, though, is the Google Web cache. It’s amazing how many pages are off-line but still available in the Google cache. Unless a new engine comes along and duplicates this feature, there’s no way Google can not stay on top of this game.

Then there’s the issue of the deep Web, or what was once called the hidden Web or the invisible Web. This typically refers to database sites using content management systems that crawlers can’t index. This is why when you do a search on *John C. Dvorak*, you get very few hits on the hundreds and hundreds of online and print columns I’ve written.

At least one start-up is working on this problem. The current methodology is to use metasearch engines (the ones that attack all sorts of little engines and piece together the results) or specialty search engines, such as All Academic (www.allacademic.com). However this shakes out, at least one thing is certain: We’ll have a lot of different search choices, and that’s pretty much the only way we can navigate all this information. Cheer these people on.

MORE ON THE WEB: Read John C. Dvorak’s column every Monday at www.pcmag.com/dvorak. You can reach him directly at pcmag@dvorak.org.



Since Google is making money and is expected to bring in big bucks in a midyear IPO, suddenly search engines are the next big thing.

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Inside



Track

JOHN C. DVORAK

Digital Camera Beat: The recent Photo Marketing Association convention in Las Vegas was one of the liveliest shows around. Even Bill Machrone would like this show. Cameras and gizmos galore. The talk of the show, and perhaps the **hottest camera** there, was the Nikon D70 (\$1,299 with lens), which is designed to beat the Canon EOS Digital Rebel. Using a standard Nikkor lens, this 6.1-megapixel camera is perfect for Nikon SLR users who have accumulated a cartload of lenses.

Everything works. Most impressive to me is the built-in **wireless flash** capability. You can take the detachable flash and put it any place in the room, and the camera will flash it, doing the through-the-lens calculation and remotely controlling the flash intensity. You can do this with several flash units to create all sorts of **special lighting effects**. This feature will become a major trend.

In **other big news**, all the major players announced lines of **8-megapixel cameras**. They are all hot, each offering features slightly different from the competition's. The unspoken reality is that there seems to be very **limited availability**. They all use the Sony sensor. And since Sony preannounced its own 8-megapixel camera last year but **failed to deliver** the product on time, one suspects some issues with the sensor itself. Perhaps the sensor is simply too small at the 2/3-inch CCD format size.

If you get an 8-megapixel camera, immediately take a few shots of a monochrome wall and look for **dead pixels** with Adobe Photoshop. Keep **returning the camera** until you get a clean one.

One of the **newest trends** in digital cameras is the emergence of 4/3 inch as not only a standard CCD size but an **open-standard lens mount** size as well. The Four Thirds standard (www.four-thirds.org) was started by Kodak and Olympus, which have recently been

joined by Fuji, Panasonic, Sanyo, and Sigma.

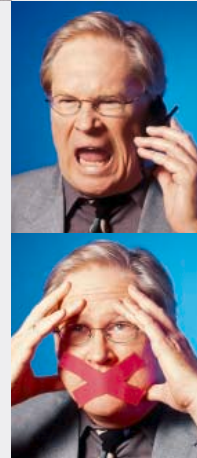
It will be interesting to see how Canon, Nikon, and Sony react to this. Sony seems least likely to join, because it doesn't make open systems and even goes its own way with the Memory Stick. It leads in consumer market share, and the Four Thirds group doesn't fully impinge on that market segment, leaving Sony to run wild. Still, the Four Thirds initiative should result in lower prices.

AOL Everywhere Dept.: I swapped out my laptop recently and needed to reload a bunch of software, including the AOL client. Like many others, I use AOL for **dial-up connections** when traveling. It's more convenient than anything else, and I like its network. But I've heard so much complaining about AOL 9.0 and I liked 8.0 so well that I went on the Net to find a copy of it.

I found it on AOL's U.K. site (www.aol.co.uk). This version has a **sultry British female** voice telling me I have mail. How quaint! I guess the "You've got mail" guy wanted extra money for the overseas gig. Overall, I prefer the U.K. version to our own.

Americans tend to ignore the international aspect of software and the fact that many Web sites and software packages are localized. The localized product for the English, French, or Singaporean market could well be superior to the U.S. product. **Check out the gray market** once in a while.

Back on the Merry-Go-Round Dept.: The DVD Forum has just approved a technology for the HD DVD-RW. I found this interesting, since we've yet to see an HD DVD. We haven't even seen dual-layer DVDs (DVD-9), for that matter. Now the read/write version of a non-existent HD DVD arrives on paper. The problem is that the DVD Forum has lost control of too many aspects of the format, especially considering the competing DVD+RW standard. This is probably



There may now be a standard for HD DVD-RW technology, even though the HD DVD doesn't yet exist.

the most versatile in home DVD TV recording, since the discs can be read on regular DVD players without going through the finalizing process. Whatever the case, the **entire HD DVD thing** is still up for grabs.

Intel Looking for the Market That Doesn't Exist Dept.: Look for an Intel initiative called the **Digital Home Working Group** (DHWG), which I'll call Microsoft at Home II. According to CEO Craig Barrett, as reported in *EE Times*, the PC will not be the center of the universe in this brave new world the company hopes will emerge. This, I'm sure, is doubly true if the PC is running the Athlon 64.

The problem with this **futuristic thinking** is that only a few people in the universe want a home that's interconnected and "smart." Guys with a lot of money to squander have had nothing but trouble comprehending this. Most people go to work, go home, eat, and watch TV. It's been hard enough getting people to upgrade to HDTV, let alone a smart home.

These folks also ignore the fact that even the few people who want smart homes have already been **screwed by the pace of change** and the fact that whatever you buy today is virtually obsolete in two years. Who wants an obsolete home? "But you'll be able to listen to MP3s from any room in the house!" Wowie.

AUTOMATIC VS. MANUAL DEFRAGMENTATION

	Diskeeper® 8.0	Built-in defragmenter
Completely automatic – requires no user or IT staff intervention	Yes	No
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Addresses critical reliability issues	Yes	No
Server-specific edition designed for large servers	Yes	No

Automatic defragmentation is essential!

Disk fragmentation is a cancer that eats away at speed and reliability—and the defragmenter built into Windows is simply too slow, too obtrusive, and too labor-intensive to solve the problem. In fact, most IT departments that rely on the built-in defragmenter wind up never defragmenting at all.

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On Technology

Staying Connected on the Road

The rational shopper keeps a car for a decade before buying a new one. Cars don't wear out before then, and most safety improvements have already been made. But if you appreciate cutting-edge technology, consider leasing, so that you can have the latest and the best every three or four years.

A case in point is telematics. I've driven several cars recently with built-in driver assistance systems, the best known of which is OnStar. Driver assistance systems are cellular-based and have embedded GPS connections; they can diagnose why the Check Engine light comes on, provide operator-assisted trip information, remotely unlock doors, call for help if an airbag deploys, and track down your car if it's stolen. They've been passably good in the past, they're better now, and they'll be really good in, say, 2007—just about the time you'll be ready to turn over your leased car.

In 2000, when telematics was barely a \$1-billion-a-year industry, analysts predicted it would grow to \$40 billion a year by 2010. More realistically, it might be half of that. But that would still average \$15 a month for every family in America.

The new reality recognizes buyer price resistance as you push down from Cadillacs and Jaguars to Saturns and Volkswagens. The cheapest service is still \$15 a month. Fortunately, the cost of hardware is coming down to about \$350 per car. Research shows that Americans like the safety features of telematics, Europeans are more concerned about navigation and trip-routing assistance, and the Japanese look for infotainment. Safety is a broad term here: For every emergency airbag notification that OnStar receives, it gets 40 sheepish calls from owners who locked their keys in their cars and 300 calls for directions.

The majority of the telematics cars I've driven used OnStar, which has 2.5 million subscribers. OnStar serves Acura, Audi, General Motors, Isuzu, Lexus, Subaru, and Volkswagen cars. It has simple, three-button controls: one for emergency help, one for nonemergency services (such as directions and traffic reports), and one for cellular calling.

Competitor ATX has about one-fifth the subscribers and is in BMW, Ford, Jaguar, Lincoln, and Mercedes cars. It's always branded by the car maker,

though. For example, it's known as Mercedes TeleAid in Mercedes cars. ATX has similar emergency, assistance, and concierge services, plus the ability to swap service information with your dealership. In BMWs, where it's called BMW Assist, ATX calculates when you're due for a tune-up and sends the information to your dealer. This sort of customer relationship management (in business-school-speak) provides value to the automaker and reduces the cost of warranty repairs.

With either ATX or OnStar, you're connected to a pool of operators so friendly they must have been trained at Walt Disney World. For the most part, the information you get is accurate. At the same time, it may leave you wanting more. Why can't OnStar transfer trip directions to my car's pricey GPS display? Why can't I link my cell phone or PDA to the in-car electronics? (That ability is coming.) Why can't I use the cellular connection for concierge services on my ATX car? (That would require a second cell phone.)

There's progress, though. Voice recognition is getting better, with IBM making great strides in this area. Just this year, OnStar switched from analog-only to analog/digital service, an important change because the FCC might allow the analog cellular network to be shut down in 2008. OnStar is holding on to analog, because it has more range in nonurban areas, even though the voice quality is worse.

Telematics offers some big perks: In the future, you'll be able to check where your kids are and how fast they're driving, or negotiate a lower insurance rate if you don't use your car during prime drunk-driving hours. But there are potential downsides as well. To get that insurance discount, you'd have to prove your driving history with telematics. Do you really want Geico to know that much about your life?

The FBI recently tried to wiretap a suspect's telematics-equipped car—essentially listening through his cell phone when he wasn't calling—and couldn't get a warrant, because the method would have disabled his emergency capabilities. You have to hope the feds want to wiretap only the bad guys.

MORE ON THE WEB: You can contact Bill Howard directly at bill_howard@ziffdavis.com. For more On Technology columns, go to www.pcmag.com/howard.



The growing telematics industry will keep you safe and informed when you're driving.

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SOLUTIONS

Clean Your Audio

Here's how to get rid of the snaps, crackles, and pops in your recordings. **BY DON LABRIOLA**

It's not hard to transfer your record or tape collection to digital media. All you need is a PC or digital recorder with analog inputs and the patience to record your albums one at a time.

The tricky part is producing results that are free of the artifacts and noise that plague legacy recordings and poorly made digital copies. Most of us have

learned to tolerate hiss, crackling, pops, and hum on analog media, but those defects can be hard to stomach in a pristine format like CD or DVD audio.

Audio restoration tools that address these problems range from simple free-ware utilities to kilobuck programs designed for law enforcement and professional multimedia authors. Their features vary considerably, but most include all

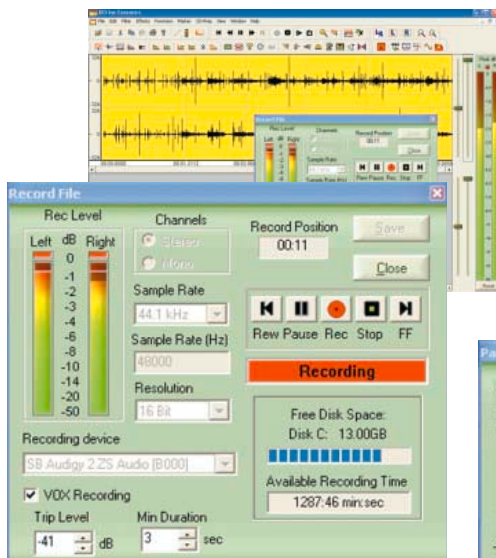
the tools you'll need to perform the tasks we describe here. In our examples, we use Tracer Technologies' application DC Live/Forensics (\$1,399 direct), which offers some of the most advanced audio restoration and forensics tools available. Tracer also offers \$59 and \$199 versions of the program that perform many of the same functions (www.tracertek.com).

Your restoration job will be much easi-

er if you can control how you record your source material to digital. Avoid degrading quality with unnecessary format conversions by recording at the same sampling rate and bit depth as your final storage medium: 44.1 kHz, 16 bits for an audio CD; 48 kHz, 16 bits for a DVD video soundtrack encoded into Dolby Digital format; and 96/24 or 192/24 for DVD audio content.

Always record to an uncompressed format like WAV or raw PCM, and avoid ripping to lossy formats like MP3, which can play havoc with some noise reduction tools. Most important, watch your recording level. Unlike analog recording, digital sound produces nasty-sounding distortion if your level strays even slightly into the red, and even the best tools may not fix that. Choose a level that places your highest amplitude peaks at -3 dB or -6 dB.

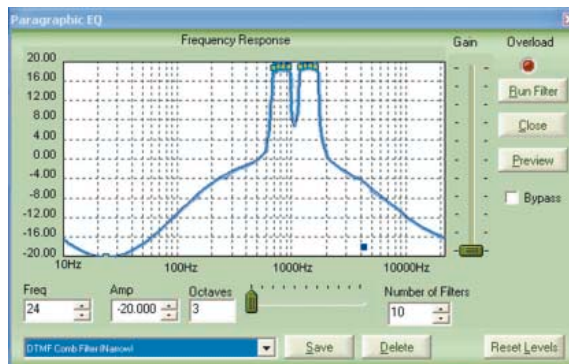
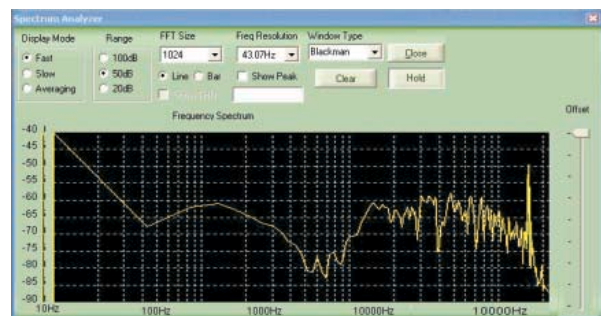
Every recording has unique sonic characteristics that you'll need to analyze before deciding on a restoration strategy. Play your sound file over good headphones and listen for distortion, clipping, hiss, pops, and dropouts, then play it again on a speaker system that has



1 RECORD YOUR SOURCE MATERIAL. Be sure to use a program that provides real-time recording-level meters. Inadvertently straying above 0 dB can produce bursts of nasty-sounding digital distortion.

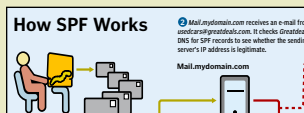
2 PLAN YOUR ATTACK.

If your package includes a spectrum analyzer, use it to find systemic problems in your recording. In the figure, the source recording displays a spike of fixed-frequency noise at about 16 kHz. Because the peak is narrow and sharply defined, it can be removed easily.

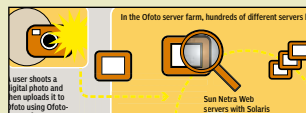


3 FILTER FIXED-FREQUENCY NOISE.

Some audio restoration programs provide specialized tools that isolate fixed-frequency noise. DC Live/Forensics' DTMF Comb Filter, for example, is used by investigators to remove everything except the fixed-frequency sounds that make up telephone Touch-Tones.



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MAKING TECHNOLOGY WORK FOR YOU

enough low-end response to reveal sub-sonic noise. If your software includes a spectral analyzer, use it to generate a graph that shows fixed-frequency artifacts, like the 60-Hz hum produced by poorly grounded electronics. Once you've identified which flaws you want to correct, tackle them one at a time.

Start by filtering out any fixed-frequency noise. Most programs let you do this with a *parametric equalizer*, which provides definable tone controls that boost or cut any frequency range you choose. Parametric equalizers let you eliminate simple fixed-frequency noise components easily. But if you're trying to eliminate a more complex sound, like ground hum, you may also need to remove its first few (and most prominent) harmonics, which occur at 120 Hz, 180 Hz, and higher multiples of the 60-Hz fundamental frequency. Some programs provide hum and buzz filters that handle this automatically.

Your next target should be impulse noise, which includes short-duration artifacts like clicks, scratches, and crackling. Virtually all audio

restoration programs provide declipping tools, with presets for different types of impulse noise, but you'll often need to make several passes, eliminating shorter-duration spikes each time. You may also wind up removing a few persistent clicks manually.

The trickiest part of most restoration jobs is eradicating continuous broadband noise, like tape hiss. The filters provided for this usually produce only modest results with default settings, and learning how to set each parameter takes a lot of experimentation. Don't try to operate a broadband-noise filter without reading the manual, and make sure your program has real-time preview capabilities.

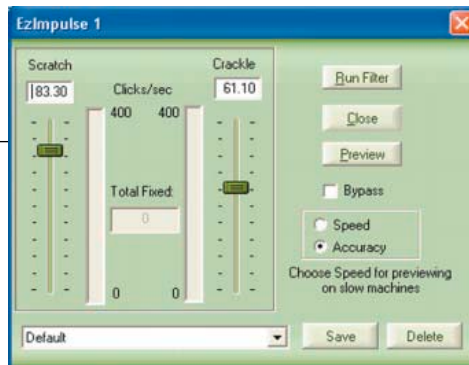
Many broadband-noise tools try to determine optimal settings automatically by analyzing a short sample of your recording's noise. If your package offers this feature, select a sample that contains no

sound other than the noise itself and is long enough to give the filter enough data (at least half a second). Even if the filter can't suggest perfect settings, a well-chosen noise sample should get you close.

If you've gotten this far, your sound file should be relatively noise-free. Don't be discouraged if it still isn't perfect. Cleaning up noise sometimes exposes difficult-to-remove types of distortion that weren't evident at the outset. Today's audio restoration tools excel at removing artifacts and noise, but they can rarely replace lost detail. Nonetheless, with the right tools and a little experimentation, you should be able to improve even the most severely compromised recordings.

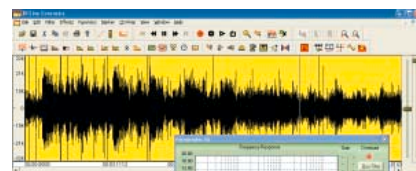
Don Labriola is a contributing editor of PC Magazine. Special thanks to restoration expert Curtis Crowe of Tracer Technologies for assistance in preparing this feature.

4 REMOVE IMPULSE NOISE. Every noise reduction application includes at least one "click and pop" filter, but all filters operate differently. You can simplify the procedure by choosing a program equipped with a good selection of presets that are preconfigured for different types of impulse noise.



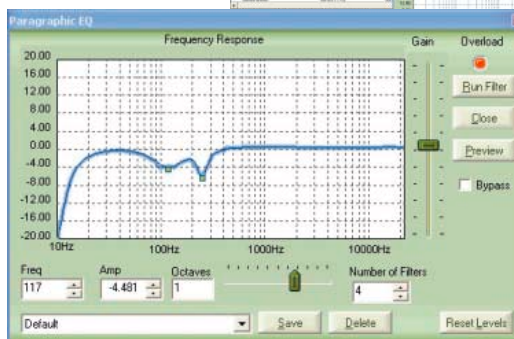
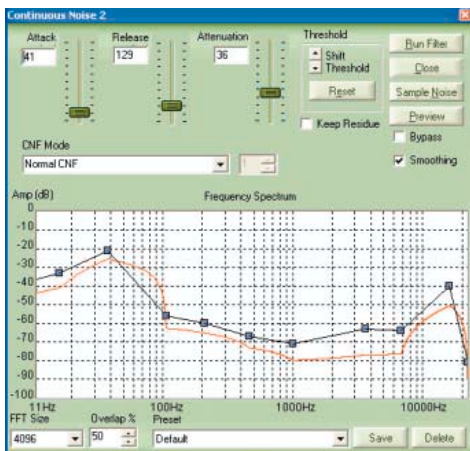
MORE ON THE WEB

Visit www.pcmag.com/solutions to download audio samples that demonstrate the techniques in this story. You'll also find a handy troubleshooting chart and a guide to current audio software.



5 REDUCE BROADBAND NOISE.

Many broadband noise filters have esoteric, nonintuitive controls, but most can be auto-configured by feeding in a small sample of your source material's continuous noise. The resulting settings don't always produce perfect output, but they'll get you most of the way there.



6 PERFORM A FINAL TOUCH-UP. A comprehensive package should include tools that let you clean up audio problems that become apparent only after the noise is gone. These include equalizers, special-purpose filters, and harmonic enhancers that liven up dull recordings.

SECURITY WATCH

Stopping Spam

SMTP authentication is a giant step toward eliminating spam and worms. But putting it in place won't be easy. **By Larry Seltzer**

If you look carefully at messages containing spam and e-mail worms, you see some things that aren't right. In almost every case, the addressing information that accompanies any such e-mail message is fraudulent. (For more information see "Heading Off Spam" at www.pcmag.com/article2/0,4149,929898,00.asp.) This is an important characteristic of these messages—and a big part of what allows them to spread so far and be so resistant to defensive measures. A solution is on the way, but it won't come easily.

The solution is SMTP authentication. The idea is that when one mail server receives a message from another, there should be some mechanism for confirming the sender's identity. That wouldn't put an absolute end to spam and e-mail worms, but it would put considerable hurdles in their path. It would make effective blacklisting practical, and it would stop the existing, endemic population of worms from spreading.

Why hasn't this happened already? There are a number of proposals in various stages of development, but progress in so fundamental an area takes time. More important, perhaps, is that implementing SMTP authentication would almost certainly require every e-mail server on the Internet to be upgraded and

thus would cause considerable disruption and expense—even if the implementation is free of intellectual-property entanglements and direct cost.

Many mail servers out there haven't been upgraded in years. It may be impossible to change some, such as those in appliances, and those will need to be replaced. SMTP authentication requires nothing of the end user, though, which is one of the factors that make it so appealing.

Most SMTP authentication schemes take a somewhat similar approach: The DNS administrator of the domain where the mail server is located must publish information that allows external users to confirm the identity of the domain's mail servers. There are a number of ways to do this. With most of them, the recipient server can confirm that a message purporting to come from *user@domain.com* in fact does come from *domain.com*. Whether the message actually came from the specified user is a matter for the *domain.com* administrators to enforce.

This last point is important: For SMTP authentication to work properly, SMTP software and administrators will have to tighten procedures. For instance, open relays—which are mail servers that allow anyone to connect and send mail through

THE LOOKOUT

MICROSOFT'S PLAN

On February 24, Microsoft Chairman Bill Gates announced a proposed open standard to deter e-mail spoofing, a scheme deemed "Caller ID for E-Mail." Outlined in a speech to the security experts at the RSA Conference in San Francisco, Microsoft's proposal echoes the emerging industry consensus that the e-mail infrastructure must be changed in order to make serious progress in the battle against spam.

The actual "Caller ID for E-Mail" specification (www.microsoft.com/mscorp/twc/privacy/spam_callerid.msp) calls for a system that has much in common with competing proposals. Like the SPF specification, its basic mechanism involves requiring domains that send messages to add records to their DNS that will let recipients determine the IP addresses of the servers authorized to send messages from those domains. If the address from which the message was received isn't on that list, it's likely that it was spoofed. Read more about Microsoft's plan at www.eweek.com/print_article/0,3048,a=120099,00.asp.—LJS

them—will have to be eliminated, so users will be forced to log on to the server if they want to send mail.

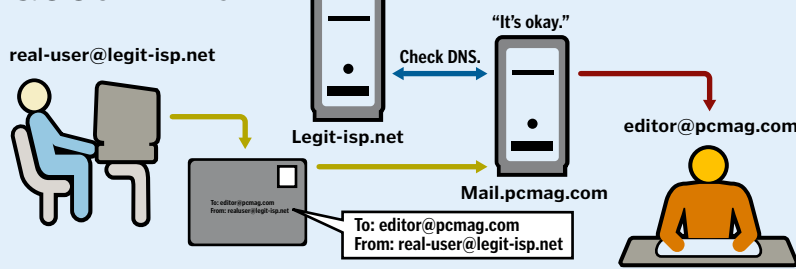
Other security improvements are also necessary. Trivial passwords, like *password* or the same value as the username, need to be banned, or worms will guess at the values. For the same reason, servers will need to disable accounts if a specified consecutive number of wrong guesses at log-on are attempted. Practices such as these are common in other network log-on scenarios.

Beyond security, we can expect other problems with SMTP authentication. Many of the proposed schemes break mail forwarding, which allows one address to forward mail to another. Instead, servers will have to re-mail each message.

By the same token, many roaming users will have problems, for instance with sending mail "from" their corporate accounts using separate ISP accounts. Such users will probably need to use VPNs.

SMTP authentication will also mess with those E-mail This Page links on many Web pages. Usually such features

Good E-Mail

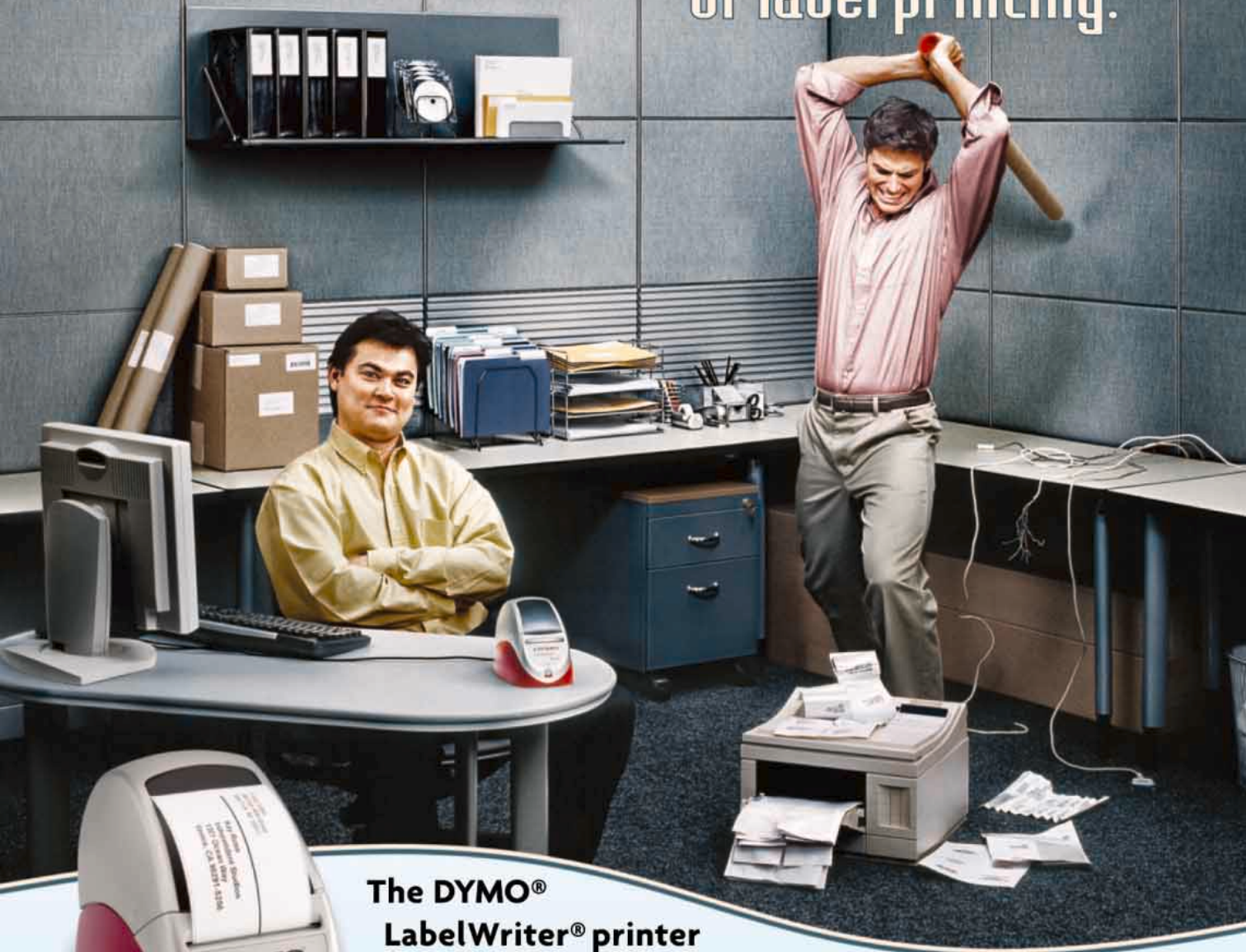


1 A real user (*real-user@legit-isp.net*) sends a message to another real user at some other domain (*editor@pcmag.com*).

2 The *Pcmag.com* mail server checks with the *Legit-isp.net* DNS to see whether the sending mail server is approved. It is.

3 *Mail.pcmag.com* accepts the message and sends it on to *editor@pcmag.com*.

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With SPF, data in a site's DNS server lets mail servers confirm where messages come from.

will send an e-mail from your address to someone else's address. With authentication, the message will have to come from a domain controlled by the Web site.

The most mature authentication scheme is SPF (Sender Policy Framework, <http://spf.pobox.com>), which was published as an Internet Draft on February 11.

Put very simply, with SPF the site advertises data in its DNS server, and other mail servers can use the data to confirm that a message sent from that server actually comes from the domain it claims to come from. Quite a few systems have begun implementing this scheme. As of February 10, 6,708 domains had put SPF records in their DNSs, including aol.com, gnu.org, google.com, symantec.com, tickmaster.com, and w3.org. Deersoft will use SPF in Version 2.70 of SpamAssassin, and Sophos plans to support SPF in upcoming releases of its antispam product PureMessage.

Since SPF works by checking the addresses of mail servers, it is subject to the problems noted above, such as breaking message forwarding and inconveniencing traveling users. There are workarounds for these problems, and even if they require changes in the mail server, that's not a big deal, since the mail server will have to change in order to support SPF anyway. Free tools are available to help you to implement SPF on your own site, including a wizard that builds the DNS entries.

Yahoo!'s Domain Keys proposal, announced

several months ago but not revealed in detail, takes the idea of authentication to the next level. Instead of working with IP addresses, Domain Keys works with public-key encryption. The sending mail server signs each message using its private key and includes the signature in a special message header. Recipient mail servers can retrieve the sender's public key from the DNS to confirm the signature. In fact, with Domain Keys a domain can have many public/private key combinations for various purposes, such as supporting subdomains or even different keys for different users.

DNS Security Extensions (DNSSEC) also works with public-key encryption and, much like Domain Keys, allows mail servers to sign some portion of each message with a private key and allow outsiders to authenticate the signature with the public key. If the signatures match, the message's origin is authenticated; if not, the message is suspicious. But DNSSEC itself may not be secure and may introduce other problems. It's a controversial spec that has been in the works for over ten years, held up both by the problems it would create and by inertia.

Several other proposals are out there in various stages of development and neglect. Two of them, Remote Mail Exchange (RMX) and Designated Mailer Protocol (DMP), were scavenged to create SPF. The RMX spec creates a new RMX record type for the DNS, which in turn requires

upgrades to DNS. RMX is more ambitious than SPF, in that it aims to authorize not just domains but e-mail addresses. DMP is still alive too, and claims it doesn't break mail forwarding. Neither has a practical implementation yet.

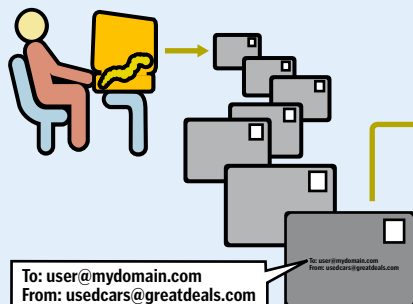
Authenticated Mail Transfer Protocol (AMTP) is different from the others. It actually replaces SMTP by creating a secure connection between mail servers, using Transport Layer Security (TLS) and X.509 certificates. The specification is still in development.

Faced with SMTP authentication, what could a worm author do? The worm would have to send mail from the same domain as the mail server to which it connects. Then it would have to trick the user's mail client into sending the message or sniff the log-on credentials from the network. Neither option is easy, and in both cases the worm would be sent from the actual user's address.

We feel SMTP authentication has a reasonable chance of success only if the major mail providers—principally AOL, Microsoft, and Yahoo!—agree on one proposal and give a date beyond which they will either reject or tag unauthenticated mail. SPF is the clear candidate for that proposal. They need to move quickly before spam overwhelms us.

Larry Seltzer is the editor of eWEEK's online Security Center (<http://security.eweek.com/>).

How SPF Works



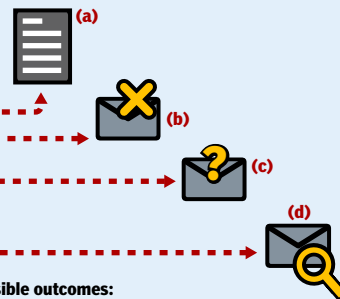
1 A user launches an attachment from a strange e-mail message, unleashing a worm that harvests e-mail addresses from his hard drive. The worm sends e-mail using its own SMTP engine. Often the messages deliberately misidentify the sender.

2 Mail.mydomain.com receives an e-mail from usedcars@greatdeals.com. It checks Greatdeals.com's DNS for SPF records to see whether the sending server's IP address is legitimate.

Mail.mydomain.com

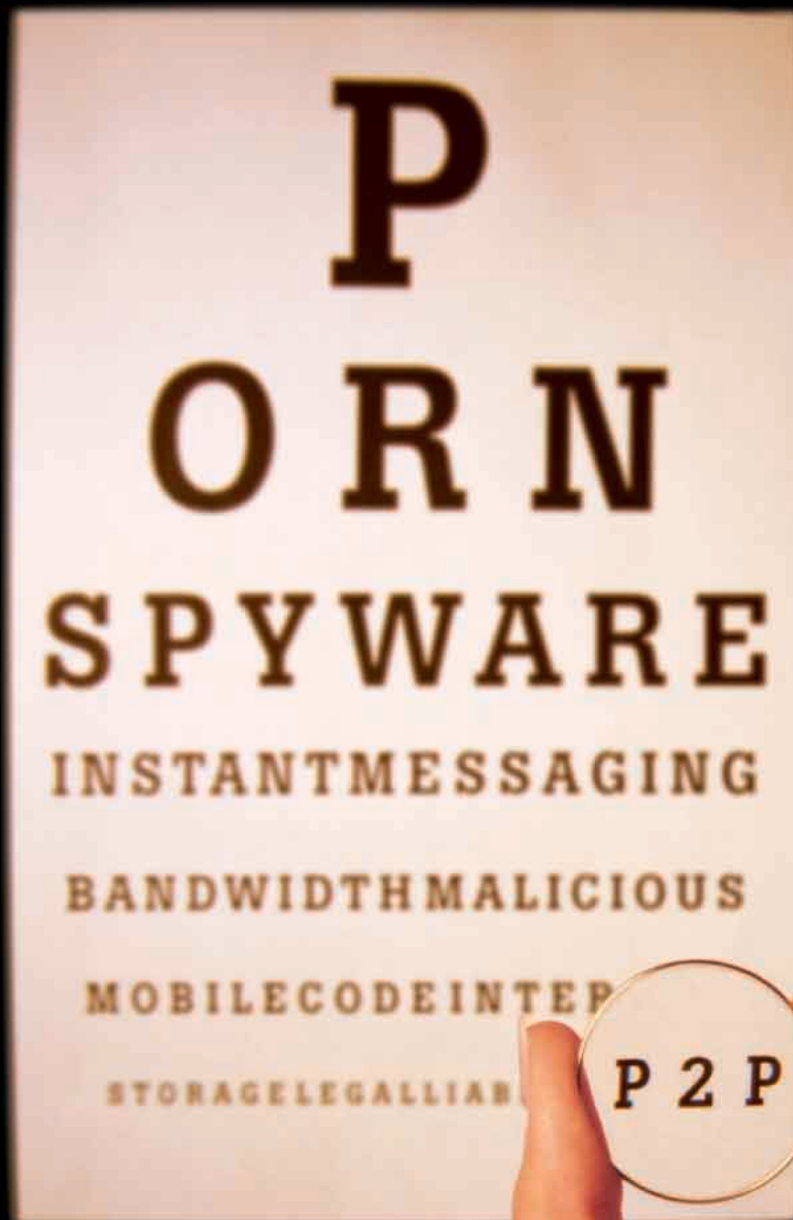
Check DNS.

Greatdeals.com



3 Possible outcomes:

- (a) If the sender is authorized, Mail.mydomain.com may check its own blacklist to see whether Greatdeals.com is a known spammer.
- (b) If the sending server is not on Greatdeals.com's list of authorized senders, the spoofed message is rejected.
- (c) If Greatdeals.com hasn't implemented SPF in its DNS, the message is suspicious. Whether it should be rejected or tagged is a policy decision.
- (d) If the message is accepted, it still has to be checked for viruses.



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March 16, 2004
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INTERNET BUSINESS

Ofoto on a Roll

Home photo printers are taking off, but that doesn't spell doom for this online photo site. **By Alan Cohen**

There's a little bit of irony in the role technology has played at Ofoto, the online photography service. The site owes its existence and growth to advances in digital photography. More consumers buying more cameras mean more photographs to be stored, shared, and printed by Ofoto—which means more business for the four-year-old company.

On the other hand, advances in photo printers mean that photobugs can now print high-quality prints at home—which means less business for Ofoto. The challenge is to hone its business model and use its technology to keep users online.

While Ofoto—a subsidiary of the Eastman Kodak Company—counts over 11 million members, only about 1 million have ever bought anything from the site, such as a print, calendar, or greeting card. The other 10 million members are simply posting, sharing, and viewing their photos. These activities are free, but for Ofoto, they can get expensive.

A 5-megapixel digital camera can produce 1MB JPEG files, so just a handful of photos can require sizable storage space. There are some 300 million images residing with Ofoto, and that number is growing. In 2003, the company counted several days when users uploaded more than a million JPEGs. "We have huge numbers of terabytes of storage to which we're constantly adding," says James Joaquin, executive vice president of Ofoto.

Why keep giving away so much space? For Ofoto, storage is a loss leader. "The more photos users send us," says Joaquin, "the more they share, the more we print."

The goal is to get more of the 10 million share-only users to join the 1 million paying users. To encourage them, Ofoto has made some careful decisions. For example, it shuns tape backup for storing old photographs. Everything—from the vacation

snapshot you uploaded yesterday to the family portrait you shot four years ago—is stored on hard drives.

"Spinning storage is reliable and inexpensive," says Joaquin. "And it lets us go back to the oldest photographs in your account and instantly get a high-resolution image for printing." Ofoto stores two versions of each uploaded image: a high-resolution copy used for printing and a lower-resolution thumbnail for viewing.

Keeping track of these copies and the related information requires proprietary database architecture. Ofoto's Sybase database contains what Joaquin calls the "metadata," including captions, names of albums, order of photos in albums, and thumbnails. Because the high-resolution images are so large, they need to be stored outside the database, in Ofoto's massive storage system, specifically network-attached storage and storage-area network systems from multiple vendors.

Another way to encourage print sales

is to let members change the tint or color saturation, add borders or greetings, and see the results on-screen. For this, Ofoto uses several dozen Dell systems running Linux as imaging servers.

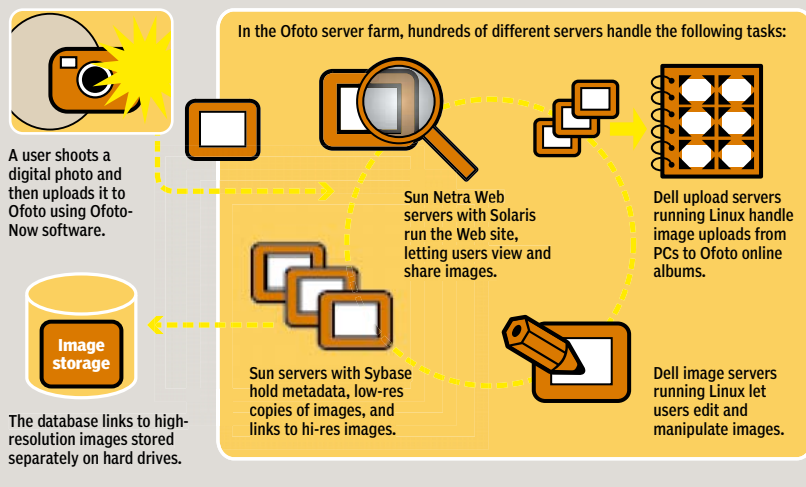
All of this technology may be impressive, but so, too, are the latest home photo printers. "At first we were worried about them," Joaquin concedes. "The quality you can get at home is getting better." Indeed, over 75 percent of Ofoto's paying customers also print at home.

That doesn't necessarily spell doom for online photo sites. While it may be easier to use a home printer for printing out a photo or two on the spot, Ofoto, Joaquin claims, is better suited for printing larger orders. "That's why sharing is so important to our business. When Grandma wants a full set of pictures from the family reunion, Ofoto is the easiest option." The company is so confident that it can coexist with photo printers that it plans to let album viewers print online images on their home printers free of charge.

One new technology promises to boost Ofoto's revenues: the camera phone. In January, Ofoto showed Kodak Mobile, which will let members upload, view, and share photos wirelessly from their phones. Of course, they'll be able to order prints, too. For Ofoto, wireless devices are picture-perfect for growth—at least until someone invents a printer phone.

A Picture-Perfect Infrastructure

At Ofoto headquarters in Emeryville, California, hundreds of servers are organized into clusters to handle all the tasks necessary to store, manipulate, and print images.



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Understanding Client-Side Scripting

To make your Web pages come alive, you need to understand the Document Object Model. **By Sheryl Canter**

You can create an attractive, colorful Web page just using HTML. But without some scripting, the page will just sit there, unresponsive to user actions. Scripts can run either on the Web server (server-side scripting) or on the user's computer (client-side scripting).

Server-side scripts are best suited for delivering custom or dynamic content. But what if you want a Windows-like menu bar on your Web site, or an expandable tree? You could implement these interface elements in a server-side script, but there are serious disadvantages to doing it this way: Your interface will be sluggish and you will greatly increase the bandwidth used.

A better solution is client-side scripting, which is designed to manipulate and display the content returned from the server. This method enables you to respond to user events by hiding or showing elements on the page, moving elements, or changing colors and fonts. Showing and hiding tables is the essence of how you create a pull-down menu on a Web page. Displaying a window in response to the mouse position allows a Web page to support ToolTips.

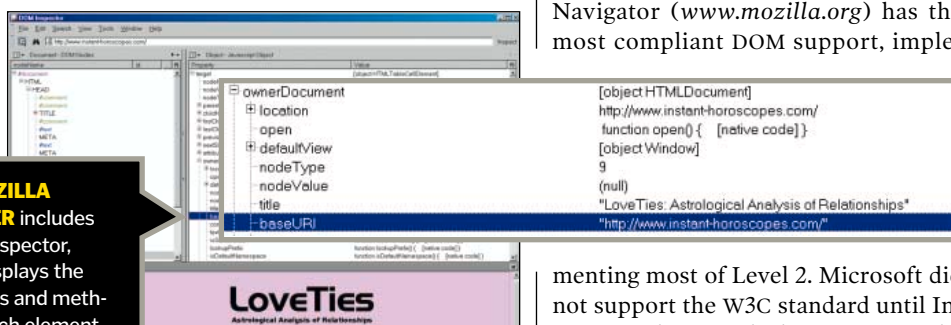
The most widely used client-side scripting language is JavaScript, which was invented by Netscape Communications and introduced with Netscape Navigator 2.0. Microsoft's JScript was released in response to JavaScript's success, and is essentially a clone. However, the two are not completely compatible.

JavaScript is more widely used than it is understood. Thanks to the many cut-and-paste JavaScript Web sites, Web designers can incorporate JavaScript func-

tions without any concept of how they work. But if you want to go beyond cut-and-paste to create your own cool effects, you need to understand JavaScript.

JavaScript is an object-oriented scripting language that runs inside a Web browser. It manipulates elements on a Web page by means of a Document Object Model, or DOM, which is an API for interacting with a Web page. The ele-

THE MOZILLA BROWSER includes a DOM Inspector, which displays the properties and methods of each element in a Web page.



ments in HTML documents are hierarchical, and are represented in the DOM as a tree structure. Each element in the tree is an object with properties and methods that are defined by the DOM. For example, a Web page is represented by a document object. Its properties and methods include the title property (document.title), which gives the title for the page, and the write method (document.write), which lets you output text. Objects can be addressed in terms of their position within the tree, or accessed directly by tag, name, or ID. The DOM also provides an interface for user events such as mouse movement or key clicks.

The DOM is separate from the language itself; different languages can implement the same DOM. Unfortunately, different versions of JavaScript can and do implement different DOMs, which hugely complicates the job of Web developers. The differences between the Netscape and Microsoft DOMs are particularly bothersome. JavaScript code of

any degree of complexity must include two versions of each function. Developers end up writing an API where each function they want to call is replaced with a version that tests the browser and calls the browser-specific version.

To stem the chaos, the W3C stepped in with a DOM standard for HTML and XML. DOM Level 1, which was completed in October 1998, focuses on basic navigation and manipulation functions. Level 2, completed in November 2000, adds support for XML namespaces, Cascading Style Sheets (CSS), and user interface events. Level 3, which is still under development, will offer enhanced XML support and other advanced features.

But defining a standard is not the same as getting vendors to use it. So far Mozilla, the open-source version of Netscape Navigator (www.mozilla.org) has the most compliant DOM support, imple-

menting most of Level 2. Microsoft did not support the W3C standard until Internet Explorer 6, which supports Level 1. Adding to developer stress is the fact that Microsoft's current proprietary implementation has some nice features that the W3C version lacks, such as the innerHTML property, which represents all the character data between an element's starting and ending tag.

The best tools for JavaScript development are built into Mozilla. The Mozilla DOM Inspector displays the DOM tree and flashes the selected element in the rendered Web page, which it displays in the lower window. Mozilla also has a JavaScript console and a debugger.

The learning curve is steeper for JavaScript than it is for server-based scripting, because of the complexity of the DOM and the need to learn multiple DOMs in order to support the most popular browsers. But the payoff is a unique and distinctive Web site that your visitors will enjoy exploring.

Sheryl Canter (www.sherylcanter.com) is a contributing editor of PC Magazine.

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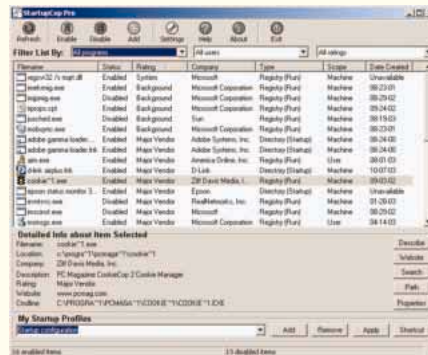
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USER TO USER

PC MAGAZINE'S COMMUNITY OF
EXPERTS AND READERS**Organize Your Desktop**

I have over a hundred applications that I use regularly. Rather than leaving them where I have to drill down to start each one, I prefer to keep them all on my Desktop, where I can access them quickly. I



YOU CAN ORGANIZE your application icons by category on your Desktop.

tried a number of ways to organize the icons, with little success. I finally hit on a simple solution, which readers with a similar problem may find helpful.

Using a graphics program such as Adobe Photoshop, I designed a background screen to organize the apps into logical groups. I made this screen my Desktop background and moved the icons into easily recognizable areas corresponding to categories. Now I don't get lost trying to find my next selection.

BILL EBURN

This is a novel approach to desktop organization. Be warned, though, that even when you don't request it, Windows sometimes will sort your icons by name or otherwise rearrange them, thereby ruining your hard work.

To complete this organization solution, you'll want a program that can maintain your icons' positions on the Desktop. *PC Magazine* utilities WinTidy and IconLock (www.pcmag.com/utilities) take different approaches to solving the problem. One of them should do the job.—Neil J. Rubenking

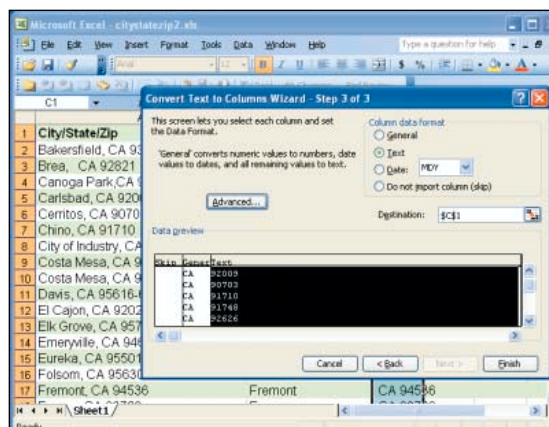
Another Way to Separate Address Elements

The method of separating address elements in the February 3 issue (page 76) is a good illustration of Excel's text functions, and anyone who is serious about learning

Excel should study that approach. For this particular problem, however, there is an easier way. Excel has a Text to Columns wizard, found under the **Data** menu, that can handle the job without any need for formulas. Using the wizard for address separation requires two passes.

The first pass separates the city from the state and ZIP code. In step 1 of the wizard, select **Delimited**. In step 2, select **Comma** as the separator. In step 3, select a blank column as the destination; if you don't do that, the first result column overwrites the input column.

On the second pass, to separate the state from the ZIP code, select **Delimited** in step 1. In step 2, check **Space** as the separator, and check the box **Treat consecutive delimiters as one** to avoid problems with extra spaces. In step 3, mark the first (blank) column as **Do not import** and the third column (ZIP code) as text, so it will be left-justified.



THE TEXT TO COLUMNS wizard moves elements in one column to other columns.

You can use the time you saved by not writing formulas to do an AutoFilter on the state field. You can easily see and correct errors caused by missing commas or spaces in the input. If, for example, there were many instances of run-together states and ZIP codes, you could copy those records to a new range and use the fixed-width option in step 1 of the Text to Columns wizard to separate them.

E.D. LYNCH

Quite a few readers wrote with similar suggestions. Yes, if you're willing to modify the data, the Text to Columns wizard can be very useful. Note that an address with no space after the comma will not import correctly; it will have a ZIP code in the state column. Note too that it's very important to mark the ZIP code column as text. If you don't, leading zeros will be dropped.

After reviewing the entries and fixing any problems, you may want to replace the original run-together city/state/ZIP entry with a string concatenated from the separated parts. For example, if the city, state, and ZIP are in columns B, C, and D, enter this formula in cell A2: =B2 & ", " & C2 & " " & D2. Then copy this formula to the bottom of the column. Now your combined city/state/ZIP will always be in sync with the handily separated address elements.—NJR

Conditionally Executing Macro

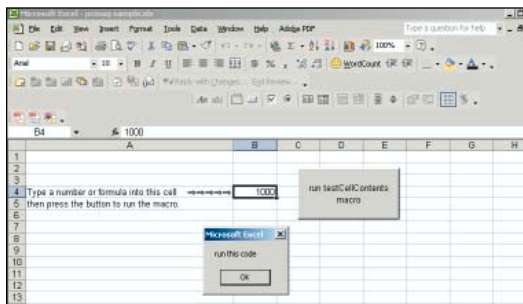
I have a problem with an IF code statement in a Microsoft Excel macro. I can't get the macro to go to cell B4 and then perform an action if the value in B4 is greater than zero. How do I do this?

MURRAY DOYLE

Here's a solution that checks to see whether the value in cell B4 of Sheet 1 of the current workbook is both greater than zero and not a text entry. If both tests return true, the statements following the Then command will be performed.

Even when you don't request it,
Windows will sometimes rearrange your icons.

Microsoft Windows XP won't allow you to uninstall Internet Explorer.



THE MACRO CHECKS the value in cell B4 and runs if the value is greater than zero.

The IsText function ensures that text typed into cell B4 won't trigger your code.

```
Sub testCellContents ()
    Dim myRange As Range
    Set myRange = Worksheets
("Sheet1").Range("B4")
    If myRange.Value > 0 And Not
(Application.WorksheetFunction.
IsText(myRange)) Then
        MsgBox "run this code"
    End If
End Sub
```

To adapt this example, replace the MsgBox with your own code and, if desired, alter the sheet name or the cell reference or both.—Helen Bradley

Remove "Orphan" Internet Explorer Toolbars

I downloaded and installed the program Download Accelerator Plus. I used it for a few weeks, then I uninstalled DAP and its toolbar. I thought I had completely uninstalled them, but the toolbar name still shows up when I click on View | Toolbars. Is there any way that I can delete the name so it won't show up next time?

EDWARD CHEN

It's unfortunate that DAP's uninstall routine didn't completely clean things up, as manual-

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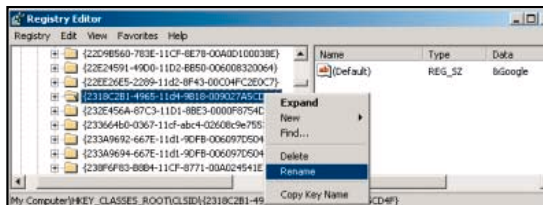
If we print your tip, you'll receive a PC Magazine T-shirt. We regret that we cannot answer letters individually.

ly removing the remnants will be a bit tedious. Launch REGEDIT from the Start menu's Run dialog and navigate to the key HKEY_CURRENT_USER\Software\

Microsoft\Internet Explorer\ToolBar\WebBrowser. You should find at least one value in the right-hand pane with a name that's a GUID—a bunch of letters and digits between curly brackets,

like {2318C2B1-4965-11D4-9B18-009027A5CD4F}. One such value represents the absent toolbar, but to find out which one, we'll have to look elsewhere.

Work through the list of GUID-named values from the bottom, as the top ones usually represent IE's own toolbars. Navigate



ALWAYS REMEMBER to rename a key and see what happens before deleting it.

to the subkey of HKEY_CLASSES_ROOT\CLSID whose name is the same as the name of the value; for example, HKEY_CLASSES_ROOT\CLSID\{2318C2B1-4965-11D4-9B18-009027A5CD4F}. Check the (Default) value in the right-hand pane to see which toolbar it represents. The example shown here is the Google toolbar.

When you've identified which one corresponds to the absent DAP toolbar, right-click on it, choose *Rename*, and prefix the name with a period. That's safer than deleting the key; if you make a mistake, you can restore its name. Back in the HKEY_CURRENT_USER\...WebBrowser key, rename the corresponding value in the same way. After you've verified that the unwanted entry in the toolbar list is gone, you can go back and delete the key and value that you renamed.

Note that in Windows XP Service Pack 2,

due sometime in the first half of 2004, *Internet Options* will include a dialog for managing add-ons such as toolbars and Browser Helper Objects. We anticipate that it will make solving problems like this one much easier.—NJR

Repair Internet Explorer 6 Under Windows XP

Microsoft Windows XP won't allow you to uninstall Internet Explorer. How can you fix the browser or even reinstall the program if it becomes corrupt?

BOB RAKOCY

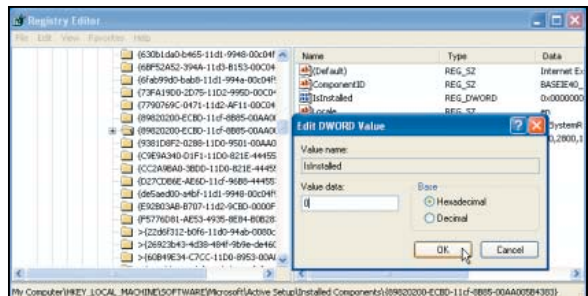
If you don't yet have the very latest Internet Explorer, you can fix many problems by visiting <http://windowsupdate.microsoft.com> and updating to the latest version. If

you're already up to date, however, the site won't let you reinstall the program. You need to fool the system into thinking you don't have the latest version.

Launch REGEDIT from the Start menu's Run dialog and navigate to the key HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Active Setup\Installed Components\{89820200-ECBD-11cf-8B85-00AA005B4383}. In the right-hand pane, double-click on the DWORD value IsInstalled and change it from 1 to 0

(no matter whether you choose Decimal or Hexadecimal). Close REGEDIT and go to the Windows update site again. Now it should let you "update" IE and, with luck, fix the problems.

By the way, you can do the same thing if



IF YOU WANT TO FIX or reinstall IE, you need to make Windows think that you don't have the latest version.

you need to repair Outlook Express, but at the key HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Active Setup\Installed Components\{44BB840-CC51-11CF-AAFA-00AA00B6015C}.—NJR

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1.877.GO1AND1

1 WEB HOST TODAY

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EVEN WAIVE THE SET-UP FEE

SWITCH TO 1&1 AND GET MORE TO BEGIN WITH:

OVER \$550 OF THE LATEST SOFTWARE - FREE WITH ALL HOSTING, SERVERS, AND ESHOPS

- NetObjects Fusion 7.5 -suggested regular retail price \$130
 - PhotoImpact 8 SE -suggested regular retail price \$90
 - Hello Engines! Professional 4.1 -suggested regular retail price \$170
 - Ranking Toolbox 3.0 -suggested regular retail price \$128
 - Wise FTP 3.0 -suggested regular retail price \$40
- (All software is free. \$6.99 shipping and handling charge applies.)



ALL THE POWER OF THE LATEST 2004 FEATURES

- in2site Live Dialogue
- Chat & Forums
- 1&1 WebStatistics
- 1&1 Newsletter Tool
- 1&1 WebDatabase
- 1&1 WebElements

THE BEST GUARANTEES IN THE INDUSTRY

- Money Back Guarantee: Test drive 1&1 risk-free for 90 days
- Service Guarantee: Your questions will always be answered promptly
- Performance Guarantee: We promise over 99.9% uptime
- Reliability Guarantee: Systems continuously monitored



1&1

FOR MORE DETAILS GO TO 1AND1.COM

IF A WEB HOST IS ONLY AS GOOD AS NOBODY BUT



THE MOST ADVANCED DATA CENTERS

- Our Data Center IV plus three other centers form the biggest web hosting arena in the world.
- 20,000+ servers already stationed in high-security zones with room for over 40,000 more.
- 43,000 GB of data stored and backed up. 255 million emails each month.

THE MOST EXPERIENCE

- 12 years experience and one of the first companies to offer web hosting.
- Long-time profitable company, over 1,100 employees.
- Part of publicly held United Internet, an industry leader with over 3,600 employees and \$500 Million in revenue.

THE MOST COMPLETE HOSTING SOLUTIONS

- All the new 2004 features to make your website truly interactive (see page 9 for details).
- One-stop shopping and upgrading from feature-rich shared hosting to dedicated servers.
- eShop packages to start you selling online.



Just one data center alone contains 11 rooms with space for over 660 racks for a total of 26,400 servers.



Lead gel batteries guarantee continuous power without interruption.



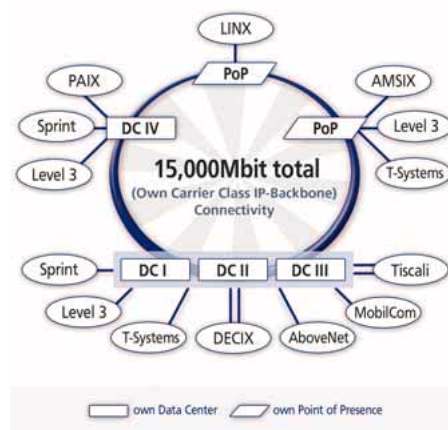
Powerful diesel generators supply constant, reliable power.

1.877.GO1AND1

OOD AS ITS DATA CENTER, EATS 1&1.

THE BIGGEST CONNECTIVITY IN THE INDUSTRY

- 15,000 Megabits versus the competition's limited bandwidth means more visitors get to your site faster.
- Nine fiber optic carriers piped in at different points gives us real redundancy. Multiple direct peerings.
- 1&1 Network Operations Center features 24/7 monitoring and administration by a dedicated team.



THE ONLY WEB HOST THAT CONTROLS ITS ENTIRE VALUE CHAIN

- Operate 4 data centers globally.
- A research and development team of over 150.
- Own backbone — We do not rely on third parties.

THE STRONGEST PARTNERSHIPS AND SUPPLIERS

- One of select Microsoft Joint Development Partners.
- Multiple Juniper M40s, Multiple Cisco GSR 12000.
- Part of the global Linux developer community from the onset.



1&1

FOR MORE DETAILS GO TO 1AND1.COM

DOMAINS

THE ULTIMATE SOLUTIONS FOR DOMAIN REGISTRATION

With the 1&1 Group, registering or transferring your domain is straightforward and fast. In minutes, you will have a professional web address plus lots of extras you won't get from anyone else. When you're ready, you can upgrade to send professional email or even build your own homepage. So, if you want to take your ideas to the next level, 1&1 has everything you need to get started.

.com .net .org .info .name

- 1&1 offers the best prices in the industry
- 1&1 has already registered 4 million domains
- 1&1 gives you more features for less money
- 1&1 provides free unlimited express support
- 1&1 Group is an accredited registrar, no middlemen

TRANSFER YOUR DOMAINS TO 1&1 TODAY. IT'S FREE.



RICH LOEN WWW.ETHERWATCH.COM

"Setting up my domain was quick and painless - and very cheap. I've been paying \$25 to \$50 per year for domains in the past - and have had very little control over the domain once it was set up. With 1&1 I was able to set up my email and website, and be online that evening. And with 1&1 Instant Mail I can check my email from anywhere. It's the greatest!"



1.877.GO1AND1

THREE INGENUOUS SOLUTIONS YOU DON'T HAVE TO BE A GENIUS (OR A MILLIONAIRE) TO USE.

<p>SECURE YOUR WEB IDENTITY WITH INSTANT DOMAIN</p>	<p>REGISTER YOUR NEW DOMAIN. It's fast, easy, and only the beginning of what you can accomplish online. What's more, the most affordable domains in the industry come without hidden charges and binding contracts.</p>
<p>\$0.49 PER MONTH (\$5.88 PER YEAR)</p> <p>BEST DOMAIN PRICE IN THE U.S.!</p>	<p>ENJOY THESE GREAT FEATURES & MORE:</p> <ul style="list-style-type: none"> ▪ 1 free email address (alias) ▪ Free unlimited email forwarding ▪ Free forwarding to any website ▪ Free domain parking for future use ▪ Masked forwarding 

OR WHEN READY, UPGRADE TO **INSTANT MAIL**

\$0.99
PER MONTH

PUT YOUR DOMAIN TO WORK. Easily arranged through your control panel, this add-on package gives you professional email power. With Instant Mail you can promote yourself more effectively, using the name of your choice instead of awkward email addresses.

ON TOP OF INSTANT DOMAIN, YOU GET:

- 5 POP3 email accounts
- 10 email aliases
- Auto responders
- Catch-all emails
- WebMail access for all POP3 email accounts



OR WHEN READY, UPGRADE TO **INSTANT WEBSITE**

\$2.99
PER MONTH

BUILD AND RUN YOUR OWN 12-PAGE WEBSITE in just 20 minutes. No budget and no know-how needed. And, whenever you're ready, you can upgrade to any of our Shared Hosting Packages (see p. 11) with just one click in your control panel.

ON TOP OF INSTANT DOMAIN, YOU GET:

- 12 pages with the online WebsiteCreator
- More than 100 customizable templates
- Reply form or guestbook is just a click away
- Just 5 easy steps and you're online
- 15 POP3 email accounts
- 20 email aliases
- Auto responders
- Catch-all emails
- WebMail access for all POP3 email accounts



SET-UP FEE WAIVED FOR A LIMITED TIME



FOR MORE DETAILS GO TO **1AND1.COM**

HOSTING

LIMITED
TIME OFFER!
FREE SOFTWARE
WORTH
\$550

ALL THE LATEST SOFTWARE AND TOOLS TO CREATE AND PROMOTE YOUR WEBSITE:

Sign up for any one of our shared hosting packages and you'll get the latest software for free (shipping and handling not included). And we're not talking free downloads, but actual software including the CDs and manuals.

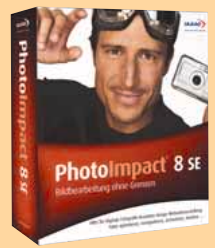
FUSION 7.5

One of the most popular development programs available, makes web page production faster and easier, thanks to high performance tools like Wizards, drag and drop functions, and much more. **\$130 VALUE**



PHOTOIMPACT 8 SE

Ideal for digital photography, artistic design, and web graphics, PhotoImpact concentrates on the needs of web users and offers a wide choice of single and multiple image enhancement options. **\$90 VALUE**



ONLINE WEBSITECREATOR

You're 20 minutes away from your own professional homepage. Created by top Web designers to the tightest specs, WebsiteCreator offers a variety of attention-grabbing fully customizable designs. What's more, you can create and amend your site in just 5 easy steps using a Word-like editor.



HELLO ENGINES! PROFESSIONAL 4.1

Register your website with hundreds of search engines like Google, Alta Vista and Fireball with Hello Engines! Generate more traffic by advertising your site to the world. **\$170 VALUE**



WISE FTP

WISE-FTP is ideal for transferring files and directories to the 1&1 server. This new edition contains all the latest functions to manage your files. **\$40 VALUE**

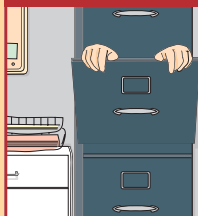


RANKING TOOLBOX 3.0

Arrange the way your site is registered and develop your own assessment criteria. A keyword database informs you of the most frequently searched keywords. **\$128 VALUE**



NEVER DODGE THE "WHY CAN'T WE DO THAT" QUESTION, EVER AGAIN.



DAN "THE DODGER" NERI: BEFORE 1&1

"There were a lot of people looking to me for answers, but I had none to give. I never actually hid from them, but there were plenty of days I entertained the thought."

DAN "THE DO-ER" NERI: AFTER 1&1

"I upgraded our standard brochure-ware site to one that is completely interactive including CRM and e-commerce. Now, my site is working harder for me, which makes my job a lot easier."



1.877.GO1AND1

OUR LATEST 2004 CRM AND E-COMMERCE FEATURES MAKE YOUR SITE THE ULTIMATE BUSINESS TOOL.

1&1 WEBDATABASE

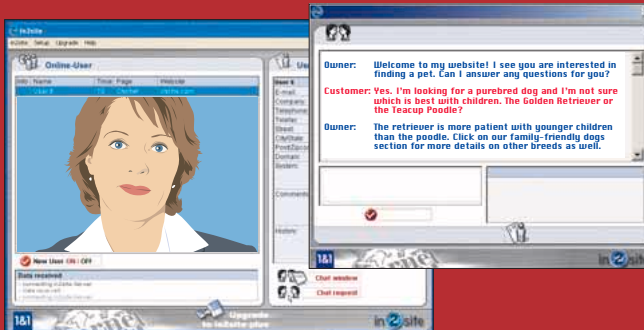
Easily integrate a customized database into your website. Unlike traditional SQL databases, 1&1 has done the programming work for you – so no technical knowledge is needed. Just click on the fields you'd like and you're ready to go! There are even ready-made templates for added ease.

Membership List

First Name	Last Name	Address	Email
Alan	Bishop	634 E. 39th Street, New York, NY 10019	alanb@myhost.com
Stephen	Bradshaw	1954 Corgin Street, Hudson, OH 44236	bradshaws@myhost.com
Catherine	Leonard	64 Stanhope Drive, Pittsburgh, PA 15237	family@myname.com
Carl	Brown	653 Liberty Avenue, Wilmington, NC 28403	brownc2521@lycos.com
Tom	Stowe	26 N. Hills Road, Chandler, AZ 85226	webunited@gmx.net
Helen	McSweeney	817 Providence Hwy, Boston, MA 02116	helenmcsweeney@hotmail.com

IN2SITE DIALOGUE

The closest thing to selling one-to-one, live and in person, with dialogue in real time. Offers site visitors a live consultant, at your discretion. Informs you of a new visitor by a visual indication or auditory alert.



NEWSLETTER TOOL

No special programming is needed to publish and automatically send your own web-based newsletter. Perfect for creating one-on-one relationships with customers and storing or updating mailing lists. What's



more, the tracking mechanism reports on your newsletter's performance and the archiving tool allows you to store previously published newsletters.

1&1 WEBELEMENTS

Provides automated forms enabling you to collect data from your visitors. Allows you to customize complex Q&A scenarios. Also ideal for gaining qualified leads including specific requests or information. Data is delivered to you easily by email.

Tell-A-Friend

Recommend the site to a friend:

Sender's Name
Mike Smith

Sender's Email
msmith@greathost.com

Recipient's Name
Lisa

Recipient's E-Mail
lisa@beave.com


Message
Hi Lisa,
I came across this site and thought you'd be interested.
<http://www.ggphotography.com>

Mike

Invitation to: Gallery Opening

June 14, 2004

Photo Exhibit
Hosted by: Susan Howard
Where: Impressions Gallery
Where: 293 Oregon Avenue, Denver, CO 80216



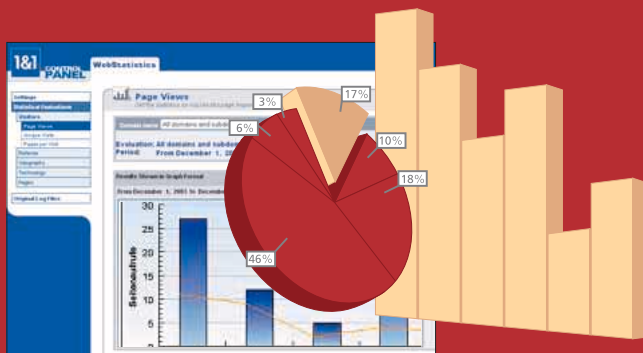
Your Name
Stephen Bradshaw

Email Address
bradshaws@myhost.com

Will You Attend?
 Yes - Gladly
 No - Unfortunately Not

1&1 WEBSTATISTICS

Tells you what visitors think of your site, including advanced live statistics about where visitors come from, how long they stay, and which pages they visit most often.



CHAT & FORUMS

Great for making your site a meeting place for customers and vendors. Chats in private rooms are possible. You can even trade experiences, interests, and views with a simple step-by-step forum.

1&1

FOR MORE DETAILS GO TO **1AND1.COM**

HOSTING

GET TRULY INTERACTIVE WITH THE LATEST 2004 FEATURES FROM 1&1.

With 1&1's feature-rich hosting solutions, you can finally realize the full potential of the Internet. Loaded with all the latest 2004 features you won't find anywhere else at such a low price, each package is designed to help you quickly build and manage content for your own truly interactive, high-performance website.

1&1 SHARED HOSTING TAKES YOU BEYOND STANDARD BROCHURE-WARE

- Fully CRM and e-commerce enabled.
- Up to 5 domain names included free.
- \$550 worth of software free.
- FREE 24/7 live support by phone and email.
- Automatic free firewall, backups, anti-virus software, and hardware updates.
- Fully scalable so you can start with us and stay with us.

LIMITED
TIME OFFER!
FREE SOFTWARE
WORTH
\$550



GLORIA VAUGHN WWW.GGPHOTOGRAPHY.COM

"We were pleasantly surprised at how quickly and easily we were able to create a professional-looking website with 1&1! All of the latest 2004 features enabled us to do more on the web than we ever thought possible. Also, our website contains several photos, and we were amazed at how fast we could upload them. And, when we had a technical question, it was answered promptly, by email, as promised."



1.877.GO1AND1

THREE FULLY-LOADED HOSTING SOLUTIONS TO UNLOCK YOUR FULL POTENTIAL.



**90-DAY
RISK-FREE
TRIAL**

100%
SATISFACTION
OR YOUR
MONEY BACK

HOME PACKAGE

\$4.99 PER MONTH

1 FREE DOMAIN

DOMAIN NAMES

- 1 domain name included free
- Handling of unlimited domain names
- Point 50 external domains to 1&1
- 5 sub domains

WEBSITE/CONNECTIVITY

- 500 MB of Web space
- 1 FTP account, unlimited access
- 5,000 MB/Month bandwidth
- Protected by up-to-date firewall
- Daily backups

APPLICATIONS

- WebsiteCreator for 12 pages
- Full version software worth \$550
- 1&1 Control Panel

EMAIL

- 50 POP3 email accounts
- Aliases, auto-responders, forwarding
- 1&1 WebMail
- Virus scanner for 1 POP3 account

WEBSITE FEATURES

- Logfiles
- CGI library (counter, guestbook, etc...)
- FrontPage 2002 extensions
- Password protection

CRM/E-COMMERCE

- 1&1 WebStatistics
- 1 chat channel
- Customizable forums

EXPRESS SUPPORT

- 24/7 support by phone and email

BUSINESS PACKAGE

\$9.99 PER MONTH

3 FREE DOMAINS

DOMAIN NAMES

- 3 domain names included free
- Handling of unlimited domain names
- Point 100 external domains to 1&1
- 50 sub domains

WEBSITE/CONNECTIVITY

- 1,000 MB of Web space
- 5 FTP accounts, unlimited access
- 15,000 MB/Month bandwidth
- Protected by up-to-date firewall
- Daily backups

APPLICATIONS

- WebsiteCreator for 18 pages
- Full version software worth \$550
- 1&1 Control Panel

EMAIL

- 150 POP3 email accounts
- Aliases, auto-responders, forwarding
- 1&1 WebMail
- Virus scanner for 3 POP3 accounts

WEBSITE FEATURES

- Logfiles
- CGI library (counter, guestbook, etc...)
- Own CGI programming
- FrontPage 2002 extensions
- Advanced password protection
- Perl, PHP3 and PHP4
- 1x MySQL database (100MB)
- SSH shell access
- SSI (Server side includes)
- Cron Jobs

CRM/E-COMMERCE

- 1&1 WebStatistics
- 5 chat channels
- Customizable forums
- In2Site one-on-one dialogue
- Newsletter Tool
- 1&1 WebDatabase
- 1&1 WebElements - Sophisticated Form Editor

EXPRESS SUPPORT

- 24/7 support by phone and email

DEVELOPER PACKAGE

\$19.99 PER MONTH

5 FREE DOMAINS

DOMAIN NAMES

- 5 domain names included free
- Handling of unlimited domain names
- Point 200 external domains to 1&1
- 200 sub domains

WEBSITE/CONNECTIVITY

- 2,000 MB of Web space
- 25 FTP accounts, unlimited access
- 30,000 MB/Month bandwidth
- Protected by up-to-date firewall
- No limits on simultaneous hits/bandwidth
- Server priority
- Daily backups

APPLICATIONS

- WebsiteCreator for 25 pages
- Full version software worth \$550
- 1&1 Control Panel

EMAIL

- 300 POP3 email accounts
- Aliases, auto-responders, forwarding
- 1&1 WebMail
- Virus scanner for 6 POP3 accounts

WEBSITE FEATURES

- Logfiles
- CGI library (counter, guestbook, etc...)
- Own CGI programming
- FrontPage 2002 extensions
- Advanced password protection
- Perl, PHP3 and PHP4
- 3x MySQL databases (100 MB each)
- Cron jobs
- SSH shell access
- Advanced developer tools
- SSI (Server side includes)
- Dedicated SSL Certificate

CRM/E-COMMERCE

- 1&1 WebStatistics
- 10 chat channels
- Customizable forums
- In2Site one-on-one dialogue
- Newsletter Tool
- 1&1 WebDatabase
- 1&1 WebElements - Sophisticated Form Editor

EXPRESS SUPPORT

- 24/7 support by phone and email

▪ **SET-UP FEE WAIVED FOR A LIMITED TIME**

FOR MORE DETAILS GO TO **1AND1.COM**

1&1

SERVERS

WHATEVER YOU NEED FROM A DEDICATED SERVER, 1&1 HAS THE DEFINITIVE SOLUTION.

1&1 Managed Servers are as convenient as Shared Hosting, yet provide greater power to the full flexibility of our Root Servers. Both are loaded with all the features you need to do more on the web.

1&1 ROOT SERVERS FOR MAXIMUM FLEXIBILITY AND CONTROL

1&1 Root Servers give you complete command and full access to the hardware, the server and the administration software as well. You'll also get:

- A pre-installed PLESK 7 control panel (100 domains)
- RedHat Linux 9
- Advanced recovery tools to get you back up and running
- Full access via SSH
- \$550 worth of software free.



1&1 MANAGED SERVERS FOR PERFORMANCE AND CONVENIENCE

A step up from Shared Hosting, 1&1 Managed Servers enable you to benefit from more features than our Developer Package. And best of all, you leave the server administration to us.

- Total management and maintenance by us
- Server configured and installed
- Unique control panel for easy administration
- Daily automatic backups
- Continuously updated firewall protection
- All features of the 1&1 Developer Package (see page 11)
- \$550 worth of software free.



ROSS McDONALD
WWW.PETPEOPLESPLACE.COM

"Choosing 1&1 was the best business decision we ever made. The dedicated server packages offer an industrial-strength solution with every feature we have ever needed. High traffic? No problem! With 1&1, we have a fast, reliable website and no worries."



1.877.GO1AND1

POWER. FEATURES. AFFORDABILITY.

EVERYTHING YOU NEED FOR A SERIOUS PRESENCE ON THE WEB

15,000 MBIT CONNECTIVITY

- 500 peerings with 250 different providers for optimized routing
- Own global backbone
- Connection to nine leading carriers for real redundancy

\$40 MILLION DATA CENTERS

- Most advanced data centers in the world
- Powered by Cisco and Juniper
- Over 99.9% uptime guaranteed
- 43,000 GB of data stored and backed up

FREE PLESK 7 WITH ALL ROOT SERVERS

- Use, create and manage your Linux based system
- Create new email accounts
- Manage entire domains and web spaces
- Become your own host by segmenting your server into shared webspace
- Go to 1and1.com for more details

24/7 MONITORING, SUPPORT & SERVICE

- Netsaint continuously tracks 40 parameters
- Technicians on standby 24/7 to maintain operations
- 24/7 assistance over the phone or by email
- Highly specialized department of trained technicians

RELIABILITY & CREDIBILITY

- 12 years experience
- Offering dedicated hosting for 4 years
- Over 1,100 employees
- Lowest churn rates in the industry for years

SERVER I

ROOT

\$49

PER MONTH

MANAGED

\$59

PER MONTH

- Intel Celeron 2.0 GHz
- 256 MB DDR-RAM
- 40 GB IDE hard drive
- 500 GB bandwidth/month included

SERVER II

ROOT

\$69

PER MONTH

MANAGED

\$79

PER MONTH

- Intel Pentium 4, 2.4 GHz
- 512 MB DDR-RAM
- 40 GB IDE hard drive
- 500 GB bandwidth/month included

SERVER III

ROOT

\$99

PER MONTH

MANAGED

\$109

PER MONTH

- Intel Pentium 4, 3.06 GHz Processor with Hyper-Threading
- 1 GB DDR-RAM
- 120 GB IDE hard drive
- 500 GB bandwidth/month included

\$99 ONE-TIME SET-UP FEE

EXTRA
BANDWIDTH

ONLY
\$0.99
PER GB

HUGE BANDWIDTH
ALLOWANCES



PLESK

1&1

FOR MORE DETAILS GO TO **1AND1.COM**

ESHOPS

SIMPLE E-COMMERCE WITH HIDDEN POWER

1&1 eShops are the easiest yet most powerful way to make money on the web. Each package starts fast and then expands with your demands so you have the freedom and confidence to lead your business to success. From the Business eShop with up to 50 products to the Developer eShop with an unlimited catalog, we have the right e-commerce solution for you.



1&1 ESHOPS COME FULLY FEATURED

- Web hosting and sub domain included
- \$550 worth of software free.
- Easy Setup - 8 Wizards
- Unique control panel for easy administration, anywhere, anytime
- Choose from 30+ design templates
- Edit any kind of correlation such as colors, sizes, product lines, promotions and discounts
- Automatic order processing
- Full account management
- Newsletter administration
- Customizable payment and shipping options

STAND ALONE SOLUTION
**WORKS WITH
ALL WEBSITES**

**90-DAY
RISK-FREE
TRIAL**

**MONEY
BACK
GUARANTEE**

**100%
SATISFACTION
OR YOUR
MONEY BACK**

**LIMITED
TIME OFFER!
FREE SOFTWARE
WORTH
\$550**



MARK BUTLER
WWW.SPYHEAVEN.COM

"The 1&1 eShop product is simplicity itself. Within a matter of hours we had a professional-looking, and well-organized site up and running, with the capability of taking secure online payments. The 1&1 eShop gives my customers a great deal of confidence in providing credit card details and as a result our business has benefited to no end."



1.877.GO1AND1

EASY TO HANDLE. EASY TO USE. BEING PROFITABLE HAS NEVER BEEN EASIER.

LOADED WITH 30+ TEMPLATES

If you want to start selling online without a big budget, lots of time and know-how - start off with one of our 30+ professional shop templates ready to be loaded with your products. They've been designed by experts in optimizing online results. You can even customize them to your liking by changing fonts, colors, and positioning.

EASY TO SET UP - 8 EASY WIZARDS

With eight well-designed wizards to guide you through the shopping basket, order process, delivery methods and, of course, payment settings, configuring your eShop is simple.

HOSTED SOLUTION - ALL INCLUSIVE

There's no software to install - traffic and webspace are included. We even take care of all updates and enhancements, leaving you to concentrate on your business.

FULLY CUSTOMIZABLE

eShops use PHP-based templates and rules so you can change styles, edit all text modules and even run an eShop in a different language or your completely private skin. Using PHP scripts you can even edit context-sensitive rules.

ONLINE CREDIT CARD PAYMENT BY PAYPAL AND WORLDPAY

1&1 Professional or Developer eShops make it easy to offer secure and live Credit Card Clearing via PayPal or Worldpay. And with PayPal - an eBay company - you don't even need a special merchant account. Just sign up, and without paperwork or any bank applications, you can accept all major cards from 35,000 loyal PayPal users. Act like a major player within hours.

SSL SECURED

Vital for customers who shop in an SSL-secured environment. All shop-based settings you make on the webserver are in SSL-secured pages for maximum integrity of your confidential data. Third parties cannot access these areas.



BUSINESS

\$9.99 PER MONTH

- 50 MB web space
- Full version software worth \$550
- 50 item product catalog
- 2 shipping methods
- 10 GB bandwidth/month included
- SSL (Secure server)
- Free support by mail and phone
- Money Back guarantee

PROFESSIONAL

\$29.99 PER MONTH

Features as above, in addition to:

- 300 MB web space
- Unlimited item variants
- 200 item product catalog
- 30 GB bandwidth/month included
- Product categories/sub-categories
- Product data import/export
- Multi-currency support
- Offer customer discounts
- 5 shipping methods
- Customer account management
- Newsletter administration
- Import/export customer data
- Self-administration for customers
- Customize images/color/fonts
- Shopping cart integration
- Online credit card clearing with PayPal and Worldpay (charges apply)
- Tax clearing server included (calculates taxes by state, city and country)

DEVELOPER

\$49.99 PER MONTH

Features as above, in addition to:

- 1200 MB web space
- FTP access
- Unlimited item product catalog
- 60 GB bandwidth/month included
- Discounts for customers, and specific customer groups
- Unlimited shipping methods
- Export of orders & append customer data
- Customer account management, including customer groupings
- Fully customizable templates
- 1 Dedicated SSL Certificate included

SET-UP FEE WAIVED FOR A LIMITED TIME

1&1

FOR MORE DETAILS GO TO **1AND1.COM**

"AFTER" 1&1, EVERY OTHER WEB HOST IS JUST A "BEFORE"

THE WORLD'S MOST ADVANCED DATA CENTERS

15,000 MEGABITS OF CONNECTIVITY

12 YEARS EXPERIENCE

1,100 EMPLOYEES

20,000+ SERVERS UP AND RUNNING

2.8 MILLION LOYAL CUSTOMERS

4 MILLION DOMAINS REGISTERED

SIGN UP FOR
SELECT PACKAGES
AND RECEIVE

SOFTWARE

WORTH
\$550

(SEE INSIDE FOR DETAILS)
LIMITED TIME OFFER

CALL 1.877.GO1AND1 OR
VISIT 1AND1.COM
AND MAKE THE SWITCH TODAY

1&1

Member of

**united
internet**

2004  TOP

100

SITES



**YOU DIDN'T KNOW
YOU COULDN'T LIVE WITHOUT**

What is a top Web site?

It's a site you rely on—one you just have to tell your friends, family, coworkers, and neighbors about. It is surprisingly useful, funny, informative, addictive. It does something cool you've never seen before.

You already know about Expedia.com and Monster—not to mention PC Magazine Online. They're part of our ever-shifting canon of Top 100 Classic Sites (see page 96). But did you know you could win \$10 million by building a working spaceship? Where to go to find out whether the presidential candidates have their facts straight? Or how to find out why your computer is suddenly acting so funny? Read on: These sites will soon have you wondering how you ever did without them.

PLUS * * * * *
**OUR UPDATED
TOP 100
CLASSIC
SITES** * * * * *

REVIEWED IN THIS STORY

- 86 Computing
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MORE ON THE WEB

View expanded test results and download links to all the sites in this story at www.pcmag.com/top100websites.

COMPUTING

BetaNews

www.betanews.com

⚡⚡⚡ <10k If you frequently find yourself on the edge of your seat, waiting eagerly for news about an upcoming version of your favorite software, then sit back, relax, and read this site. Information ranges from news about mainstream products to downloads of the latest builds of utilities.

BlackViper.com

⚡⚡⚡ <1k Turning off unneeded services gives Windows performance a boost—but turning off

vide for other people earn you points toward seeing the answers to your own and other people's questions. The site will take your money instead, if you're not willing to volunteer your brain.

Longhorn Blogs

www.longhornblogs.com

⚡⚡ <100 No, it's not a haven for raving Texas football fans. It's a collection of more than 50 Web logs dedicated to Microsoft's Longhorn operating system, the next major update to the Windows platform. This



needed services can render a system unbootable. Here's an amazingly comprehensive list of Windows 2000/XP services, with details on what you should and shouldn't turn off and why.

Experts Exchange

www.experts-exchange.com

⚡⚡ <100k Barter your brain, exchanging your expertise for that of others. Many experts hang out at Experts Exchange, where the answers you pro-

no-frills site gives you all the latest Longhorn news, gossip, tips, and tricks—not to mention a wide selection of Longhorn merchandise. Microsoft thong, anyone?

MacFixIt

www.macfixit.com

⚡⚡⚡ <10k MacFixIt offers help, troubleshooting, news, and tips for Mac-heads (though some content is available only to premium subscribers). The forums—which cover topics from waking up your machine to retrofitting a backlight on a PowerBook—and the excellent utilities make this a site worth visiting.

TechSoup

www.techsoup.org

⚡⚡ <100 TechSoup serves up resources for doing good. The Products section provides nonprofits with access to discounted and donated

tech products, and it has a Donate Hardware link, which lets you search for recyclers of old equipment in your area. The extensive How-To section offers tons of tech advice that's useful to a wide audience, too.

Tech Support Guy

www.helponthe.net

⚡⚡ <1k Tech Support Guy is actually a forum for more than 100,000 guys (and gals) ready to jump all over your tech problems, whether they concern e-mail, programming, networking, OSS, or specific software applications. You may have to wade through replies from people who are more eager to post than able to answer your question, but the real experts will find you and give you the straight dope.

Woody's Watch

www.woodyswatch.com

⚡ <100 Woody's Watch has been a source of Microsoft Windows and Office news and advice since the mid-nineties. All of its newsletters, way back to the first Office Watch letter in 1996, are available on the site. Woody's Office Portal has become a haven for Microsoft Office junkies, and the Lounge area, a particularly useful spot, is a very active forum where expert users offer handy tips and answer people's questions about Office applications.

lean toward the more technical—such as up-and-coming products and standards. To stay up to date, subscribe to Sandy and Dave's report on The Broadband Home.

BugMeNot.com

⚡⚡⚡ <10k Are you concerned that each time you register with yet another site, you're selling a bit of your soul, or at least inviting more spam? BugMeNot.com may hold the key. You'll find log-on information, submitted by real users, for lots of popular sites. Check out the FAQ if this idea gets your scruples in a bunch.

Computer Security Resource Center

<http://csrc.nist.gov>

⚡⚡⚡ <1k This site is for those seeking the latest on information systems security classes, white papers, news, and explanations of related government research. There are also links to NIST security bulletins covering intrusion detection systems, secure Web servers, secure e-mail, cryptographic standards, and guidelines.

Internet Society (ISOC)

www.isoc.org

⚡⚡ <1k Who are Leonard Kleinrock and J.C.R. Licklider? What are DARPA and ARPAnet? You can find answers to all your questions about where the Internet came from on the Internet Society (ISOC) site, which includes a history section with essays, facts, and other information about the growth of the Net.

Internet Storm Center

<http://isc.sans.org/>

⚡⚡ <100 The site looks like a stock ticker combined with a weather map, but what you're viewing is attack trends from over 3 million intrusion detection log entries from across the Internet every day. You can read about emerging threats (and their TCP port numbers, so you know how to block them) and top source IP addresses for originating attacks. And of course, everyone is invited to submit logs.

INTERNET, WIRELESS, & SECURITY

Broadband Home Central

www.broadbandhomecentral.com

⚡⚡ <1k With up-to-the-minute reporting on all things related to the broadband abode, Broadband Home Central has useful information on basic subjects like things to consider when setting up a home network, but the articles

* * * **KEY** * * *

Speed

- ⚡ Slow (more than 6 seconds)
- ⚡⚡ Normal (2–6 seconds)
- ⚡⚡⚡ Fast (less than 2 seconds)

Number of Google backlinks

- <100 Under 100
- <1k 100–999
- <10k 1,000–9,999
- <100k 10,000–99,999

PestPatrol Pest Research Center

www.pestpatrol.com/pestinfo

⚡ <100 You won't find a more comprehensive resource of information about spyware, adware, Trojan horse programs, and other nonvirus malicious software. PestPatrol's encyclopedia lists over 80,000 "pests" in more than 5 dozen categories. If you suspect your computer has an infestation, the site's online scan offers confirmation or relief.

SamSpade.org

⚡⚡ <10k This is the site for hard-boiled Internet sleuthing, where you'll find muscle to stop a spammer like a cheap watch. New gumshoes can get wise about IP addresses, DNS, and more in the Library. Use the site's many tools—a URL de-obfuscator and a blacklist checker, for example—or download Sam Spade for Windows to play Internet lowlifes a little chin music from your PC.

SpywareInfo

www.spywareinfo.com

⚡⚡ <1k Be afraid, because people *are* spying on you. Spyware is everywhere, and in addition to a good antispyware application, the best tool in the battle against the spymasters is knowledge. That's what SpywareInfo provides: independent news, reviews, forums, and newsletters that keep you on top of what's happening in this remarkably sleazy world.

TinyURL.com

⚡⚡⚡ <100 Post a superlong URL in an e-mail message and word-wrap may render it impossible to use. TinyURL.com will trade that too-long link for a short one that will always redirect surfers to the original long URL. Don't use it for sensitive or secure links, though, as all clicks are routed through TinyURL.com.

Wi-Fi Planet

www.wi-fiplanet.com

⚡ <10k Everything you ever wanted to know about 802.11 wireless protocols: news, reviews, and tutorials for your wireless life.

CONSUMER ELECTRONICS & PHOTOGRAPHY

DPChallenge

www.dpchallenge.com

⚡⚡ <1k For newbies and experienced digital photo buffs alike, this site offers weekly challenges on a wide variety of themes, some for paying members and some for anyone. There's also a lively community, as well as lots of help and tutorials. Paying members can even sell prints via the site.

Dynamism.com

⚡ <1k Dynamism.com brings to our shores the coolest tech toys meant for the Japanese market, like sub-2-pound notebook PCs, big-screen PDAs, and USB memory key/aquatic-night-light combos (we kid you not). Of course, Dynamism wants you to buy the toys, but occasionally we visit the site just to dream.

eCoustics.com

⚡⚡ <100 When you're buying your first digital camera or upgrading your home entertainment system, finding answers can be hard—but knowing what to ask may be even harder. eCoustics.com, which covers everything from wireless hubs to car stereos, offers buying guides, consumer reviews, message boards, and links to product reviews from well-respected resources like *Stereophile* and, of course, *PC Magazine*.

Gizmodo

www.gizmodo.com

⚡ <10k Gizmodo is a Web log about all sorts of tech gadgets. The site's authors comb the Web and post summaries and links to news, reviews, and musings about gizmos. Bonus: Sign up for Gizmodo's RSS feed and be alerted each time a new posting goes up.

Panoramas.dk

⚡ <1k The world isn't flat; pictures of it shouldn't be, either. Panoramas.dk provides

access to a wonderful collection of QuickTime VR panoramic photos—from all over the world—which you can move in and out of and pan around in.

Phone Scoop

www.phonescoop.com

⚡ <1k If the thought of trying to pick the right mobile phone makes you lightheaded, Phone Scoop is for you. The site's mobile-phone database includes specs, photos, and user reviews. The Carriers

can bump up their storage and traffic and add video clips. And there are no ads, spam, or pop-ups to annoy you or your visitors.

Thoughts Media Network

www.thoughtsmedia.com

⚡⚡ <10k Thoughts Media Network is the portal page to two sites, Smartphone Thoughts and Pocket PC Thoughts, for people who like to keep something intelligent in their pockets. Whether you're into cell



section provides information on various service providers and the models they have available. Try the Phone Finder to see which phones fit your requirements.

PVRblogs

<http://pvr.blogs.com>

⚡⚡ <100 This site is all about PVRs—personal video recorders, such as the TiVo—and the people who really, really love them. You'll find a huge database of news, product reviews, and workarounds, as well as articles on related topics such as video on demand, privacy and copyright issues, and HDTV.

smugmug

www.smugmug.com

⚡⚡ <10k Share, print, and (at higher subscription levels) even sell your photos and videos here. Family and friends—heck, the world—can be your audience. A yearly subscription of \$29.95 gets you unlimited photo storage and up to 2GB of monthly traffic, or 20,000 views of large photos. Power and professional users

phones that think they're PDAs or PDAs that know they're PDAs, you'll find the latest news and lively discussions among kindred spirits.

ENTERTAINMENT

The Agony Booth

www.agonybooth.com

⚡⚡ <100 There are bad movies, and then there are movies so awful that they make it onto this site, where they are dissected, analyzed, and pitilessly trashed in a most amusing way. If you've ever parted with precious cash only to be tortured by a badly written, poorly filmed, atrociously acted ex-

cuse for a movie—and haven't we all?—here's some payback.

The Baseball Archive

www.baseball.com

⚡⚡⚡ <100 This site's standout feature is its remarkably extensive, downloadable database of batting and pitching statistics from 1871 to 2003. But there's also lots of fun reading about baseball's history and the science of the sport's stats. It's all free, though a donation for the database is encouraged—and warranted.

Baseball-Reference.com

⚡⚡⚡ <100 This site's extensive hyperlinks will have you hopping endlessly from players and teams to league leaders, career stats, and more. Before you visit, make sure someone can check on you and remind you to take breaks for food and sleep.

Comic Book Movies

www.efavata.com/CBM

⚡ <100 Every comics geek worth his salt knows that *Spider-Man 2* will feature Doc Ock and maybe the Lizard, but how many of you have heard the buzz that Eliza Dushku is an odds-on favorite to play the Black Cat in *Spider-Man 3*, or that Man-Wolf and Venom are likely to appear as well?

Dismuke's Virtual Talking Machine

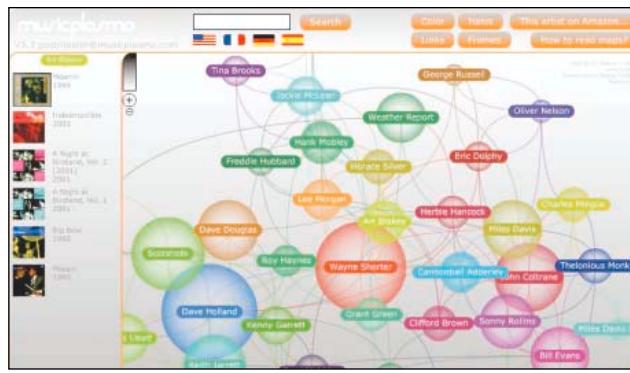
www.dismuke.org

⚡⚡ <1k Using RealPlayer, Dismuke offers a generous assortment of digitized music recordings from 1900 to 1939, with playlists, free downloads, and a radio feature, as well as a message board. This site is an excellent way to satisfy your jones for old music or introduce your elders to the world of online music.

FilmAffinity

www.filmaffinity.com

⚡⚡⚡ <100 Is your Netflix queue empty? Bypass that site's mediocre recommendations engine and head over to FilmAffinity. Take the movie tour, then rate a bunch of films, and within a few minutes you'll have a handful of like-minded "movie soulmates"



whose ratings can help you suss out what to watch next.

Joy of Hockey

www.joyofhockey.com

⚡⚡ <100 For hockey team and player statistics, awards, records, and more, look to this unofficial site. Our favorite part is the gallery of photos of players as child prodigies. And you can look for stats unencumbered by banner ads or commentary.

Metacritic

www.metacritic.com

⚡⚡ <10k Looking for insight on the latest movie, computer game, or popular CD? Try Metacritic, where three ex-lawyers and a volunteer staff systematically sum up dozens of reviews and give each new release a Metascore, which is a weighted average of ratings, with links to relevant write-ups online. Using this system, the film *Lost in Translation* gets 88 points out of 100 among professional critics—although 273 site visitors give it just 6.1 points out of 10. There's also a version for handheld devices.

Musicplasma

www.musicplasma.com

⚡⚡⚡ <100 Type an artist's name and you get a weblike zoomable map of related musicians, with that artist at the center (the map recenters when you click on another artist) and a partial discography. You can hear sound clips for each artist or group.

TitanTV

www.titantv.com

⚡ <1k What's on TV tonight in your house? TitanTV gives

you real-time program schedules and information based on your signal strength, the broadcasters in your area, and the channels you receive.

Turner Classic Movies

www.turnerclassicmovies.com

⚡ <1k This site offers a searchable schedule for the commercial-free cable TV channel, plus monthly movie spotlights, games, downloads (skins, wallpaper, and more), forums, and a shopping section. It also has an amazing streaming-video catalog with hundreds of trailers, classic movie scenes (including some deleted ones), and short documentaries, as well as a huge photo gallery.

USBasket

www.usbasket.com

⚡⚡⚡ <1k Ever wonder where college basketball stars go after they leave school? Whether they're playing in Los Angeles or Lithuania, you'll find them in USBasket's Ex-NCAA Tracker. This European site tracks 16 active, recently defunct, and newly formed pro leagues in the United States, from the NBA to the NABL.

FUN & GAMES

Al Lowe's Humor Site

www.allowe.com

⚡⚡ <100 The man wrote a computer game called Freddy

Pharkas, Frontier Pharmacist—not to mention Leisure Suit Larry in the Land of the Lounge Lizards—so you know he has a sense of humor. From his new Web site, former Sierra Online developer Al Lowe serves up everything from popular Internet chain letters and video gags to good old-fashioned one-liners.

Caricature Zone

www.magixl.com

⚡⚡ <1k Why let sidewalk artists have all the fun? At Caricature Zone, it takes just a few mouse clicks to create your own funny face. Play with the options in the generator to create a unique visage, or wreak havoc on the faces of the rich and famous (or infamous) with the Transformer.

gamesindustry.biz

⚡ <1k This U.K. site isn't about games as such. It's about the gaming industry, with everything from top-selling games in all popular formats to share prices (and even job listings) for game companies, as well as news and commentaries.

Ghost Sites

www.disobey.com/ghostsites

⚡ <1k Feeling nostalgic? Take a stroll through the graveyard of departed sites, an image gallery reaching way back to 1998. Some of the dying sites had time to create their own epitaph pages, while other images show signs of hope: "We're undergoing routine maintenance." Still others seem to have been caught unawares—or else just didn't realize they'd be preserved for posterity.

Insultmonger.com

⚡⚡ <1k The art of the insult is sadly neglected in this increasingly politically correct, V-chipped, PG-13 country. How long has it been since one of your insults made someone actually gnash his teeth? Check out this decidedly un-PC, V-chipless, NC-17 site and you'll be rolling around on the barroom floor in no time. Learn to curse in 133 languages. Still

stumped? Visit the advice column for helpful hints.

1moregame.com

⚡⚡⚡ <100 This is the home of some of the most inventive, colorful, and just plain strange Java games we've seen. Click on Yeti Sports, for example, for a rousing round of penguin thwacking, and prepare to be addicted—as many of our office staff can confirm.

IUP.com

⚡ <100 First, we'll disclose that IUP.com is part of the Ziff Davis Media family (along with *PC Magazine*). That said, this gamer site rocks, with a mind-bending array of game news, reviews, cheats, and strategies from *Computer Gaming World*, *Electronic Gaming Monthly*, *GMR*, *Official U.S. PlayStation Magazine*, and *Xbox Nation*.

SlashNOT

www.slashnot.com

⚡⚡ <1k You think Slashdot is funny? Wait till you see SlashNOT, an uproarious send-up of that ridiculously popular "News for Nerds" site. Headlines include "Mozilla Adds Security Holes" and "NASA Admits Spirit Rover Running Windows 98"—followed up with "Spirit Finds Evidence of WMDs on Mars." It's the funni-

est thing to hit the computer industry since the PCjr.

Stupid.com

⚡⚡ <100 If you're looking for a good gag gift or you just need a new Mr. T Chia pet, you're in luck: Stupid.com probably has what you want. It's home to all things stupid—candy, gifts, toys, and more.

Worth1000.com

⚡⚡ <1k Visit this site once and you'll never believe photo-



graphic evidence again. If you're an Adobe Photoshop whiz, enter the daily themed contests; if not, vote on the entries. All past contests—Fun with Propaganda and Feats of Strength, among others—are archived in the site's impressive, sometimes creepy, usually hilarious gallery.

INFORMATION

AllExperts.com

⚡⚡⚡ <10k Want to know which episode of *The Simpsons* Homer went 3D in, or how to make a perfect martini? AllExperts.com may have the answer. The site covers topics as diverse as day trading and hairstyles. Its volunteer experts answer your e-mails, usually within hours, and you can rate how helpful each response is.

eNature.com

⚡⚡ <10k Discover all you need to know about flora and fauna at this site run by the National Wildlife Federation. It has a searchable database of more than 4,800 birds, mammals, fish, plants, and more. You can also get your own local wildlife guide, either based on your ZIP code or via a clickable map.

Internet FAQ Archives

www.faqs.org

⚡⚡⚡ <100 What's more useful than a list of frequently asked questions? Lots of lists of frequently asked questions. The searchable lists here come

from Usenet groups, among other sources. Don't miss the page of top-rated FAQs—and ponder how Quaker Religion FAQs, Tattoo FAQs, and The Annotated "American Pie" all made it onto this site.

InterTran

<http://www.tranexp.com:2000>

⚡ <100 InterTran translates words, phrases, and entire Web sites from any of 28 languages to another. Translations aren't always perfect, but the interface is easy to use. It's very handy if you need to ask where the bathroom is in Turkish, or if you want to read a Norwegian news site in Polish. Translating from English to English, however, produces some very interesting results.

Knowledge Hound

www.knowledgehound.com

⚡⚡⚡ <1k For the avid do-it-yourselfer—or just those who need help with cooking, parenting, or job hunting—there is Knowledge Hound. It claims to be the Web's largest directory of free how-to links, and also includes its own original how-to content.

Martindale's

The Reference Desk

www.martindalecenter.com

⚡⚡⚡ <10k Want to learn Icelandic sign language, analyze

WHAT WE FOUND

Although we chose our top sites based on their content, we felt compelled to do a little testing. We gauged the popularity and loading speeds of our Top 100 Sites You Didn't Know You Couldn't Live Without (which, for the sake of brevity, we'll call the Undiscovered 100 sites) and our Top 100 Classic sites, and we recorded the operating

systems and server software they're using as well. For a full accounting of what we found, visit www.pcmag.com/top100websites.

POPULARITY

Part of Google's page-ranking algorithm involves analyzing all the links to a page, or backlinks—useful as a rough measure of popularity. We grouped the figures exponentially, dividing them at 100, 1,000, 10,000, and 100,000. Not surprisingly, our Undiscovered sites averaged fewer links, with one-third under 100 and another third under 1,000. Over half of our Classic sites had 10,000 or more backlinks, and 10 percent had 100,000 or more.

LOADING SPEED

Measuring how fast a page loads is difficult, since outside factors

can affect the speed. Performance analysis company Webmetrics helped us measure the loading speeds of all the sites, timing each site at intervals over a 72-hour period and reporting the average time each page took to load completely. We called load times under 2 seconds fast and those over 6 seconds slow. One-quarter of both groups were slow, whether from too much content or inadequate server resources. Just under 20 percent of the Undiscovered and just under 10 percent of the Classics qualified as fast.

OS AND SERVER SOFTWARE

Netcraft (www.netcraft.com) reports the OS and server software any site is using. The results come from whichever servers answer the query, so they may not represent all the servers a site uses. About two-thirds of our Undiscovered sites run on Linux or FreeBSD, as do almost half of the Classics. One-fifth of the Classic sites run on Solaris—twice as many as among the Undiscovered 100. About one-fifth of the Undiscovered and nearly one-quarter of the Classic 100 run some version of Windows. Apache is the clear leader in Web server software; over 70 percent of our Undiscovered and almost half of our Classics use it—significantly more than in last year's story. The increase comes at the expense of Microsoft and Netscape.—*Analysis written by Neil J. Rubenking*

the traffic patterns in Bogotá on a live Webcam, or browse among 18,000 mathematical and scientific converter/calculators? Jim Martindale's no-frills site serves as an information aggregator and easy-to-use portal for anyone researching international art, business, science, or technology.

The Museum of Hoaxes

www.museumofhoaxes.com

💡 <1k Sometimes it's hard to tell the difference between what's real and what's just a complete fabrication. The Museum of Hoaxes catalogs hoaxes big and small. Visit and see how many fibs you've fallen for over the years.

Privacy Rights Clearinghouse

www.privacyrights.org

💡💡 <10k How can you protect yourself from identity theft? What can you do to stop spammers and telemarketers? Is it legal for your employer to snoop on your Internet activity? The Privacy Rights Clearinghouse's dozens of fact sheets, testimonials, and helpful links help you understand and safeguard your rights.

Wikipedia

www.wikipedia.org

💡 <100k Wikipedia is a collaborative, community-built, open-content encyclopedia; anyone can edit any page, augment an existing entry, or add a new one. Sure, there's a lot of questionable and incomplete content, but you'll also find many fascinating, detailed, well-written articles. Go ahead and make your contribution to the sum of human knowledge.

X Prize

www.xprize.com

💡 <1k Ever get the urge to build a rocket ship? X Prize is offering \$10 million to whoever builds a spaceworthy passenger vehicle, hoping to make commercial space tourism a reality. Dozens of teams are competing, and the contest should wrap up by January 2005. Make a donation, root for your favorite would-be astronaut, and learn more about space flight at this informative, fun site.

JOBS & MONEY

Credit Card Goodies

www.creditcardgoodies.com

💡 <100 Pick a card, any card: The right one can mean hundreds of dollars back from your credit card issuer each year. Credit Card Goodies tracks the cash-back credit card market and helps you choose which card to get. Check out the discussion forums for friendly advice.

EH.Net

💡 <1k While economic historians gravitate to the scholarly main page, the rest of us will click on "How Much Is

Speed not tested <100 LinkedIn, a professional-networking tool, helps you find out who your friends and contacts know (and who their contacts know) and lets you ask for an introduction. LinkedIn keeps the chain private; you see only your primary connections and the ultimate connections you want to make, not the people in between.

Quatloos!

www.quatloos.com

💡 <1k Before you sign up to start making money from home or invest in a tiny, unknown kingdom's space program, check out Quatloos! (The name comes from an episode of *Star Trek* in which aliens force Captain Kirk and company to fight, wagering quatloos on the outcome.) The site lists common scams, explains how they work, and

Workplace Fairness

www.workplacefairness.org

💡 <100 If you're getting a raw deal at work, turn to Workplace Fairness. The nonprofit site is apparently in its early stages (parts were under construction when we visited), but the information that is available is valuable. Categories of concerns include overtime pay, unemployment insurance, workplace safety, and more.

LIFE STYLE

BobVila.com

💡 <1k It's been 25 years since Bob Vila first appeared on *This Old House*, and he's still going strong. He even has his own Web site, which offers everything from a Bob Vila TV schedule and home improvement tutorials to a massive online store. Can you say "stud finder"?

BookCrossing

www.bookcrossing.com

💡 <10k After signing up at the site, users register books (each with a tracking number) and print out labels to put inside. Once the books are released "into the wild"—given to charity, left on park benches, and the like—it's up to the finders to register, list the books as "captured," and even include reviews. Users can browse captured books and chat on forums and e-mail discussions.

DailyCandy

www.dailycandy.com

💡 <1k Visiting DailyCandy is like having your own personal assistant to provide you with the scoop on arts and culture, beauty, drinks and food, fashion, and more. You can visit sites specific to New York City and Los Angeles—or one that's geography-independent called Everywhere.



That?" Work out what your current salary would be in 1950 dollars, check the exchange rate between the U.S. and any of 40 countries over time, see how the dollar's purchasing power has changed, and more.

FlipDog.com

💡 <10k FlipDog.com crawls employer Web sites looking for job opportunities not advertised elsewhere. Post your résumé or search for jobs by location, field, employer, or keywords. The Resource Center has links to information on specific companies, tips, résumé tools, and lots of external resources.

LinkedIn

www.linkedin.com

offers advice on protecting yourself. Even if you aren't concerned about fraud, Quatloos! is worth visiting just to read about some scams so ridiculous they would've made old P.T. Barnum proud.

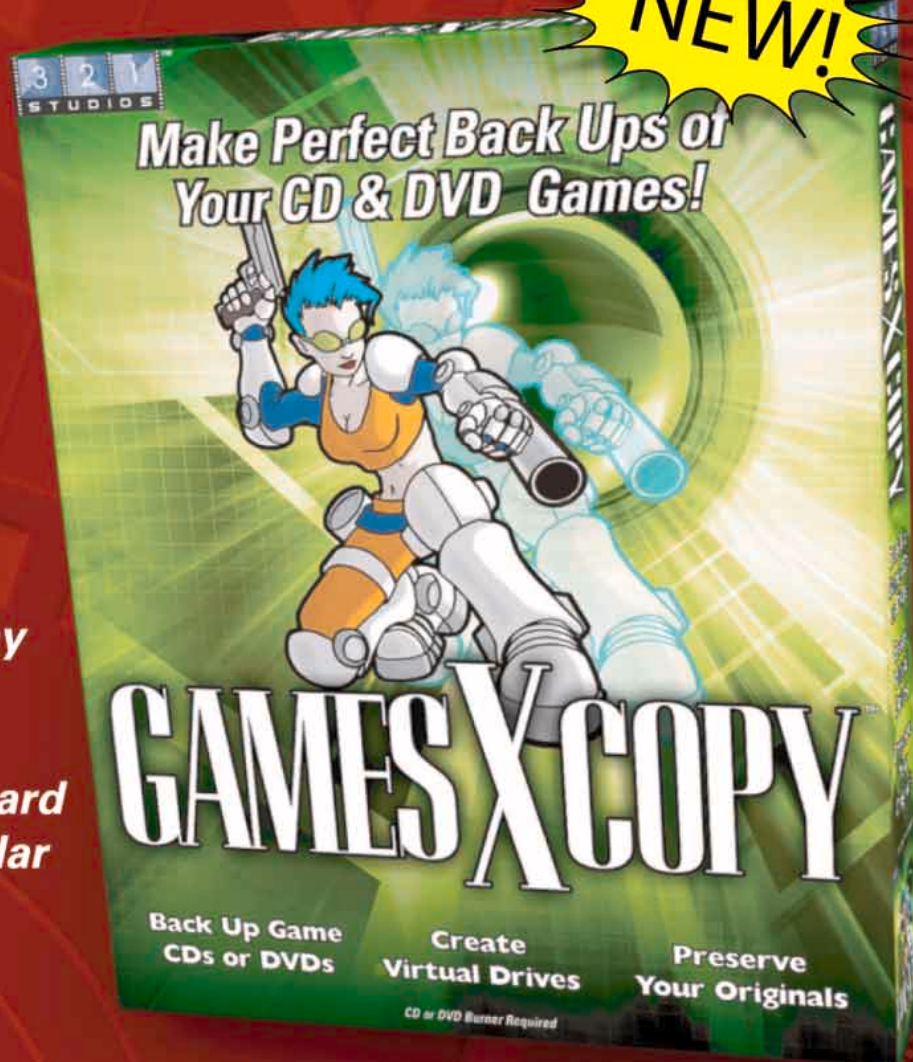
RealEstateABC.com

💡 <10k Owning a house is a dream for most people; actually buying one can be a nightmare. RealEstateABC.com offers insight into the complicated process for both first-time buyers and those looking to trade up their spaces. The Tips and Advice section covers topics ranging from timing the market to finding financing.

GAMESXCOPY™

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Learn more at www.gamesxcopy.com.

Femina

<http://femina.cybergrrl.com>

⚡ <1k Everything on this site—articles, events, news, a site of the month, and more—is geared toward women. For female-friendly information and links, march to Femina's comprehensive, searchable database.

Freecycle

www.freecycle.org

⚡ <100 Freecycling is a nice word for giving away your junk—er, treasured possessions—to people who want it, and getting their junk too. Freecycle links to city-specific Yahoo! Groups—253 at the time of this writing—in which people post items wanted and items available. No selling or trading allowed, just giving and receiving.

Furthur Network

www.furthurnet.com

⚡ <100 You already knew you could trade tapes from Grateful Dead concerts, but did you know that lots of other bands, such as AC/DC, Stereolab, and Stupid Sexy Flanders, encourage fans to trade recordings from their shows? The Furthur Network is a noncommercial, open-source, peer-to-peer network of legal live music. Just go to the site, download the free client software, and start sharing your love of live music.

Getcrafty

www.getcrafty.com

⚡ <1k This bustling online community is all about “making art out of everyday life.” You'll find helpful tips on everything from brewing your own hooch to making your own bonsai. The site's own “Dear Abby”—really, Amanda and Johanna—provides advice for the crafty.

Home Energy Saver

www.homeenergysaver.lbl.gov

⚡ <1k With natural energy resources being depleted at an alarming rate, saving energy is a priority for many. Give Home Energy Saver your ZIP code and answer a short questionnaire and the site shows you how much you can save by making your home energy-efficient—and gives you tips to accomplish your goal.

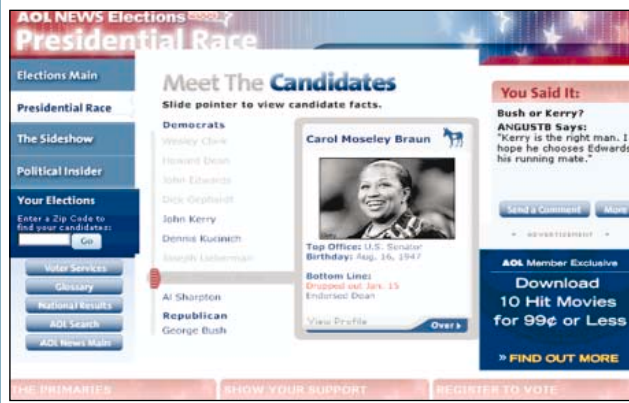
Joseph Wu Origami

www.origami.vancouver.bc.ca

⚡ <1k This site's singular purpose is to promote the ancient Japanese art of paper folding. Beginners and experts alike will be impressed with the variety of instructions and

Tolerance.org

⚡ <1k This Southern Poverty Law Center site exists to counteract hate crimes and bigotry within America. It offers news items and ideas for activists, resources for teachers and parents, and games and stories for



diagrams available. Start with the ever-popular crane and then move on to something a little more exciting, like a goblin warrior.

Meetup

www.meetup.com

⚡ <100k Meetup, a free service, brings together like-minded strangers, letting them organize local gatherings. Since its launch in June, more than 6,900 have gotten together for poker games, and over 4,400 have gathered to discuss *Buffy the Vampire Slayer*. But this is nothing compared with the nearly 200,000 Howard Dean supporters who have registered since last summer. They organized meetups in South Carolina, Oklahoma, Arizona, North Dakota, and New Mexico, not to mention California, Texas, and New York. Yeaaghhhhh!

Network for Good

www.networkforgood.com

⚡ <10k When you're ready to give your money or your time, Network for Good is a great place to start. The site provides information about 85,000 charities and lets you make donations with just a few easy clicks. You can also find groups in your area that will welcome your volunteer spirit.

youngsters, plus a test designed to reveal your inner biases.

Wilson & Alroy's Record Reviews

www.warr.org

⚡ <1k Thousands of albums are reviewed here, with most of the content devoted to bands from the 1960s through the 1990s—classics like The Beatles' *Abbey Road* and no-so-classics like Ringo Starr's *Time Takes Time*. In Wilson's Top 20 Lists, you'll find music grouped in novel ways, including Best Songs About Prostitutes and Top 5 Songs Where the Imitating Artist Excelled the Imitated One.

POLITICS**Capitol Hill Blue**

www.chblue.com

⚡ <100 This nonprofit news site—which claims to be the oldest news site on the Web, having begun in 1994—gives you the lowdown on doings in high office. Set a spell in the Capitol Hillbillies section, which tracks incongruousness in Congress; let CHB Investigations draw back the curtain on

questionable goings-on; or choose numerous other views of your tax dollars at work.

FactCheck.org

⚡ <1k The late senator Daniel Patrick Moynihan said, “Everyone is entitled to their own opinion but not their own facts.” This nonprofit organization seeks to reveal the truth in politics by monitoring news, advertisements, and other sources of information for accuracy.

President Match

www.presidentmatch.com

⚡ <10k Don't rely on ad campaigns alone to decide who should be the next leader of the free world. President Match, from AOL, strips leading candidates down to the issues. Take the quiz to find out which candidate claims to agree with you on the most issues. It's a solid way to start before progressing to judge the competitors' military records, youthful indiscretions, or mental states.

READS**Arts & Letters Daily**

www.aldaily.com

⚡ <10k Arts & Letters Daily is a portal that links to some of the most fascinating articles on the Web, with a strong slant toward the humanities. It's updated six times a week and divides links into three main categories: Articles of Note, New Books, and Essays and Opinion.

BoingBoing

www.boingboing.net

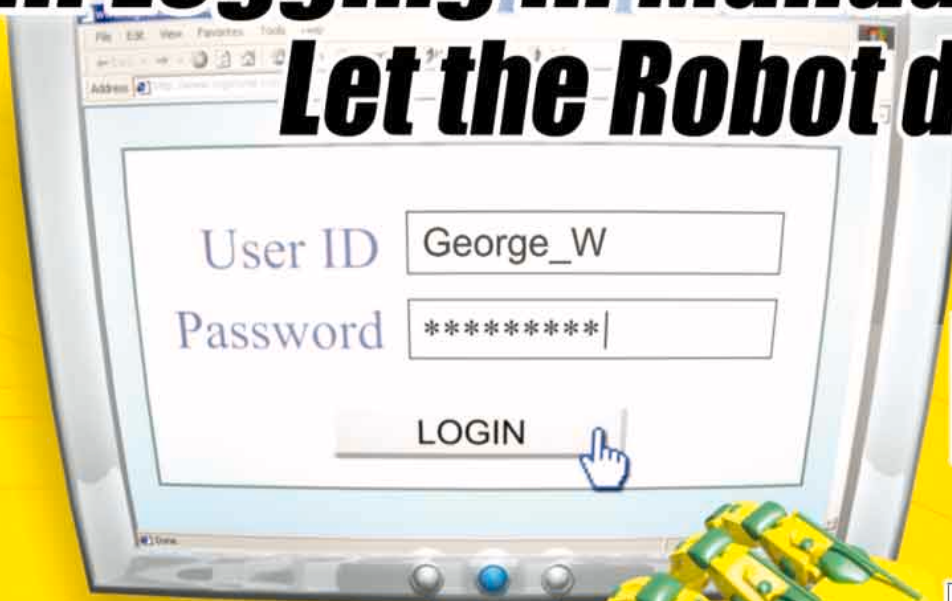
⚡ <10k This “directory of wonderful things” is an eclectic blog containing mostly links to weird and fascinating stories. On any given day you might find squibs for articles on social networking, portraits of X-tina and her ilk made entirely from bubblegum, and a secret report from the Pentagon to the president.

Fourmilab

<http://fourmilab.ch>

⚡ <100 John Walker, the

Still Logging in Manually? Let the Robot do it!



Works on
Windows PCs
with most
browsers



View your
passwords and
Address Book
on PDA



Keep your
passwords
on USB key for
extra security
and portability

DO-IT-ALL Password Manager and Web Form Filler

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- Logs you into online accounts automatically
- Fills long registration and checkout forms
- Stores secret text notes in Safenotes
- Generates Random Secure Passwords
- Sensitive data is 3-DES encrypted with Master Password
- Backup, restore, copy, and print your passwords
- Imports your Gator passwords
- Defeats keyloggers as you are not typing anything

"My favourite password manager... Easy to use, does not pop up ads in my face or grab information from me. Most importantly, it simply works well."

Financial Times

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Wall Street Journal

"Best of all, this program simply works well.

We have yet to see a Web-based form stump it."

PC Magazine



WWW.ROBOFORM.COM

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founder of Autodesk, maintains this eclectic site. Its main emphases are computing and science, informed by philosophy, literature, and humor. You'll find downloadable utilities for various platforms; articles on mathematics, nanotechnology, and retropsychokinesis; science fiction stories; and even The Hacker's Diet.

J-Walk Blog

<http://j-walkblog.com/blog>

💡 <100 Computer book author and Excel guru John Walken-

"make no mistake" make you cringe, visit LSSU's Banished Words List. LSSU has been compiling lists of overused and misused language for 28 years.

Paul Thurrott's Internet Nexus
www.internet-nexus.com

💡 <1k Tech editor, author, and blogger Paul Thurrott presents the (mostly) non-Microsoft world on this site. The blog mixes his sometimes acerbic, often amusing musings on things Apple, Linux, and even Windows with news

bach scours the Web for interesting news and sites. His blog, updated daily, presents these stories and sites, with commentary. Be warned: You may spend too much time following the fascinating links.

KuroShin

www.kuroshin.org

💡 <10k KuroShin defines itself as a site about technology and culture, but it encompasses a lot more: political coverage, stories on current events, and even fiction pieces. It's a democratic site: Members submit articles, they monitor the submission queue to decide what gets posted, and the community votes on articles to decide what gets the most exposure (and what doesn't get read). The result is a site that covers a variety of topics that may not get much attention in mainstream media.

Lake Superior State University Banished Words List

www.lssu.edu/banished

💡 <1k If words or phrases such as "metrosexual" or

and opinion pieces from a wide variety of other sources.

Plastic

www.plastic.com

💡 <10k This informative, witty site serves up stimulating articles—usually in response to stories from major news sites—in eight categories from FilmTV to Politics. The 40,000 members' comments on the pieces are a lot to wade through, but fortunately, other users rate the comments on their merit.

WikiWikiWeb

<http://c2.com/cgi/wiki>

💡 <10k The original wiki, WikiWikiWeb is a collaborative communication tool open to anyone. The focus has been on people, projects, and patterns in software development, but the wikis are evolving and new focuses may emerge. There are few no-nos, but WikiSquatting, WalledGardens, and WikiSpam are frowned on. You can edit others' contributions, all material is saved, and recent changes are available for all to see.

SEARCH & LEARN

Abebooks.com

💡 <1k With 50 million used, rare, and out-of-print books at 12,000 bookstores, Abebooks.com is a bibliomaniac's worst enabler. Whatever title you're looking for, chances are it's here. Don't know the title? The BookSleuth forum can help you find that book with the guy who did the stuff in the place.

The Educator's Reference Desk
<http://eduref.org/>

💡 <100 This education site offers more than 2,000 lesson plans contributed by teachers from all over the U.S., from "Computer Olympics" and "Measuring Calories" to a "History of Flight" time line. There's also a resource collection with over 3,000 links to online education information, including sites, organizations, and discussion groups, and a search interface to the ERIC database.

Google Alert

www.googlealert.com

💡 <10k Google Alert is your free, automated research assistant. Register and enter up to five queries and you'll get regular e-mails with up to 50 Google results per topic. Your requests can use the same advanced features available in a regular Google search, and after the initial set of results the service is smart enough to send only updates.

Search Engine Showdown

www.searchengineshowdown.com

💡 <10k As search engines merge and differentiate, this site tracks the changes and provides the latest news and statistics. It reviews the major search engines and offers "showdown" comparisons in areas such as data freshness and dead links. If you rely on Web searching, this site is a must-visit.

Tutor.com

💡 <1k It started as a match-

making service to connect independent tutors with people who needed help in academic subjects, business, standardized tests, computers, and more. Now Tutor.com includes extensive library and subscription services, including Live Homework Help, Virtual Reference ToolKit, and Librarians by Request.

TRAVEL

FlyteComm

www.flytecomm.com

💡 <1k Need to track a flight? This site gives you all the info you want. Search by flight number or airport and you can see a plane's speed, altitude, arrival time, and flight status—even a map showing the plane's location and the weather conditions. But it can't tell you what the in-flight movie is.

One Bag

www.onebag.com

💡 <100 Getting there is half the fun, but only if you know how to pack right. One Bag teaches you to travel with just one carry-on—how to choose a bag and decide what to put in it, and how to pack to take optimal advantage of limited space.

SeatGuru.com

💡 <100 Don't know where you should sit on your next flight? SeatGuru.com knows. Select the airline you're flying with and the model of the plane and the site tells you which seats are quiet and which have legroom, which recline and which don't. Unfortunately, it can't tell you how to avoid talkative seat neighbors.

Trails From Rails

www.trailsfromrails.com

💡 <100 Many old American railroad lines, including those that once ran through the Kansas prairies and the Black Hills of South Dakota, have been transformed into biking trails. Trails From Rails details these scenic paths, providing photos, maps, and even hotel information.

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..... Visit www.fourseasonsofhope.com



TOP 100 CLASSICS

Our updated list of the top sites on the Web is ever-evolving, though most of the best are maintaining their positions. But that's not to say they've stood still. We've brought you the scoop on new or hidden treasures on many of the sites, marked with the ☀ icon.

COMPUTING

Annoyances.org

After all these versions of Windows, we still turn to Annoyances.org to get un-annoyed.

Answers That Work

Software questions, hardware problems, a vague feeling that something could be working better? Bring it all here.

Digital Photography Review

Reviews, comparisons, forums, and buying guides for the photography enthusiast.

☀ Use the site's unique time line to find out when the camera you want to buy was first released. Is it already obsolete?

EarthWeb

More IT literature than you should shake a stick at.

☀ Web developers, take note: EarthWeb's collection of HTML Goodies offers innumerable ways to spice up your sites.

eWeek

Essential IT news and reviews, updated constantly. Check out the newsletters too.

ExtremeTech

We've been outgeeked by our child.

Java Technology

What Java developers need to know—straight from the horse's mouth.

PalmGear.com

More than 20,000 apps for your Palm-based PDA.

☀ Too busy to look through 20,000 downloads? The site identifies 40 Palm-based apps that it considers essential.

PC Magazine

Well, duh.

Slashdot

The news-for-nerds discussion forums here are as lively and informative as ever.

Technology Review

Fascinating cutting-edge tech stories from the brainiacs at MIT.

Webopedia

An essential resource for anyone baffled by Internet acronyms. Look them up here.

☀ The "Did You Know?" page features time lines of Net history and an indispensable guide to the confusing world of DVD formats.

W3Schools

Free Web-building tutorials from basic HTML and XML to advanced scripting.

SECURITY AND THE NET

Broadbandreports.com

Got broadband? Want broadband? Find an ISP, test your speed, and scrutinize elements of your connectivity that you didn't know existed.

☀ Head for the user forums to find brutally honest opinions of the ISPs and cell-phone companies you're currently considering.

CERT

CERT's not an acronym; it's a security information site.

GetNetWise

Learn how to keep your com-

puter, identity, and family safe. **Gibson Research Corporation**
<http://grc.com>

There are more Web nasties than ever, and Gibson Research retaliates with more info and helpful apps.

Internet Traffic Report

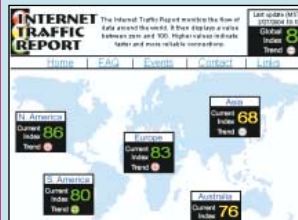
This dashboardlike site shows worldwide Net performance up to the minute.

Netcraft

Find out what lies beneath the sites you admire. Just type a URL into the search box here.

SecurityFocus

Read techie articles about all aspects of computer and Net protection.



Trend Micro

Vigilant virus experts keep you up to date on the latest threats and provide fixes.

☀ Click on the interactive virus map to find out how and where viruses have been spreading in the past day, week, and month.

APPS: PC AND MOBILE

AvantGo

Thousands of Web sites formatted for your PDA or Smartphone; just sign up and sync.

Homestead

Stake your claim online: Homestead has the best raw materials for easy Web site building.

☀ Homestead's new service, Photosite, helps users create online photo albums and add them to their Web sites.

Mailblocks

Web mail specifically built to handle spam.

MSN Hotmail

The best of the popular free-mails.

☀ Hotmail's latest deal for power users: 100MB of mail storage and 20MB attachments for \$59.95 per year.

Shutterfly

Our favorite online photofinisher is easy to navigate, has one-click access to common finishing tasks, and, of course, does a fine job printing your photos.

Vindigo

Helpful indexes of where to eat, what to see, and how to get there for many major cities.

☀ Vindigo info is now available via cell phone with several wireless carriers.

WebEx

Host business meetings online, complete with whiteboards and simultaneous Web browsing.

Yahoo! Groups

One of the Net's easiest ways to share messages, files, and mail among like-minded people or coworkers.

SEARCH, REFERENCE, AND PORTALS

About.com

Experts and enthusiasts teach you about almost anything.

Centers for Disease Control and Prevention

Knowledge is disease-preventing power.

☀ One of this site's most comforting features is a page that debunks current health rumors and hoaxes (www.cdc.gov/hoax_rumors.htm).

Dictionary.com

Not just a metadictionary (and not just in English) but also a thesaurus, a translator, a source of grammar help, and more.

Encyclopædia Britannica

The online home of one of the most respected sources of information on just about everything.

FedStats

Did you know there were 26,911 births in Nevada in 1997? Two clicks on this site will get you to many, many, many U.S. statistics.

FirstGov.gov

Your portal to the U.S. government on the Web.

Google

www.google.com

When it comes to searching, Google is The Man.

☀ Start your shopping searches at Froogle. A first cut on price ranges and stores carrying the product is just a few clicks away.

iVillage

www.ivillage.com

Articles, advice, and conversations—serious and frivolous—by, for, and about women.

Librarians' Index to the Internet

www.lii.org

Use this comprehensive guide to the Net to find Web sites vetted by experts who know quality when they see it.

The Library of Congress

www.loc.gov

The largest library in the world fits right in your browser.

☀ The LOC's delightful monthly online magazine, *Wise Guide*, is now in its third year. It's a quick way to discover many of the site's buried treasures.

MSN Encarta

<http://encarta.msn.com>

Click here to find the Web's liveliest family-style encyclopedia, with a lot of multimedia extras.

☀ Encarta Premium includes an invaluable homework helper and searchable archives of leading magazines.

Nolo

www.nolo.com

Legal information, accessible to everyone.

WebMD

www.webmd.com

Symptoms, diseases, syndromes, conditions, procedures, drugs, and diagnostics tests: WebMD isn't just fun, it's informative.

Yahoo!

www.yahoo.com

Pick and choose from among countless services—some free, some for a fee—to set up your perfect personal portal.

☀ For tons of music, music videos, artist information, and even lyrics, head to *launch.yahoo.com*.

BUSINESS AND FINANCE**Bloomberg.com**

A Bloomberg and his money will never be parted. Read the site; be like Mike.

☀ Don't just read the site.

Watch and listen, too. Live Bloomberg TV and radio feeds are always available.

Internal Revenue Service

www.irs.gov

If you haven't done your taxes, you're late. Get all your forms, advice, and instructions here.

☀ Visit the Newsroom for the latest tax code changes before you sign your forms.

The Motley Fool

www.fool.com

Motley fools are less often parted from their money than other types.

MSN Money

<http://moneycentral.msn.com>

Microsoft is pretty good at making money and, as it turns out, helping you manage your own.

SmartMoney.com

The experts at Dow Jones offer analysis and opinions on this personal finance supersite.

TheStreet.com

Wall Street, that is. It has the facts you need to find the shortcuts while avoiding the potholes and detours.

☀ Choose from an impressive list of 40 columnists to find your favorite mix of opinions on personal finance, stocks, and options.

U.S. Securities and Exchange Commission

www.sec.gov

Smart investors get familiar with the role this agency plays in keeping markets fair.

☀ Corporate filings and reports are free for searching and downloading in the SEC's EDGAR database.

CAREERS**Dice**

www.dice.com

Tech job listings, undiluted by nontech job listings.

Monster

www.monster.com

Numbers matter, and everyone knows Monster.

☀ Register with Monster's new networking service to tap into millions of potential career

contacts, searchable by occupation and ZIP code.

Yahoo! HotJobs

<http://hotjobs.yahoo.com>

Not just job listings but all about jobs—from résumé writing to how to get a raise once your foot's in the door.

**NEWS AND ENTERTAINMENT****AMG All Music Guide**

www.allmusic.com

Do they exaggerate? Not much.

BBC News

<http://news.bbc.co.uk>

One of the most popular sources of world news, the BBC tells you what's happening—in 43 languages.

☀ BBC's Cult Television page is a shrine to cult classics like *Doctor Who* and cult newcomers like *Buffy the Vampire Slayer* and *The Family Guy*.

CNN.com

They shamefully overplayed Howard Dean's "I have a scream" speech, but this is still one of the best sources for news online.

☀ Click on CNN to Go to find out how to get CNN content and breaking news alerts on your cell phone.

E! Online

www.eonline.com

Your favorite shows, movies, gossip, and award-winning (okay, not really) Paris Hilton coverage.

ESPN.com

From the Schumacher who races F1 to the one who rides Xtreme Bulls, it's all the sports you could ever want.

Internet Archive

www.archive.org

An Internet library that holds more than 300 terabytes of text, as well as audio, video, and images from Web sites.

☀ It's not just Web sites. The archive is also trying to add vintage software apps to its collection, but copyright issues have slowed its

progress. Stay tuned.

The Internet Movie Database (IMDb)

www.imdb.com

Your first stop for movie trivia and information online.

MSN Slate Magazine

<http://slate.msn.com>

Plenty of biting content, ranging from politics and business to food and travel.

☀ You can get Slate content in e-book form, free. Just go to Output Options | eBooks. You can get all articles published in the past seven days, or choose which ones you want.

The New York Times On the Web

www.nytimes.com

The paper of record: Visit for news, op-ed pieces, thoughtful analysis, and, sadly, internal scandals.

☀ The 65-cent electronic edition downloads to your desktop or notebook and looks just like the real paper—and it's searchable.

NPR

www.npr.org

Terry Gross, Click and Clack, and *This American Life*: some of radio's best, online.

The Onion

www.theonion.com

"Six Dead in West Point Panty Raid." The laughs keep coming, thanks to "America's Finest News Source."

RollingStone.com

Whom is Britney Spears dating now? Is Norah Jones's new album worth your \$18? Find out here.

Salon.com

You can still read some of Salon.com's incisive content free, or view an ad to get a premium day pass.

☀ Note that the \$35 annual Premium subscription also gets you subscriptions to three magazines: *Wired*, *National Geographic Adventure*, and *U.S. News and World Report*.

ScienceDaily

www.sciencedaily.com

Keep abreast of the latest scientific breakthroughs.

Television Without Pity

www.televisionwithoutpity.com

Missed the latest *Surreal Life*? Recaps of the best in trashy TV, with plenty of snark.

☀ The recaps are funny enough, but the discussion forums are even funnier.

Wired News

www.wired.com

Still the Web's best source for great insights on how technology affects culture, society, and business.

CURRENT EVENTS AND NEWS YOU CAN USE

Electronic Privacy Information Center

www.epic.org

Keep tabs on how the government and other organizations are keeping tabs on you.

☀ Taking a shot at the Department of Homeland Security, EPIC spoofs the color-coded terror threat scale by recasting it as a "Privacy Threat Index."

IEEE Virtual Museum

www.ieee-virtual-museum.org

Fun family-friendly exhibits tell the story of electricity and reveal its most interesting aspects.

Also included: magnetism!

NASA

www.nasa.gov

The final frontier for space and aeronautics on the Web.

☀ Space buffs can read the entire 32-page report "2004 Vision for Space Exploration," which includes the request for return trips to the moon and more exploration of Mars.

Project Vote Smart

www.vote-smart.org

Get the skinny on all the candidates, so you can make an informed decision.

World Health Organization

www.who.int

Up-to-date health news and resources, from AIDS to zoonoses.

LIFESTYLE AND FUN

Citysearch

www.citysearch.com

Where to go and what to see in new cities—or even in your own backyard.

Discovery Kids

<http://kids.discovery.com>

An excellent site for kids, with plenty to do (based on content from the TV channel).

☀ The Trading Spaces: Boys vs. Girls section shows kids how to do the craft projects

they've seen on TV.

Epicurious

<http://eat.epicurious.com>

Hunger may be the best sauce, but it helps if you can make a good sauce too. Sauces are among this site's 16,000 recipes.

☀ Go beyond the recipe listings to check out the travel content. Foodies can get great restaurant recommendations for cities around the world.

HowStuffWorks

www.howstuffworks.com

Lock picks, chocolate, Magna Doodles—it's all in there. If only science class had been this interesting!



ifilm

www.ifilm.com

One of the biggest collections of movie, TV, and video clips on the Web.

☀ The site's "viral videos" are the newsmaking clips everyone's talking about around the water cooler.

National Geographic

www.nationalgeographic.com

Get news, tips, and guides; browse content from the Society's magazine; and, of course, shop.

☀ Put those yellow magazines in your basement to use. Click on Search to find an online index to the print publication that goes all the way back to 1888.

Nickelodeon Online

www.nick.com

Lots of fun interactive content for kids, plus a programming schedule and message boards.

Pogo

www.pogo.com

Hundreds of thousands of online opponents are just waiting for you to throw down the gauntlet.

Smithsonian Institution

www.si.edu

James Smithson's "establishment for the increase and diffusion of knowledge" also has a mighty fine Web site.

Yahoo! Games

<http://games.yahoo.com>

Got 5 minutes to spare? That's all it'll take to get hooked for the rest of the day.

SHOPPING

Amazon.com

Amazon.com keeps adding more stores; there's very little you can't find here.

☀ In this election year, Amazon.com is even selling presidential candidates. Make a one-click campaign donation here.

CarsDirect.com

Buy a car online? What a country!

ConsumerReview.com

Reviews of electronics, sporting goods, cars, computers, and more from the people who love them.

eBay

www.ebay.com

From the mundane to the truly bizarre, you can buy or sell just about anything here.

☀ Among cool new shipping features: online postage. Print out the amount you need, and pay for it via PayPal.

Netflix

www.netflix.com

A huge selection, free shipping, and no late fees. Movie rental doesn't get much better than this.

Overstock.com

A lot of good deals on a huge selection of stuff that other places didn't sell.

PriceGrabber.com, Shopping.com

From PCs and printers to potty-training equipment, find the best prices online at these sites.

☀ Put all your items into Pricegrabber's new Shopping List tool, and let it figure out

whether the most cost-effective way to buy them is from a single source or from several stores. At Shopping.com you can read user reviews from Epinions.com.

Surprise.com

Gift ideas for your favorite secret agent, gardener, or chocoholic, or anyone else in your life.

Techbargains.com

A clearinghouse of—well, tech bargains.

☀ If you don't find a deal you like, you can ask the site to do some research for you. No

guarantees on a response, but it's worth a try.

TRAVEL

Expedia.com

Get tickets to wherever you want to go, book your hotel, rent a car, even line up stuff to do while you're there.

☀ If you're flexible on your travel dates, use the new "rates without dates" search tools to find the best bargains on plane tickets and hotel rooms any time in the next 60 days.

Fodors.com

A classic for travel information, as well as traveler forums.

☀ Consider downloading one of Fodor's nine interactive city guides (\$19.95 each) to your PDA before you make your next trip.

Frommers.com

Solid travel info, but we head straight for the Deals section.

Lonely Planet Online

www.lonelyplanet.com

Our planet is anything but lonely; just ask the teeming, traveling masses contributing to this site.

☀ Check out the site's monthly Travel Ticker to see whether elections, strikes, political unrest, or holiday schedules may hinder your upcoming travels.

Orbitz

www.orbitz.com

A perennial favorite for deals on flights, hotels, cars, cruises, and vacations. Before you get away, get here.

Travelocity

www.travelocity.com

More than just a basic travel site, Travelocity offers tools, tips, and videos. ☰

OUR CONTRIBUTORS: Gary Berline, Glen Boisseau Becker, Sean Carroll, Ben Z. Gottesman, Matthew P. Graven, Vicki B. Jacobson, Michael Kobrin, Carol A. Mangis, Cade Metz, Laarni Almendrala Ragaza, Erik Rhey, Matthew D. Sarrel, and Michael J. Steinhart are *PC Magazine* staff members. Don Willmott is a contributing editor of *PC Magazine*. Janet C. Rubenking is a freelance writer. Associate editor Sarah Pike and PC Magazine Labs lead analyst Neil J. Rubenking were in charge of this story.



Centrino HB 556 Series

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Tablet PC Series

- Transmeta Crusoe 5800
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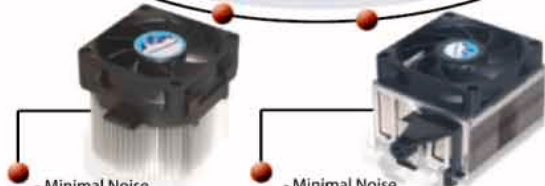
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- Max. 4GB, Dual Channel 400MHz / 333MHz / 266MHz ECC DDR
- AGP 8X VGA Mode Supported
- 4 Serial ATA / 150 ports & Integrated Intel® RAID Technology



755 Series

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- Max. 3GB DDR400 / DDR333 / DDR 266 DRAM
- AGP 8X slot (1.5v only)
- 4 Serial ATA / 150 (SATA) w/ RAID 0, RAID 1 & JBOD
- 5.1 channel, AC97 v2.3 audio
- Gigabit Ethernet LAN 10 / 100 / 1000 Mbps



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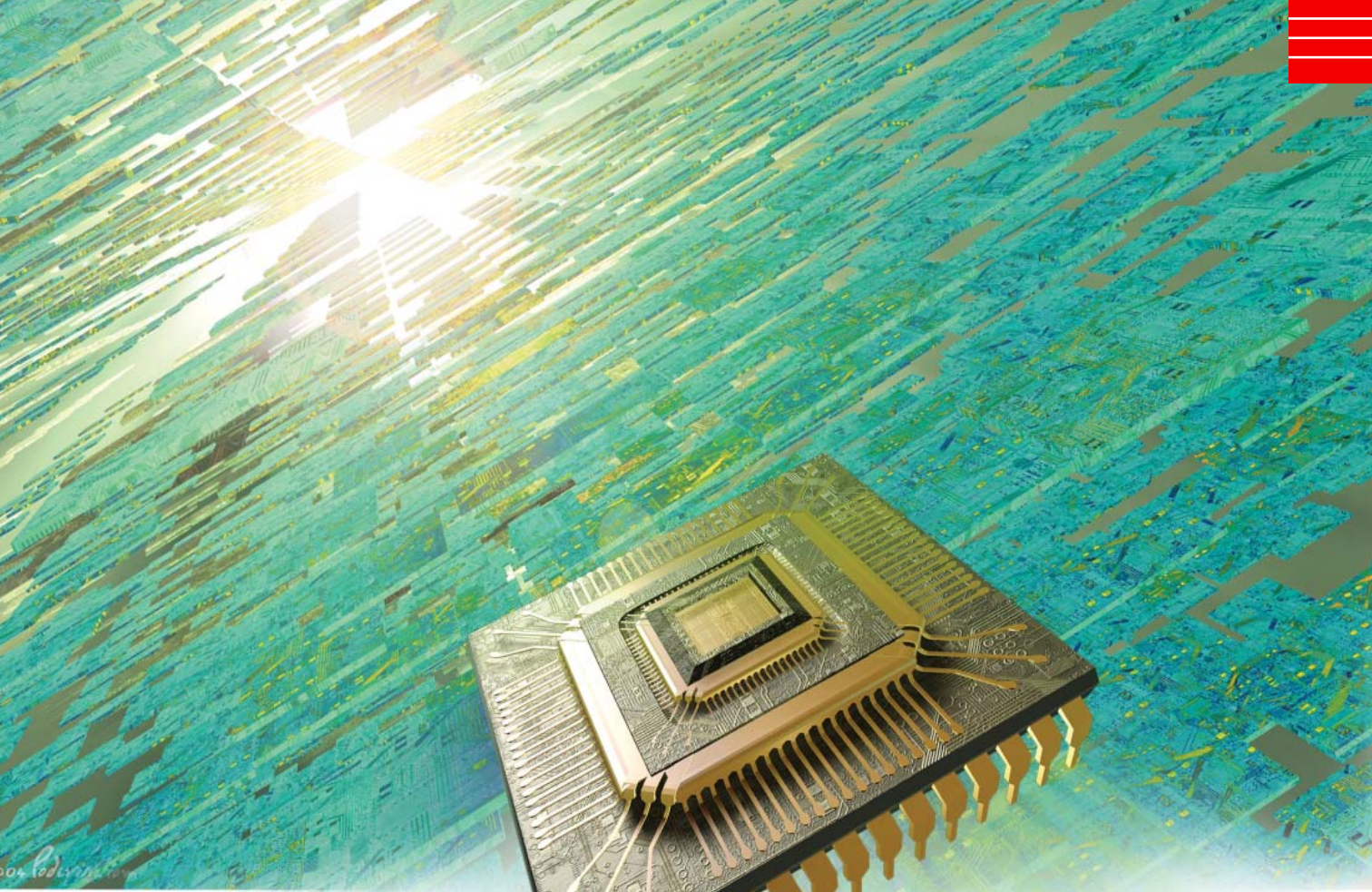
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CPUs The Road to Tomorrow

We explore the newest chip architecture and give you the lowdown on what's next, what's hot, and what's worth it.

By Richard Fisco Illustration by Jean-Francois Podevin

Faster clock speeds, smaller die sizes, and more cache are what we've come to expect each year from the major desktop CPU vendors—and 2003 didn't disappoint. As always, AMD and Intel led the charge in the high-end CPU war, with the Intel Pentium 4, based on the Northwood core, and the AMD Athlon 64. Apple partnered with IBM to come up with a new architecture for its PowerPC processors, and with smaller manufacturer VIA, better known

in Europe and Asia, which spent last year revving its C3 CPU's clock speed and trying to gain more ground in the U.S.

This year, AMD and Intel have ratcheted up the battle by doggedly promoting gaming-centric chips, which push the performance curve to the extreme.

Apple and IBM are playing their dual G5 plans close to the vest. Speculation is, however, that they will move to a 90-nanometer (90-nm) process and possibly a dual-core design.

Reviewed in this story

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Processors Down the Line

Here's a road map of chip development plans through 2006.

2003

1ST QUARTER

Banias

Centrino: new mobile CPU with 1MB of L2 cache

2ND QUARTER

Sledgehammer

Opteron MP: 64-bit server chip supporting up to 8 processors

3RD QUARTER

Clawhammer

Opteron DP: 64-bit server chips supporting 2 processors

Madison

Itanium 2: next-generation 64-bit Itanium (beyond the original McKinley chip); 2MB to 6MB L3

Deerfield

Itanium 2: low-cost 64-bit chip for the value workstation and server markets, with a lower bus speed and 1.5MB L3

PowerPC G5

New 2-GHz, 64-bit CPU based on the IBM Power4 core, with 1-GHz FSB

- Athlon 64
- Athlon 64 FX

The first 64-bit chips for desktops, with Sockets 754 and 940, respectively

4TH QUARTER

Duron

Discontinued

Nehemiah C3

0.13-micron, 1-GHz chip

Clawhammer

Mobile Athlon 64: the first 64-bit chip for notebooks

2004

1ST QUARTER

Clawhammer

- Athlon 64 3400+: 2.2 GHz, Socket 754
- Athlon 64 3700+: 2.4 GHz, 1MB L2, Socket 754
- Athlon 64 3400+, Athlon 64 3700+: 2.2 GHz and 2.4 GHz, respectively; Socket 940
- Athlon 64 FX-53: Socket 940

Newcastle

Athlon 64 3400+: 2.4 GHz, 512K L2, Socket 754

Prescott

P4 with SSE3, 90 nm, 3.4 GHz, 1MB L2

Northwood

3.4-GHz P4 EE, 512K L2, 2MB on-die L3

Mobile Prescott

2.8, 3.06, or 3.2 GHz

Gallatin-4M

Xeon multiprocessor, 3 GHz, 4MB L3

Prestonia

Xeon dual-processor, 3.2 GHz, 1MB L2

Dothan

Pentium M; 1.6-, 1.7-, 1.8-GHz mobile CPUs; successor to Banias; 90 nm, 2MB L2

Efficeon

1.2 GHz, 256-bit VLIW CPU

2ND QUARTER

Celeron with SSE3

Prescott core, 2.53 to 3.06 GHz, 256K L2, 533-MHz FSB

Mobile Prescott

Will hit 3.4 GHz

MAINSTREAM CPUs

Intel's mainstream CPU, the P4, has had a long run since it debuted in late 2001. Microarchitectural enhancements make the latest iteration of the P4, code-named Prescott, more than just a typical die shrink and speed bump. Intel promises to introduce 64-bit technology to the desktop P4 by the middle of this year.

Intel increased clock speed to the maximum of 3.4 GHz, though the chip at this speed was in limited supply at release. (It should be widely available by the time you read this.) But Intel risks confusing consumers by offering both Prescott and Northwood P4 chips, which share the same clock speeds but not the same microarchitecture. There are also slower Prescott chips that duplicate Northwood's clock speeds (2.8, 3.0, and 3.2 GHz). To distinguish the two chips, Intel has added an E to the Prescott processors (as in 3.4E).

With Prescott, Intel has moved to its new 90-nm manufacturing process, allowing for smaller die sizes with even more cache on-chip. Prescott doubles the L1 data cache size to 16K, implementing an eight-way associative architecture versus the four-way version in older P4 chips. The new architecture permits data retrieved from a particular memory location to be stored in eight possible cache locations. The design increases *cache hit rate*, or the likelihood that the requested data will be stored in the cache. Higher associativity requires a more complex hardware design and results in higher *cache access latency* (the amount of time it takes to find data in the cache).

As part of Intel's focus on multimedia and multitasking, Prescott adds microarchitectural improvements for Hyper-Threading (HT) technology and doubles the L2 unified (instruction/data) cache to

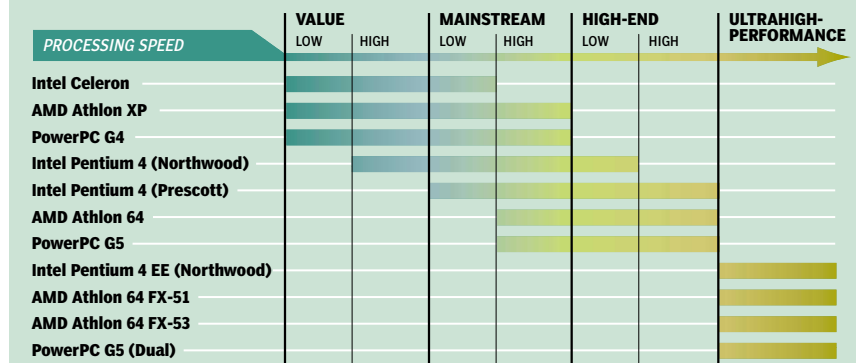
1MB. It also has introduced SSE3, which has 13 more multimedia instructions than the older SSE2 instruction set. These new SSE3 instructions will help in areas such as 3D graphics, video compression, and multitasking.

As with previous iterations of SSE, software developers need to rework their programs to take advantage of SSE3. We'll have to wait to see its full impact, as new apps with SSE3 extensions will hit the market later this year. But having HT technology present in various Northwood and all Prescott processors shows benefits in many multithreading and multitasking scenarios.

To allow higher clock frequencies, Intel has increased the number of stages in Prescott's pipeline to 31; by comparison, Northwood has 20 stages. The deeper pipeline and higher clock speeds work well with streaming-media apps such as video and audio encoding, in which processing is sequential and predictable. But long pipelines have drawbacks as well: Typical business apps have branchy, less predictable code, and when a processor mispredicts where the program will jump next, the entire pipeline must be flushed and reloaded, effectively wasting CPU cycles. The more stages in a pipeline, the longer it takes to flush and reload. The 20 stages of the Northwood design make it difficult to go much beyond 4 GHz. The Prescott chip's 31 stages, however, enable speeds of at least 6 GHz, but the many stages could also wreak havoc with branch mispredictions.

At press time, Intel announced its version of 64-bit extensions for its x86 CPUs, which will first be released in the Intel

Fitting In: Desktop CPUs



THE KEY PLAYERS:



Nocona
Xeon 3.6-GHz: Prescott server version, 90 nm, dual processors; will introduce Intel 64-bit extensions; 1MB L2 (possibly 2MB L3), Intel HT II technology support

3RD QUARTER

- **Fanwood**
 - **Madison 9M**
- Next Itanium update. Fanwood: dual-processor chip, 1.6 GHz, 3MB L3; Madison 9M: multiprocessor chip, 1.7 GHz, 9MB L3

Celeron
Will hit 3.2 GHz

Prescott
Will get 64-bit extensions

Mobile Prescott
Will hit 3.73 GHz

Esther
2 GHz, SOI, 90 nm

Microsoft Windows XP 64-Bit Edition
Support for AMD's and Intel's 64-bit x86 extensions

4TH QUARTER

Microsoft Windows Server 2003 64-bit
Three releases: Standard Edition for Intel Itanium systems, Standard Edition for 64-Bit Extended Systems, Enterprise Edition for 64-Bit Extended Systems

- **Venus**
 - **Troy**
 - **Athens**
- Opteron 152, 252, and 852, respectively: 90-nm successors to Opteron; expected to run at 2.6 GHz; 1MB L2; one-way, one- to two-way, and one- to eight-way, respectively

San Diego
Athlon 64 FX-55: 90-nm successor to Athlon FX-53, expected to run at 2.6 GHz; 1MB L2; Socket 939

Winchester
Athlon 64 3700+ and 4000+: 90-nm successors to Athlon 64 core; expected to run at 2.4 GHz and 2.6 GHz, respectively, and contain 512K L2; Socket 939

Paris
Athlon XP: crossover chip using Athlon 64 core and Socket 754; will run only in 32-bit mode; core built on a 130-nm process; expected to have 256K L2

Victoria
Athlon XP: similar to Paris but built on a 90-nm process

Odessa
90-nm successor to Mobile Athlon 64; expected to have 1MB L2

Dublin
Athlon XP-M: similar to Paris but for the mobile market

Continues

Xeon series in the second quarter of this year. Code-named Compatibility Technology (CT), they will be strikingly similar to the AMD64 design. The new extensions will let 64-bit systems process 32-bit apps more effectively by giving access to a larger amount of memory address space and by operating in a 64-bit OS. Intel stated it will most likely use the same Windows 64-bit version that will be released for the AMD64 architecture. There will be some proprietary differences, such as AMD's 3DNow! and Intel's HT/SSE3, but that can be handled with different code paths in the OS.

The AMD Athlon 64, introduced in September 2003, beat Intel to the punch by bringing 64-bit technology, or the promise of it, to PC desktops. The Athlon 64 is a follow-up to the 64-bit server/workstation-oriented AMD Opteron CPU, which was released in April 2003. Both the Athlon 64 and Opteron are based on the AMD64 architecture, and the Athlon 64 is now AMD's mainstream offering, moving its previous mainstream chip, the Athlon XP, to the budget category.

The Athlon 64's top speed grade is 3400+, with an actual clock speed of 2.2 or 2.4 GHz. The speed grade reflects benchmark test performance versus Intel CPUs, though AMD publicly states that the number is relative to prior Athlon chips. In addition to its 64-bit capability, the Athlon 64 is also fully compatible with x86, Intel's 32-bit architecture, and is the fastest x86 processor for many business and gaming applications.

The Athlon 64 launched with the

promise of 64-bit OSs from Microsoft, Red Hat, SUSE, and Turbolinux. But only SUSE has a 64-bit version of Linux 9.0 for AMD64 processors. Red Hat and Turbolinux are still in development, and Microsoft is scheduled to release a 64-bit Windows XP version in the third quarter of 2004. So we'll focus on the Athlon 64's 32-bit capabilities for now.

The Athlon 64 includes a 128K, 2-way set-associative L1 cache, a 1MB 16-way set-associative L2 cache, AMD 3DNow! Professional, and support for SSE2. It also has a

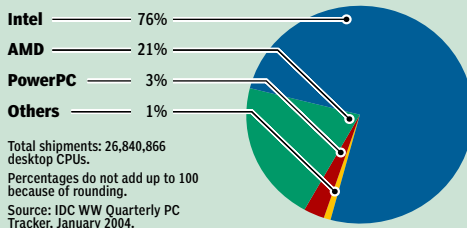
Athlon 64 has a short integer pipeline of 12 stages. It suffers less of a performance hit when it predicts branches of code incorrectly, because there isn't as much data in the pipeline to flush and reload. With a smaller branch mispredict penalty to deal with, it can achieve a higher effective number of instructions per clock cycle (or IPCs). This is why the 2.2-GHz Athlon 64 3400+ outperformed the 3.4-GHz P4 on some of our benchmark tests. The Athlon 64 also has very strong floating-point performance, which improves some gaming, multimedia, and high-end workstation apps.

Apple announced and shipped its 64-bit PowerPC G5 desktop CPU about a week ahead of the Athlon 64. The G5 processor, built on the Power 4-based IBM PowerPC 970, is a five-way superscalar 64-bit RISC processor with 58 million transistors implemented on a 130-nm SOI process. Its 64-bit front-side bus (FSB) is actually composed of two 32-bit unidirectional buses (permitting simultaneous data transfer in both directions) and runs at half the CPU core frequency (1 GHz for the top-of-the-line 2-GHz G5 chip).

For even more power, Apple sells a dual-processor version of the Apple Power Mac G5 system, with two 2.0-GHz or 1.8-GHz G5 chips. The G5 chip has cache coherency logic, which, in a system with two or more CPUs and shared memory, lets each CPU be aware of what's in the other's cache. It also includes an optimized 128-bit AltiVec (Velocity) Engine.

Apple can use its 64-bit technology now,

U.S. Desktop PC Sales
by processor brand (January to September 2003)



single-channel, on-chip DDR memory controller with a 64-bit interface. This controller supports 200- to 400-MHz DDR SDRAM with a maximum 3.2-Gbps memory bandwidth. That's half the throughput of the P4, with its dual-channel DDR-based 875 chipset. The Athlon 64 overcomes its raw memory bandwidth disadvantage to some extent by integrating the memory controller on-chip, thereby reducing memory access latencies.

Compared with the Intel P4 designs, the

PROCESSORS DOWN THE LINE (continued)

2005

Prescott

Will hit 4 GHz

Oakville

Mobile Athlon 64: 90-nm SOI, successor to Mobile Athlon 64

Tejas

IA-32 processor built on a 90-nm process; successor to Prescott; will use a 775-pin-contact LGA package letting users snap chips in and out of motherboards; improved HT, eight more SSE instructions, 24K L1, 800-MHz FSB, 3.6-GHz

Jayhawk

Xeon DP: 90-nm process; roughly 4 GHz, 2MB L3, 800-MHz FSB, 64-bit extensions

- Denmark
- Italy
- Egypt

Opteron 100, 200, and 800 series; successors to Venus, Troy, and Athens, respectively; 90-nm, SOI

Toledo

Athlon 64 FX: successor to San Diego

Palermo

Athlon XP: successor to Victoria

Trinidad

Athlon XP-M: successor to Dublin

Microsoft Windows Longhorn

Successor to Windows XP; possibly late 2005 or 2006

Montecito

Follow-up to Itanium 2 (Madison) IA-64 CPU core; dual-core design, 90 nm, roughly 2 GHz, 24MB L3

Millington

Dual-processor Itanium IA-64 core, successor to Fanwood

Nehalem

Pentium 5: successor to P4 NetBurst-architecture CPUs; new architecture, 90-nm process

Potomac

Xeon MP: successor to Gallatin, 90-nm process, roughly 4 GHz

Yonah (or Jonah)

Mobile processor, successor to Dothan; architecture will differ from previous Banias-based processors; 90-nm process, may be dual-core

2006

Tukwila

Successor to Montecito IA-64 CPU; expected to be dual-core; may introduce asynchronous serial FSB; to be developed with ex-Alpha CPU team

Millington

Successor to Fanwood IA-64 CPU; dual-processor version of Tukwila

Gilo

Mobile processor; 65-nm successor to Yonah

K9 CPU

Initially in Opteron 870, 868, and 866; will incorporate new technologies, like threaded architecture, CMP (chip-level microprocessing), and media/vector processing extensions; expected to work at roughly 10 GHz with GHz-performance I/O and have huge caches

since the company controls its whole platform, including hardware and software. Apple's newest version of Mac OS X 10.3 (Panther), although still a 32-bit OS, takes advantage of the G5 chip's 64-bit virtual-memory addressing by incorporating a new kernel and updating system software math libraries using 64-bit extensions. The math libraries take advantage of the faster math functions of the G5. Even apps not tuned for the G5 can get some benefit from the faster math functions.

The G5 has 42-bit physical addressing, permitting up to 4 terabytes (TB) of physical memory rather than the 4GB available with 32-bit processors. But current Power Mac G5 systems can physically handle only up to 8GB of installed memory. Like the Athlon 64, the G5 CPU can run both 32- and 64-bit applications and OSs without emulation (without having to run the other apps in a software framework). Currently, there are few if any 64-bit apps for the G5. Apple will most likely release a full 64-bit OS and numerous 64-bit apps, though the company remains tight-lipped about when this will happen.

ULTRAHIGH-PERFORMANCE CPUs

Bleeding-edge performance has always been what Intel and AMD have used to promote their best CPUs. The fastest main-

stream CPUs filled that role nicely, until both manufacturers decided to re-architect their x86 server/workstation CPUs to create a new class of ultrahigh-performance processors. This new processor class is aimed at ultimate game play, 3D game development, content creation (such as video and audio), and uniprocessor workstations.

The Athlon 64 is the fastest AMD CPU, and the upcoming Athlon 64 FX-53 is what AMD calls its ultrahigh-performance CPU. The FX-53 borrows some features from its Opteron server CPU cousin: Its clock speed is 2.4 GHz, and it uses a 128-bit memory interface—twice the integrated memory controller width of the Athlon 64 3400+. The wider interface doubles the memory throughput of the Athlon 64 from 3.2 GBps to 6.4 GBps. But the Athlon 64 FX chip requires registered (or buffered) memory that slows down performance and adds cost. Even then, the Athlon 64 FX-53 is still the top performer overall in many business and gaming applications.

AMD plans to have only one FX chip on the market at a time. Its current FX-51 will be discontinued when the FX-53 begins shipping, and so on. The FX series doesn't use a performance rating like the Athlon 64, because AMD believes that the FX series is simply the fastest line of desktop CPUs. The higher the number after the FX, the faster the chip. Our testing mostly bore out that claim, as the FX-53 won or tied for first place on most of our benchmark tests.

AMD's shipping of the FX chip series was like throwing down the gauntlet in front of Intel, and Intel accepted the challenge. It took its Xeon server CPU with an integrated 2MB L3 cache and disabled the support

for multiprocessors. Intel calls the chip the Pentium 4 Extreme Edition (EE). The extra cache boosts performance, making the P4 EE the top-performing Intel CPU. In fact, the 3.4-GHz P4 EE, based on a reworked Xeon MP core with 512K L2 cache and 2MB L3 cache, outperforms the 3.4-GHz P4 (Prescott) in many apps. Though the FX-53 beat the P4 EE by a nose on our 3D and gaming tests, the P4 EE bested the FX-53 on our overall multitasking tests.

While both the FX-53 and P4 EE are top performers, they cost more than twice the price of Intel's mainstream CPUs and almost twice as much as AMD's. (The 3.4-GHz P4 costs \$417, compared with \$999 for the 3.4-GHz P4 EE; the Athlon 64 3400+ costs \$417, compared with \$733 for the FX-53.) Clearly, these chips are only for people who absolutely need the extra performance, like content creators who realize that time is money, hard-core gamers who demand the best gaming experience, or those with expendable dollars who want bragging rights for their PCs.

VALUE CPUs

Though most of the press focuses on the fastest CPUs produced, value CPUs still command about 20 percent of the market.

For years the top-performing AMD CPU was the Athlon XP, with the Duron chip filling the value CPU niche. With the Athlon 64 moving to the forefront, the Athlon XP becomes the value leader—a tough marketing message for AMD to get across. The current top-performing Athlon XP CPUs based on the Barton core have 512K of L2 cache, can run at FSB speeds up to 400 MHz, and attain a 3200+

more on the web

Point your browser to www.pcmag.com for a summary of features on processors.

rating with a 2.2-GHz clock speed.

The current **Intel** Celeron CPUs are based on the P4 Northwood core. To differentiate the Celeron and P4 (Northwood) chips, the Celerons have one-quarter the L2 cache and are limited to 400-MHz FSB. Intel also throttles the clock speeds lower than its fastest P4's: 3.4 GHz for the P4 compared with 2.8 GHz for the Celeron. AMD charges the same for the Athlon XP CPUs that Intel does for the Celerons, but the Athlon XP CPUs have significant performance gains over the Celerons.

Our tests showed that on a clock-for-clock comparison, Intel's fastest Celeron value CPU can't compete with the fastest Athlon XP. Even the top Celeron with a 600-MHz clock advantage gets trounced by the Athlon XP.

You can still find the Duron, a discontinued AMD value CPU, in extreme low-end boxes, but the Athlon XP makes the most sense for value buyers, because it provides near-mainstream CPU performance

(sans 64-bit capabilities) at budget prices.

Known mostly for its chipsets and motherboards, **VIA Technologies** offers desktop, mobile, and embedded CPUs, though it caters mostly to the budget end of the spectrum. The company's newest low-power, low-cost desktop processor, the VIA C3, is based on the Nehemiah core and runs at 1.2 GHz. It also dissipates very little heat—a maximum of 18 watts at 1.2 GHz. While intriguing for entry-level apps, e-mail, Web browsing, and word processing, VIA chips just haven't caught on in the U.S. Even Microtel, which started selling VIA-based systems through Wal-Mart, has abandoned the chip in favor of AMD Duron processors.

LOOKING AHEAD

Moore's Law lives on. CPU manufacturers will continue to produce faster processors and fit more transistors into a given die area in the foreseeable future. And each new design promises to advance CPU technology,

either in baby steps or in giant steps.

AMD introduced the Newcastle design to the Athlon 64 family in the first quarter of 2004. It's basically the same CPU as the regular Athlon 64 but with 512K of L2 cache instead of 1MB. The reduced cache lets AMD make a less expensive CPU yet still offer a competitive performance rating. Newcastle chips do have a lower performance rating than regular Athlon 64s. For example, the 2-GHz Athlon 64 with 1MB of L2 cache is rated at 3200+, while the Newcastle running at the same speed is rated at 3000+.

Late in 2004, AMD will be moving to 90-nm designs with the San Diego (with an Athlon 64 FX core) and Winchester (Athlon 64 core). Both chips will use a new 939-pin package and incorporate the 128-bit memory controller into the Athlon 64 line, so they will match the Athlon 64 FX.

AMD's 2004 plans for the Athlon XP include a melding of the Athlon XP and the Athlon 64. Code-named Paris, the new Athlon XP chip will use the Athlon 64

Mobile CPUs

Notebook CPUs aren't just low-powered desktop versions; they're designed specifically to work in a mobile platform. Even desktop chips are reworked to perform better in notebooks.

Intel currently offers seven CPUs found in notebooks: the desktop P4 EE and desktop Pentium 4 (commonly used in multimedia, gaming, and desktop replacement notebooks); the Mobile Intel Pentium 4, Mobile Intel Pentium 4 Processor-M, and Pentium M (typically for mainstream and ultraportable notebooks); and the Mobile Celeron and Celeron M (usually for value notebooks). All CPUs except the two Celerons have Speed-Step technology. (For more on the differences among the Pentium CPUs found in notebooks, see the Solutions piece "A Plethora of Pentiums," August 19, 2003.)

With the P4-based CPUs comes a trade-off: More performance generally means less battery life. And with the Pentium M comes a new microarchitecture that's different from the P4. The Pentium M combines better performance (despite the lower clock speed) with excellent battery life. Intel also offers the Pentium M in low-power and ultra-low-power versions. In mid 2004, Intel will launch the Mobile P4, based on a Prescott core, at 2.8 to 3.2 GHz. Versions up to 3.73 GHz are expected by the third quarter.

Intel has just updated the Pentium M with the Dothan core (previous versions were based on the Banias core). Dothan, set to

be released in the second quarter of this year, will be built on the same 90-nm core as the Prescott and will double the L2 cache to 2MB. Dothan will feature clock speeds of 1.6 to 1.8 GHz. Other improvements to the platform will come with Intel's new chipset, code-named Alviso. Alviso adds built-in Gigabit Ethernet and support for DDR, Serial ATA hard drives, and PCI Express. (For more details, see "What's New with Notebooks," February 17, 2004.)

AMD offers the Mobile AMD Athlon XP-M, now considered the company's value option, and the Mobile AMD Athlon 64, the first 64-bit chip for notebooks. Both are based on their desktop

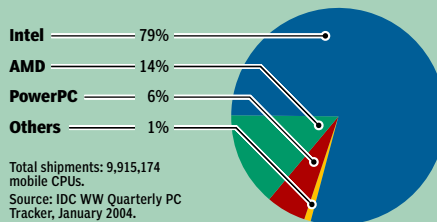
cousins, the Athlon XP and Athlon 64, respectively. Unlike Intel, AMD doesn't offer a built-from-the-ground-up mobile CPU design. The Mobile Athlon 64, seen on mobile workstations and gaming notebooks, still needs a 64-bit Windows OS and apps written to take advantage of the architecture. AMD says that toward the end of the year it will launch the 90-nm successor to the Mobile Athlon 64, code-named Odessa, with 1MB of L2 cache.

Apple offers only the PowerPC G4 CPU in its notebooks. Through Mac OS X, Apple can lower the G4's clock speed to increase battery life. Currently, Apple doesn't offer a G5 processor on any of its notebooks.

Transmeta rounds out the field with its Efficeon brand, which is typically used in ultraportable and lighter notebooks and is the successor to the Transmeta Crusoe TM5800. Unlike the typical x86 architecture, Transmeta's CPUs use an x86-compatible code-morphing VLIW (very long instruction word) core. The Efficeon recently became available in the U.S. via the Sharp MM2-5NE notebook.—RF

U.S. Mobile PC Sales

by processor brand (January to September 2003)



What the Numbers Mean



This year, the big story continues to be the AMD/Intel showdown on the desktop CPU playing field. But Intel, the 800-pound gorilla, also has been competing with itself, with the introduction of the Pentium 4 Extreme Edition or EE (based on the Northwood core), the Pentium 4 (also based on Northwood), and the Pentium 4 with SSE3 (based on the Prescott core). Each of the three processors runs at 3.4 GHz with an 800-MHz front-side bus. Not to be outdone, AMD has released its “ultra-high-performance” Athlon 64 FX-53 (2.4 GHz), which will replace the FX-51 (2.2 GHz) as AMD’s fastest desktop CPU.

STRESSING THE CPU

With this story we add to our regular lineup two benchmark tests that specifically stress the CPU: FutureMark’s PCMark04 CPU test and the 3DMark03 CPU test. Unlike the system-based Winstone tests, these tests stress only the CPU and memory subsystem and not the rest of the PC’s subsystems, such as graphics, the hard drive, and I/O.

The file conversion, encoding, and compression tasks in PC-Mark04 CPU show the effect the memory bandwidth has on the system. Since the Celeron, Athlon XP 3200+, and Athlon 64 3400+ have a narrower 3.2-Gbps bandwidth, they generally couldn’t keep up with the Pentium 4s and Athlon FX CPUs.

The file conversion, image-processing, audio-processing, and video compression tasks are also relatively linear processes. They favor the deeper pipeline, larger L2 cache, and efficient branch prediction found in the P4 chips. The 2MB L3 cache in the P4 EE helped it gain the highest PCMark04 CPU score. Hyper-Threading also helped the P4 processors with their PCMark04 scores: Several of the CPU tests are multithreaded.

FAST-FORWARD

Among the gaming monsters, we put the 2.4-GHz AMD Athlon 64 FX-53 up against its top-of-the-line competitor, the 3.4-GHz

Pentium 4 Extreme Edition (EE). According to our tests, the Athlon 64 FX-53 is the fastest chip out there. It finished in first place on most of the tests, performing roughly 11 percent better than the P4 EE on Business Winstone 2004. That’s because the 12-stage pipelines of both Athlon 64 FX chips let them handle the branchy code found in Business Winstone more efficiently than the other chips do. (The P4 and P4 EE with Northwood have 20-stage pipelines, and the P4 with a Prescott core has a 31-stage pipeline.)

The P4 EE edged out the Athlon 64 FX-53 on our multitasking tests by virtue of its strength on Scenario 3 of the tests. This scenario runs a Norton AntiVirus scan in the background while WinZip and Microsoft Access, Excel, FrontPage, PowerPoint, and Project perform tasks in the foreground.

BETTER MULTIMEDIA

The Athlon 64 3400+, FX-51, and FX-53 have begun to intrude on ground that was once the Pentium 4’s exclusive domain: multimedia content creation speed. The Athlon 64 series supports the SSE2 instruction set, which previous Athlon XP chips lacked. So the Athlon 64 chips excel at multimedia content creation tasks such as 3D rendering and Web site creation; on our tests the Athlon 64 3400+ outperformed the P4 chips in the same category. The shorter pipelines in the Athlon 64 FX chips also make them more efficient for dealing with task switching.

The Athlon 64 FX CPUs’ new memory architecture, which includes dual-channel DDR SDRAM and an integrated memory controller, now matches the 6.4-Gbps memory throughput of the dual-channel Pentium 4 CPUs and supporting chipsets. That means both architectures can move large chunks of data back and forth to system memory with equal efficiency.

The Athlon 64 FX-53 showed a 12 percent advantage over the P4 EE on Multimedia Content Creation Winstone 2004. The more mainstream Athlon 64 3400+, with a 64-bit, single-channel memory architecture, also compared favorably with the P4 EE:

CPU ROAD MAP

High scores are best. Bold type denotes first place within each category.	Clock speed (GHz)	BUSINESS APPS	MULTIMEDIA APPS	CPU TESTS		3D TESTS	GAMING TESTS	
		Business Winstone 2004	Multimedia Content Creation Winstone 2004	PCMark04	3DMark03	3DMark03	Serious Sam SE (fps)	Splinter Cell (fps)
Resolution ▶ Anti-aliasing/Anisotropic filtering ▶						1,024 x 768 2X/2X	640 x 480 2X/2X	640 x 480 0H/2X
ULTRAHIGH-PERFORMANCE								
Athlon 64 FX-51	2.2	27.0	34.6	4,163	717	2,854	143	44
Athlon 64 FX-53	2.4	29.4	37.1	4,353	781	2,868	151	45
Pentium 4 EE (Northwood)	3.4	26.6	33.2	5,230	758	2,847	139	44
MAINSTREAM								
Athlon 64 3400+	2.2	27.4	34.4	4,154	689	2,820	131	44
Pentium 4 (Northwood)	3.4	24.2	31.9	5,208	680	2,836	122	43
Pentium 4 with SSE3 (Prescott)	3.4	24.6	31.9	5,227	694	2,845	121	43
VALUE								
Athlon XP 3200+	2.2	21.5	28.6	3,757	563	2,774	94	42
Celeron	2.8	15.8	19.3	3,464	354	2,774	57	30

RED denotes Editors’ Choice. We tested each desktop with 1GB of DDR400 SDRAM, Microsoft Windows XP Professional, two Western Digital WD2500JD hard drives set in a RAID 0 array, and an ATI Radeon 9600 XT (Catalyst 4.1).

Even with its 3.2-Gbps memory throughput, it bested the P4 EE by 4 percent on the same test program. The Athlon chip's SSE2 compatibility and integrated memory controller presumably contributed to this gain.

Among the mainstream chips we tested, the Athlon 64 3400+ beat the P4 Northwood by 13 percent on Business Winstone 2004, and it beat both P4s (Northwood and Prescott) by 8 percent on Multimedia Content Creation Winstone. The Athlon 64 3400+ lagged behind the P4 Prescott on the PC-Mark04 and 3DMark03 CPU tests; it performed almost evenly with the comparable P4 chips on the 3D and gaming tests, except for Serious Sam, where it surpassed the others by 7 or 8 percent.

As for the Intel-versus-Intel battle, the P4 Northwood and P4 Prescott chips (both 3.4 GHz) performed identically on our Multimedia Content Creation Winstone tests, although the Prescott chip has more stages in the pipeline and double the L2 cache. But Prescott's more complex chip architecture, including its 31-stage pipeline, gives it the edge in ever-increasing clock speed. Northwood maxes out at or near the current 3.4 GHz.

On the Business Winstone tests, Prescott had a 2 percent advantage over the P4 Northwood chip at the same speed, far below the 10 percent we consider a significant difference. For business apps with branchy code, Prescott performed worse than we expected because of its longer pipeline; Northwood has only 21 stages. But the P4 Prescott still outperformed the P4 Northwood because of its improved branch prediction algorithms.

Though Prescott boasts an SSE3 instruction set, none of the current apps are written to take advantage of this new technology. Once SSE3-optimized applications appear, Prescott is likely to have a performance advantage over Northwood and the Athlon 64. Until then, if you want an P4-based box, we recommend you buy your next desktop system based on its features rather than which version of the P4 is installed.

THE EDGE IN GAMING

The full 3DMark03 suite of tests is a better judge of system performance for gaming and testing the graphics card, memory, chipset, and CPU. It illustrates what you're paying for when you must have the latest CPU hardware. By using the same video card on all test machines, we eliminated its influence from the comparison.

Though all of the CPUs we profiled will play today's games—as long as you have a powerful enough graphics card—3DMark03 shows which CPU is at the end of its rope when pushed even a little. The Celeron is a fine budget CPU, and for office workers it may be all they need. But for gamers, the more frames per second the better. The Athlon 64 FXs, the Athlon 64 3400+, the P4s, and the Athlon XP 3200+ all displayed at least 42 fps on the Splinter Cell test, but the Celeron could barely manage 30 fps, which we consider the limit for the low end of playability.

At this speed, Celeron users will start to notice dropped frames from time to time, and a dropped frame can make the difference between seeing an enemy in your sights and seeing the enemy walk over your (virtual) dead body. This deficit will show in games like DOOM III and Half Life 2, both of which will be

MULTITASKING TESTS

	Clock speed (GHz)	BUSINESS WINSTONE 2004			
		Scenario 1	Scenario 2	Scenario 3	Overall
ULTRAHIGH-PERFORMANCE					
Athlon 64 FX-51	2.2	2.9	2.9	2.9	2.9
Athlon 64 FX-53	2.4	3.0	2.9	3.1	3.1
Pentium 4 EE (Northwood)	3.4	2.9	2.6	3.8	3.3
MAINSTREAM					
Athlon 64 3400+	2.2	2.5	2.8	2.8	2.8
Pentium 4 (Northwood)	3.4	2.6	2.4	3.5	3.0
Pentium 4 with SSE3 (Prescott)	3.4	2.4	2.5	3.6	3.0

RED denotes Editors' Choice. We tested each desktop with 1GB of DDR400 SDRAM, Microsoft Windows XP Professional, two Western Digital WD2500JD hard drives set in a RAID 0 array, and an ATI Radeon 9600 XT (Catalyst 4.1).

available later this year. Both games are designed to turn off features that slow down play if your CPU or graphics card is not strong enough. Do you really want to have game features turned off on your brand-new PC?

At \$999, the P4 EE is the most expensive CPU in the roundup, followed closely by the Athlon 64 FX-53 (\$733). The P4 EE is more than twice as expensive as the Pentium 4 Northwood or Prescott; this translates to about a \$700 difference in the price of a system—the amount you are paying for a minuscule increase in the overall 3DMark03 score and about 15 percent on Serious Sam. The increase in Splinter Cell performance was only 1 frame per second.

That said, hard-core gamers with money to burn will not balk at the chance to brag about their benchmark test scores, just as Ferrari owners gush about their cars' ability to go from 0 to 60 in 3.4 seconds.

By a slim lead, the king-of-the-hill gaming CPU is the Athlon 64 FX-53. It scored about 1 percent higher than the P4 EE on 3DMark03 overall, and it showed 9 percent and 2 percent advantages on Serious Sam and Splinter Cell, respectively. At these levels, they are in a virtual dead heat. But both CPUs will have the horsepower to play today's games exceptionally well, with the promise of playing tomorrow's games without much need to upgrade. (For a reviews of a full system using the Athlon 64 FX-53, see First Looks, page 34.)

HOW WE TESTED

To keep as many components in common as possible between the test-beds, we installed the same video cards, hard drives, and memory (with one exception) in all the white boxes we used for testing.

We used the ATI Radeon 9600 XT video card with 128MB of video memory and the Catalyst 4.1 video driver. We did not activate ATI's overclocking utility Overdrive. Each system had dual Western Digital 2500JDs (7,200-rpm SATA hard drives), set up in a RAID 0 striping array. Likewise, each machine had 1GB of system memory; wherever possible, it was Corsair TwinX DDR400 SDRAM. Since the 940-pin Athlon 64 FX CPUs require registered (or buffered) RAM, the Athlon 64 FX systems used Mushkin registered DDR400 SDRAM.

We installed the CPUs on retail motherboards from ASUS and Intel. We thank AMD, ATI, Corsair, Intel, and Western Digital for their assistance with this story.—*Analysis written by Joel Santo Domingo*

Servers and Workstation CPUs

Though the consumer market has recently added a new category—ultrahigh-performance CPUs—the true high performers have always been server and workstation chips. Such chips are at the pinnacle of performance, with features like 64-bit capability to address more memory and quickly access huge amounts of data, multiprocessor support, and large L3 caches.

Intel commands this area of the CPU market, with the Xeon and Itanium 2, though you can also find other Intel chips—like the Celeron, P4, and P4 EE—in servers and workstations.

Itanium 2, released in the third quarter of 2002, is the next generation of Intel's 64-bit CPU architecture IA-64. Unlike AMD 64, IA-64 is a new 64-bit architecture and not an extension of the existing x86 32-bit design. Intel's 64-bit processors are based on the EPIC (Explicitly Parallel Instruction Computing) architecture, a form of VLIW, defined and created jointly by HP and Intel. Itanium 2 isn't 32-bit-compatible and must be run with a 64-bit OS and 64-bit apps written specifically for EPIC. The processor is meant for servers and workstations with large data sets and heavy floating-point calculations.

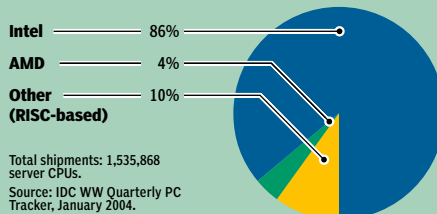
The Intel Xeon processor, released in May 2001, is basically the P4 (Northwood) with added L3 cache and dual-processor capabilities. It works well for midrange servers or workstations that perform heavy multitasking and run multithreaded apps, because the Intel HT technology can make dual CPUs appear to the system as four virtual processors. Intel has just announced 64-bit extensions for its Xeon and P4 CPUs. The Xeon will be the first processor

core but will only be enabled for 32-bit extensions. Having an Athlon 64 core for the Athlon XP (Paris) chip will help put both Athlon 64 and Athlon XP CPUs on a more similar path. AMD will then shrink the die to a 90-nm design in a chip code-named Victoria.

Intel's future plans center around the proliferation of the Prescott core. Expect to see Extreme Edition and Celeron processors based on Prescott sometime later in 2004. Farther out, we'll see improvements to Prescott with a chip code-named Tejas. It will increase cache size and reduce latencies, add more SSE instructions, and speed up the FSB. It could also be the first chip to top 4 GHz.

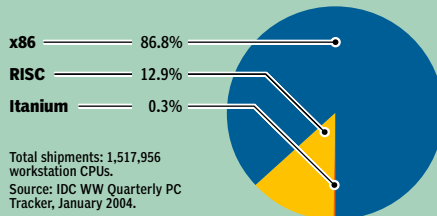
U.S. Server Sales

by processor brand (January to September 2003)



U.S. Workstation PC Sales

by processor brand (January to September 2003)



CPUs. These links are used to connect multiple CPUs, and they have added cache coherency algorithms, so the multiple processors are aware of what is in one another's cache. Toward the end of 2004, AMD will release Opteron 152, 252, and 852 CPUs, the 90-nm successors to the Opteron. The chips will contain 1MB of L2 cache and are expected to run at 2.6 GHz.

The Xserve G5 signifies Apple's reentry into the server market. The Xserve G5 uses the same G5 core found in Apple desktops and is sold only as a single- or dual-CPU configuration in a 1U chassis. The G5s come with dual independent FSBs. Each bus is a dedicated bidirectional interface to the system controller, giving the G5 16 GBps of total bandwidth on dual-2-GHz systems.—RF

to get such extensions in the second quarter of this year, as Intel says the ability of 64-bit technology to access a greater amount of address space will benefit high-end workstations and low- to mid-range servers. P4 chips should be getting the 64-bit extensions soon after. The 64-bit extensions are similar to AMD's 64-bit implementation and won't compete with Itanium 2 at the high end.

AMD still offers its Athlon XP and Athlon MP processors for entry-level servers and workstations, but its top performers are its Opteron, Athlon 64, and Athlon 64-FX CPUs.

The 64-bit Athlon server and workstation processors are in the Opteron family. The Athlon 64-FX and Opteron are similar in design, but the latter adds features specifically for servers and high-performance workstations. In order to be able to have multiprocessor-capable systems up to eight-way, AMD implements more HyperTransport links on its Opteron

The next new microarchitecture for an Intel x86 technology-based chip is rumored to be found in Nehalem, due in late 2005. Little detail has been released on this chip other than it will use a new, different core than Prescott and could be called Pentium 5, though that's somewhat redundant.

Apple has always been secretive about its product plans, so details on the future of the G5 are unknown. You should expect, however, IBM and Apple to follow established CPU road maps and look at performance enhancements such as larger caches, improvements to its AltiVec (Velocity Engine) extensions, and other pipeline improvements. With the G5 being based on the

Power4 architecture—currently a dual-core design—there is plenty of room for Apple to continue improving its G5 processor.

The never-ending battle by the major chip companies will continue, as each tries to come up with the fastest, best-performing CPUs for desktops, notebooks, servers, and workstations. And as always, the real winner of the CPU wars will be the consumer. Tomorrow has never looked brighter. ■

Our contributors: **Richard Fisco** is a technical director at PC Magazine Labs. Associate editor **Laarni Almendrala Ragaza** and PC Magazine Labs lead analyst **Joel Santo Domingo** were in charge of this story.

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Notebooks

By Bill Howard

Illustrations by Nick Rotondo

READ ON TO LEARN:

- The differences among the three main classes of notebooks and what you get with each
- Which notebook vendors are in the lead
- What types of features and components to look for when making your buying decision
- How much it will cost to upgrade

The simple fact is: Notebook PCs can go anywhere and handle almost anything a traditional desktop PC can, including multimedia applications. No wonder notebook sales are gaining on desktop sales.

That's not to say that desktops are on the fast track to extinction—far from it. The best desktops are blazingly fast, and the cheapest cost under \$500. Gamers, graphics professionals, and heavy-duty engineering types may want to stick with desktops.

Still, notebooks can be just as powerful as desktops, and they offer users the freedom to roam. With increasingly low weights, longer battery life, and the addition of integrated wireless, today's notebooks are taking mobile computing to a new level.

Choices

No matter what kind of computer user you are—a frequent flier, a gamer, a multimedia buff, or a typical home user—there's a notebook out there for you. Notebook manufacturers offer systems in three major categories: desktop replacement, mainstream, and ultraportable. A few smaller categories exist, too, such as tablets and mini-notebooks.



No matter what kind of computer user you are, there's a notebook out there for you. We help you find the perfect system for your needs.

Desktop replacements are the heavyweights among notebooks. These are gaining popularity among consumers and run from 7 to 10 pounds. They come in two main flavors—high-end and value.

High-end desktop replacements generally cost \$1,500 to \$3,000. These notebooks incorporate top-shelf components such as fast processors, which can easily top 3 GHz, and impressive graphics. They also offer substantial 15- to 17-inch displays, many of which are wide-screens. That is great for multimedia creation and viewing, and some of these systems even include TV tuners. If you're into gaming, photography, or video editing—and mobility isn't high on your list—then this class of desktop replacements will suit your needs.

If you don't want to shell out \$3,000 and don't expect to do much more than some light photo retouching, Web browsing, and e-mail, then a *value desktop replacement* is the way to go. Such systems fall in the \$1,000 to \$1,200 range, with lower-level components (often last year's high-end components). They're ideal for budget-conscious home users and students or as second PCs for the home.

Mainstream notebooks are typically owned by business users who travel frequently. These weigh 4 to 7 pounds, tend to have 14- to 15-inch screens, and cost \$1,200 to \$2,500.

Highly regarded as a business traveler's salvation, such systems strive to achieve the perfect blend of portability and power. They are almost always outfitted with low-voltage processors that reduce power consumption, like the Pentium M, and yield solid battery life, averaging 5 hours or more, as well as solid performance. Wireless capability is also very important; 802.11b is almost always an option, and 802.11g is becoming increasingly prevalent.

More consumers are beginning to favor this category because of its well-balanced blend of portability and power, as well as these systems' long battery life. For college students especially, the systems at the lower end of the price spectrum—which usually means the higher end of the weight spectrum—are good buys.

Ultraportables are the sleekest, slimmest full-featured notebooks on the market, weighing from 2.2 to 4 pounds. These notebooks tend to be on the expensive side, costing from \$1,500 to \$2,800, and are primarily intended for high-level business executives who travel frequently and need to check e-mail often, surf the Web, and read documents more than they create content.

Thanks to improved low-power and ultralow-power CPUs and small hard drives with increased capacity, more business users are relying on these compact computers to get work done on the road. They typically have 12-inch screens, and though some have smaller-than-standard keyboards, you can find models that manage to fit full-size keyboards.

Mini-notebooks and tablets make up the smallest part of the market. Mini-notebooks are most popular in Europe and Asia. They weigh less than 2 pounds, with diminutive 10-inch screens and compressed keyboards. These systems are best if you'll use them only for reading documents and doing light e-mail.

Tablets come in two types: convertibles and slates. *Convertibles*, which are more popular, look like typical mainstream notebooks, yet a convertible's display swivels around so you can write on it using a digitizer stylus and Microsoft Windows XP Tablet PC Edition. *Slates* are more popular in vertical markets like hospitals and real estate. A slate is simply a display and an embedded CPU, with a keyboard that attaches separately.

TOP 10 TIPS for Buying A Notebook

1. If you're buying a notebook just for the basics—word processing, Web surfing, and e-mail—almost any system will do, but make sure it has at least 30GB of hard drive space.
2. Try to get a system with 512MB of RAM (instead of 256MB). More RAM can significantly improve performance at minimal cost.
3. Consider a system with a writable optical drive—either a CD-RW or DVD-RW drive. If you want a writable DVD drive, look for a multiformat drive that handles both DVD-R and DVD+R media.
4. Get a wireless-integrated notebook and opt for 802.11g. This standard is compatible with the slower yet popular 802.11b used in many public hot spots.
5. If you travel frequently, consider buying a second battery and a second AC adapter. The second battery will come in handy during the last leg of a long trip. The second AC adapter can be dedicated for home use and trips, so you can leave your first one at the office.
6. In case you're searching for a bargain, refurbished PCs can be discounted by as much as 20 percent. Such machines should include all documentation and a full warranty. Direct sellers like Dell and Gateway sell such units on their Web sites, as do retail computer stores.
7. If your notebook comes with a rebate offer, by all means send it in. Don't delay: Some rebates expire two weeks after the purchase date.
8. A port replicator or docking station (ranging from \$75 to \$200) is a convenience if you move around a lot with your notebook. No more unplugging half a dozen cables to go to a meeting down the hall!
9. Accessorize. Don't travel without a portable mouse (\$10 to \$50), security lock (about \$25), and car DC-to-AC power inverter (about \$50).
10. Consider an extended warranty, for peace of mind. This kind of warranty costs an additional \$50 to \$100 per year.



Desktop replacement

▲ This heavyweight category includes both the most expensive and the cheapest mobile systems. You can find a desktop replacement that includes all the bells and whistles of a desktop or one with cheaper components and an attractive price tag.

PRICE • \$1,500 to \$3,000 for a high-end, top-shelf system; \$1,000 to \$1,200 for a value system.

SYSTEM WEIGHT • 7 to 10 pounds.

DISPLAY • 15 to 17 inches; can be wide-screen, with XGA, SXGA, or UXGA resolution.

KEYBOARD • Full-size 19-mm key pitch with 3-mm travel.

PROCESSOR • Typically about 3.0 GHz, with either a traditional desktop CPU or one modified for mobile systems. Both kinds tend to run hotter than other mobile chips, requiring more room for airflow and fans. Some desktop replacements come with CPUs specifically designed for notebooks, such as the Intel Pentium M, with lower clock speeds but high performance and built-in power savings to extend battery life. AMD offers the only 64-bit CPU commonly found in desktop replacements.

HARD DRIVE • Anywhere from 30GB to 80GB, depending on the class of desktop replacement. Media Center PCs require larger hard drives to store multimedia files.

GRAPHICS • A standard ATI or nVidia midrange graphics chip. Gaming/multimedia users should opt for a top-of-the-line graphics chip, such as the ATI Mobility Radeon 9700 or the nVidia GeForce FX Go 5700.

BATTERY LIFE • Anywhere from 2 to 6 hours, depending on the processor. Battery life is not so important with desktop replacements, which often stay plugged in and unmoved.

WIRELESS • Integrated 802.11b, 802.11g, or 802.11a/g. 802.11g and 802.11a/g provide the fastest throughput.

USB PORTS • Usually at least two are included; the more the better.

FIREWIRE PORT • One may be included.

This is useful for some cameras and most digital camcorders.

MEDIA CARD SLOTS • These are becoming more popular on notebooks, particularly Secure Digital slots.

OPTICAL DRIVES • An internal DVD/CD-RW combo drive is often included; readable and writable DVD drives are also available but can add more than \$100 to the cost. If you opt for one, try to get a multiburner that handles both DVD+R and DVD-R.

SPEAKERS • A high-end model may have two speakers and even a subwoofer.

Features

Once you've decided on a notebook class, you still need to choose the processor, wireless technology, and optical drive you'll want, not to mention

the hard drive capacity. Sometimes keeping the latest components straight can be overwhelming, especially with technology advancing at such a rapid pace. Here's a breakdown of the most important elements.

Size and weight. Notebooks come in many shapes and sizes. System weight—the weight of the notebook alone—ranges from 2.2 pounds to 10 pounds. The travel weight, which includes added components such as an external AC adapter and an external optical drive, usually adds anywhere from half a pound to a pound.

Display. The options here are dizzying. Screens range from 10 to 17 inches diagonally and come in half a dozen resolutions. Wide-screen displays, available in 15- and 17-inch models, are gaining popularity among consumers because they match up with the aspect ratios of many DVDs. And 15-inch screens are quickly becoming the mainstream displays of choice, supplanting 14-inch screens, just as 14-inch displays supplanted 13-inch screens about three years ago.

Screen resolution is another important factor: The higher the resolution the crisper the image. Small displays (12.1 inches) usually employ XGA resolution (1,024-by-768). Larger displays (15 or 16 inches) use SXGA+ (1,400-by-1,050), and a few use UXGA (1,600-by-1,200). Wide-screens use WXGA (1,440-by-900) or WUXGA (1,920-by-1,200).

Processor speed. Notebooks come with various AMD, Intel, or Transmeta processors, but not all of those were designed specifically for notebooks. Intel offers various chips for notebooks, but its most capable mobile processor is the one-year-old Pentium M. The clock speeds may seem low, at 1.4 to 1.7 GHz, but the top-speed Pentium M CPU performs as well as a desktop Pentium 4

Notebook Market Share Leaders

COMPANY	MARKET SHARE
1. Dell	26.5%
2. HP Compaq	20.0%
3. Toshiba	12.3%
4. IBM	9.0%
5. Apple	5.1%
6. Sony	4.8%
7. Gateway	3.4%
8. Fujitsu/Fuji	1.1%
9. Acer	1.1%
10. eMachines	0.8%
Others	16.0%

Worldwide sales in 4Q 2003. Percentages do not add up to 100 because of rounding. Source: IDC WW Quarterly PC Tracker, 2004.

does, at 2.6 to 3.0 GHz, because of its optimized design.

The Pentium M comes in low-voltage (LV) and ultralow-voltage (ULV) versions, which save power. When a Pentium M is paired with an Intel chipset and wireless module, the umbrella technology is called Centrino. Not all Pentium M systems are Centrino systems; some manufacturers choose to pair the chip with a wireless chipset from a different manufacturer. An updated version of the Pentium M (code-named Dothan), which doubles the L2 cache to 2MB, is due out in the middle of the year.

Still on the market is the older Mobile Intel Pentium III Processor-M, which, though specifically designed for mobile computing, is roughly equivalent to the Pentium III generation of desktop processors. PIII-M speeds range from 800 MHz to 1.33 GHz, though this type of chip does not perform as well as a Pentium M at a given clock speed.

Intel also sells mobile-adapted versions of its Pentium 4 processor, both with and without Hyper-Threading, that run at speeds of up to 3.2 GHz. These are used primarily in desktop replacements; the mobile Celeron is often used in value-oriented desktop replacements. A trend over the past year or so is that vendors looking for low-cost, powerful CPUs for notebooks have simply dropped in desktop parts and added more cooling vents, giving them a \$50 to \$100 price advantage over equivalent mobile-adapted CPUs.

Intel's biggest competitor, AMD, has the fastest CPU for notebooks, the Mobile AMD Athlon 64. This processor will show even greater performance gains once the first 64-bit version of Windows and 64-bit applications trickle into the market. You can also find 32-bit AMD CPUs for notebooks, the Mobile AMD Athlon XP-M and the older, discontinued Mobile AMD Athlon 4.

A smaller manufacturer, Transmeta, recently introduced its mobile Efficeon CPU, which is primarily intended to run smaller notebooks at maximum power efficiency. Stay tuned to www.pcmag.com for more on this.

Hard drive. Hard drive capacities range from 20GB to 80GB. Most users find that 40GB is plenty. The majority of mainstream notebooks use 4,200-rpm or 5,400-rpm hard drives, while the largest desktop replacement notebook drives spin at 7,200 rpm and ultraportable drives at 4,200 rpm. The faster a hard drive spins, the better the system's performance.

Optical drive. A basic CD-ROM drive is almost standard in notebooks these days. But for only a few dollars more you can move up to DVD-ROM, which allows you to play DVDs. A DVD/CD-RW combo drive reads DVDs and reads and writes CDs. A DVD-RW drive can add \$200 to \$300 to the cost of a system but allows you to read and write DVDs. If you get one, try to go for a multi-format model that handles both DVD-R and DVD+R technologies.

In the near future, look for optical bays to shrink from 12.7 mm to 9.5 mm with the arrival of DVD multiburners to fit the smaller slot.

Keyboard. Your notebook keyboard should be as comfortable as the desktop keyboard you're used to using. Desktop keyboards have a 19-mm key pitch with 3-mm travel. This means there's three-quarters of an inch between the centers of two adjacent keys, and each key recesses 3 mm when pressed. (A row of ten

▼ Mainstream systems make good travel companions and offer more bang for the buck than lighter ultraportable systems.

PRICE • \$1,200 to \$2,500.

SYSTEM WEIGHT • 4 to 7 pounds.

DISPLAY • 14 to 15 inches, with XGA or SXGA+ resolution.

KEYBOARD • Full-size 19-mm key pitch with 3-mm travel.

PROCESSOR • A 1.8- to 2.8-GHz Intel or AMD mobile processor or a Pentium M.

HARD DRIVE • 40GB to 60GB.

GRAPHICS • A standard midlevel ATI or nVidia graphics card.



BATTERY LIFE • From 3 to 6 hours, because of power-saving technologies in processors.

WIRELESS • Integrated 802.11b, 802.11g, or 802.11a/g; "g" and "a/g" have the best throughput.

USB PORTS • Two or more.

FIREWIRE PORT • Not standard but useful, especially for a digital camcorder.

MEDIA CARD SLOTS • Becoming more popular on notebooks, especially Secure Digital slots.

OPTICAL DRIVES • An internal combo DVD/CD-RW drive is common fare, but you can also get a DVD-R, DVD+R, or multiformat DVD ± RW drive.

More business travelers are turning to ultraportables to help them get serious work done on the road.

PRICE • \$1,500 to \$2,800.

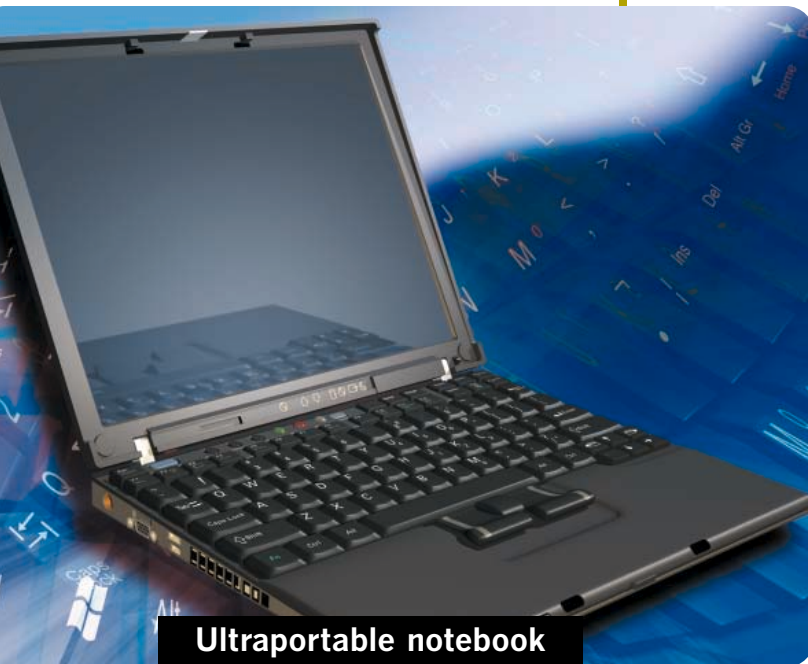
SYSTEM WEIGHT • 2.2 to 4 pounds.

DISPLAY • 12.1 inches, with XGA resolution.

KEYBOARD • 17-mm to 18.5-mm key pitch or full-size 19-mm key pitch, with 3-mm travel.

PROCESSOR • Intel Pentium M or a Transmeta Efficeon or Crusoe processor.

HARD DRIVE • 1.8- or 2.5-inch, with 20GB to 40GB of storage.



Ultraportable notebook

GRAPHICS • Integrated into the chipset.

BATTERY LIFE • Batteries are small to keep weight down, yielding about 2 hours. Add-on batteries can yield an additional 4 hours or so.

WIRELESS • Integrated 802.11b, 802.11g, or 802.11a/g; "g" and "a/g" have the best throughput.

USB PORTS • One or two.

FIREWIRE PORT • Not standard but useful, especially for a digital camcorder.

MEDIA CARD SLOTS • Becoming more popular on notebooks, especially Secure Digital slots.

OPTICAL DRIVES • An external drive such as a combo DVD/CD-RW model usually comes standard, though some heavier models have built-in drives. You can also opt for a DVD-R, DVD+R, or multiformat DVD±RW drive.

adjacent keys on a full-size keyboard measures 7.5 inches end to end.)

The smallest notebooks—ultraportables—include keyboards with key pitches from 17 mm to the full-size 19 mm. Many users say that an 18.5-mm key pitch is adequate, while 18 mm is harder to negotiate and 17 mm is too small.

Ideally, a keyboard should have eight cursor control keys (four Arrow keys plus PgUp, PgDn, Home, and End) rather than four keys that do double duty. Also, the Spacebar should be centered under the B key. Before purchasing a notebook, try typing on it.

Pointing device. Your choices are a pointing stick, a touch pad, or both. If you have to choose one, try both of them first. And consider buying a mouse, which you can plug in and use when you're not traveling.

Communications/wireless. An integrated modem and wired Ethernet are now a given in notebooks. Most but not all come with built-in wireless Ethernet antennas.

The fastest wireless option is 802.11g, with a theoretical maximum throughput of 54 Mbps (the actual rate is 22 Mbps). It is also compatible with the older yet still popular 802.11b standard, which has a theoretical maximum throughput of 11 Mbps (actually 6 Mbps). Many wireless hot spots use 802.11b technology. A third wireless standard, 802.11a, offers speeds similar to 802.11g, but it is used mostly in business settings.

Antenna design is something of an art, and the best-engineered antennas get the fastest throughput and longest distances. The difference is noticeable even when you're less than 50 feet from your access point.

Bluetooth. This short-range radio-frequency technology lets your notebook communicate with PDAs, cell phones, the occasional printer, and possibly your next car's dashboard. Bluetooth is more prevalent in Europe, and though it has caught on slowly in North America, many believe it will supplant infrared wireless technology.

Ports. All new notebooks have USB 2.0 adapters for connecting components like memory keys, mice, printers, external drives, and portable music players. A typical notebook has two ports, though three or four is ideal, especially if one port is on the side or near the front of the notebook. In addition, a consumer-oriented system may have a FireWire (IEEE 1394) port, whose value has been diminished somewhat by the equally speedy USB 2.0. But virtually all digital camcorders use FireWire.

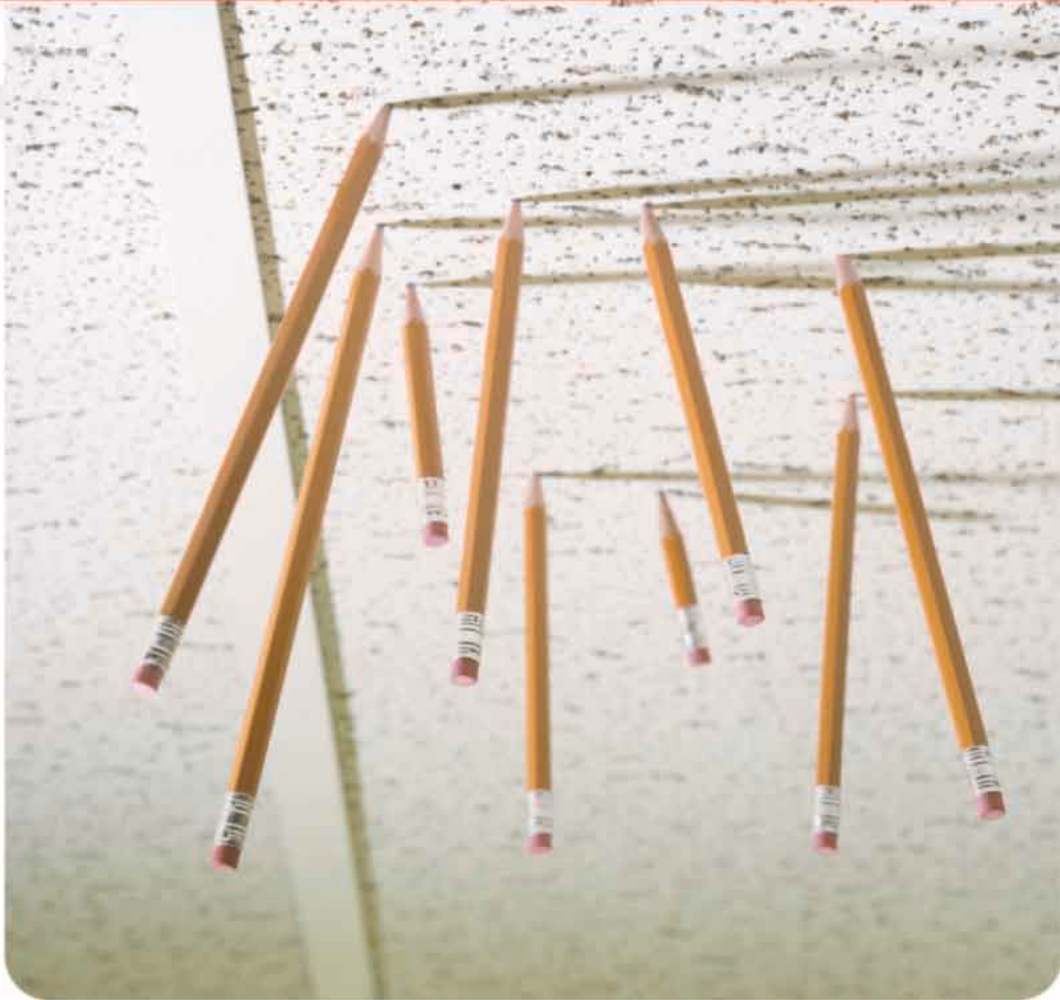
Notebooks also include some legacy ports, such as parallel, serial, and PS/2 (mouse/keyboard) ports; these allow you to connect older accessories. Legacy ports are slowly being phased out in favor of USB.

PC Card or ExpressCard slot. With so much built into notebooks, there's less need for the credit card-size PC Card slots that used to house modems and network cards; many notebooks have cut back from two to one. By year's end, a smaller, higher-speed card system called ExpressCard will be available; it will be linked to the coming PCI Express bus. Proponents say it has the potential to be used extensively on desktop systems, as PC Card slots never were, and appear later in notebooks. Critics say the acceptance of ExpressCard will be slow, just as it was for USB. Some mainstream notebook vendors will likely build in both slots rather than moving immediately to ExpressCard.

Memory card slots. A consumer-oriented notebook may have a slot for reading digital media from a camera or MP3 player. All Sony notebooks have slots for reading the company's proprietary Memory Stick format, while an increasing number of notebooks have turned to Secure Digital card slots, which have supplanted CompactFlash as the most popular flash media.

Battery. Your notebook's battery rundown time is affected by the notebook's efficiency and the battery's size. The most important measurement is watt-hours (whr). This spec now ranges from 20 whr to 100 whr; 50 whr is typical.

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- > CD-RW/DVD Combo



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Upgrade Prices: Have It Your Way

Many vendors, especially those that sell direct online, let you customize your system. Don't like the installed wireless solution? Want a bigger screen? Want better graphics? Upgrade. Just remember that all those upgrades can really add to your bottom line.

- Processor upgrade, \$50 for one step up (for example, moving from a 1.4-GHz to a 1.5-GHz Pentium M). Stepping up to the fastest CPU available, \$100.
- Larger hard drive, \$50 per step (from 30GB to 40GB or from 60GB to 80GB).
- Increasing the display size (for example, from 14 to 15 inches), \$100.
- Moving from XGA to SXGA+ resolution, \$50; from SXGA+ to UXGA+, \$100.
- Upgrading a CD-ROM drive to a DVD-ROM, \$25.
- Upgrading a CD-ROM drive to a CD-RW, \$25.
- Upgrading a CD-ROM to a combo DVD/CD-RW drive, \$100.
- Upgrading a CD-ROM drive to a DVD-RW drive, \$150 to \$200.
- Adding a spare battery or optical-bay battery, \$100 to \$200.
- Adding an extra AC adapter, \$75.
- Adding a wireless Ethernet adapter (internal or PC Card), \$25 to \$50.
- Upgrading from Microsoft Windows XP Home to Windows XP Pro, \$75 to \$100.
- Increasing RAM from 256MB to 512MB, \$100 to \$200.
- Adding a better graphics adapter with more memory, \$100 (not available on all systems).
- Adding an expansion slice, \$150 to \$250.

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If we've whetted your notebook appetite, visit www.pcmag.com and read our numerous in-depth notebook reviews and Editors' Choices. Uncover a system's true battery life. Check out the tested wireless range from 1 foot to 160 feet. Discover which system is best for business, which is best for photo editing, and which you will want for DVD playing. And be sure to visit us often; we're updating, changing, and adding new reviews daily.

Virtually all current batteries are lithium ion models, supplanting nickel hydride batteries. Most battery packs comprise individual cells the size of double-A batteries, but some use molded lithium polymer elements, which are costly but effectively fill odd sizes.

Even rechargeable batteries don't last forever; they're good for 300 to 500 charge/discharge cycles. That's why a two-year-old notebook doesn't run as long as it did when it was new.

Operating system. Budget notebooks (and some aimed at home users) come bundled with Windows XP Home Edition. Most businesses require Windows XP Professional Edition because of its added networking and security features. Even some home users (especially those with network connections to the office) can benefit from Win XP Pro, though it adds about \$75 to \$100 to a system's cost. Some enterprises still use Windows 2000 because of its long track record and its stability, though Win XP has proved stable as well.

Windows XP Tablet PC Edition is a version of Windows XP Pro with extensions that support screens' tablet-writing ability. Another flavor is Windows XP Media Center Edition, a version of Win XP Pro that focuses on multimedia features. It has a couch-friendly "10-foot interface," meaning that you can hook your system up to a large-screen monitor and control media via remote from 10 feet away. (Currently you can get Windows Media Center only on a Media Center notebook or desktop; you can't buy it as standalone software.)

Bundled software. Consumer-oriented notebooks often include software with varying degrees of value. If Microsoft Works comes bundled, find out whether it's the version with Microsoft Word (useful) or one with the bare-bones Works word processor (less useful).

Sometimes you can get discounts on additional software when you buy a notebook. Check for deals on Microsoft Office. Consumer notebooks may include multimedia software, particularly photo-editing, video-editing, and CD/DVD-burning programs that go beyond the rudimentary features built into Windows.

Port replicator, docking station, and expansion slice. If you're constantly attaching and detaching your notebook at your desk and you have a lot of cables connected (AC power, printer, mouse, monitor, Ethernet, modem, external drive), a *port replicator* can make your life easier.

A *docking station* is a port replicator on steroids; it may also have room for bigger speakers, a module to charge a spare battery, and an optical drive bay, and it may have a security lock. But because docking stations cost so much (twice the price of port replicators), they're mostly used by businesses.

An *expansion slice* is typically used to add an extra battery or optical drive to an ultraportable.

Warranties. One-year warranties on parts and labor are common, but you'll have to get your notebook back to the dealer or manufacturer. For an extra charge (about \$50 to \$100 a year), you can increase the warranty to two or three years. Some sub-\$1,000 notebooks have 90-day warranties; add \$50 to bring the term up to one year.

No-fault warranties are also available, meaning that you're covered even

if the damage is your fault—if you drop your notebook, for example. If you can't be without your notebook for very long, check into expedited repair services with three-day turnaround: The unit is returned to the vendor on day one, fixed on day two, and back in your hands on day three. ☰

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Network Printers:

Leading Lasers

For heavy-duty business printing, you can't beat the monochrome laser's work ethic.



BY M. DAVID STONE

Photography by Thom O'Connor

Despite the allure of the color laser, the network monochrome laser printer remains the leading choice for businesses. More precisely, it's the preferred choice for businesses that print thousands of pages per month and require one or more printers that have built-in Ethernet cards, duplexers, 35- to 50-page-per-minute ratings, and 1,000-page or better input capacity.

Network laser printers also have such options as hard drives, cost-tracking tools, and a multitude of paper trays. For those whose task it is to purchase such beasts, PC Magazine Labs tested nine of these printers to make your job easier.

The surprising news for this class of printers is its ease of installation. Installing a single network printer—or, worse, a newly arrived shipment of several network printers—used to be a daunting

IN THIS STORY

127 Dell Workgroup Laser Printer M5200n ●●●●○

127 HP LaserJet 4300dtnsl ●●●●○

127 HP LaserJet 9000dn ●●●●○

128 IBM Infoprint 1352n ●●●●○

130 Kyocera FS-9520DN ●●●●○

130 Lexmark T634dtn ●●●●○

130 Lexmark W820dn ●●●●○

132 Ricoh Aficio AP4510 ●●●●○

133 Xerox Phaser 4500DT ●●●●○

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132 Summary of Features

proposition. But companies have finally made setup easier. A few installation routines stand out as particularly slick, but even the hardest installation routine in this group is not all that difficult.

As always for this class of printers, we took a careful look at network installation and remote management tools, including the ability to check printer status without walking to the printer. These features can affect the total cost of printing in terms of time saved or wasted. Management features also affect the person charged with supporting and maintaining the printers in your office.

Only four of these printers handle tabloid-size paper. But this feature increases the cost enough to make you think twice



Dell Workgroup Laser Printer M5200n (left) and HP LaserJet 9000dn.

before buying such a model. The tabloid-size printers in our roundup cost from \$3,080 to \$4,060; the range for letter- and legal-size printers is \$1,377 to \$2,700. And the most expensive letter- and legal-size printers are packed with extras, compared with relatively stripped-down offerings for the least expensive tabloid-size printers.

Once testing was finished, we had one more surprise: The Xerox Phaser 4500DT—with one of the slowest-rated engines in the group, at 36 ppm—turned in the fastest times on our performance suite. Count this as one more reason you shouldn't take manufacturers' engine ratings as the last word in printer performance.

One finding that didn't surprise us: Output quality was about the same across the board. All the printers turned in respectable quality scores ranging from 6.0 to 7.1 out of 10, which means you can all but eliminate output quality as a factor in choosing one printer over another. If wading through manufacturers' technical specs is making you dizzy, we'll help you sort out what really matters.

PERFORMANCE TESTS

In Black and White: What the Numbers Mean



Speed, setup, manageability, and quality were our primary criteria in rating these nine workhorse printers.

Here you'll find test results for speed and quality. (You

can find an expanded table with additional test results at www.pcmag.com/laser.)

All manufacturers cite engine speeds with no network traffic and no processing time. Recognizing that companies print multiple fonts, not to mention endless charts, graphs, tables, pictures, and other data that the printer has to process before printing, we put the rated speeds to the test with all of the docu-

ment types companies print today.

We used our own subset of QualityLogic's PageSense 3 (www.qualitylogic.com), an automated system for gathering performance results, along with our own test suites. PageSense uses an LED sensor to capture data points as output is printed from several typical office applications. The test documents range from simple text to extensive graphics elements and bitmaps.

Performance tests. Our test chart shows individual document timings as well as total output times. We used these timings, rather than the companies' rated speeds, as a factor in our overall ratings. (We also clocked our quality tests; the results are posted online.)

The Xerox Phaser 4500DT earned speed-of-light status, with a total output time of 3 minutes 17 seconds, although it had one of the lowest engine speed ratings of the lot (36 ppm) and did not have the most installed RAM. Driver implementation, a streamlined pipeline with a fast controller and processor, and good memory management worked together to make the 4500DT shine.

Quality tests. Although brilliant picture reproduction should not be the deciding factor, each printer should still produce sharp, legible text and graphics. We rated the output on a scale of 1 to 10. The table shows image quality ratings for graphics and photos printed at general-purpose

PERFORMANCE TESTS

In seconds except where otherwise indicated ▼

▲ High scores are best.
▼ Low scores are best.

Bold type denotes first place.

	Adobe Acrobat 6.0			Microsoft Word 2003				Microsoft Excel 2003				Microsoft PowerPoint 2003
	2 pages, text and graphics	4 pages, text and graphics	4 pages, text and photos	2 pages, text and lines	2 pages; photos, text, graphics	3 pages, text and graphics	12 pages, text	1 page, text and table	1 page, charts and graphs	3 pages, charts and graphs	5 pages; charts, graphs, tables, text	4 pages, text and graphics
Dell Workgroup Laser Printer M5200n	75	40	42	13	20	15	35	9	8	20	17	17
HP LaserJet 4300dtnsl	55	29	41	11	20	13	27	8	8	21	18	16
HP LaserJet 9000dn	32	36	41	9	13	13	21	7	8	24	18	13
IBM Infoprint 1352n	68	37	39	10	19	11	25	9	9	18	16	14
Kyocera FS-9520DN	50	32	28	11	12	14	32	8	6	11	13	16
Lexmark T634dtn	66	36	37	13	16	13	33	9	9	14	20	18
Lexmark W820dn	98	29	33	9	24	10	22	7	7	10	16	12
Ricoh Aficio AP4510	26	24	23	19	10	9	30	13	13	16	13	11
Xerox Phaser 4500DT	33	21	22	10	16	11	27	8	8	13	15	13

RED denotes Editors' Choice.

Dell Workgroup Laser Printer M5200n

35 ppm, 1,200 by 1,200 dpi, 8.5- by 14-inch maximum, \$1,377 direct. Dell Inc., www.dell.com.
OVERALL RATING: ●●●●○

At only \$1,377, the Dell Workgroup Laser Printer M5200n could make any budget-conscious IT administrator drool. Although Dell rebrands the printer from Lexmark, it adds a few twists that improve the value for small workgroups and offices.

One of Dell's improvements is the easy setup. At 16 by 17 by 20 inches (HWD) and 42 pounds, the M5200n is small enough for one person to handle. Simply follow the setup guide's instructions to stack the printer, duplexer, and extra paper drawer. The toner cartridge ships in the printer.

Network setup isn't as slick as the industry-leading Xerox routine, but it improves on Lexmark's version. Once the printer establishes its IP address, you need to find out what the address is, typically by

settings, reflecting posterization, dithering, and gradient abilities.

For driver configurations, we asked each company to recommend the best settings for performance and quality. Most kept the same setting for both. We printed on inexpensive multipurpose paper as well as on premium stock to gauge image quality.

Test configuration. To minimize trafficking problems, we put each printer on an isolated 10/100 Ethernet network with its own server (a MicronPC ClientPro, with a 2.8-GHz P4, 512MB RAM, and a 40GB EIDE hard drive, running Windows Advanced Server 2000 with SP4) and its own client (a MicronPC Millennium with a 2.53-GHz Pentium 4, 512MB RAM, and a 40GB EIDE hard drive, running Windows XP Pro SP1).

—Analysis written by Glenn Menin

QUALITY TESTS

Rated on a scale of 1 to 10 ▲

Total output time (minutes:seconds)	Average time to return to app	QUALITY TESTS	
		Graphics	Photos
5:10	3	7.8	4.2
4:26	2	7.3	5.6
3:57	3	8.1	4.9
4:35	3	8.3	4.2
3:54	3	7.6	5.6
4:43	8	8.5	5.6
4:36	7	8.5	5.6
3:28	5	7.9	6.3
3:17	3	8.1	5.6

Overall: Xerox Phaser 4500DT Tabloid: HP LaserJet 9000dn



The leader in speed, quality, and manageability is the Xerox Phaser 4500DT. Rated at only 36 ppm, this printer blew away the competition for speed and was among the best for quality. And it's the second-cheapest printer in this roundup, at only \$1,800, compared with others reaching beyond \$4,000.

Setup, installation, and remote management also played a key role in this story, with most of the entries making surprising strides in ease of use. Xerox has long been a leader in this respect, offering network configuration that just doesn't get any easier. Choosing the 4500DT as our Editors' Choice was a no-brainer.

If you need a printer that handles tabloid-size paper, be aware that the 4500DT doesn't go there. The HP LaserJet 9000dn, however, offers that and a whole lot more, including a stacker, stapler, and paper trays that handle up to 2,000 pages. One of the better performers in this roundup, it also offers extremely easy setup and configuration. If you need tabloid-size output and can shell out \$3,800, the 9000dn is the way to go.

For the budget-minded, Dell comes through with our honorable mention. At just \$1,377, the price of the Dell Workgroup Laser Printer M5200n is unbeatable. The printer also improves on its Lexmark legacy with easy setup and installation—important for any company but especially for small offices, which rarely have an IT staff. It wasn't the fastest printer in the group by any means, but for some, saving a few seconds printing a document isn't nearly as valuable as saving 2 to 3 thousand dollars.

printing the configuration page. Then insert the installation disc and enter the IP address along with a few other items, including names to use for the drivers. Unlike with the Lexmark printers, setup handles the rest of the process.

Dell takes an unusual approach to remote administration. The M5200n has a built-in Web page to let you check the status and modify settings. But it offers no additional management software. Instead, the company points out that you can use Lexmark's MarkVision or HP's WebJet Admin, both world-class tools. If you aren't running one of these on your network already, you can download either for free. We tested with WebJet Admin, figuring that the unit would work with Lexmark's MarkVision. The combined printer and program gave us a full complement of management tools.

One reason for the low price is the engine speed: 35 ppm, compared with 40 to 50 ppm for most of the other printers we tested. Not surprisingly, this model was also the slowest on our tests. On our performance suite, the M5200n took a total of 5 minutes 10 seconds, compared with a blazing 3:17 for the Xerox Phaser 4500DT.

It was one of the faster printers on the quality suite, but most other printers were within 10 seconds of the M5200n's 46 seconds. But you might not notice much speed

difference if you have to walk to the other side of your office to pick up the output.

For overall print quality, the M5200n got a score of 6.0 out of 10. With the company-recommended settings for both performance and quality, its text was readable at 6 points or smaller in the vast majority of the fonts we tested. The M5200n's mix of price, administrative tools, and quality makes it an attractive choice for smaller workgroups and offices.—MDS

HP LaserJet 4300dtnsl, 9000dn

4300dtnsl: 45 ppm, 1,200 by 1,200 dpi, 8.5- by 14-inch maximum, \$2,700 street. ●●●●○ **9000dn:** 50 ppm, 1,200 by 600 dpi, 11- by 17-inch maximum, \$3,800. ●●●●○ Hewlett-Packard Co., 800-646-4683, www.hp.com.

Hewlett-Packard brings two strong contenders to this roundup, offering solid performance, quality, and ease of use. The HP LaserJet 4300dtnsl is a 45-ppm printer that can print on letter- and legal-size paper. The HP LaserJet 9000dn is a 50-ppm model that can handle up to tabloid-size paper. In line with the rated speeds, the 9000dn offered the better performance of the two on our tests, but both are acceptably fast and are more than reasonable choices.

Setup is among the slickest available, requiring little or no prior knowledge about setting up a network printer. You can

search for printers on the network and then simply pick the one to install. Even for those who are knowledgeable about installation, this approach is highly welcome. If you need a dozen printers in as many departments on multiple floors in your building, for example, you can simply plug the printers in where you want them, then install them from any convenient computer.

After the software finds the printer, it automatically installs a port for the printer and installs the drivers you choose. Along the way, it asks whether you want to share the printer on the network. Answer yes and give the printer a share name, and the software handles everything else.

WebJet Admin, the HP remote-administration program, doesn't come with either printer; you get it from HP's Web site. A menu option is available in the installation program for optional software, with a WebJet Admin download as one of the choices.

Each printer has a built-in Web page, which lets you change settings. WebJet Admin provides some of the same controls and the ability to divide your printers into groups (such as "all color printers"). Compared with most remote printer management apps, WebJet Admin is easy to learn and among the more capable of the breed.

The 4300dtnsl—one of the medium-size printers in this group, at 76 pounds and with a footprint of 16 by 21 inches—has straightforward installation. Stack the printer on top of the paper drawer, and put the stacker on top of the printer. Then put in the toner cartridge and paper, and plug in the power cord and cables.

On our tests, the 4300dtnsl's overall timing on the performance suite was a respectable but not impressive 4 minutes 26 seconds. On most of the individual tests, however, it was close in speed to the first-place Xerox Phaser 4500DT, falling significantly behind only on the Adobe Acrobat PDF files and the three-page Excel document. Its timing on the quality suite was a relatively slow 55 seconds, largely because it used 1,200 dpi, compared with the 600 dpi of most of its competitors. Even so, it took only 10 seconds longer on this suite than the fastest printer in the group, the Lexmark W820dn, which took 45 seconds.

The 4300dtnsl earned an overall quality score of 6.4. But given how competitive the reviewed printers are in quality, it easily made up for its slight lack of output quality in graphics and photos with its excellent text output. The text was readable at 4-point size in more than half the fonts we tested, at company-recommended settings for both performance and quality.



IBM Infoprint 1352n.

The larger 9000dn is hefty enough to need two or three people to move it (24 by 30 by 24 inches and 158 pounds). Aside from that, setup is easy. Put in toner and paper, plug in the cables and power cord, and you're done. The toner cartridge doesn't even require shaking or pulling a tab to release the toner; just take the cartridge out of the bag and slide it in.

On our performance suite, the 9000dn was one of the better performers, at 3:57. It also turned in one of the fastest overall times on the quality suite, at 46 seconds; here it tied for second place with the entries from Dell and IBM.

The 9000dn earned an overall quality score of 6.3 but did an excellent job on text output. Here, too, the text was easily readable at 4 points in more than half the fonts we tested, at company-recommended settings for both performance and quality.

The excellent remote management and easy network installation are enough to make both the HP LaserJet 4300dtnsl and 9000dn worth considering. Offering reasonable performance and output quality, both are strong contenders in this roundup.—MDS

IBM Infoprint 1352n

40 ppm, 1,200 dpi, legal-size maximum, \$2,070 street. IBM Corp., www.ibm.com.



With a compact 17- by 20-inch footprint, the IBM Infoprint 1352n packs a lot of printer into a relatively small package. Rated at 40 ppm and bearing a striking resemblance to others that share its Lexmark heritage, the 1352n starts at \$1,510 and offers an optional duplexer (\$300) and an extra 500-sheet paper drawer (\$260); these were included with the unit we tested, bringing the total to \$2,070.

Installation was easy. At a bit more than

40 pounds, the printer is manageable by a single person, though you might want help with lifting it. It uses a combination toner and drum cartridge that drops into the case smoothly. IBM provides plenty of printed documentation, but an experienced user won't need to refer to it for assembly.

Setup and configuration were mixed. When the driver was installed on the server, it was not automatically set to *shared*. We selected the options installed on the printer, such as the extra paper tray (other printers discover installed options on their own). And when configuring the unit to print across the network from the client, we had to create a new TCP/IP port. This was not difficult but was more complex than with the Xerox and HP entries.

IBM relies on Lexmark's software MarkVision Professional for printer management. The Web page embedded in the printer provides access to many useful features, including the ability to flush the current print job using an on-screen emulation of the printer's control panel. (For print queue management, you are limited to Microsoft Windows controls, unless you have the optional hard drive installed on the printer.) MarkVision provides a good range of management features.

Despite its fiery speed rating, most of the printers in this group were rated even faster. So we were not surprised that the 1352n was among the slower performers. Keep in mind, however, that the differences were small on most tests; speed is not a major differentiator here. In terms of quality, the 1352n was low on the photo scores, with visible banding in large areas of gray, but it scored near the top on our graphics test and managed an overall quality score of 6.1.

The 1352n is a mixed bag. The driver supports print-and-hold features, which are helpful for security, but the cost-tracking features require a third-party database or an optional hard drive. Compared with some of the other printers in the group, this one fails to make a compelling competitive statement about network management, price, or performance. It fails nothing wrong with the printer, but it fails to shine by comparison.—Alfred Poor

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Kyocera FS-9520DN

51 ppm, 1,800 by 600 dpi, 11- by 17-inch maximum, \$4,060 street. Kyocera, www.kyocera.com.



The Kyocera FS-9520DN is big, and so is its price. The base-model price of \$3,500 makes it one of the most expensive printers in the group; add the 512MB memory and internal hard drive, which we had for testing, and it's \$4,060. At 51 ppm, it is also the fastest-rated of the group, albeit by 1 page per minute. It has good performance and exceptional expansion options, but these may not be enough for most buyers to justify the extra cost.

At nearly 150 pounds, this printer requires more than one person to put it in place. It does have retractable handles for easier lifting. Installation is simplified by the monocomponent toner system, which does not require a separate developer unit. The printer also uses a separate long-life drum, which is rated for 500,000 pages; toner is the only consumable required until the drum needs replacement.

Configuration for the network was easy. Once the printer was set to get its IP address automatically from DHCP, the server installation went smoothly. Installation on the client was also easy; once you're logged on to the server, you can install the driver locally by accessing Windows' Point and Print. For direct printing, we used the Add Printer feature in Windows and installed the driver from the software CD. We still had to configure an IP port for the printer, because the process was not able to discover the printer on the network automatically.

The print driver has a number of convenient features. First, one driver handles all language emulations, including PCL, PostScript, and Kyocera's own language, Prescribe. Prescribe has special support for bar code and forms printing. The printer can also print PDF files directly without requiring another application. One weakness is that the driver required us to enumerate the installed options manually.

KM-Net Viewer's administration features provide typical functions, including access to the printer's configuration settings. But queue management is limited to Windows'

capabilities, and job cost management requires third-party software.

Despite its top speed rating, the FS-9520DN was ranked merely third in tested speed. The differences between its results and the faster printers were small, but according to the rated speeds, the FS-9520DN should have been the fastest in the batch. The print quality was about average, with an overall score of 6.7, and the unit performed well on our font test, with almost all typefaces easily readable at 4 points.

The FS-9520DN offers a wide assortment of options that can quadruple its size. Still, it's not a compelling buy in its basic configuration. Despite the high speed rating, there are not enough performance or feature benefits to justify the price.

Lexmark T634dtn, W820dn

T634dtn: 45 ppm, 1,200 by 1,200 dpi, 8.5- by 14-inch maximum, \$2,400 street. **W820dn:** 45 ppm, 600 by 600 dpi, 11- by 17-inch maximum, \$3,080. Lexmark International Inc., www.lexmark.com.

Lexmark offers two 45-ppm printers: the Lexmark T634dtn for letter- and legal-size paper and the W820dn for tabloid-size. Both offer essentially the same network

In fact, both printers have identical network setup. It requires prior knowledge of how to install a network printer (unlike Dell's setup, which is simplified for less experienced users). First we had to choose the installation options, then install the driver and install the printer for LPT1. We then had to go to the printer properties for the PCL driver and add a Lexmark network port. We also had to set both the PCL and PostScript drivers to use the port and give an update command in both, so the drivers would list all the installed options. The best installation programs handle most of these steps automatically.

The good news is that Lexmark's MarkVision Professional is among the most capable remote printer management packages available. The printers include built-in Web pages that let you check the status and change printer settings. MarkVision gives you much the same capability, as well as other features, such as the ability to create groups of printers. Although MarkVision can be overwhelming at first, it includes useful help files, and the features shouldn't take long to learn.

The T634dtn is similar to the Dell and IBM units in size and weight. The front panel has an LCD and controls at the top center.

At 4 minutes 43 seconds, the T634dtn was slow on our performance suite. It scored above average on only 1 out of 12 tests, which means that if speed is a major concern, you can do better. But even with so many average and below-average scores, the T634dtn was still only 29 seconds behind the average and 1:26 behind the fastest time for total output. On the quality suite, the T634dtn took roughly twice as long as five of the other printers, but

that's primarily because it was one of only two running at 1,200 dpi instead of 600 dpi.

The higher resolution and slower speed paid off in higher quality, with an overall score of 7.0. More impressive, at the company-recommended settings for speed, the text was easily readable at 4-point size in more than half of the fonts we tested. And at the recommended settings for quality, it was readable at 4 points in even more fonts. If you're a stickler for getting the best possible output—even if it's only a bit better



Kyocera FS-9520DN (left) and Lexmark W820dn.

management tools, similar overall performance, and slightly better output quality than most competitors. Neither did very well in terms of speed, but both are well worth considering.

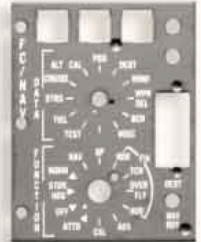
Installation was similar to that of the Dell Workgroup Laser Printer M5200n. The T634dtn is small enough for one person to manage, and the directions are easy to follow. The W820dn arrived fully assembled, but according to Lexmark the two have similar setup procedures.

OUR CONTRIBUTORS: Alfred Poor and M. David Stone are lead analysts at PC Magazine Labs. Associate editor Sarah E. Anderson and lead analyst Glenn Menin were in charge of this story.

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than the competition—this slightly better-than-average quality, combined with MarkVision's excellent remote management, makes the T634dtn worth a look.

The W820dn is built on a larger engine than the T634dtn and is best described as a rectangular box with an output bin on top. On our performance suite, it was just a bit faster than the T634dtn, with a total output time of 4:36. But unlike the T634dtn, it scored above average on 7 of the 12 performance tests.

It was the fastest for quality, at 45 seconds. And even with 600-dpi resolution, it managed an overall score of 6.9, thanks to Lexmark's 1,200 Image Quality setting. It also came close to the T634dtn in text quality, with well over half the fonts readable at 5 points or smaller using the recommended settings for both performance and quality. Here again, if you are more interested in quality than speed, the combination of good output plus excellent remote-administration features should be enough to put the W820dn on your short list.—MDS

Ricoh Aficio AP4510

45 ppm, 600 by 600 dpi, 11- by 17-inch maximum, \$3,800 street. Ricoh Corp., www.ricoh-usa.com. ●●●○○

If versatility is a top concern, the Ricoh Aficio AP4510 is worth consideration. Rated at 45 ppm, it has enough paper-handling and finishing options to fill a small cubicle. And at 139 pounds and a base price of \$3,000, the AP4510 is a hefty printer. Our test unit had 256MB installed in addition to the 64MB base-model memory, which boosted the price to \$3,800.

You need at least two people to set up this giant. Like the Kyocera FS-9520DN, it has rugged lifting handles that retract into the case. The printed documentation is thorough; an experienced user should have no difficulty installing the toner bottle or performing general setup.

When configuring the printer for network use, a quick-install feature makes installing the PCL 6 and Ricoh RPCS language drivers easy; you need to choose to install PostScript if you want it. In our test-

ing, SmartNetMonitor (Ricoh's management software) failed to install automatically, and we ended up having to change the assigned ports for the print drivers. We were able to log on to the server from a client and install the drivers as part of the server installation.

Besides the included SmartNetMonitor, according to Ricoh, the printer will work with HP's popular WebJet Admin, though we did not confirm that on our tests. SmartNetMonitor does a good job of network management tasks, and its front-panel emulator lets you easily adjust the printer's configuration. You must rely on Windows' queue management unless you have the optional hard drive installed, but the program does offer some job-tracking features if you create an access control list.

The print driver has a choice of interfaces. One uses a window with multiple tabs, like most print drivers. Another mode crams most of the choices onto a two-tab window, which is a bit cluttered for easy navigation but efficient to use when making

SUMMARY OF FEATURES

Network Laser Printers

	Dell Workgroup Laser Printer M5200n	HP LaserJet 4300dtnsl	HP LaserJet 9000dn	IBM Infoprint 1352n	Kyocera FS-9520DN
■ YES □ NO					
Rated engine speed (ppm)	35	45	50	40	51
Price (tested configuration)	\$1,377 direct	\$2,700 street	\$3,800 street	\$2,070 street	\$4,060 street
Number of paper trays	2	3	3	2	2
Other options	Additional paper tray	Additional paper tray, envelope feeder, duplex, stacker, stapler, printer stand with storage cabinet	Additional paper trays, stacker/stapler, multi-function finisher	Additional paper trays, envelope feeder, sorter/stapler, 5-bin mailbox	Additional paper trays, finisher, finisher with hole punch, saddle-stitch finisher, 7-bin mailbox
Installed/maximum RAM	64MB / 320MB	80MB / 416MB	64MB / 384MB	64MB / 320MB	64MB / 576MB
Engine manufacturer	Lexmark	HP	HP	Lexmark	Kyocera
Processor	300-MHz (brand unknown)	350-MHz PMC-Sierra	300-MHz RISC	350-MHz PMC-Sierra	500-MHz PowerPC
Optional hard drive capacity	N/A	10GB	10GB	20GB	20GB
PostScript emulation	Lexmark	HP	HP	Lexmark	Kyocera
Server platform support:					
Windows NT 4.0/2000/XP	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Linux/NetWare 5.x	■ ■	■ ■	■ ■	■ ■	■ ■
Client platform support:					
Windows 95/98	■ ■	■ ■	■ ■	■ ■	■ ■
Windows NT 4.0/2000/XP	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Linux/Mac OS	■ □	■ ■	■ ■	■ ■	■ ■
Thumbnail/booklet/watermark printing	■ ■ ■	■ □ ■	■ ■ ■	□ ■ ■	■ ■ ■
Job hold/preview/reprint	■ ■ ■	■ ■ ■*	■ ■ ■*	■ ■ ■	■ ■ ■*
Rated cost per page (5% coverage)	1.05¢	1.1¢	1¢	0.96¢	0.32¢
Management utility	Printer Configuration Web Tool (Dell Web page)	HP JetDirect 615n Fast Ethernet internal EIO print	HP JetDirect 610n EIO internal print server for Ethernet 10/100Base-TX	MarkVision Professional	KM-NET Viewer
Web-based management utility	Printer Configuration Web Tool (Dell Web page)	WebJet Admin 7.5	WebJet Admin 7.5	MarkVision Professional	KM-NET Viewer for Web
Usage tracking	■	■	■	■	□
Rated duty cycle (pages per month)	175,000	200,000	300,000	200,000	300,000
Standard input/output capacity (pages)	1,100 / 250	1,100 / 750	1,100 / 600	1,100 / 500	1,200 / 500
Maximum paper size (inches)	8.5 x 14	8.5 x 14	11 x 17	8.5 x 14	11 x 17
Maximum resolution (dpi)	1,200 x 1,200	1,200 x 1,200	600 x 600	1,200 x 1,200	1,800 x 600
Technical-support hours (eastern time)	24/7	24/7	24/7	8:00-8:00 M-F	9:00-6:00 M-F

RED denotes Editors' Choice. All the printers are IPP-compliant and support PCL up to Level 6 and PostScript up to Level 3. They all print on transparencies and envelopes, and they all offer standard alerts (paper jam, paper

changes. We had to try three times to figure out the right setting to get a long document paginated correctly to print in booklet form.

The AP4510 was among the fastest printers in the group. It also scored 7.1 for overall print quality. But this unit did not do as well on our font tests as some others, as letters tended to merge at sizes smaller than 10 points in the boldest font.

Nevertheless, this powerful printer offers a full slate of options. The AP4510's forte is versatility and speed, but you should weigh that carefully against price and quality.—AP

Xerox Phaser 4500DT

36 ppm, 1,200 by 1,200 dpi, 8.5- by 14-inch maximum, \$1,800 street. Xerox Corp., www.xerox.com/office.



The ideal network printer offers top speed and print quality, good management tools, easy installation, and a low price. And you might even want it to look good, too. The impressive Xerox Phaser 4500DT combines all of that in a beige box with some handsome blue highlights. It's rated at 36 ppm



Ricoh Aficio AP4510 (left) and Xerox Phaser 4500DT.

but managed to turn in the fastest timings of the entire group on our tests. And at just \$1,800, it's the second-least-expensive printer in our roundup and a real bargain.

This little printer has a 17- by 16-inch footprint and weighs in at around 45 pounds. Setup is simple, and most users won't have to look at the documentation.

The single cartridge holds the toner and the drum, making maintenance easy. The only nuisance is a removable lid that fits on the paper drawer: The lid protects the printer from dust because when the printer has legal paper in it, the drawer doesn't close all the way, leaving part of it exposed.

Network configuration is almost too easy to believe. One mouse click is practically all you need to install the printer on the server or for direct printing on a workstation: drivers, queues, share settings, the works. And setup is just about as easy on a client; use the standard Add Printer feature on Windows and it will find the printer on the network, download the driver, and configure everything for you. The print driver communicates with the printer and automatically enumerates the installed features.

The management software, CentreWare, is full-featured and among the easiest to use. You can reconfigure the printer, though the software doesn't have a front-panel emulation feature. And you can cancel only the current print job using the printer; you'll need to use Windows to control jobs in the queue. The printer stores records on print jobs for accounting purposes and can export this information in a comma-delimited text file from its built-in Web page, but the data is lost when the power is turned off, so this may be less robust than some installations require.

The Phaser 4500DT took first-place honors in speed, with a blazing 3:17 total output time and a good overall score of 6.8 for print quality, with only a little streaking and banding on large gray areas. Nearly all fonts were easily readable at 4 points, even in 600-dpi mode.

You get a lot for a little with the 4500DT. Full-featured and swift yet easy on the budget, this is the best of the breed among the latest network laser printers.—AP

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Lexmark T634dtn	Lexmark W820dtn	Ricoh Aficio AP4510	Xerox Phaser 4500DT
45	45	45	36
\$2,400 street	\$3,080 street	\$3,800 street	\$1,800 street
2	2	3	3
Additional paper trays, envelope feeder, StapleSmart finisher, stacker, output expander, 5-bin mailbox	Additional paper tray, envelope feeder, finisher	Hole punch, cabinet, 9-bin mailbox	Additional paper tray, feeder, stacker with job offset
80MB / 336MB	64MB / 384MB	64MB / 320MB	64MB / 512MB
Lexmark	Info not available	Ricoh	Fuji/Xerox
500-MHz (brand unknown)	350-MHz PMC-Sierra	300-MHz PMC-Sierra	400-MHz PowerPC
20GB	5GB	10GB	20GB
Lexmark	Lexmark	Adobe	Adobe
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
■ ■	■ ■	■ ■	■ ■
■ ■	■ ■	■ ■	■ ■
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
1.1¢	0.96¢	0.8¢	1.25¢
MarkVision Professional	MarkVision Professional	SmartNetMonitor	CentreWare
MarkVision Professional	MarkVision Professional	Web SmartNetMonitor, Embedded Web Status Monitor	CentreWare Web
■	■	■	■
225,000	250,000	250,000	150,000
1,100 / 500	1,035 / 500	1,050 / 500	1,250 / 500
8.5 x 14	11 x 17	11 x 17	8.5 x 14
1,200 x 1,200	1,200 x 1,200	600 x 600	1,200 x 1,200
9:00-9:00 M-F, noon-6:00 Sat.	9:00-9:00 M-F, noon-6:00 Sat.	8:00-8:00 M-F	8:00-8:00 M-F

low, paper out, toner low, and toner out). N/A—Not applicable: The product does not have this feature. * Requires an optional hard drive.

small and
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Integrated Broadcom 10/100 networking
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8-cell Lithium Ion Battery
1-Year Worldwide Limited Warranty**

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monitor
not included

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Microsoft® Windows® XP Professional Edition
40GB Ultra ATA/100 Hard Drive†
(7200 rpm)
512MB PC3200 DDR SDRAM
NVIDIA® Quadro NVS 280 AGP
48X CD-RW Drive††
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512MB DDR SDRAM
40GB Hard Drive†
DVD/CD-RW Drive
Integrated 56K Modem†† + 10/100 NIC
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follows: for recording to CD-R media, the max transfer rate may be up to 4800 Kbps (use 48X discs for best performance); for writing to CD-RW media, the max transfer rate may be up to 1500 Kbps (use 4X-12X high-speed media discs for best performance); for reading CD media, the max transfer rate may be up to 6000 Kbps. Actual transfer rates may vary depending on media quality. †ITU-T V.90/V.92 Modems are designed only to allow faster downloads from K56flex- or V.90/V.92-compliant digital sources. Maximum achievable download transmission rates are currently unknown, may not reach 56 Kbps and will vary with line conditions. ***Wireless access point is required and is not included. Availability of public wireless access point is limited. Wireless Internet use requires separately purchased Internet service contract. Microsoft and Windows are registered trademarks of Microsoft Corporation in the United States and/or other countries. Intel, Intel Inside, the Intel Inside Logo, Intel Centrino, Intel Xeon, Pentium and Celeron are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries. Other products mentioned herein may be trademarks or registered trademarks of their respective companies. ©2004 Hewlett-Packard Development Company, L.P.



Forward

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Refresh

Home

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Favorites

History

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Fullscreen

Mail

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EASY

*No programming experience? Tight budget?
No problem. An all-in-one service can have
your Web store up and running fast.*

E-COMMERCE

By John Clyman Illustration by Asaf Hanuka

Last year's holiday season saw a tremendous upswing in online shopping. Sure, most of it was on big sites like Amazon and those of popular retailers, but there's no reason your store can't get in on the action. We'll show you how you can claim your piece of the e-commerce pie without spending a fortune or being a programming whiz.

The one-stop services we review here will let you easily build and host an online store where customers can buy your products and interact with you directly. They'll feed you new leads and increase return visits. For those who just want to build a site and don't need to sell, we look at services like Tripod and Geocities in the sidebar "Just for Fun: Personal Site Builders."

Once it was enough to post what amounted to an online Yellow Pages ad. But today's tools make it easy for you to design a site, upload your catalog, and start taking orders. For just an afternoon or two of your time and \$50 a month in hosting fees, you can open the doors to your virtual store.

In the past, you'd have to find a hosting provider, build your pages with software like Microsoft FrontPage or Macromedia's Dreamweaver MX, and then tie into an e-commerce engine like Miva or osCommerce. Now, hosting services with integrated site building and e-commerce let you do it all in one place.

To give you the lowdown on e-com-

merce hosting solutions suitable for a small business, we evaluated seven services priced at a maximum of \$50 a month. You can spend even less, but that often means sacrificing features crucial to many e-commerce operations, such as automatic calculation of tax and shipping charges or the ability to accept credit cards. Of course, you can spend much more—and you may have to if you have a large catalog, need large amounts of disk space or bandwidth, or want more advanced marketing features.

Building your own e-commerce site isn't the only way to sell products over the Web; listing on an auction site like eBay or in an existing marketplace like Yahoo! Stores is a popular alternative, and it can offer the advantage of positioning you squarely in front of a large audience. The hosting solutions give you more control over your presence, though, and some services we tested offer the best of both worlds by linking products on your site to your auction listings and providing search engine placement and e-mail marketing managers. Other advanced features include integration with your existing accounting systems, such as QuickBooks.

For help in planning your site strategy, see the sidebar "12 Tips for a Successful Web Store." If it's time to launch—or simply reinvigorate—your small business's e-commerce efforts, our reviews in the following pages will show you which hosting services deliver the goods.

ALL REVIEWS BY JOHN CLYMAN

bCentral Commerce Manager

\$24.95 a month. Microsoft Corp., www.bcentral.com.
OVERALL RATING: ●●●○○

bCentral Commerce Manager takes a different approach to building an online store than most of the other services here. Rather than focusing on site design, it centers on managing your product catalog, which you can publish into a variety of existing marketplaces or into your own "product gallery" or custom Web site. While Kurant's StoreSense would be a better fit if you want rich, fully integrated site-building capabilities, bCentral offers strong commerce management tools for companies that don't have demanding design needs.

bCentral has loads of features, and the sea of links you encounter when you first log in (a Microsoft Passport account is required) can be daunting. bCentral doesn't open with a simple checklist to follow or wizard to walk you through the process. The natural place to start is by building your catalog. bCentral gives you plenty of options, among them adding a number of product attributes such as size, color, and so on. When you upload images, an ActiveX plug-in lets you perform simple editing and cropping.

From there you can publish your catalog items into a variety of marketplaces, including MSN Marketplace, bCentral Marketplace, and eBay. Alternatively, you can create a custom product gallery and customize its appearance somewhat using numerous predefined themes or one you create yourself. While the themes let you tune a few layout options and add a bit of customized content, there are no integrated site-building tools that let you do the kind of free-form design customization you find in most of the other plans

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138 Bigstep ●●●○○

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141 SimpleNet Commerce ●●○○○

142 StoreSense ●●●○○

144 Yahoo! Merchant Starter ●●●○○

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StoreSense



Kurant's StoreSense, which we tested via the NeoVerve hosting service, hit the mark on all the criteria we consider most important for an e-commerce site builder: ease of creating a selling site that reflects your business's character, depth of resources to manage your products and customers, and ways to promote and keep track of sales. StoreSense also gives you an upgrade path if you want to step up to cross-selling, inventory control, and advanced reporting. But even the \$49.95-a-month plan we tested offers delegated administration, which lets you assign different rights to different employees. StoreSense is the most sophisticated turnkey Web store builder we've seen, letting you build a highly functional site rapidly.

Honorable mention goes to Yahoo! Merchant Starter. This service has a slew of wizards for adding features to your site the easy way, but it also allows custom HTML and database interactions and PHP and Perl scripting for more advanced sites.

we tested. If you want to build a truly custom site, you have to use Microsoft Front-Page (sold separately) and its Commerce Manager plug-ins.

bCentral's strengths lie in its order-processing and management tools, which include e-mail list builders and dashboards with commerce-centric reporting. bCentral also contains an online appointment manager and a SharePoint portal site—unique in this roundup.

Note that bCentral's low monthly price does not cover phone support. This costs an extra \$9.95 a month and is available only from 6:00 A.M. to 6:00 P.M. Pacific time Monday through Friday.

If in-depth, integrated site-building tools aren't your top priority, bCentral may be a good choice. It brings together strong tools for selling products through a variety of marketplaces.

Bigstep

\$29.95 a month. Affinity Internet Inc., www.bigstep.com. ●●●○○○

Bigstep gives you reasonable tools and Web-based templates for building small e-commerce sites, and you can automatically import a site from another host. But the restrictions imposed by the relatively small catalog size, the limited feature set, and the challenge of developing a good-looking site make Bigstep suitable only for smaller operations.

Bigstep is an entry-level service now owned by Affinity Internet, which also operates ValueWeb—an Editors' Choice in

Our contributors: **John Clyman** is a contributing editor of *PC Magazine*. **Cade Metz** is a senior writer. Associate editor **Michael W. Muchmore** and PC Magazine Labs lead analyst **Sahil Gambhir** were in charge of this story.

our previous roundup of Web hosts (see "Web Hosting: A Host of Options," March 25, 2003). When you sign up for an account, you get a phone call from a Bigstep representative to introduce you to the service. Getting started on your site requires little explanation, though: Using a browser-based interface, you select from four basic layouts, choose your fonts and colors, and even compose a logo that can superimpose text on a graphic you upload (or select from an uninspired collection of clip art). You can then add pages using predefined templates for company news, FAQs, employee bios, and more. Along the way, the Bigstep interface keeps you apprised of unfinished tasks and changes awaiting publication.

To add products, you need to switch into the Catalog section, where you can enter items by hand or upload them in bulk. Bigstep let us vary as many as three attributes (such as color or size) for each item we created, but it permits a maximum of just 20 products. The Bigstep Pro plan (\$49.95 a month) raises that limit to 100 products.

Both plans can accept payments via PayPal, or you can use Bigstep's interface to set up a merchant account with Cardserve International.

Bigstep contains the usual tools for submitting a site to search engines and creating customer newsletters—plus the ability to mail a newsletter to customers automatically whenever you publish updates to your site. To help col-

lect those addresses in the first place, Bigstep generates power tags—snippets of HTML that, when pasted into a page, expand into an e-mail sign-up box or a customer survey. Unfortunately, that's the limit of Bigstep's support for scripting or dynamic content.

Unlike other services, Bigstep offers no integrated WYSIWYG layout tools, and we found that navigating its text-heavy, forms-based design interface quickly became tedious, especially when we tried to go beyond the basics. Frequently needed tools are scattered around different parts of the interface.

Promotional and reporting capabilities are relatively limited, though reports do include the useful ability to track customer interactions with a product from initial viewing through final sale.

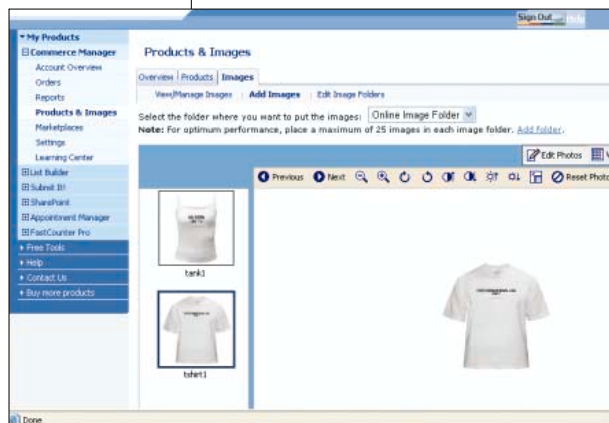
While Bigstep's simplicity may appeal to novice e-commerce builders, we think that some of the other services in this roundup offer a more compelling combination of features for the price.

FreeMerchant Silver

\$49.95 a month; setup, \$25. Digital River Inc., www.freemerchant.com. ●●○○○○

Digital River's FreeMerchant commerce plans have limited appeal when stacked up against the alternatives. Although we liked some of the service's back-end features, its few highlights weren't enough to outweigh the other shortcomings we encountered. Among them: FreeMerchant's site-building is painfully rudimentary; reporting is minimal; and the mailing list manager in the Silver plan we tested (\$49.95 a month) supports only 250 customers.

FreeMerchant starts the site-building process by having you select an overall site template, offering four categories to



bCentral lets you add a number of product attributes to change criteria such as size and color in your online catalog.

12 TIPS FOR A SUCCESSFUL WEB STORE

Hosting services that integrate site-building tools and e-commerce capabilities can simplify building an e-commerce site, but you can still take some steps to make the most of the opportunity. Here are a few suggestions:

Before you start...

- **Compare the costs.** Monthly hosting fees are just the beginning. You'll also need a merchant account if you intend to process credit cards. That often means another monthly fee, as well as a percentage "discount" on each purchase, and possibly a fixed per-transaction fee. Some hosts, like the Yahoo! Merchant plans, take a cut out of each transaction as well, and some merchant accounts withhold a reserve against charge-backs (disputed or reversed transactions).
- **Get your paperwork in order.** Secure your domain name, if you haven't already. Set up your merchant account. Even if your business has one for a retail location, you may need a different one to accept card-not-present transactions. And consider a visit to your accountant and attorney to find out if expanding your sales to new regions will have tax or legal implications.

When you design your site...

- **Plan your site.** Know who your customers are and develop a clear vision of how your site will meet their needs. Devise a plan: Put together some simple mockups—even on paper—and decide what pages and sections your site needs before you jump into designing pages and uploading your product catalog. Remember that different users may prefer to find products in different ways: browsing by manufacturer or brand, browsing by product category, or using a site search, for example.
- **Apply best practices to your design.** Common principles of effective Web site and e-commerce design are well established at this point. Consult books and Web sites, like Jakob Nielsen's Alertbox (www.alertbox.com), for expert advice. Surf your competitors to see what they do well—and not so well.
- **A few basic principles:** Keep it simple. Don't make your customers work hard: Other sites are just a click away. Make sure your pages are slim and fast-loading (lots of users still have dial-up connections), but don't skimp on detailed product information that will help them make an informed purchase. Use tactics like creating thumbnail images that you can click to enlarge; this helps keep page size down but still lets customers see lots of detail if they're interested in a particular item.
- **Include critical information.** Almost every e-commerce

site needs to provide contact information, payment options, shipping and return policies, and a privacy policy. If you also have retail locations, be sure to provide addresses, business hours, maps, and directions, too. Other types of content that are often useful include an About Us page describing the company and providing bios of key personnel. You can also have pages for customer testimonials, news and announcements, and order status.

- **Conduct informal usability testing.** Do a quick sanity check on your design and site organization. Show it to a friend or colleague who hasn't seen it before and is willing to give an honest opinion. Ask them if they can figure out how to find interesting products and place an order. Repeat this with a few different people and you'll quickly flush out major shortcomings and oversights.
- **Check your site carefully before you launch.** Nothing says unprofessional like broken links, spelling errors, missing graphics, and other obvious glitches. Make sure you catch them before the site goes live. And check again after you launch to make sure nothing changed when you went from preview mode to live site.

After you launch...

- **Gain visibility.** You don't necessarily need to pay for a search-engine submission tool: It's not hard to submit your site manually to the big players like Google and MSN Search. You can try to get a listing in directories like Yahoo!'s, but you'll have to pay for the privilege. Driving traffic to your site can be a major challenge, so consider cross-listing your products in high-traffic marketplaces like eBay or Amazon.
- **Keep it fresh.** Take advantage of seasonal opportunities, refresh content regularly, and consider running promotions and specials so that visitors get in the habit of returning to see what's new. Don't forget to remove dated material when sales or other special offers end.
- **Build customer relationships.** It's often much more efficient to service repeat customers than to acquire new ones. Entice visitors to sign up for e-mail notifications, offer promotions and discounts to your best customers, or find other ways to go beyond just fulfilling individual transactions.
- **Monitor your results.** What sections of your site are customers visiting? How many of them buy, and how many just leave? Which products are selling well? Use whatever reporting tools your host provides to learn as much as you can. Update your site often to serve your customers better.—JC

choose from: Artsy, Corporate, Fun, and Holiday. Within the Corporate category, which most e-commerce storefronts would choose, the options are limited to minor variations in colors and button styles.

As with Interland Online Marketing Suite, FreeMerchant then lets you view and edit the pages by clicking on embedded buttons. But the resemblance is a dis-

tant one. While Interland let us customize pages almost as thoroughly as a GUI-based Web design tool would, we weren't able to make more than superficial changes to the look of our FreeMerchant site. Nor does FreeMerchant offer a Web-based file manager or scripting support that would let you go beyond basic customization.

Behind the scenes, FreeMerchant did

have some features we liked. Its catalog uploading was among the best we tested. Other pluses include accepting Excel and Access files in native format rather than requiring you to export them to CSV first. A coupon creator let us define single- or multiple-use coupons with complex discount schemes. And enabling customers to check on their order status is a single-check-box affair. But to accept credit cards, you need

SUMMARY OF FEATURES

Site-Building and -Hosting Services

Download this table at
www.pcmag.com.

■ YES □ NO	bCentral Commerce Manager	Bigstep	FreeMerchant Silver	Interland Online Marketing Suite	SimpleNet Commerce	StoreSense	Yahoo! Merchant Starter
Monthly price/Setup fee	\$24.95 / None	\$29.95 / None	\$49.95 / \$25	\$49.95 / \$49.95	\$34.99 / \$50	\$49.95* / \$100	\$39.95 / \$50
Number of products the catalog allows	10,000	20	Unlimited	Unlimited	Unlimited	Unlimited	50,000
Disk space allocated	Unlimited	200MB	Unlimited	350MB	300MB	75MB*	350MB
Bandwidth	Unlimited	10GB	Unlimited	Unlimited	12GB	75MB	35GB
Includes Windows-based store builder	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Allows transfer of existing domains to this service	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SITE MANAGEMENT							
Number of style templates	90	25	64	200+	1	99	300+
Supports third-party HTML editors	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Imports inventory/products/customer data	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Customizable forms	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Preview/staging capability	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
STORE OPERATION							
Allows catalog search by keyword/product name/manufacturer	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Supports multiple images per product	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Accepts order confirmation via e-mail	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
User can view and manage pending orders by status	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
BILLING AND PAYMENT OPTIONS							
Standard payment options:							
Credit cards/Store card/Checks	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
PayPal/Money orders	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
SSL enabled throughout the order process	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Merchant-defined customer order limit	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
PROMOTIONS							
Shows discount amounts/expiration dates	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Limits on usage/Increases at higher price points	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Tools to launch an affiliate program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Tools for submitting the Web store to a search engine/a Web mall/eBay	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
User can create and distribute e-mail newsletters	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
User can up-sell and cross-sell products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
INVENTORY MANAGEMENT							
User can upload electronically stored data in a batch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
User can set up a site with product subcategories	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
User can hide products from catalog when inventory reaches zero	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
User can set inventory threshold levels (reorder points) by product	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Reporting							
Syncs orders with third-party accounting software	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Predefined and customized reports:							
Total costs and profit margin reports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sales by product, category, and manufacturer	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Online report on low inventory and back-ordered products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

RED denotes Editors' Choice. * Depending on the provider.

to sign up with FreeMerchant's own payment gateway; PayPal isn't supported.

The Silver plan we tested does not come with phone support, which is available only on the \$99.95-a-month Gold plan. With Gold, you also get a larger mailing-list limit, an eBay listing tool, and accounting software integration. On the other end of the spectrum, FreeMerchant offers plans beginning at just \$9.95 a month. But with so many other fuller-featured options available at comparable prices, we recommend looking elsewhere for e-commerce hosting needs.

Interland Online Marketing Suite

\$49.95 a month; setup, \$49.95. Interland Inc., www.interland.com. ●●●○○

Interland Online Marketing Suite presents a sophisticated Web-based interface for building and managing your store. Although the Online Marketing Suite uses PayPal to handle payment processing, PayPal's WAX technology lets you accept credit cards even from customers without PayPal accounts: You don't need a separate merchant account. Interland's combination of well-designed site-building capabilities and extensive tools will appeal to compa-

nies with straightforward commerce needs, and the company's more advanced plans offer further customization options.

Interland's site templates, designed with variations for a variety of vertical markets, let us set up a professional-looking site quickly and painlessly. Pick the Merchant template and check off which of 15 standard page types you want on your site: Interland's server not only generates the page outlines but fills them with sample text and default graphics—a nice way to help counter writer's block if you haven't already defined all your Web site content.

Interland also supplies a large library of good-quality clip art—more than 7,000 images in all.

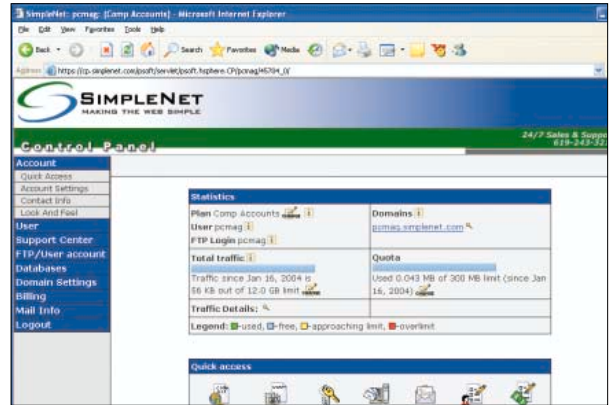
To edit your site, you use a browser-based tool derived from Trellox, which gives you extensive visual control over page content in a manner we found almost as natural as using a GUI-based, drag-and-drop tool like Yahoo! SiteBuilder. Although Interland does not support custom scripting, it includes a large variety of drop-in components that let you add features like a Recommend This Site button, map and directions, custom Web forms, arbitrary HTML code, and even a very easy-to-use blogging tool that can automatically add RSS feeds. We also liked Interland's ability to mark pages private—requiring customers to log in before viewing them—by simply clicking a check box.

Uploading and managing product catalogs was easier than with many other services we tested. And once your site is built, Interland includes several tools to promote it, though we wish the plan's e-mail newsletter promotion feature allowed more than 50 names. The service also comes with integrated WebTrends reporting capabilities.

For businesses that require merchant accounts for accepting customer credit cards directly, Interland offers a Platinum plan (\$99.95 a month) that includes the

Miva e-commerce engine. The Platinum plan also has a gift certificate manager and Web coupon creator—extra-charge options in the basic plan.

If you sell products that can be purchased with PayPal and don't need custom scripting capabilities, Interland Online Marketing Suite offers you an excellent collection of tools that let you build and maintain a highly polished e-commerce site.



SimpleNet Commerce's control panel is easy to navigate, but e-commerce integration is not as seamless as in other services.

SimpleNet Commerce

\$34.99 a month; setup, \$50. SimpleNet Inc., www.simplenet.com. ●●○○○

SimpleNet Commerce has a capable integrated site builder. But because the commerce features are not built in, it's suitable primarily for businesses that want to build their own solution. To that end, SimpleNet also comes with MySQL database access and support for PHP scripting.

SimpleNet's Web control panel is typical of what you find at a Web host that has commerce capabilities but relies on you to do most of the integration. The service

gives you links to configure the included Miva Merchant or osCommerce engines. You then tie these engines to sites you create in your own tools and upload via FTP or the Web-based file manager.

SimpleNet also offers a more wizardlike site-building tool called Site Studio. In this, you start by choosing from dozens of template styles, each available in multiple color variations. Then you add pages from a gallery that includes a variety of content-specific page designs, as well as a few that provide interactive capabilities like user surveys. Like Affinity's Bigstep, SimpleNet has you populate page content by filling out Web-based forms, but it doesn't include some of the status indicators and guidance found in Bigstep. Its online help also is sparser. Site Studio automatically creates graphical navigation bar buttons and can even auto-generate a fancy Macromedia Flash-based welcome and navigation page.

When it comes to building product and category pages, SimpleNet doesn't offer much guidance. Site Studio lets you create product pages with links to third-party Add-A-Cart shopping, and of course you can use the capable Miva or osCommerce to build a highly customized storefront, as you could with almost any hosting provider that offers these tools. But there are no built-in catalog management capabilities or any significant facilities for promoting your site or managing customer interactions, though you can crunch site statistics with the included Webalyzer package.

SimpleNet is comparable with the tool sets you find at standard hosting providers, with the addition of the Site Studio to help walk you through creation of a simple site. But for turnkey commerce integration and store management tools, it can't match the other services in this roundup.

SCORECARD



For our **integrated site-building** rating, we consider the clarity of the site-building process, wizards, and control panel; how professional the templates look; clip art and prebuilt content; the page design interface; interactive elements; and image handling. We base our **commerce and catalog management** rating on the number of products a site can accommodate, support for product variants, payment acceptance, shipping charge and tax calculation, bulk upload tools, ability to track inventory, and phone support.

For **promotions and customer management**, we evaluate e-mail list management, cross-listing for services like eBay, search engine submissions, gift certificates and coupons, and reporting. **Advanced features** include scripting support, database access, delegated administration, Web-based file managers, and direct FTP access.

	Integrated site building	Commerce and catalog management	Promotions and customer management	Advanced features	OVERALL
bCentral Commerce Manager	●●	●●●●●	●●●●	●	●●●
Bigstep	●●●	●●●	●●	●●	●●●
FreeMerchant Silver	●	●●●	●●●	●	●●
Interland Online Marketing Suite	●●●●	●●●●	●●●●	●●	●●●●
SimpleNet Commerce	●●	●	●	●●●●	●●
StoreSense	●●●●●	●●●●●	●●●●	●●●●	●●●●●
Yahoo! Merchant Starter	●●●●	●●●●	●●●●	●●●●●	●●●●

●●●●●—EXCELLENT
 ●●●●—VERY GOOD
 ●●●—GOOD
 ●●—FAIR
 ●—POOR

RED denotes Editors' Choice.



StoreSense

\$49.95 a month; setup, \$100. NeoVerve Inc., www.neoverve.com. ●●●●○

Kurant's StoreSense online e-commerce service gives you not only integrated site building but also extensive back-office support tools as well. (Because Kurant doesn't offer the service directly, we tested it through NeoVerve, one of several resellers; others are Homestead

and SiteStores.) We were able to build a site quickly and easily with StoreSense, and it offers some of the most comprehensive commerce management capabilities we've seen—a truly compelling combination.

StoreSense achieves an impressive balance between power and usability. When you first sign in, a welcome page clearly shows you how to create a new site or import material from your existing site, and a

collapsible tree view keeps all your management tools within easy reach. Using the Store Setup Wizard, we were able to create and deploy a simple but surprisingly functional site—including a variety of content pages, a handful of products, and even detailed catalog search and customer order-management—in a matter of just minutes.

Switching into Design Studio mode and downloading an ActiveX control lets you

JUST FOR FUN: PERSONAL SITE BUILDERS

Not interested in setting up a full-fledged online store? Don't need database hooks, backup tools, and marketing software? If you just want a simple, inexpensive Web site for your own personal use, you can turn to one of the many online site-building services aimed at consumers. Popular portals Lycos and Yahoo! still offer those tried-and-true consumer services, Tripod and GeoCities. Similar tools are available from companies such as Homestead Technologies and the U.K.-based Moonfruit.

Lycos has two site-building services, and both have been around since the Internet's late-nineties heyday. **AngelFire** (www.angelfire.lycos.com) is intended for teenagers and other young Internet users, whereas **Tripod** (www.tripod.lycos.com, ●●●●○) suits more mature site builders. If you're reading this piece, chances are you're a better fit for Tripod, which offers five different site-building plans, ranging from a free, ad-based plan that gives you 20MB of disk space and 1GB of monthly bandwidth to a \$19.95-a-month plan with 150MB of space and 30GB of bandwidth. All but the free plan have an additional setup fee, ranging from \$10 to \$15.

Tripod's tools are wonderfully comprehensive. Even with the \$4.95-a-month Plus plan, you get a wizardlike tool that helps you easily build sites using a wide variety of templates. You also get a massive library of images, scripts, and simple animations as well as both CGI and HTML editors for creating more advanced content. You can quickly add audio and video to your site, install search boxes, or upload files. And with the service's new blog builder, you can create your own drop-dead-

gorgeous Web log in a matter of seconds. Literally.

The only drawback is that Tripod's tools are entirely HTML-based. While you're building a site, you can't drag and drop, rotate, and move elements as you can with the Java- and Flash-based tools that other services offer. And since you have to wait for your browser to load a new page each time you make a change, the process is far slower.

In addition to its SiteBuilder tool (see the Yahoo! Merchant Starter review on page 144), Yahoo! still offers its familiar **GeoCities** service (<http://geocities.yahoo.com>, ●●●●○), which has served consumers for as many years as AngelFire and Tripod. GeoCities offers three different plans: a free, ad-based plan, with 15MB of disk space and 3GB of bandwidth; a \$4.95-a-month Plus plan, with 25MB of space and 5GB of bandwidth; and an \$8.95-a-month Pro plan with 25MB of space, 10GB of bandwidth, your own domain name, and five matching e-mail accounts. The Plus plan carries a \$10 setup fee; the Pro plan, a \$15 fee.

GeoCities lacks a blog builder like Tripod's, but its Java-based PageBuilder is far more nimble than the core Tripod service, letting you quickly and easily drag and drop elements as you create your site. And you can just as easily augment your site with news headlines, counters, Webcam feeds, weather updates, and even an icon that indicates whether you're online and ready to receive instant messages.

Homestead's service (www.homestead.com, ●●●●○) is even more elegant. You'll have to spend a few minutes downloading and installing its Java-based client, but once it's up and running, you can freely drag, drop, and move site elements; draw from a library of over 1.2 million images; insert metatags; create and manage forms; and, if need be, write your own HTML. You won't find a blogging tool, but you do get the Animation Factory, a library of animated icons, and GifWorks, a tool for editing animations and images. The service costs from \$6 to \$27 a month plus an initial setup fee of \$20, but a free trial is available.

Without a doubt, **Moonfruit** (www.moonfruit.com, ●●●●○) is the slickest of these online site builders. Its Flash-based tool runs inside your browser, letting you edit your site in real time, moving elements from place to place as if they were icons on your Windows desktop. There's also an impressive image and animation library, and a nifty Jukebox tool lets you easily upload MP3s to your site. Pricing ranges from \$5.99 to \$13.99 a month, and though there's no free trial available,



Tripod, from Lycos, offers a large choice of site-building tools like those shown here. But they're all HTML-based rather than using Java or Flash for quicker response.

Our hosting solutions have guided
over one million people to web success.



Who's next?

edit your pages in a full WYSIWYG environment right within your browser. But in Design Studio, you're not just editing static pages: You can actually embed tags that insert variables and implement logic, such as For Each loops. It's easy to get an idea of how these work by viewing the pages that StoreSense generates automatically, but to use the tags on your own you'll likely want to spend some time with the online help. The online help was generally thorough, but it sometimes got the context wrong.

Once your store is open, you can use the StoreSense administrative tools to manage your product list and categories, manage promotions, and handle orders. A convenient dashboard gives you an at-a-glance view of critical statistics, like the number of visitors and shopping carts today, as well as dollar values for pending orders and information on your best customers and best-selling products. StoreSense also lets you set up multiple users with specific roles, such as product manager and shipping manager, to let you restrict their privileges in the administration interface.

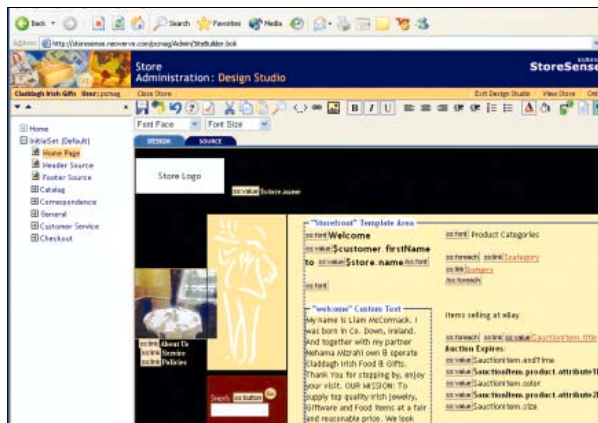
Moving up to NeoVerve's Professional plans, which start at \$149.95 a month, brings you even more features, such as up-sell and cross-sell tools, inventory functions, additional customer e-mail notification options, order policy enforcement, advanced reporting, and even a plug-in interface for adding functions like supply chain management.

StoreSense's combination of design and process management tools impressed us with their rich features and ease of use. The service is hard to beat—and an excellent bargain, to boot—making it worthy of our Editors' Choice designation.

Yahoo! Merchant Starter

\$39.95 a month; setup, \$50; 1.5% transaction charge. Yahoo! Inc., www.yahoo.com. ●●●●○

Yahoo!'s Merchant plans offer some of the strongest small-business e-commerce choices we tested. Especially if you're looking for a solution that nicely integrates commerce into a WYSIWYG page layout environment and avoids the complexity of



Kurant's StoreSense offers an outstanding design interface and advanced features that can grow with your business.

Web-authoring software and third-party shopping carts, Yahoo! Merchant Starter holds a lot of appeal.

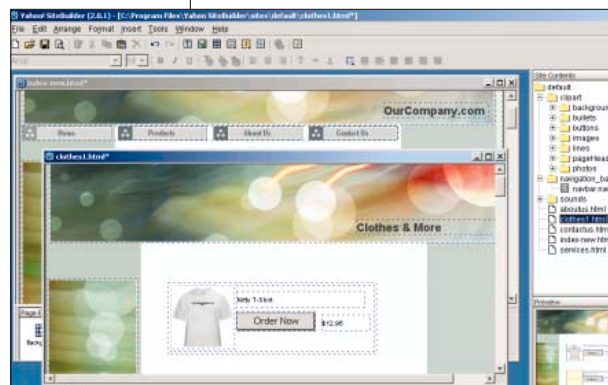
The Merchant plans combine and expand on the features in Yahoo!'s standalone hosting and Yahoo! Stores. The result is a lot of different ways to build your site—a breadth that can seem almost overwhelming at first. PageWizards and Site-Wizards let you build a simple informational site by filling out Web forms. Page-Builder, a Java- and Web-based tool, lets you do WYSIWYG layout. But by far the most compelling option is Yahoo!'s SiteBuilder 2.0, a full-fledged GUI application that resembles Microsoft FrontPage but with a simpler learning curve. SiteBuilder has hundreds of predefined templates; also, time-saving features like dynamic navigation bars let you create by graphically overlaying text on images. In our testing, we did experience some instability, encountering "unexpected error" messages, although SiteBuilder recovered smoothly from these errors rather than crashing and losing our work.

Yahoo! Merchant supports Adobe GoLive, Dreamweaver MX, and FrontPage. Or you can custom-build HTML pages and

upload them via FTP, using "store tags" to insert product information or commerce capabilities into your pages. Yahoo! Merchant includes a variety of tools, such as a search engine and a hit counter, that you can add to your site; if those don't give you enough customization, you can write PHP and Perl code and interact with a MySQL database.

Although Yahoo! Merchant Starter doesn't limit the number of products you can sell, it does impose a 1.5 percent transaction fee on top of any merchant account fees. As you move up to more expensive plans, the per-transaction fee goes down. You also get expanded order-management and merchandising tools, the ability to export order data to a database, click-trail reporting, gift certificate and coupon managers, and a cross-sell engine. Rather than using PayPal, Yahoo! works with PayDirect, Yahoo!'s similar, competing service, in addition to major credit cards. Yahoo! also provides tools that let you publish listings to Yahoo! Shopping and

merchandising tools, the ability to export order data to a database, click-trail reporting, gift certificate and coupon managers, and a cross-sell engine. Rather than using PayPal, Yahoo! works with PayDirect, Yahoo!'s similar, competing service, in addition to major credit cards. Yahoo! also provides tools that let you publish listings to Yahoo! Shopping and



Yahoo! Merchant's Windows-based StoreBuilder is a WYSIWYG design tool that helps you build a sophisticated site.

take advantage of that traffic on a pay-per-click basis.

Yahoo! Merchant's order management features include automatic order confirmation, status e-mails, and inventory alerts. The service's "snapshots" periodically back up your site and provide an interface to roll back changes. Reporting exposes a variety of information about your visitors, or you can download raw logs to crunch them in a third-party tool.

If you want lots of options for building a rich and customized e-commerce site, Yahoo! Merchant Starter is a good choice. Just keep in mind the extra per-transaction fees. ☰

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<p>Category SE & 6 T10 Punchdown Style</p> <p>MMP102K-WT From \$3.77 MMP102K-BK From \$3.77 MMP102K-W From \$3.77 MMP102K-RV From \$3.77</p> <p>MMP102K-W For 1 Keystone Jack, White From \$3.77 MMP102K-B For 2 Keystone Jacks, White From \$3.77 MMP102K-W For 3 Keystone Jacks, White From \$3.77 MMP102K-RV For 4 Keystone Jacks, White From \$3.77</p> <p>MMP102K-W For 1 Keystone Jack, Ivory From \$3.77 MMP102K-B For 2 Keystone Jacks, Ivory From \$3.77 MMP102K-R For 3 Keystone Jacks, Ivory From \$3.77 MMP102K-RV For 4 Keystone Jacks, Ivory From \$3.77</p>	<p>Wallplates with Port Identifying Icons</p> <p>MMP102K-WT For 1 Keystone Jack, White From \$3.77 MMP102K-BK For 2 Keystone Jacks, White From \$3.77 MMP102K-W For 3 Keystone Jacks, White From \$3.77 MMP102K-RV For 4 Keystone Jacks, White From \$3.77</p> <p>MMP102K-W For 1 Keystone Jack, Ivory From \$3.77 MMP102K-B For 2 Keystone Jacks, Ivory From \$3.77 MMP102K-R For 3 Keystone Jacks, Ivory From \$3.77 MMP102K-RV For 4 Keystone Jacks, Ivory From \$3.77</p>	<p>Bulk Cable</p> <p>TC2129 Cat. 5E, PVC Jacket, 4 P, Solid From \$49.50 TC2127 Cat. 5E, PVC Jacket, 4 P, Solid From \$49.50 TC2189 Cat. 5E, PVC Jacket, 4 P, Shielded From \$99.90 TC2188 Cat. 5E, PVC Jacket, 4 P, Shielded From \$99.90 TC2001 Cat. 6, PVC Jacket, 4 P, Solid From \$125.50 TC2050 Cat. 6, PVC Jacket, 4 P, Shielded From \$147.50 TC2004 Cat. 5E, PVC Jacket, 4 P, Shielded From \$206.70 TFC32004 Cat. 5E, L229 Jacket, 4 P, Shielded From \$300.20 TFC2487 Cat. 5E, Plenum Bulk, 4 P, Solid From \$167.50 TFC2487 Cat. 5E, Plenum Bulk, 4 P, Solid From \$167.50 TFC2156 Cat. 6, Plenum Bulk, 4 P, Solid From \$221.16</p>	<p>FD25C-01 Dual ST / Dual SC, 1.0 m From \$27.86 FD25C-02 Dual SC / Dual SC, 2.0 m From \$28.46 FD25C-03 Dual SC / Dual SC, 3.0 m From \$29.06 FD25C-04 Dual SC / Dual SC, 5.0 m From \$30.26 FD25C-05 Dual SC / Dual SC, 10.0 m From \$35.72 FD25C-06 Dual SC / Dual SC, 15.0 m From \$41.18 FD25C-07 Dual SC / Dual SC, 20.0 m From \$46.64 FD25C-08 Dual SC / Dual SC, 25.0 m From \$52.10 FD25C-09 Dual SC / Dual SC, 30.0 m From \$57.56 FD25C-10 Dual SC / Dual SC, 35.0 m From \$63.02 FD25C-11 Dual SC / Dual SC, 40.0 m From \$68.48 FD25C-12 Dual SC / Dual SC, 45.0 m From \$73.94 FD25C-13 Dual SC / Dual SC, 50.0 m From \$79.40 FD25C-14 Dual SC / Dual SC, 55.0 m From \$84.86 FD25C-15 Dual SC / Dual SC, 60.0 m From \$90.32 FD25C-16 Dual SC / Dual SC, 65.0 m From \$95.78 FD25C-17 Dual SC / Dual SC, 70.0 m From \$101.24 FD25C-18 Dual SC / Dual SC, 75.0 m From \$106.70 FD25C-19 Dual SC / Dual SC, 80.0 m From \$112.16 FD25C-20 Dual SC / Dual SC, 85.0 m From \$117.62 FD25C-21 Dual SC / Dual SC, 90.0 m From \$123.08 FD25C-22 Dual SC / Dual SC, 95.0 m From \$128.54 FD25C-23 Dual SC / Dual SC, 100.0 m From \$134.00</p> <p>Most assemblies in stock Custom lengths / types available</p>	<p>TRO25S-03 Category SE, 3.0 ft. From \$2.89 TRO25S-05 Category SE, 5.0 ft. From \$2.89 TRO25S-07 Category SE, 7.0 ft. From \$2.89 TRO25S-10 Category SE, 10.0 ft. From \$2.89 TRO25S-14 Category SE, 14.0 ft. From \$3.04 TRO25S-25 Category SE, 25.0 ft. From \$4.19 TRO25S-50 Category SE, 50.0 ft. From \$6.82 TRO25S-75 Category SE, 75.0 ft. From \$9.44 TRO25S-100 Category SE, 100.0 ft. From \$12.07</p> <p>TRO25S-01 Category 6, 1.0 ft. From \$5.01 TRO25S-03 Category 6, 3.0 ft. From \$5.35 TRO25S-05 Category 6, 5.0 ft. From \$5.68 TRO25S-07 Category 6, 7.0 ft. From \$6.02 TRO25S-10 Category 6, 10.0 ft. From \$6.36 TRO25S-14 Category 6, 14.0 ft. From \$6.70 TRO25S-25 Category 6, 25.0 ft. From \$7.38 TRO25S-50 Category 6, 50.0 ft. From \$11.50 TRO25S-75 Category 6, 75.0 ft. From \$15.62 TRO25S-100 Category 6, 100.0 ft. From \$19.74</p>

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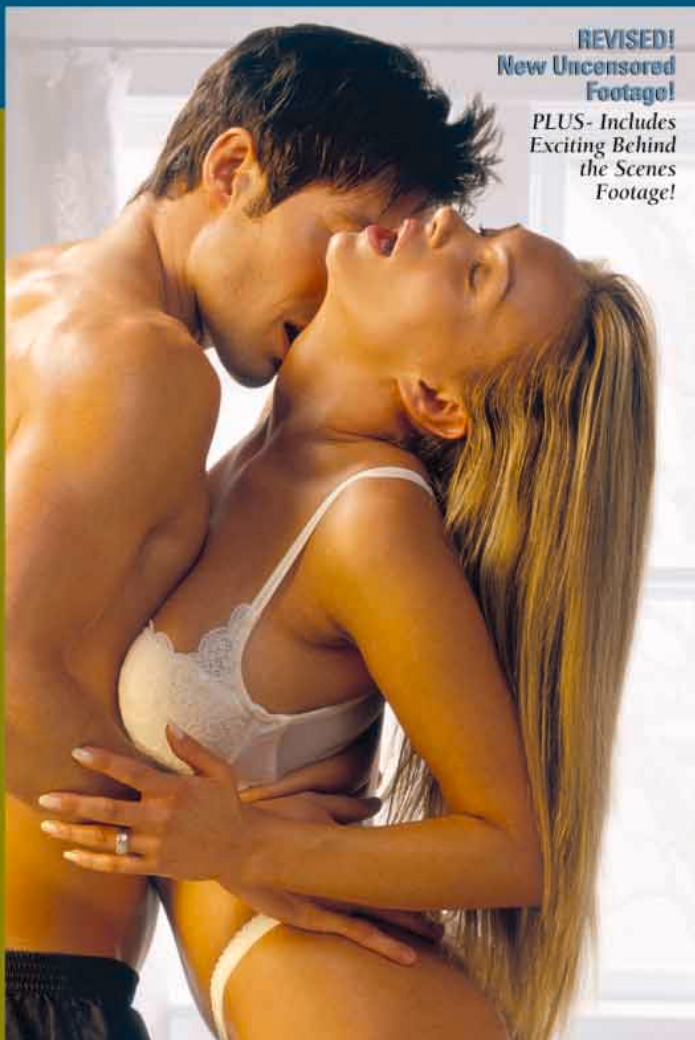
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2 INTERCHANGEABLE BANDS



1923WATCH.COM

"I collect timepieces. When I received my Steinhausen, I knew from the look, feel, and quality of the watch that this would be one of my favorites. I have spent thousands of dollars for inferior watches. It will be my gift of choice this holiday season."
Sol S., Mt. Vernon, NY

So rare that only a handful were made in 1923

In 1923, a Swiss watchmaker crafted the most advanced watch of its time. After 80 years, the Steinhausen watch has finally been "reborn," preserving its mastery of technology and classic design. Once only displayed in high priced collections, this rare timepiece from history can now be yours.

Step back in time to Steinhausen, Switzerland circa 1923. A master watchmaker works for months, trying to create the world's most perfect watch. Finally he succeeds—the first of its kind to display the date, day and month, and the only one to designate AM/PM.

Collectors Pay Thousands \$\$\$\$

He makes a limited number of these distinctive handmade timepieces, which eventually find their way onto the wrists of only the world's most distinguished gentry. Today, collectors are willing to pay thousands of dollars to add one of these original Steinhausen masterpieces to their own collection.

Reborn After 80 Years

Until now, that was the only way you could own a Steinhausen, still one of the world's rarest and most prized wristwatches. But for the first time in 80 years, the original Steinhausen masterpiece is now being painstakingly reproduced for modern day collectors. Still manufactured by hand, this 21st-century reproduction carries the same graceful styling and features as the original. The scratch-resistant crystal comfortably rests in a surgical grade stainless steel case and bezel, which provides the ultimate in precision and protection.

Powered by You

This handsome timepiece has been updated with a kinetic automatic movement that is powered by the motion of the wearer's arm, so the watch never needs winding or batteries.

Hand-crafted Elite Movement

The Steinhausen movement consists of 185 parts, that are assembled entirely by hand. To prevent wear on gears, fine watches use tiny gemstones to reduce friction. The Steinhausen features up to 35 jewels, 15 more than most of the world's elite watches. The movement is then rigorously tested for flaws and accuracy. Only 6% of the movements made ever meet the stringent requirements to be placed in this noble timepiece, making the Steinhausen one of the most accurate in the world.

Adapted from Swiss Technology

A Swiss engineered movement comparable to the Steinhausen has never been produced at this low price. Each watch comes housed in a handsome storage case and includes two interchangeable leather wristbands in black and brown.

\$14.95 "Wear It and Love It" Trial Offer

Until now, most of us couldn't afford an original 1923 Steinhausen. For a limited time though, the manufacturer has decided to offer this masterpiece of technology and design to watch lovers worldwide "risk free."

In fact, they are so confident you'll love the Steinhausen masterpiece, they want you to try it on your wrist for a full 30 days for only \$14.95 plus s&h. Experience this unparalleled value for thousands less than comparable collectable watches. If not satisfied, return the Steinhausen for a full refund of the trial fee.

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Kinetic movement...never needs batteries... never needs winding!

THE HISTORY OF WATCH MAKING

1868	Steinhausen masterpiece is created	1st Automatic movement in a wrist watch	1923	Lips produced the first battery powered watch	1953	Girard-Perregaux introduces the Swiss quartz watch	2003	Steinhausen masterpiece is reproduced for first time
Patek Philippe makes first wrist watch								

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DSC-P10 \$334.99

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Mavica CD-350 \$299.99

SONY CyberShot DSC-V1
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DSC-P52 \$279.99

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Trip the Sites Fantastic

BY ALAN COHEN

Not too long ago, a travel site earned its keep if it simply steered you to a cut-rate airfare. Today, that's not enough. Airlines offer those same fares on their own sites—minus the \$5-to-\$10 booking fees and often with frequent-flier miles as a bonus. So the top travel sites have evolved from travel bots to travel agents, pointing you to a growing roster of package deals, such as airfare and hotel combinations at specially negotiated (and, in theory, money-saving) rates. Can you really save a bundle? You bet. But the sites vary widely in what they give you, how much it will cost you, and how easy they make the whole process. We tested each site by searching for several of the same trips. Our results should help you get through travel-booking turbulence.

Cheap Tickets

There's a reason this site isn't called Cheapest Tickets. It was able to match some airfares we found on Expedia, Orbitz, and Travelocity, but it never beat them in our testing.

Air and hotel packages were in short supply; we were able to choose among only 13 hotels in Las Vegas. And there



weren't many A-list picks, though we did find a package for the Venetian resort in Las Vegas at a price that was topped only by Expedia.

Like Travelocity, Cheap Tickets can be frustrating to use. It shows the lowest fare and tells you which dates that rate is valid for, but regardless of which flight legs we

chose, our final fare was invariably higher. And don't expect extras that you'll find at other sites, such as checking fares at nearby airports or selecting seats.

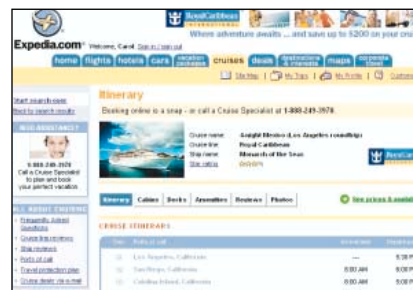
\$5 booking fee. CheapTickets, www.cheaptickets.com. ●●●○○○

Expedia.com

It may not be as slick as Orbitz, but Expedia scores where it counts: your pocketbook. It had the best rate of all the sites we checked for a five-day trip to Las Vegas, saving us more than \$400 over what we would have spent at the airline and hotel sites. And unlike Orbitz, it put us on a nonstop flight.

Expedia offers an enormous selection of hotels, far greater than that of the other sites. But we had to spend time to get the best bargains. Expedia won't flag cheaper deals using nearby airports (whether you're searching for a flight and hotel package or just a flight), so you have to enter all the alternatives manually. And get ready to scroll through long lists of options; Orbitz's Matrix display is far more user friendly.

Conveniently, you can buy attraction tickets at the same time you book your



trip, but the options are limited mostly to guided tours. Expedia does let you reserve a specific aircraft seat. And the site's cruise section was particularly impressive, with extensive ship reviews.

\$5 booking fee. Expedia, www.expedia.com.

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OneTravel.com

OneTravel breaks a cardinal rule of travel sites: It misses some fares entirely. This might not be so bad if it were missing the highest fares, but unfortunately, OneTravel falters at the low end.

For a trip from Newark to Orlando, the site turned up a "lowest" nonstop fare of \$462 on Delta, which was almost \$200 more than what Delta.com and other booking sites gave us—for the same flight legs on the same days. You can search for fares at nearby airports, though, a helpful feature. Even so, OneTravel missed a \$301 nonstop from New York's JFK airport to Las Vegas, pointing us instead to a \$374 flight from Newark. And air and hotel packages are limited—just four hotels in Las Vegas, and none rated higher than 3 stars.

\$6 booking fee. OneTravel, www.onetravel.com.





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Orbitz

Orbitz has long been our go-to site for checking airfares, and there's ample reason: It does such a good job of packing flight options into a comprehensive and clear display that nearly every other site imitates it (though none quite pull off the feat). Plug in departure and destination airports, and Orbitz will alert you if a nearby airport has a cheaper fare; we saved over \$100 on a New York to Orlando flight that way.

But Orbitz doesn't want you just to check the fares. It wants you to buy the tickets. To that end, it has bulked up its airfare and hotel packages. There were some good deals here; we saved over \$350 on a five-day trip to the Venetian in Las Vegas. But the packages have some annoying quirks, such as requiring you to take a stop-over flight when nonstops are available. But with all the other smart features—including alerts that send departure information to your cell phone and user-written hotel reviews—we're optimistic that Orbitz will work out the kinks. \$6 booking fee; \$10 for international flights. Orbitz, www.orbitz.com. ●●●●●

Site59

Site59 is dedicated solely to last-minute travel. You book airfare and hotel packages anywhere from three hours to 14 days prior to departure. The idea is that by buying up unsold seats and rooms, Site59 can then sell them to you at a discount. The problem is that airlines and hotels have gotten pretty good at selling their own excess inventory, so Site59's deals often aren't so hot.

We booked a last-minute trip to the Hard Rock Hotel in Orlando only to learn that we had saved a whopping \$12. If we had booked the room via the hotel's site, we would have gotten free passes to Universal Studios, which Site59 didn't offer. And a four-night Chicago trip was \$350 less on Site59 than if we had booked the same

flight and hotel directly, but five minutes on Orbitz turned up a cheaper flight and a cheaper (but comparable) hotel for \$200 off Site59's price.

No booking fee. Site59, www.site59.com.

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TravelNow.com

If the package deals at TravelNow look familiar, that's because they're the same deals that you'll find at Expedia. (In fact, the packages are provided by Expedia's sister site, Hotels.com.) But if you're just looking for an airline ticket, stick with Expedia—or any other site. TravelNow charges a hefty \$10 booking fee per ticket, and routinely missed cheap fares we found elsewhere (like OneTravel, it steered us to a “low” Newark-to-Orlando ticket that was nearly \$200 more than what we found on several other sites).

The site will tell you what airports are nearby, but makes you search for them separately, a time-consuming task. Some flight info is suspect: It listed a flight from Newark to Lima, Peru with a trip time of 5 hours 52 minutes. Unless Continental Airlines has acquired a Concorde, that's two hours too short.

\$10 booking fee. TravelNow, www.travelnow.com. ●●○○○

Travelocity

Like an aging 747, Travelocity is showing some wear. Features that appear to be time- and money-savers are often frustrating to use. For example, if your travel plans are flexible, Travelocity will show you which dates will get you the cheapest fare. For a trip from New York to San Francisco, Travelocity displayed dates that

would have landed us a \$163 fare, about \$20 less than the best price turned up by the other sites.

But each time we attempted to book this trip, though—and we tried half a dozen flight/date combinations—the ultimate fare was \$20 higher, saving us no money but costing us patience.

Travelocity doesn't offer as many package deals as Expedia; we couldn't find any for the Venetian in Las Vegas, a resort both Expedia and Orbitz offered. Our second-choice hotel, Mandalay Bay, was actually over \$100 more than if we had booked via the hotel's site—which was



offering its own promotion (in fairness, Orbitz didn't beat this promotion, either). And Travelocity couldn't find a direct flight from Newark to Lima, Peru, when almost every other site found a Continental nonstop. You can book attractions and reserve a specific aircraft seat, and the booking fee is \$5.

COMPARE THE FARE

An annoying aspect of booking travel online is knowing you could have saved more had you checked one last site. Fare-comparison services—which search dozens of sites to get you all the options—have always been a mixed bag, as most of them don't check quite enough sites. And the long-time market leader, Qixx (www.qixx.com), charges a hefty \$20-per-ticket booking fee.

But a newer service, SideStep (www.sidestep.com), looks much more promising. A browser plug-in that pops up when you search any travel site, SideStep covers a wide range of sites, including Orbitz, Continental Airlines, and JetBlue (a site Orbitz itself doesn't cover), and searches nearby airports, giving it an uncanny knack of turning up bargains. On a New York to San Francisco trip, it found a JetBlue flight to Oakland that saved us \$24 over Orbitz's lowest fare.

Unlike Qixx, SideStep doesn't charge fees (it simply steers you to the site where it found the fare), and it can search for hotel rooms, too. By plugging directly into hotel chain sites, SideStep unearths site-only promotions, like a \$99 Web-only rate at Chicago's Hotel InterContinental (\$20 off the lowest rate Expedia, Orbitz, and Travelocity turned up). And now you can search for hotels at SideStep's own site. Flights and car-rental searches will be added soon.



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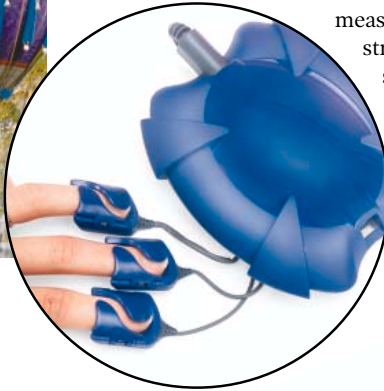
GEAR & GAMES



Science of the Mind

The goal of **Journey to Wild Divine** is to teach you how to control your body's alertness and relaxation levels. Biofeedback hardware that measures your heart rate and skin conductivity (both stress indicators) is included in the box along with the software. As you wander through an idyllic landscape, guides introduce you to meditative exercises. You then attempt to master onscreen activities such as juggling and archery by consciously becoming calmer or more alert. Wild Divine is innovative and fun, and even better, it's very effective.—*Carol A. Mangis*

\$159.95 direct. The Wild Divine Project;
www.wilddivine.com. ●●●●●



Charge It Up

If you've ever needed to power a 13-inch TV at a tailgate party or to recharge your notebook between sales calls, the **Xantrex Micro-Inverter 175** may be just what you need. The self-contained microinverter plugs into your car's power connector (cigarette lighter) and provides 115 volts of AC power for loads up to 175 watts. It shuts down if overloaded, overheated, or if the voltage gets too low, ensuring that you won't kill your car's battery or draw too much power. An internal fan, although fairly quiet, runs continuously to keep the unit cool.

—*Craig Ellison*

\$44.99 list. Xantrex,
www.xantrex.com. ●●●●○



Surprise Me

The beauty of the **Ceiva 2** is that the owner needs to do next to nothing to enjoy it. You just plug this digital picture frame into the phone jack, set up an account, give your account info to your friends and family, and let them upload some fun pictures. The Ceiva Web site even lets you enhance the photos or add some captions before uploading. Every night, the photo receiver calls up a local number to download any photos that may have arrived overnight. The next morning, you wake up to a pleasant surprise.—*S. Jae Yang*
\$149 direct; www.ceiva.com account,
\$7.95 a month. ●●●●○



Creature Speakers

These speakers look a little like two tentacles and a jellyfish. But acoustically, they swim with the sharks, serving up clear treble, strong bass, and great imaging when we tested them using a CD player, a PC, and an iPod. The **SoundSticks II** tweak the original design to reduce the near-field bias, creating more room-filling sound. They also add touch-sensitive volume buttons and change the old USB interface to a standard mini jack, letting you drive these with any portable audio device or PC. Top notch.—*Sascha Segan*

\$199.95 direct. Harman/Kardon.
www.harman-multimedia.com. ●●●●●

Pumped-Up Portable Sound

By Matthew D. Sarrel

Are you still using the inferior headphones that came with your portable player? You can do better. We tested using a Creative Labs Nomad Muvo2 and an iRiver SlimX iMP-350 MP3/CD player. When you're ready to buy, HeadRoom (www.headphone.com) has a wide selection of audio gear.

AMPS

HeadRoom BitHead

The BitHead is a portable music amplifier and an external sound card that can provide high-quality audio on your PC. Although it's large for pocket use (1 inch high and 2.9 inches wide, and it weighs 6 ounces), the BitHead is perfect for use on a laptop. Battery life (it uses four triple-A batteries) approaches 30 hours.

\$199 direct. HeadRoom, www.headphone.com. ●●●●○

Xin SuperMicro Amp

This minuscule pocket amp (2.5 by 1 by 0.6 inches, and just 1 ounce) has full, warm, and accurate sound quality. We were disappointed by battery life—the one triple-A lasted only 7 to 9 hours—and the music quality degraded before the power light indicated that the battery was going. For a mobile listener, though, this is the best choice.

\$159.99 direct. Xin Technologies, www.fixup.net. ●●●●○

HEADPHONES

Etymotic ER-4P, ER-4S

When you're ready for aural bliss, shell out the big bucks for the ER-4P or ER-4S. These ear-canal headphones have flanged ear tips that provide noise isolation. The ER-4S requires an amp; the ER-4P produces 10dB more output at high frequencies and 13 dB more at low frequencies, providing ample bass and high-end response for a player only. You can also buy the ER-4P headset for your player and then add an amp with the 4P-to-4S cable. \$250 street (ER4P-24 cable, \$50 street). Etymotic Research, www.etymotic.com. ●●●●●

Etymotic ER-6

These lightweight ear-canal headphones provide clean, clear, slightly bass-heavy sound; flanged eartips reduce external sound. The ER-6s are well suited for use



SENNHEISER PX 100,

SHURE E3C (CENTER)

with a player only, and we heard improvement when adding an amp. We did find them difficult to fit. \$115 street. Etymotic Research, www.etymotic.com. ●●●●○

Grado SR60

These bulky but effective open-air headphones with solid bass and midrange response are the least expensive head-

phones we tested that are worth the addition of an amp.

If you're into the retro look, value durability, and want an extra-long cable, then the SR60s are for you. \$70 street. Grado, www.gradolabs.com. ●●●●○

Sennheiser PX 100

These comfortable headphones are an improvement over the sets that ship with players, but they provide accurate sound at only a narrow volume range. They fold up, but it isn't worth bothering with the cumbersome storage case. Adding an amp did not yield much improvement. \$40 street. Sennheiser, www.sennheiser.com/sennheiser/icm_eng.nsf. ●●●●○

Shure E2c

These light, durable, and accurate ear-canal headphones provide lots of value but are slightly uncomfortable; a significant portion remains outside the ear. They're a good choice for those who won't be adding an amp to their rig. \$99 direct. Shure, www.shure.com. ●●●●○

Shure E3c

These comfortable ear-canal headphones provide airy, accurate audio response with slightly punchy bass. You can use them with an amp, but they don't need one. Rubber tips block external noise, though not as well as the Etymotic's flanged design. \$179 direct. Shure, www.shure.com. ●●●●○

QUICK CLIPS

Points.com

You have 5,000 frequent-flyer miles with seven different airlines—which gets you absolutely nowhere. Wouldn't it be great if you could combine your miles and grab a free flight to Europe? That's the premise of Points.com, a loyalty-points exchange service. But only a handful of airlines have partnered with the site, and most place hefty restrictions on exchanges. And the exchange rates are so skewed, you might have better luck going through Tony Soprano.—Alan Cohen

\$5.95 for each exchange or \$19.95 a year for unlimited exchanges. Points.com Inc., <https://points.com/homePage.jsp>. ●●●●○

MusicMagic Mixer

An artificially intelligent DJ for your music collection, MusicMagic Mixer acoustically analyzes your MP3s and WMA, matches tunes with similar soundscapes, and creates custom playlists for your favorite player. You can also save a playlist as a "mood," finding new songs that fit with the group. Feeding in a Cake song got a mix with the Streets, the Beastie Boys, the Offspring, and a stray REM track for variety. Unfortunately, it doesn't currently work with songs from any of the major online music stores—a big minus.—Sascha Segan

\$29.95 direct or \$9.95 a year. Predixis Inc., www.predixis.com. ●●●●○

World War I: The Great War

This intense real-time strategy game is filled with authentic land vehicles, aircraft, and ships to command as you pour more and more of your troops into a seemingly hope-

less cause. Although the game is visually impressive, with detailed uniforms and smooth animations, the audio effects lack the same level of polish, and the voice acting is laughable.—Peter Suci
\$29.99 list. Encore, www.encoresoftware.com. ●●●●○



BACKSPACE

IF YOUR SEARCH ENGINE BLOWS A GASKET, LET US KNOW

Edited by Don Willmott



◀ Backspace on the Road: Chesterton, Indiana. At first glance, weird. At second glance, less weird.

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▲ Just wondering: How many typos will be on the diploma? (Unidentified spam)

▼ Right now really doesn't seem like the best time. (discoveryhealth.com)

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Best spa, revealed

The votes have been counted: Nashville's best spa revealed

◀ After all he's been through, Frodo could certainly use a nice massage. (Citysearch: Nashville, TN)

When Should You Put Your Dog Down?

How to make a decision you never want to make.

By Jon Katz

▲ Does this writer have a hidden agenda? (MSN site)

► No wonder the world regards us as cultural imperialists. (Google News)

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