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THE INDEPENDENT GUIDE TO TECHNOLOGY

JUNE 22, 2004

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"The biggest advance in computing in recent years." — ***Peter Lewis***, Fortune

"One thing that's for sure is that the G5 is the biggest advance in computing in recent years, and not just because it is the first personal computer to use a 64-bit desktop processor."

— ***Peter Lewis***, Fortune, 10/27/03

"To say that the latest and greatest G5 screams does a disservice to the word. I can say flatly that if you have been waiting for the G5 to update your aging Power Macs, you need wait no longer. It will chew through any processor-intensive task you throw its way."

— ***Ken Mingis***, Computerworld

"After two weeks with a dual processor 2GHz Power Mac G5, it's the fastest Mac I've ever used in my entire life, and not by a small margin, either. I'd call it wicked fast, but that wouldn't even come close to doing it justice. It was astonishing."

— ***Bob Levitus***, in the Houston Chronicle

"The Power Mac G5 shatters the long-standing limits of expectation imposed by Intel and Microsoft."

— ***Tom Yager***, InfoWorld

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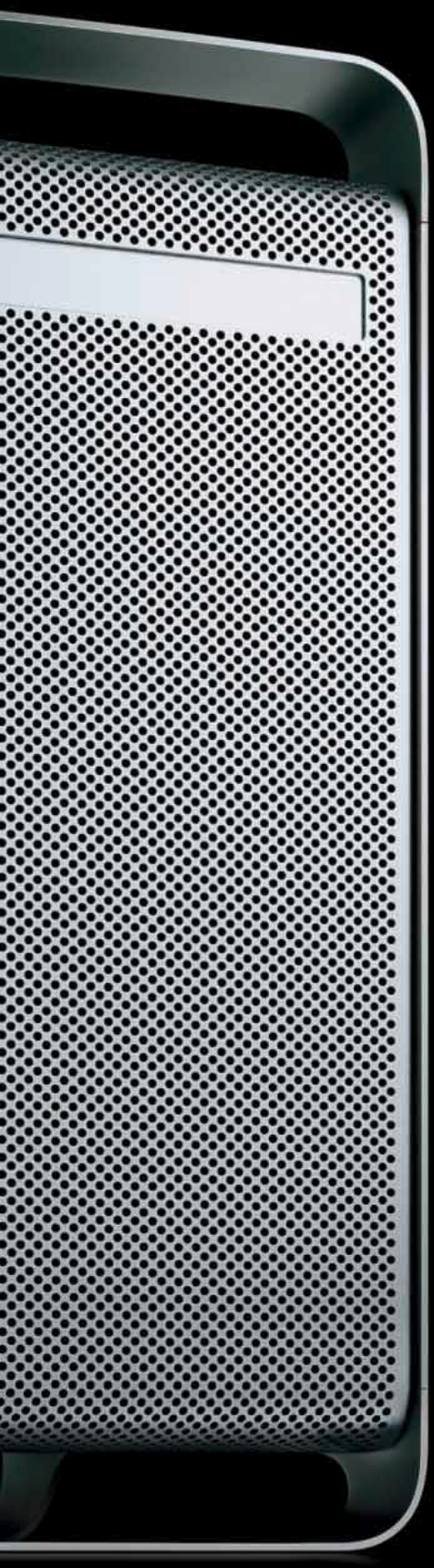

"With the Power Mac G5, the increase in speed is three-fold over the old machine. Especially in my line of work, this means more rendered scenes in the same amount of time, more freedom to try different versions, or simply a chance to go home before midnight."

— ***Thomas Tannenberger***, Look Effects

"I wasn't prepared for the truly overwhelming performance of my new dual 2 GHz G5. The combo of this amazing hardware and OS 10.3 [Panther] adds up to a work platform that is not only astounding in its power but also in the joy that it brings to the user – just for the quality of work life that it offers those of us who spend hours and hours in front of our machines."

— ***Pat Metheny***, Musician

"It is a leap of not only faith, but over tall buildings in a single bound. The G5 is so revolutionary, it almost cannot be thought of as simply a better Macintosh, or as a trump card over the hand dealt to us by the Wintel world. This changes everything; the Power Mac G5 is really in a class by itself."

— ***George Tomlin***, Digital Output

"Having Apple Computer's new Power Mac G5 around the office is like having a superhero assistant. If you've got lots of graphics or video heavy-lifting to do all at once, it's amazing."

— ***Jon Fortt***, San Jose Mercury News

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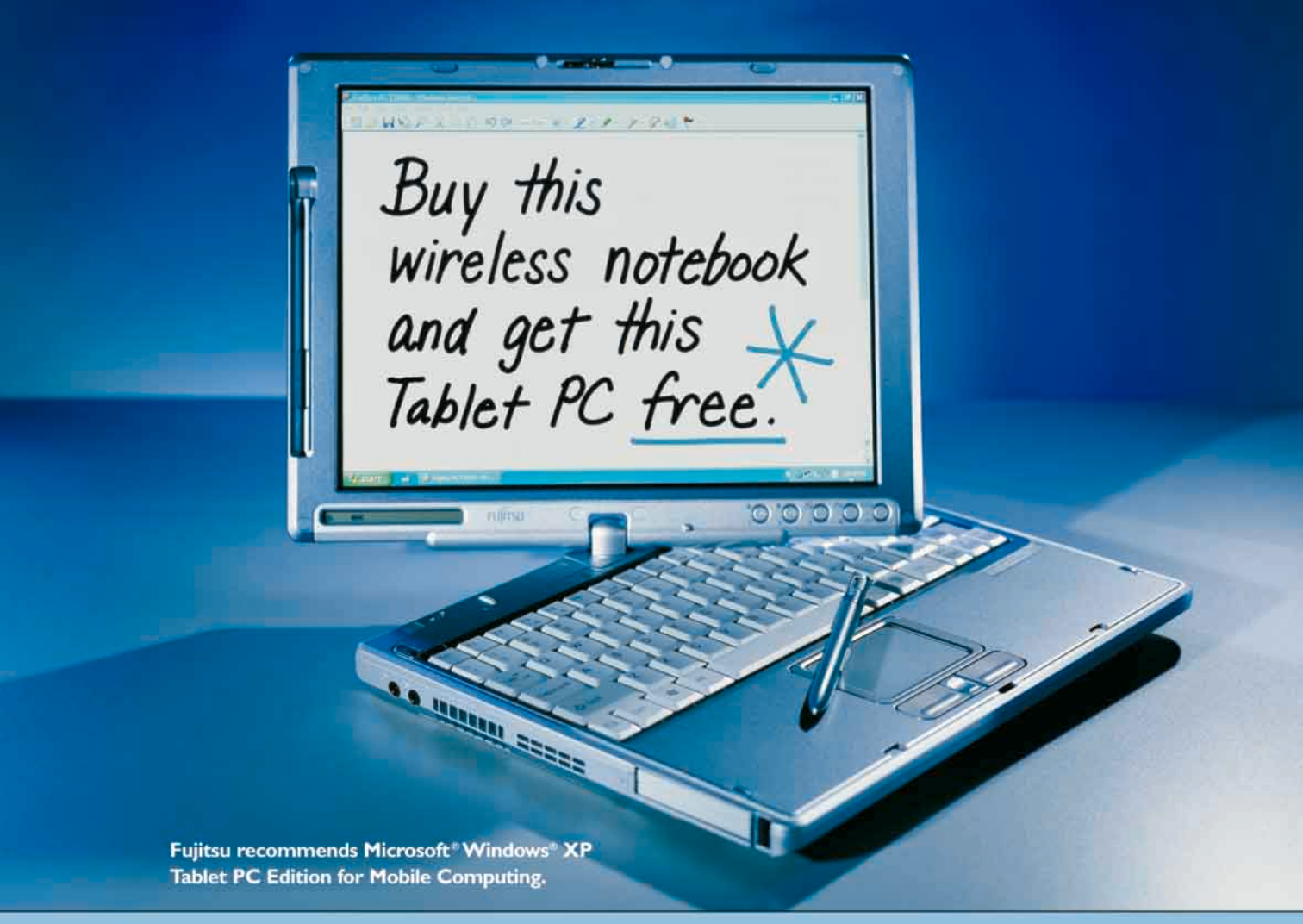

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MICHAEL J. MILLER

Forward Thinking

Perfecting the Perfect PC

The gadget-head in me thinks how neat all this technology is, but the business person in me isn't quite as amazed.

Every year for the past dozen or so, we've published our Perfect PC story, in which we pick the best components for different kinds of systems. This year, you'll see a number of configurations starting on page 93. As I reviewed the list of components, I was struck by just how far we've come. Ten years ago, our dream machine had a 90- or 100-MHz Pentium processor, 32MB of memory, a 1GB hard drive, a CD-ROM drive, and a graphics card with 4MB of RAM. It cost $10,000.

Compare that with today's perfect multimedia system, which has a 3.4-GHz Pentium 4 or the equivalent, 1GB of memory, two 74GB SATA drives in a RAID 0 configuration plus another 250GB for multimedia files and other incidental storage, a writable DVD drive, and a fast graphics card with 128MB of graphics RAM. Price tag? Just under $3,000.

We've seen something like a 32-fold increase in processor speed, main memory, and graphics memory, which follows Moore's Law almost perfectly with five doublings, one every two years. Storage has increased at least 250 times for the hard drive and over a thousand times as we've moved from a floppy disk to a writable DVD. And it all costs about a third of what a far less capable system cost ten years ago.

The gadget-head in me thinks how neat all this technology is. There's no denying that we're getting faster and cooler machines, more realistic games, and a lot more Internet content than we had ten years ago. But the businessperson in me isn't quite as amazed.

Are we really 32 times as productive as we were ten years ago? Has Microsoft Office, WordPerfect, or Adobe Photoshop really come that far? Sure, today's desktop software has more bells and whistles, but we've seen far greater improvement in server software such as customer relationship management and electronic-resources–planning packages. I'm still waiting for the next great business productivity application. Show me the applications that make me a lot more productive and I'll really have the perfect PC.

From Our Mailbag

I've gotten more letters on my column about the inevitability of some IT jobs moving offshore than on any column I've done in years. While I'd much rather talk about technology than politics in these pages, more discussion is called for, since many of you were quite outspoken in disagreeing with me. (See Feedback, page 63.)

Some of the stories from readers whose jobs have been replaced by those in other countries were particularly pointed; I certainly do understand the pain that outsourcing can cause. Many readers noted that the group that funded the study I referenced, the Information Technology Association of America (ITAA), is funded in large part by companies that have offshore operations. (That would be true of almost all the large IT companies.) I probably should have noted that connection, although I'm not sure it would have changed the main thrust; I've never seen any study indicating that trade hurts the economy as a whole.

MICHAEL J. MILLER

Forward Thinking

The Benefits of Offshore Outsourcing

I wish I heard more ideas for the future. When I asked what we should do about outsourcing, the most common answer I got was to avoid talking about it, which seems like a self-defeating strategy. A number of people suggested that the U.S. government could make it illegal for U.S. ▶

ILLUSTRATION BY KENN BROWN

Forward Thinking

MICHAEL J. MILLER

companies to fire U.S. employees and hire people in other countries. I'd rather see the U.S. corporate tax code reworked to be fairer and simpler and to reward companies for creating jobs within the U.S.

I had suggested education—particularly graduate education in computer science and related fields—as one answer and noted how enrollments in these fields have been declining for years. A number of you said that enrollment was down because of offshore activities, but I'm skeptical. Most of the companies I've talked with continue to look for people with advanced job skills. I'm convinced that innovation has led to the growth of the computer industry and will do so in the future. Much of that innovation has come from research at universities and from students—including the original research projects that led to the Internet, and graduate-student projects that grew into important businesses such as Google.

Offshoring IT work is an important topic, but we heard the same kind of worries in the 1980s when a lot of semiconductor manufacturing moved overseas. Yet with innovation, U.S. companies have remained leaders in many areas of semiconductor production. In fact, a number of you wrote about offshore projects that didn't work out as expected; some companies simply got better quality in the U.S. If that continues to be the case, maybe the bottom line will be better jobs for everyone.

HP on the Future of Printers

Recently, I talked with Vyomesh Joshi , general manager of Hewlett-Packard's Imaging and Printing Group, about the future of printing. Here's an excerpt from that interview. You can read the entire interview at *www.pcmag.com/interviews.*

MJM: *Ink jet printing technology is following Moore's Law by doubling in speed and quality every 18 months. When do we get to a point where ink jets replace lasers?*

VJ: There is no real reason for just replacing laser jets with ink jets. From the customer need point of view, laser technology is serving its purpose in the office very well. We've been lowering the price point and increasing the speed significantly on the laser business. Laser technology is not really applicable for photographic quality; ink jet is. We are going to increase our speed and make ink jet technology even more viable in photographic printing applications. Color laser jets are now available at $800, and we're working on that price/performance curve. Our monochrome laser is $179 now. We are going to continue to work on the price/performance curve on mono and color and provide the ink jet technology where we can make a different value proposition.

MJM: *Does monochrome go away at some point? It certainly went away in ink jet.*

VJ: Right now we are seeing monochrome declining, but it's much slower than a lot of people predicted. The first reason is that the laser jets have been really reliable for a very long time, and the replacement business is just now kicking in. Now you can get much faster monochrome laser jets at much lower price points. That's why monochrome is not declining as fast. The second thing that is happening is we're getting faster and faster speeds—35 pages per minute at a very reasonable price point. The third reason is the replacement of color. Instead of buying four monochrome lasers, I'll buy three mono and one color.

MJM: *The price of color lasers has dropped dramatically. Five years ago they were a niche market, but now they are very mainstream. The prices seem to be falling faster in color than in monochrome.*

VJ: Today you can buy a $179 laser printer, but for color to get to that price will take some time. The key application we are looking at is do-it-yourself marketing in small and medium-size businesses. Our research shows that lots of small and medium-size businesses would like to do that. Say you spend $17,000 a year on marketing collateral using outside print jobs. It would be much cheaper with a color laser jet. We see a tremendous opportunity in the color laser business.

MJM: *I talk to consumers who buy inexpensive ink jets but then spend eight times that on cartridges over the next two years.*

VJ: If you are not going to use your printer that often, then you want to buy a very low-end printer. If you're going to use lots of pages, you should really buy a business ink jet, because it has the lowest cost of ownership of any of our ink jet devices. It's even cheaper to own than a color laser. Our business ink jet cost per copy is cheaper than our color laser. What we need to do is get some more awareness in terms of what kind of a user you are. If you're a moderate or heavy user, you should really buy a higher-end ink jet. That's the best in terms of price and performance. You get a much better cost of ownership with our $199 business ink jet than with our $49 ink jet.

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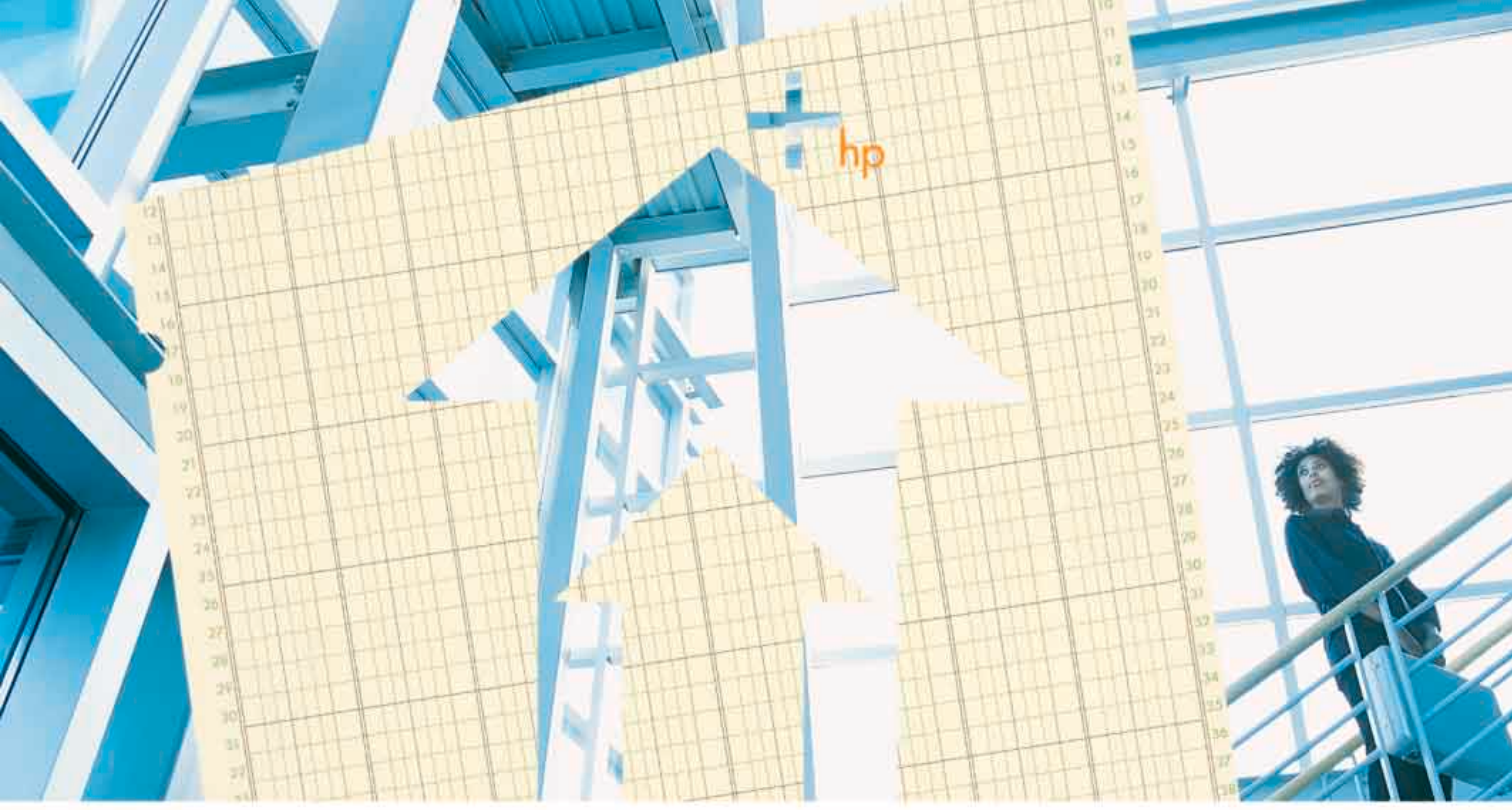

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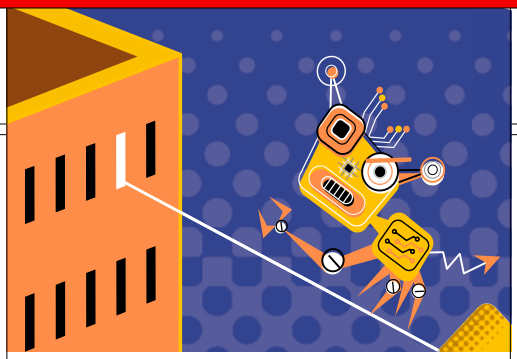

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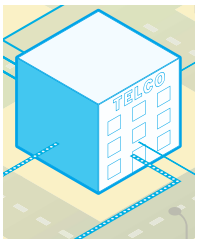

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EAST COAST ACCOUNT EXECUTIVE
Osbourne Trail, Jr. 212-503-3284

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Andrew Wesley 415-547-8047

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Tara Culleny

ADVERTISING SERVICES MANAGER
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Michele Itzkowitz

SALES DEVELOPMENT COORDINATOR
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PIPELINE

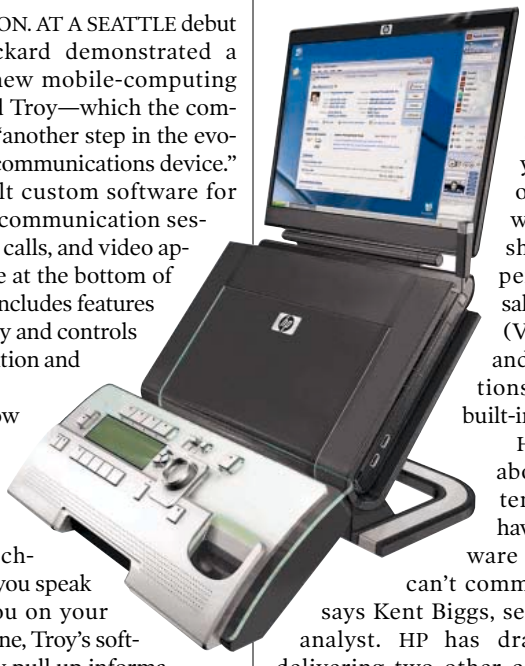
TECHNOLOGY TRENDS & NEWS ANALYSIS

HP's Troy: It's a Concept

Will the latest take on a communications center materialize?

PC DESIGN MARCHES ON. AT A SEATTLE debut in May, Hewlett-Packard demonstrated a prototype of a racy new mobile-computing concept—code-named Troy—which the company characterizes as "another step in the evolution of the PC into a communications device."

The Microsoft-built custom software for Troy enables unified communication sessions for e-mail, phone calls, and video applications. The console at the bottom of the photo shown here includes features such as a second display and controls for managing collaboration and communication tasks.



As an example of how the hardware and software work together: Troy recognizes cell phone presence via Bluetooth wireless technology. So if someone you speak to frequently calls you on your Bluetooth-enabled phone, Troy's software can automatically pull up information about the person calling, such as a recent e-mail thread or detailed call history.

If you decide you want to exchange video instant messages with the caller, you can switch instantly to that mode via the bottom console.

An integrated camera gets the job done. The software also includes collaboration features, so you and the person on the other end can work together on a shared application—perhaps cocreating a sales presentation. VoIP (Voice over IP), Wi-Fi, and other communications technolgies are built-in.

HP is keeping mum about when Troy systems might ship. "We have software and hardware to demonstrate but can't commit to any date yet," says Kent Biggs, senior technical staff analyst. HP has dragged its feet on delivering two other concept PCs similar to Troy: Agora, shown in 2002, and Athens, shown last year. Troy's design and software are significantly farther along, so systems could arrive soon. Just don't hold your breath. —*Sebastian Rupley*

CHIP SHIFT Bill Gates pronounced the shift to 64-bit computing on the desktop "almost here" at the Windows Hardware Engineering Conference in May. He said all chips AMD ships by the end of 2005 will be 64-bit–capable, and the majority of Intel's will be in less than two years.

Paper Discs

When you think of efficient storage media, does paper immediately come to mind? Sony and Toppan Printing are thinking that way. The companies have developed an optical, 25GB Blu-Ray disc, 51 percent of which is made from paper. Sony expects Blu-Ray eventually to replace VCR and DVD technology.

Sony and Toppan claim such discs are useful, because they can be cut up (a security benefit for discarded discs), and they should reduce manufacturing costs. No date is set yet for availability.

Because Blu-Ray discs do not require laser light to travel through the substrate, Sony and Toppan were able to develop their paper version. Paper may not be such an antiquated storage medium after all.—*Mark Hachman*

No Attachment Needed

IN A DISTURBING TURN FOR THE worse in the virus blizzards, breeds of worms are appearing that don't require the user to open an e-mail attachment to infect a PC. In March, multiple variants of the Bagle worm appeared that could infect a PC when a user simply opened an e-mail. The Sasser worm followed. Several of the worms exploited known Windows vulnerabilities to infect PCs automatically when users clicked on e-mails, lending more importance to installing operating-system patches diligently.—*SR*

ILLUSTRATION BY JAMES O'BRIEN

Punching Out: Workplace Web Surfing

Of U.S. employees who use the Internet at work, 51 percent spend between 1 and 5 hours per day online at the office for personal reasons, says a recent "Web@Work" study. Reading news online is by far the most popular online workplace diversion.

Based on surveys of 500 Internet users. Source: Websense and Harris Interactive, April 2004.

Sniffing For Wi-Fi

Wi-Fi may not be ubiquitous yet, but it's getting there. From airports and hotel lobbies to hot spots and your neighbor's untethered network, many public and private places are home to Wi-Fi signals. The Chrysalis Wi-Fi Seeker is a key chain–size device, much smaller than similar gizmos. The Wi-Fi Seeker aims to eliminate the need to turn on a notebook computer or PDA and use a program like NetStumbler to sniff out wireless presence and signal strength.

The $29.95 gadget has a button on top, and when it's pressed, four red LED lights begin flashing. If an 802.11b/g access point is within range, one or more of the lights will stay illuminated. More lights signify a stronger Wi-Fi signal.

Remember that Wi-Fi shares spectrum with other wireless devices. "It's able to differentiate between an 802.11b/g network, cordless phone, microwave oven, and baby monitor," says Eric Seedman, president of Chrysalis. ExtremeTech, *PC Magazine*'s sister Web site, performed tests and found the device good at tasks such as leading testers down a street toward a Starbucks with Wi-Fi. The device failed within inches of a microwave oven, but from a few feet away it worked fine.

Chrysalis has a patent pending on the Wi-Fi Seeker and will start selling its product in June at *www.wifiseeker.com.*—*SR*

Entertainment Face-Off

MICROSOFT CONTINUES TO GO HOLLYWOOD. In a major step in its efforts to deliver subscription-based music and video content for portable and networked devices, the company has unveiled the next version of its Windows Media digital rights management (DRM) software. Numerous online music and movie services, entertainment companies, and consumer electronics firms have lined up to support the software, code-named Janus.

The new DRM software has a "time bomb" feature, which will allow users to rent music and movies only for short periods. The idea is that "you will be paying a low monthly fee to fill your portable music player with thousands of songs, or renting a dozen movies to take with you on a Portable Media Center," says Amir Majidimehr, Microsoft corporate vice president. Microsoft officials also confirm that the company will deliver an MSN-branded online music store this year, though no details are available yet.

Among the companies supporting Microsoft's DRM software are AOL, CinemaNow, Creative, Dell, Disney, Movielink, Napster, Rio, and many others. But not everybody has signed on to Microsoft's agenda. Hewlett-Packard is standing behind Apple's iTunes music store and DRM technology and is cobranding the iPod music player. AOL is aligned with both Microsoft and Apple.

By the end of this year, Microsoft and Apple will be toeing new kinds of competitive lines. Now that's entertainment.—*SR*

SHUT THEM DOWN *Phishing*—e-mail attempts to hijack personal information through official-looking inquiries—is becoming the online scam du jour. Gartner researchers argue that "Internet commerce will be hurt by an erosion of consumer trust if the attacks are not sharply reduced." They say an estimated 57 million Americans have received phishing e-mails, nearly 11 million have clicked on links to fraudulent Web sites, and 1.78 million users have given phishers financial information. The moral: Never provide personal information in response to an e-mail from an unverified source.

Putting Spammers in the Pokey

THE GOVERNMENT WANTS you to know that violating its CAN-SPAM law can send you up the river. In April, the Department of Justice busted its first accused spammers.

Four defendants from the Detroit area—Christopher Chung, Daniel J. Lin, James J. Lin, and Mark M. Sadek—are accused of disguising their identities and hawking a fraudulent $59.95 herbal weight-loss patch by sending hundreds of thousands of spam messages.

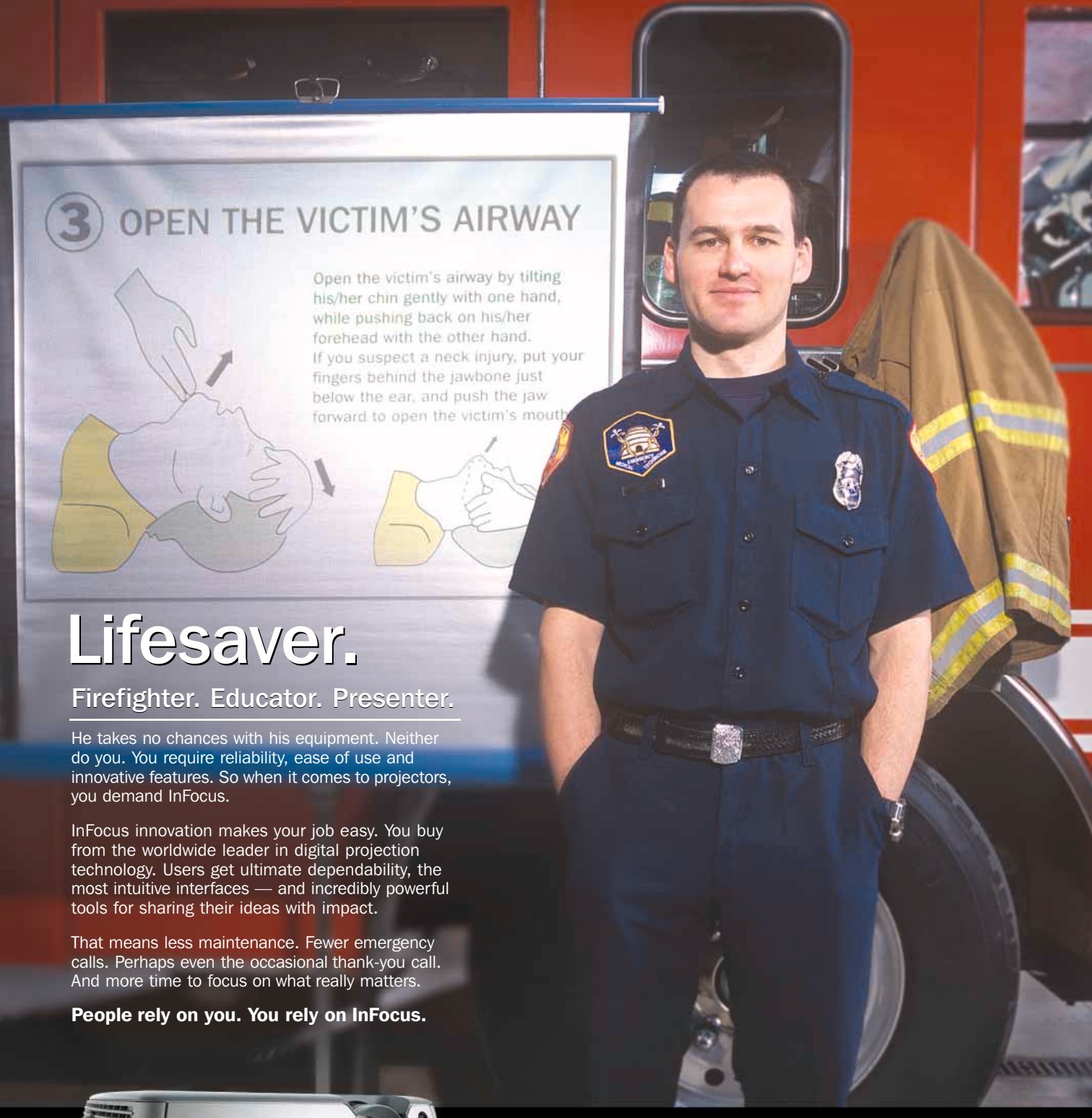
According to the FTC, more than 10,000 complaints were lodged against the accused, who allegedly operated companies under various names, including AIT Herbal and Avatar Nutrition, and used a common technique to hide their identities: bouncing e-mails through unprotected relay computers on the Net. The Department of Justice found the four not by tracking IP addresses but by following a paper trail through the postal service. At press time, two of the accused had appeared in U.S. District Court, but the Lins had not been located, underscoring how easily spammers can hide.

"The problem is that the forensics to prove it actually was that person who sent that e-mail can cross geographical and political boundaries," says Paul Wood, chief analyst at MessageLabs.

According to MessageLabs, CAN-SPAM caused a dip in junk mail volume, but April saw the volume of spam worldwide reach 67 percent of all messages—a record. Wood says the law should make it more expensive for spammers to operate, but adds that in the U.S. the problem appears to be growing steadily.—*John R. Quain*

BIG CAT Apple has not yet announced a formal shipping date for Tiger, the next major release of Mac OS X. But Apple CEO Steve Jobs said that he will attempt to tame a preview version at the company's worldwide developer conference on June 28.

ILLUSTRATION BY JAMES O'BRIEN; PHOTO: GETTY IMAGES



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COMING ATTRACTIONS

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The new **IBM M400 Micro Portable projector** is the company's first exclusive projector design in years. A road-warrior machine, the DLP projector is both light (2.4 pounds) and bright for this size machine (1,100 lumens). With a footprint about half the size of a sheet of paper, the M400 has a native XGA resolution of 1,024-by-768 and promises up to 2,000 hours of lamp life.—*Daniel S. Evans*

$1,849 direct. IBM Corp., www.ibm.com.

Neither Rain nor Snow...

Billed as the HumVee of notebooks, the ruggedized **Getac A770** just received MIL-STD-461E certification from the Defense Department—meaning that this notebook is cleared for the harsh environs of wartime. Or your shop floor, for that matter. The 12.5-pound luggable can withstand temperatures from minus 4 degrees F to a scorching 130. The water-resistant unit also can survive three-foot drops onto steel plating and 15G shocks and vibrations.—*DSE*

Price to be determined. Getac Inc., www.getac.com.

Improved VideoStudio

Ulead's next iteration of it popular and easy-to-use VideoStudio series promises to build on the features that have made it one of the most popular midlevel video-editing products around. **Ulead VideoStudio 8** has added a three-step movie MovieWizard for quick and easy video editing. The product now also features an Audio Mixer for more soundtrack control, allowing you to blend up to four tracks at any moment in your video.—*DSE*

$99.99 direct. Ulead Systems Inc., www.ulead.com.

Make Your Own Music

The new **Magix mp3 maker 2005 deLuxe** promises to be the only music software you need. mp3 maker 2005 lets you rip, mix, encode, convert, clean, and organize all of your music files and then burn them to a CD or DVD. The package supports most major file formats (including Ogg Vorbis) and users can import JPEG files to create musical slide shows, then burn them as AVI files.—*DSE*

$39.99 direct. Magix AG, www.magix.com.

Wrist-Sized GPS

The Garmin Foretrex 101 might look like an oversized watch, but it's actually a full-fledged GPS device. Made for the especially active GPS user, the 101 is waterproof and has six dedicated buttons for easy and quick navigation. Garmin's exclusive TrackBack feature allows trekkers to leave an electronic breadcrumb trail back to their original starting point.—*DSE*

$139 direct. Garmin International Inc., www.garmin.com.

Coin-Sized MP3

The BenQ Joybee 102 is the world's smallest and lightest MP3 player. Weighing in at 0.5 ounces and about the size of a half dollar, the 102 (available in three colors) looks more like fashion jewelry than a music player. BenQ will sell 128MB and 256MB versions, and the units' rechargeable lithium ion batteries deliver a claimed 8 hours of battery life.—*DSE*

128MB, $129 direct; 256MB, $189. BenQ Corp., www.BenQ.com.

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NEC-MITSUBISHI ELECTRONICS DISPLAY

EDITORS' CHOICES

JUNE 8–21, 2004

In the market to buy? Here are our latest Editors' Choices in the leading technology categories—the products we've picked as the best from the hundreds that PC Magazine Labs has been testing. For links to the complete reviews, including dates of publication, visit www.pcmag.com/editorschoice.

DESKTOP PCs

IBM ThinkCentre A50p

GAMING DESKTOPS
- Dell Dimension XPS—3.4-GHz Extreme Edition
- Falcon Northwest FragBox Pro
- Velocity Micro Vision FX

MULTIMEDIA DESKTOPS
- Apple Power Mac G5 Dual 2 GHz
- Velocity Micro ProMagix

MEDIA CENTER PC
- Sony VAIO Digital Studio PCV-RZ46G

VALUE PC
- eMachines T2865

HOME PC
- Sony VAIO PCV-W500GN1

SMALL-BUSINESS PC
- NEW IBM ThinkCentre A50p

CORPORATE PC
- IBM ThinkCentre S50

PORTABLE PCs

VALUE NOTEBOOKS
- Averatec AV3225HS
- HP Compaq Presario R3000Z

BUSINESS NOTEBOOKS
- NEW Acer Travelmate 8000
- IBM ThinkPad T40

GAMING NOTEBOOK
- Dell Inspiron XPS

MULTIMEDIA NOTEBOOK
- HP Pavilion zd7000

ULTRAPORTABLE
- IBM ThinkPad X40

TABLET PCs
- Motion M1400
- Toshiba Portégé M205-S809

MOBILE DEVICES

PDAs
- HP iPaq Pocket PC h4350
- NEW palmOne Zire 72

PDA/PHONE COMBO
- Handspring Treo 600

PHONE
- Motorola MPx200

GPS DEVICE
- TomTom Bluetooth GPS Receiver

HOME ENTERTAINMENT

MEDIA HUBS
- Creative Labs Sound Blaster Wireless (music)
- Prismiq MediaPlayer (multimedia)
- Turtle Beach Audiotron AT-100 (music)

DIGITAL VIDEO RECORDER
- SnapStream Beyond TV 3

HDTV
- Sharp Aquos 37-inch LCD TV

CAMERAS

COMPACT CAMERAS
- Kodak EasyShare LS743
- Sony Cyber-shot DSC-T1

MIDRANGE CAMERA
- Olympus C-5060 Wide Zoom

SUPERZOOM CAMERA
- NEW Olympus Camedia C-765 Ultra Zoom

palmOne Zire 72

Nikon D70

PROSUMER CAMERAS
- Konica Minolta DiMage A2
- Leica Digilux 2
- Olympus C-8080 Wide Zoom

DIGITAL SLR CAMERA
- NEW Nikon D70

ENTRY-LEVEL DV CAMERA
- Sony DCR-HC40 MiniDV Handycam

DIGITAL IMAGING

FLATBED SCANNER
- Microtek ScanMaker 6100 Pro

CONSUMER IMAGE EDITOR
- Adobe Photoshop Elements 2.0

PROFESSIONAL IMAGE EDITOR
- Adobe Photoshop CS

PHOTO ALBUM SOFTWARE
- Adobe Photoshop Album 2.0

PHOTO SHARING
- OurPictures
- Smugmug

PHOTO-PRINTING SERVICE
- Shutterfly

DIGITAL AUDIO & VIDEO

ANALOG CAPTURE DEVICE
- HP DVD Movie Writer dc3000

PROFESSIONAL VIDEO EDITOR
- Adobe Premiere Pro

CD/DVD-BURNING SUITE
- Roxio Easy Media Creator 7

DVD AUTHORING
- Sonic MyDVD 5.2 (consumer)
- Ulead DVD WorkShop 2 (pro)

PORTABLE AUDIO PLAYERS
- Apple iPod
- Apple iPod Mini
- iRiver iFP-390

SOUND CARD
- Creative Labs Sound Blaster Audigy 2 ZS

SPEAKERS
- Creative Labs Gigaworks S750
- Klipsch ProMedia GMX D-5.1

PC JUKEBOX
- MusicMatch Jukebox 8.2

MUSIC STORE
- Napster 2.0

WEBCAM
- Logitech QuickCam Pro

PRINTERS

PERSONAL PRINTERS
- Brother HL-5040 (laser)
- HP Deskjet 5150 (ink jet)
- Lexmark C510n (color laser)

PERSONAL MFPs
- Brother MFC-8420 (laser)
- Canon MultiPass MP730 (ink jet)
- Dell A940 (ink jet)

PHOTO PRINTERS
- NEW Canon i9900 Photo Printer (pro)
- Epson Stylus Pro 4000 (pro)
- HP Photosmart 7960 (consumer)

NETWORK PRINTERS
- HP LaserJet 9000dn (monochrome laser)

Canon i9900 Photo Printer

- Xerox Phaser 4500DT (monochrome laser)
- Xerox Phaser 7750DN (color laser)

DISPLAYS & STORAGE

BUSINESS DISPLAYS
- IBM ThinkVision C220p
- NEC MultiSync LCD1960NXi
- Samsung SyncMaster 171N

BUSINESS PROJECTOR
- NEC VT460

GAMING GRAPHICS CARD
- ATI Radeon 9800 XT

EDITORS' CHOICES

JUNE 8–21, 2004

MAINSTREAM GRAPHICS CARD
•PNY Verto GeForce 5700 FX Ultra
DVD BURNERS
•HP DVD Movie Writer dc3000
NEW Memorex True 8X External Dual Format Recorder
NEW Pioneer DVR-A07YLB
EXTERNAL DRIVE
•Maxtor OneTouch
REMOVABLE STORAGE
NEW Iomega Rev 35
PORTABLE PHOTO STORAGE
NEW Micro Solutions RoadStor

PRODUCTIVITY SOFTWARE

OFFICE SUITE
•Microsoft Office 2003
OCR
•ScanSoft OmniPage Pro 14 Office
PDF CREATION
•Adobe Acrobat 6.0
•FinePrint pdfFactory PRO 1.57
•Jaws PDF Creator 3.0
DOCUMENT MANAGEMENT
•ScanSoft PaperPort Pro 9 Office
DESKTOP PUBLISHING
•Adobe InDesign CS
FINANCE & ACCOUNTING
•Microsoft Money 2004 Premium
•QuickBooks Premier 2004

Iomega Rev 35

•Quicken 2004 Premier
WEB SITE CREATION
•NeoVerve StoreSense
WEB RESEARCH
NEW Onfolio Professional
MEDIA CREATION SUITE
•Roxio Easy Media Creator 7
E-MAIL CLIENT
•Microsoft Outlook 2003
VIDEOCONFERENCING
•SightSpeed Video Messenger
•VidiTel
DATABASE
•FileMaker Pro 7
BLOG/WIKI TOOLS
•EditMe

Memorex True 8X External Dual Format Recorder

•Socialtext Workplace 1.0
•TypePad

UTILITIES

ANTIVIRUS
•Norton AntiVirus 2004
FIREWALLS
•Norton Personal Firewall 2004
•ZoneAlarm 4.5 (firewall)
SECURITY SUITE
•Norton Internet Security 2004
ANTISPYWARE
•SpySweeper 2.2
ANTISPAM
•Norton AntiSpam 2004
•Qurb
POP-UP BLOCKER
•PopUp Cop
INSTANT MESSAGING
•MSN Messenger 6.1
FILE COMPRESSION
•PKZip 8.0 for Windows
•StuffIt Deluxe 8.0
BACKUP
•Retrospect Pro 6.5
ONLINE BACKUP
•IBackup
ROLLBACK
•Norton GoBack 3.0
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•ExplorePlus 6.1
MIGRATION
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VULNERABILITY SCANNER
•Retina Network Security Scanner

NETWORKING

SERVER HARDWARE
•Dell PowerEdge 1750
SERVER OS
•Microsoft Windows Server 2003 Enterprise Edition
WIRELESS INFRASTRUCTURE
•Linksys Wireless-G WRT54GS (802.11g)
•Netgear ProSafe-FWAG114 (802.11a/g)
SECURITY APPLIANCE
•ServGate EdgeForce (small-business)
REMOTE-ACCESS APPLIANCE
•Neoteris Access 1000

GAMES & EDUCATIONAL SOFTWARE

SIMULATION
•Microsoft Flight Simulator 2004
ACTION/COMBAT
•Battlefield Vietnam
•Halo: Combat Evolved
•Orbz 2
•Savage: The Battle for Newerth

Savage: The Battle for Newerth

SPORTS
•Madden NFL 2003
VIRTUAL WORLD
•Second Life
ONLINE
•EverQuest: Evolution
EDUCATION
•Math Mission: The Race to Spectacle City Arcade, The Amazing Arcade Adventure
•Zoombinis Island Odyssey
MOBILE GAME
•Bejeweled
REFERENCE
•Microsoft Encarta 2004
•Visual Thesaurus

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GPU Wars Heat Up Again

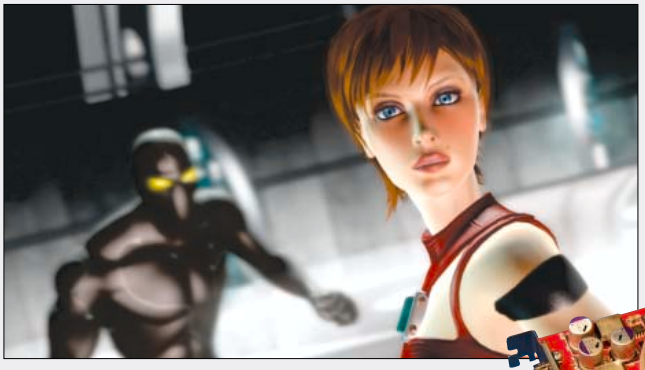
THE MAGAZINE WORLD'S LARGEST COMPUTER-TESTING FACILITY

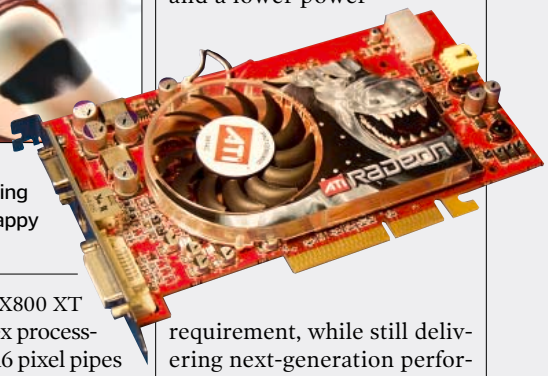
PC LABS

BY DAVE SALVATOR

Within weeks of each other, the two major players in the PC graphics processor unit (GPU) business, ATI and nVidia, have released new chip architectures—without question their fastest and most powerful GPUs yet. And the stakes couldn't be higher for both companies, as ATI hopes to maintain its top-dog status and nVidia seeks to reclaim market dominance. • In recent years nVidia was the performance leader, with ATI running a pretty close second. Then the tables turned. ATI introduced the R300 GPU, branded as the Radeon 9700 Pro, and it was a resounding success. Meanwhile, nVidia shipped its GeForce FX 5800, which turned out to be a disappointment. ATI found itself in the driver's seat, winning over gaming gurus with the high-end Radeon 9700 Pro. And its derivative GPUs—the Radeon 9500 Pro, 9600 Pro, and 9600 XT—were also solid performers that hit the all-important $200 sweet-spot price.

ATI has now unveiled its latest GPU, the Radeon X800 XT, which is intended to go head-to-head with nVidia's recently introduced—and impressive—GeForce 6800 Ultra. These new top-of-the-line 3D cards are not for the faint of wallet: $500 is a hefty investment to make on a PC component. But if you're a gamer who insists on having the best 3D graphics performance on the planet, this is the hardware you crave. Both GPUs are solid performers.





THE ATI RADEON X800 XT GPU should bring game play to a new level, thanks to its more realistic rendering capabilities. Those upgrading a current card will be happy to know the board fits in one slot.

ATI Radeon X800 XT

ATI has actually taken the wraps off not just one but two new GPUs—the Radeon X800 XT and the Radeon X800 Pro. The X800 XT represents the company's flagship high-end GPU, whereas the X800 Pro is a lower-priced version, with 12 pixel pipes and lower engine and memory-clock speeds.

Like the new nVidia GeForce 6800 Ultra, the X800 XT features six vertex processing engines and 16 pixel pipes (up from the previous generation's 8). This GPU also has a 256-bit memory interface and support for DDR-3 graphics memory. The biggest differences between ATI's X800 and nVidia's 6800 lines can be seen in clock speed, chip size, power requirements, and support for Direct3D's Pixel Shader 3.0. (For more on the X800 XT's underpinnings, see ExtremeTech's review at *www.extremetech.com/X800XT*.)

In addition to the wider data paths, ATI's approach for this new generation of GPUs was to crank up the clock speed to 520 MHz—a 30 percent advantage over nVidia's new GeForce 6800 Ultra, which runs at 400 MHz. In testing, we found this difference gave ATI a small performance advantage at high resolutions with lots of antialiasing and anisotropic filtering enabled.

But beyond performance, the X800 XT GPU offers another advantage: You won't have to upgrade your current power supply to run it. Unlike nVidia, ATI decided to hold off on support for the new Pixel Shader 3.0 specification. This allows for a smaller chip size and a lower power requirement, while still delivering next-generation performance. The ATI unit fits into one slot and draws only 65 watts at peak performance. By contrast, the new nVidia top-of-the-line processor requires two slots and has a peak power draw of 110 watts.

We'll reserve our final assessment for when boards using the GPU begin shipping in

PRODUCT PHOTOGRAPHY BY THOM O'CONNOR

L O O K S

WHAT THE RATINGS MEAN: ●●●●● EXCELLENT | ●●●●○ VERY GOOD | ●●●○○ GOOD | ●●○○○ FAIR | ●○○○○ POOR

48 Pentax Optio S40
49 Sony VAIO PCV-V200G
50 palmOne Zire 31
50 palmOne Zire 72
52 Onfolio Professional Edition
52 Reg Organizer 2.0
54 Canon i9900 Photo Printer
54 Lexmark Z816 Color Jetprinter
54 Fujitsu ScanSnap fi-5110EOX
54 PictureMate by Epson
56 Iomega Rev 35
56 Micro Solutions RoadStor
56 Memorex True 8X External Dual Format DVD Recorder
56 Pioneer DVR-A07XLB
56 Toshiba SD-R5272
58 Microsoft Speech Server 2004 Standard Edition
59 Angel.com Voice Sites

Red type denotes Editors' Choice

nVIDIA AIMED FOR UNPRECEDENTED REALISM with the GeForce 6800 Ultra GPU, as seen in this company-provided demo screen. The chip itself is large, requiring add-in boards that eat up two slots and draw up to 110 watts of power.

volume later this spring. But right now it seems that the X800 XT has an edge, thanks to slightly faster game performance at 1,600 by 1,200 with 4X anti-aliasing and 8X anisotropic filtering enabled. Although it lacks Shader Model 3.0 support, the ATI Radeon X800 XT is the performance leader by a nose. And its lower power draw means that it should run with your existing power supply.

ATI Radeon X800 XT

$500 street. ATI Technologies Inc., www.ati.com. ●●●●○

nVidia GeForce 6800 Ultra

nVidia's new chip strategy is based on an increased number of shading units in addition to forward-thinking support for Direct3D's Pixel Shader 3.0 standard, which ATI has decided to skip for now. The GeForce 6800 Ultra is a considerably larger chip than its ATI counterpart, which in turn means that the board requires two slots. And the chip has a higher peak power draw, so

you may need a beefier power supply to keep things running smoothly. But unlike early builds of the company's previous GeForce FX 5800, there is no issue with excessive noise from the cooling setup.

What's behind such a big chip? The answer is a whopping 222 million transistors, which makes it one of the largest processors ever manufactured. Most of this extra logic space is taken up by support for Direct3D's Shader Model 3.0, and nVidia's support of 32-bit floating-point precision. The processor also has four times as many pixel pipes as its predecessor, the NV30 GPU family, and eight times the number of pixel shader units.

Built on IBM's 0.13-micron manufacturing process, the GeForce 6800 Ultra clocks in at 400 MHz. Although this speed is 25 percent slower than that of the ATI entry, note that the GeForce 6800 Ultra just about makes up the difference in efficiency: It can process about 12 pixels per clock, or 4.8 gigapixels per second. (For more in-depth technical coverage of the GeForce 6800 Ultra, see the ExtremeTech analysis at *www.extremetech.com/6800.)*

The support for Shader Model 3.0 does give nVidia an edge. Some games written for the spec will take advantage of this support. That said, these games will also have a "fallback" code path to let them run on ATI and older nVidia GPUs that don't support the new standard. As of now, the GeForce 6800 Ultra is the only GPU that supports Shader Model 3.0, and it's likely to be some time before 3.0's features are in widespread use.

Again, until we test the final production-level hardware and see the software offered by nVidia's partners, we can't make a call on which bundle you should buy. But it is clear that nVidia's new GPU is extremely capable and can go toe to toe with ATI's latest and greatest. The GeForce 6800 Ultra merely loses a step—and a small step at that—at very high resolutions with anti-aliasing and anisotropic filtering enabled.

nVidia GeForce 6800 Ultra

$500 street. nVidia Corp., www.nvidia.com. ●●●●○

NEW GRAPHICS PROCESSORS

High scores are best. Bold type denotes first place.

	3DMARK03	UNREAL TOURNAMENT 2003 (fps)	HALO (fps)	SPLINTER CELL (fps)
Resolution ▶ *Anti-aliasing/Anisotropic filtering ▶*	1,280 x 1,024 *2X/4X*	1,600 x 1,200 *2X/4X*	1,600 x 1,200 *Off/Off*	1,600 x 1,200 *Off/8X*
ATI Radeon X800 Pro	5,115	61	64	58
ATI Radeon X800 XT	**6,843**	**72**	**67**	**73**
nVidia GeForce 6800 Ultra	6,526	60	63	67
ATI Radeon 9800 XT*	3,140	45	29	34
nVidia GeForce FX 5950 Ultra*	2,832	38	28	25

* Reported for comparison.

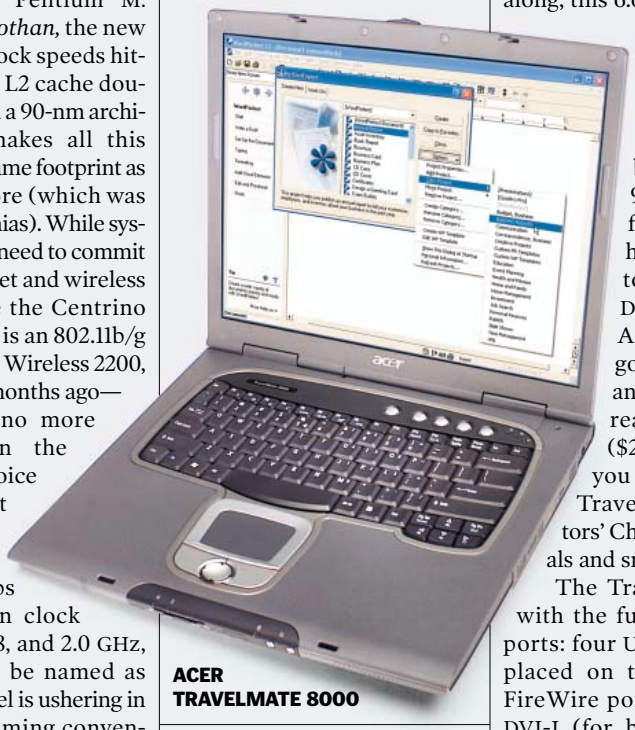
Intel's Mobile Platform Offers Improved Speed

BY KONSTANTINOS KARAGIANNIS

Taking an already terrific mobile processor and making it better, Intel has created a real winner with the revamped Pentium M. Code-named *Dothan,* the new chip features clock speeds hitting 2.0 GHz, an L2 cache doubled to 2MB, and a 90-nm architecture that makes all this possible in the same footprint as the previous core (which was code-named Banias). While system makers still need to commit to an Intel chipset and wireless solution to use the Centrino branding, there is an 802.11b/g option—the Pro Wireless 2200, released a few months ago—making Centrino more attractive than the 802.11b-only choice offered when it first debuted.

The new Pentium M chips are available in clock speeds of 1.7, 1.8, and 2.0 GHz, but they won't be named as such. Rather, Intel is ushering in its new CPU naming convention, calling these 700-series chips the 735, 745, and 755. All still have a 400-MHz front-side bus, and current Intel chipsets support only a maximum 333-MHz DDR SDRAM. Now a new, enhanced data pre-fetcher is supposed to take better advantage of the now-larger L2 cache to make operations within the processor faster. Intel's next chipset, code-named Alviso, will be available in the second half of 2004. It will support new DDR2 memory, PCI Express, and ExpressCard.

To see how Intel delivered on its promise of new levels of power without painful power draw—thermals are down from 24.5 to 21 watts—we tested seven of the first Dothan-based machines. Our test results show that if you're looking for a battery-friendly powerhouse, the new Pentium M is likely your best bet. In general, performance from these machines bested previous mobile processor–based machines we've tested. To get better performance than what the new Pentium M offers, you'd need to move to a notebook based on a desktop CPU, with the larger chassis and lower battery life that goes along with it.



ACER TRAVELMATE 8000

In terms of components, the seven entries reviewed in this roundup vary in the choice of processor speed, hard drive speed and size, graphics chipset, and wireless solution. They also represent different classes of portables, ranging from 4-pound thin-and-light road-warriors to 7-pound mainstream models. So think of this more as a survey of what's out there rather than a pure head-to-head shootout. Still, the reviews that follow will help you determine which balance of size, price, and performance is right for you.

Acer TravelMate 8000

PC MAGAZINE EDITORS' CHOICE

The **Acer TravelMate 8000** pleasantly surprised us. Reasonably easy for road-going professionals to take along, this 6.6-pound portable comes with a full complement of features: a 15-inch screen, robust ATI Mobility Radeon 9700 graphics, a fast 7,200-rpm hard drive, Bluetooth, and even a DVD±RW burner. Add to that very good performance and battery life at a reasonable price ($2,499 direct) and you can see why the TravelMate is an Editors' Choice for individuals and small businesses.

The TravelMate comes with the full contingent of ports: four USB 2.0 ports (all placed on the left side), a FireWire port, audio line in, DVI-I (for both digital and analog video out—the only notebook in the group to have this), VGA, and S-Video. Security-conscious organizations will be happy to see the integrated Smart Card Reader, which can limit access to only authorized card holders. Network connectivity is via Gigabit Ethernet, and best of all, Centrino G wireless.

One of the design features we're still not sure about is the Acer keyboard, which has the keys arrayed in a slight curve. The company claims it's more ergonomically friendly, but we found it takes a bit getting used to, and the keys are sitting a little closer than we like. Convenient touches we do like are the four-way scroll wheel between the mouse buttons and four programmable quick-launch buttons above the keyboard.

The TravelMate comes with the best 3D graphics solution in the group: the ATI Mobility Radeon 9700 with 128MB DDR SDRAM. This makes it a good choice (for a portable) when work ends and games begin. That GPU, along with the Pentium M 745 (1.8-GHz) processor helped the TravelMate turn in the best Business Winstone score in this group (22.2). Acer's battery score was also impressive at 5 hours 12 minutes.

Corporate fleet buyers will more likely gravitate to the IBM ThinkPad T42, since Acer does not offer common accessories across its line or the OS image stability IT managers crave. But for small businesses and individuals, the Acer TravelMate 8000 could cost more and still not seem overpriced.—*Cisco Cheng*

Acer TravelMate 8000

With Pentium M 745 (1.8 GHz), 512MB DDR SDRAM, 60GB hard drive (7,200 rpm), ATI Mobility Radeon 9700, DVD+/-RW, 15-inch UXGA screen (2,048-by-1,536), Centrino 2200 B/G wireless, Microsoft Windows XP Professional, $2,499 direct. Acer Inc., www.acer.com. ●●●●○

Dell Latitude D800

The Dell Latitude D800 has an extensive feature set, but middle-of-the-road performance and some design choices hold it back.

DELL LATITUDE D800

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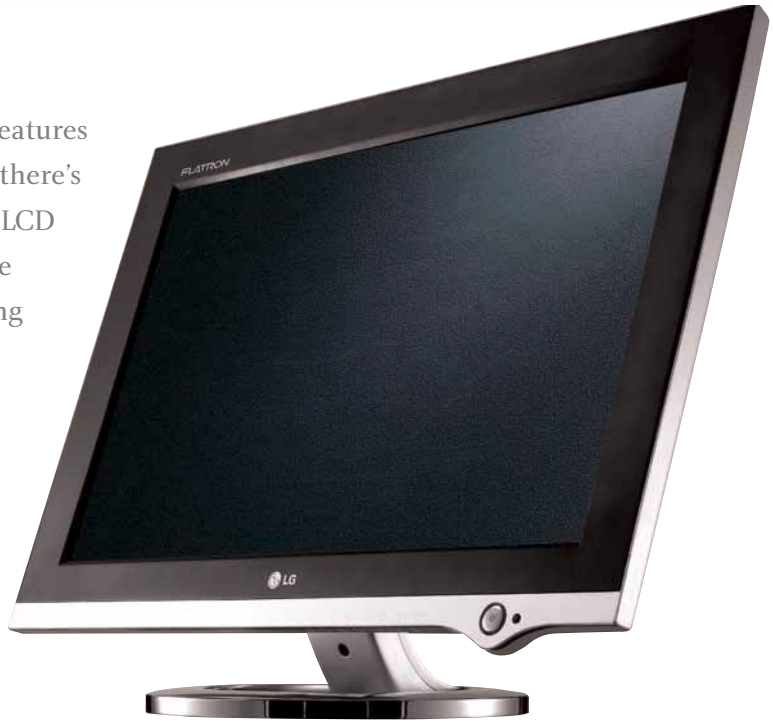

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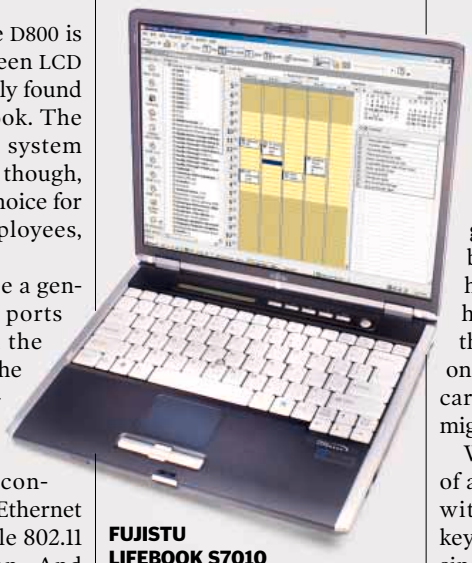
The highlight of the D800 is its 15.4-inch wide-screen LCD—a feature not typically found on a business notebook. The large screen brings system weight to 7.2 pounds, though, making this a better choice for your desk-bound employees, not road warriors.

We are happy to see a generous four USB 2.0 ports (distributed on both the back and the side of the system), not to mention a FireWire port, an S-Video port, and a VGA port. Network connectivity is via 100MB Ethernet or the Dell TrueMobile 802.11 b/g wireless solution. And Dell has included a Smart Card slot below the PC Card slot, for companies going that route for security.

The keyboard is comfortable, and we like that the D800 has both a touch pad and a pointing stick. But the touch pad's mouse buttons are noisy. And when using the pointing stick, we felt that the area below the Spacebar wasn't recessed enough; we found our thumb constantly hitting against it.

With the D series, Dell introduced new docking stations and accessories not compatible with older Latitudes. But corporate buyers will be pleased to know that Dell has committed to keeping these items unchanged for at least five years (for a point of reference: The previous C series accessories worked with newly introduced models over a seven-year span). Performance was fine for business applications, if a bit shy of the other Pentium M 745 (1.8-GHz) boxes here. Battery life (3:15) took a hit because of that big screen. But the 802.11g wireless adapter performed well.



FUJISTU LIFEBOOK S7010

The D800 rounds out the Latitude line with a wide-screen offering, something that most other corporate lineups don't include. But be aware that you're paying a premium for that screen, not the machine's performance.—*CC*

Dell Latitude D800

With Pentium M 745 (1.8 GHz), 512MB DDR SDRAM, 80GB hard drive (5,400 rpm), nVidia GeForce FX Go 5650 (128MB), CD-RW/DVD-ROM drive, 15.4-inch WUXGA screen (1,680-by-1,050), Microsoft Windows XP Professional, $2,656 direct. Dell Inc., www.dell.com. ●●●○○

Fujitsu LifeBook S7010

Aimed at the frequent traveler, the sleek Fujitsu Lifebook S7010 is the lightest notebook in this group (4.3 pounds) and does a good job of balancing portability and performance. To hit this weight, though, you have to give up some niceties that are becoming standard on other portables. But if you carry a notebook all day, this might be a fair trade-off.

We really like the addition of a pointing stick to go along with the touch pad. But the keyboard feels flimsy, and the single set of mouse buttons is located below the touch pad, which makes them a little hard to reach when using the stick.

The S7010 has three USB 2.0 ports, one FireWire port, and a Gigabit Ethernet port. And though we would like see a better graphics solution, Intel's integrated 855GM graphics is fine for typical 2D productivity chores. Features found on other systems, like a memory card slot and parallel and serial connections, are absent from this system. On the plus side, our S7010 configuration did include a DVD±RW burner.

Equipped with a Pentium M 735 (1.7 GHz), the S7010 isn't blazingly fast, though again it is adequate for 2D business chores. It delivered 3 hours 44 minutes of runtime, which is decent for such a small notebook. Wireless throughput in 802.11g mode is a little below average. Still, if you value portability and won't miss the legacy ports, the Fujitsu LifeBook S7010 is a fine choice.—*CC*

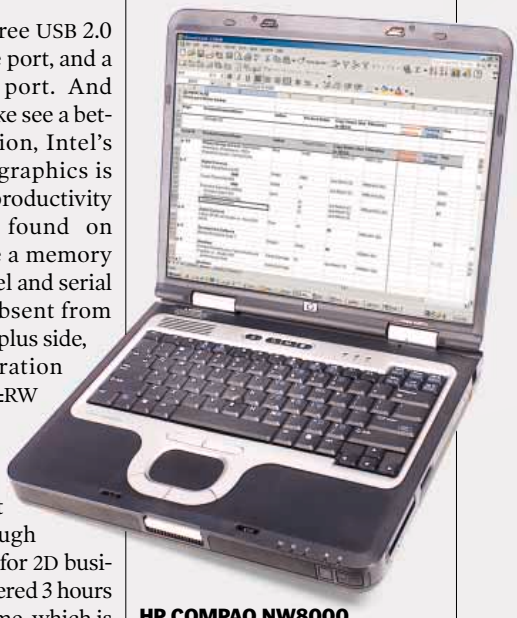
Fujitsu LifeBook S7010

With Pentium M 735 (1.7 GHz), 512MB DDR SDRAM, 80GB hard drive (4,200 rpm), Intel 82855 GME graphics (64MB), DVD+/-RW drive, 14.1-inch XGA screen (1,028-by-768), Centrino 2200 G, Microsoft Windows XP Professional, $2,259 direct. Fujitsu, www.fujitsu.com. ●●●◐○

HP Compaq nw8000

Sometimes you get what you pay for. With the HP Compaq nw8000, you pay for what you get. Marrying the range-topping Pentium M 755 (2.0-GHz) CPU with 1GB of RAM and a 7,200-rpm hard drive doesn't come cheap. Neither does the ATI Mobility Fire GL T2 GPU (with 128MB of on-board memory). But if the engineers in your organization need a full-fledged workstation that is also portable, the nw8000 is a solid choice.

Having top-shelf components helped the nw8000 perform at the top of its game. It delivered very good wireless performance and had a strong showing on Business Winstone 2004 (21.9). But it showed its true workstation colors on the Multimedia Content Creation test, blowing away the competition with a score of 27.9. The nw8000 also gets the gold medal on our BatteryMark scores. The eight-cell battery adds heft, to be sure (system weight is 7.4 pounds), but delivered a runtime of 5:13.



HP COMPAQ NW8000

The full-size keyboard with dual pointing devices is comfortable. The chassis has all the standard legacy ports, as well as an S-Video port, FireWire,

BENCHMARK TESTS

High scores are best. Bold type denotes first place.	Pentium processor	Business Winstone 2004	Multimedia Content Creation Winstone 2004	Business Winstone 2001 BatteryMark (hr:min)
Acer TravelMate 8000	M 745 (1.8 GHz)	**22.2**	22.3	5:12
Dell Latitude D800	M 745 (1.8 GHz)	18.8	21.6	3:15
Fujitsu LifeBook S7010	M 735 (1.7 GHz)	19.5	21.6	3:44
Gateway 450XL	M 745 (1.8 GHz)	19.2	20.1	4:37
HP Compaq nw8000	M 755 (2.0 GHz)	21.9	**27.9**	**5:13**
IBM ThinkPad T42	M 735 (1.7 GHz)	19.7	20.4	3:59
WinBook W360	M 735 (1.7 GHz)	18.7	23.3	3:22

RED denotes Editors' Choice.

and Gigabit Ethernet. But there are just two USB ports (three is becoming the norm). We do like that HP included an SD slot as well as two PC Card slots. The hard drive is a fast-spinning 7,200-rpm unit, but at only 60GB, engineers will need to figure on some external storage as well. HP includes a CD-RW/DVD-ROM combo drive, but on such a high-end system we expected a DVD burner.

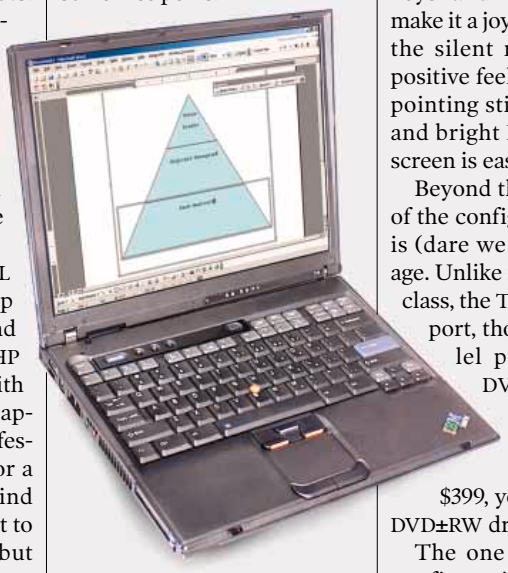
The ATI Mobility Fire GL T2 graphics controller is up to running the latest 2D and 3D workstation apps, and HP has certified the system with the latest ISV workstation applications. So business professionals who are looking for a mobile workstation will find that the nw8000 brings a lot to the table. It ain't cheap, but then quality never is.—*CC*

Compaq nw8000

With Pentium M 755 (2.0 GHz), 1GB DDR-SDRAM, 60GB hard drive (7,200 rpm), ATI Mobility Fire GL T2 graphics (128MB), 15-inch UXGA screen (1,600-by-1,200), CD-RW/DVD-ROM drive, HP WLAN 802.11a/b/g wireless, Microsoft Windows XP Professional, $4,424 direct. Hewlett-Packard Co., www.hp.com. ●●●●○

IBM ThinkPad T42

The IBM ThinkPad family has always been highly regarded for its reliability and dependability. ThinkPads have also had the rap of being pricey, so we were surprised when the ThinkPad T42 configuration that showed up was the lowest-priced entry in this group. Granted, you don't get all the features of the pricier models, but there is nothing essential missing for business users, and there are some nice perks.



IBM THINKPAD T42

One bonus feature unique to IBM is the Access IBM collection of utilities. The blue button on the keyboard launches a self-serve help wizard you use to get updates for the operating system and keep device drivers up to date. Also within Access IBM is Access Connections, a utility that manages connection profiles for the built-in wireless and Ethernet adapters. In our testing, the built-in AMBIT wireless network adapter performed flawlessly, giving us the best throughput numbers in this roundup.

The T42's thin profile and system weight of 5.0 pounds makes this a good choice for road warriors. Another standout feature, as always, is the IBM keyboard. The full-size keys and intelligent layout make it a joy to use, and we like the silent mouse clicks and positive feel of the TrackPoint pointing stick. And the sharp and bright 14.1-inch TFT LCD screen is easy on the eyes.

Beyond that, the feature set of the configuration we tested is (dare we say) merely average. Unlike most others in this class, the T42 has no FireWire port, though it has a parallel port. The CD-RW/DVD-ROM combo drive is fine for a corporate machine, and for $399, you can step up to a DVD±RW drive.

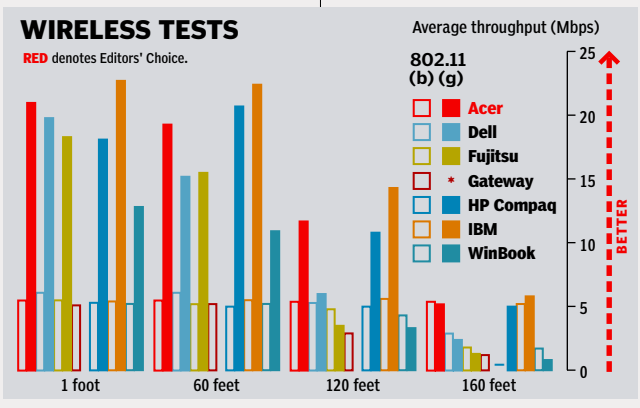
The one thing in our test configuration we would certainly change is the 40GB hard drive. Unfortunately, moving up to 80GB will set you back an additional $399. Fleet buyers will be happy to know that IBM uses the same OS image across the entire family. The docking station can be used with T40 and T41 ThinkPad models, as well as with the company's R series of notebooks.

The T42 falls in the middle of the pack on both Business Winstone (19.7) and Content Creation Winstone (20.4). Its 3 hours 59 minutes of runtime on BatteryMark 2004 is good for a 5-pound machine.

So while the T42 we tested isn't the fanciest machine on the block, it isn't priced like one, either. For less than two grand you get a solid-performing machine with the basics a business user needs—and extras the IT department will appreciate.—*Omar Cintron*

IBM ThinkPad T42

With Pentium M 735 (1.7 GHz), 512MB DDR SDRAM, 40GB hard drive (5,400 rpm), ATI Mobility Radeon 9600 graphics, CD-RW/DVD-ROM drive, 14.1-inch screen, AMBIT 802.11b/g wireless, Microsoft Windows XP Professional, $1,983 direct. IBM Corp., www.ibm.com. ●●●●○



Gateway 450XL

Pros: Good graphics. Fingerprint reader for added security and convenience.
Cons: Only 802.11b wireless at this price. Average performance and feature set.
Bottom line: The Gateway 450XL isn't a bad machine for businesses or corporations, but there's not much to get excited about. If it were lower priced, it would be worth considering. But for this money, we'll take a ThinkPad, thanks.

$2,312 direct. Gateway Inc., www.gateway.com. ●●◐○○

WinBook W360

Pros: Very sharp high-resolution wide-screen display. Good multimedia performance. Roomy, comfortable keyboard.
Cons: Subpar wireless performance and somewhat low Business Winstone 2004 score.
Bottom line: The W360 is a bit expensive, but you get a lot of machine for your dollar. And that beautiful screen is worth a second look.

$2,578 direct. WinBook Computer Corp., www.winbook.com. ●●●○○

www.pcmag.com/notebooks

Desktop PCs that Mean (Small) Business

BY JOEL SANTO DOMINGO

Small-business owners are the unsung heroes of the PC industry. While the big corporate accounts can mean large individual orders, it's the mom-and-pop shops that make up the bulk of the PC market.

So we challenged business PC makers to send us their best small-office/home-office desktops, with an eye toward balancing price, performance, and features. We found that for around $1,300, you can get a reasonably equipped machine that will provide enough horsepower to last your business five years or more.

DELL DIMENSION 4600

DELL DIMENSION 4600

Dell's Dimension 4600 series is a very flexible platform, equally serving the small-business user who wants an easy-to-configure PC or the home user who wants a powerful mainstream PC.

As a business system the Dimension 4600 works well: The 2.8-GHz Pentium 4 (with Hyper-Threading) ensures that business and graphics tasks will be done quickly. Hyper-Threading gives the Dimension 4600 an almost 20 percent boost on our Business Winstone 2004 Multitasking test over a 2.8-GHz P4 without HT. Thanks to the nVidia GeForce FX 5200 graphics card, the Dimension 4600 outperforms systems with more powerful CPUs but with integrated graphics, since the card takes some of the load away from the CPU. And the system is easily expandable if you should desire more graphics power, hard drive space, or memory.

If you look at documents onscreen all day, an LCD is the way to go over a CRT. Our test bundle included Dell's E172 17-inch flat panel. With Windows XP's ClearType technology, text and numbers look sharp on the monitor, even at the 1,280-by-1,024 maximum resolution. The entry-level GeForce FX 5200 graphics card is fine for business chores and even low-res 3D games.

A Dell Support icon on the desktop leads you to local help files and links to a local troubleshooting utility. It includes help procedures for everything from burning a CD to connecting your digital camera. Dell Support also identifies your installed components, Dell Service Code and Service Tag, so you don't have to crawl under your desk to find out these things when you have tech support on the line. But there isn't a lot in the way of included productivity software (save for CD and DVD burning utilities) at this price.

Still, we think the Dimension 4600 is a fine choice for the user who needs a powerful computer now but also foresees the need to upgrade the system down the road.

Dell Dimension 4600

With 2.8-GHz Intel Pentium 4 (with Hyper-Threading), 512MB DDR400 SDRAM, 120GB hard drive, nVidia GeForce FX 5200 graphics, CD-RW drive, DVD-ROM drive, 17-inch LCD monitor, Microsoft Windows XP Professional, $1,299 direct (E-Value Code 6V411-460RPW). Dell Inc., www.dell.com. ●●●◐○

GATEWAY 510 HOME OFFICE

The Gateway 510 Home Office is the company's customized PC for home and small-business workers. Standout features include the 6-in-1 media card reader and DVD writer.

The memory card reader is a definite boon for those who need to transfer digital pictures from a camera to the desktop quickly, such as real estate agents. Gateway's customization of the operating system replaces the media bay's generic icons with icons that look like the memory cards, so it is easy to see at a glance which icon you should open to check your Memory Stick (as opposed to the icon for Smart Media cards).

The built-in DVD writer is a feature we recommend for small businesses, too: The 4.7GB capacity of DVD media means that you can use backup software to save key files and store them off-site for protection in case of an emergency. You can also use the included Pinnacle Instant CD/DVD software to make presentations and slide shows

GATEWAY 510 HOME OFFICE

SMALL-BUSINESS DESKTOPS

High scores are best. Bold type denotes first place.

	Processor	Hard drive (7,200 rpm)	Graphics card	Business Winstone 2004	Business Winstone 2004 Multitasking	Multimedia Content Creation Winstone 2004
Dell Dimension 4600	Pentium 4 (2.8 GHz)	120GB	nVidia GeForce FX 5200	19.1	**2.3**	26.0
Gateway 510 Home Office	Pentium 4 (2.8 GHz)	120GB	Intel 82865G	17.8	2.2	26.0
HP Compaq Business Desktop dx2000	Pentium 4 (3.0E GHz)	40GB	Intel 82865G	20.8	**2.3**	27.2
IBM ThinkCentre A50p	Pentium 4 (2.8 GHz)	120GB	Intel 82865G	17.5	1.9	23.6*
Polywell Qbox-NF2-3200	Athlon XP 3200+ (2.2 GHz)	80GB	nVidia GeForce4 MX	19.4	2.1	23.8*
Velocity Micro Voyager Pro MX	Pentium 4 (3.0 GHz)	80GB	nVidia GeForce FX 5200	**21.0**	**2.3**	**27.5**

RED denotes Editors' Choice.
* For the IBM and Polywell systems, we set Multimedia Content Creation Winstone to run just one LightWave thread. The other machines ran two threads, since their processors support Hyper-Threading.

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Kingston TECHNOLOGY

ISO 9001:2000 SGS

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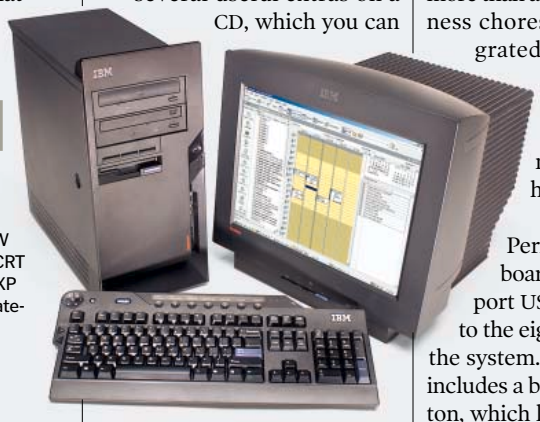
that can be played on a PC or on a set-top DVD player.

The 510 is an adequate performer, but note that the 510's Intel 865GV chipset, without an AGP slot, limits you to internal graphics. So while the unit is fine for business tasks, blowing off some steam with a 3D game once in a while won't be a pleasant experience. That said, the Gateway 510 Home Office is an attractive option.

Gateway 510 Home Office

With 2.8-GHz Intel Pentium 4, 512MB DDR400 SDRAM, 120GB hard drive, Intel Extreme Graphics 2, 8X DVD±RW drive, CD-ROM drive, 17-inch CRT monitor, Microsoft Windows XP Professional, $1,899 direct. Gateway Inc., www.gateway.com. ●●●◐○



IBM THINKCENTRE A50P

HP COMPAQ BUSINESS DESKTOP DX2000

The HP Compaq Business Desktop dx2000 is not a machine for a home that needs to share business and home duties. Rather, this is a system to give your employees so they can get some work done.

HP bundles its L1530 15-inch LCD monitor with the dx2000, which is a good choice for working on business documents: With Windows' ClearType technology, letters look crisp on the LCD display. The speakers built into the monitor work fine for business beeps and sounds, though they're tinny for listening to music.

While the dx2000 "only" comes with a 40GB hard drive, that's plenty for Windows XP, e-mail, and Microsoft Office. Caveat: If your business involves editing videos or other multimedia files, configure your system with a larger hard drive. Also note that the integrated graphics can't be upgraded later on. Still, the dx2000 was the second-highest performer in our roundup. Thanks to its state-of-the-art "Prescott" Pentium 4 processor, the dx2000 is well positioned to last for years of use.

The dx2000's preinstalled programs are pretty basic: Windows XP Pro and Microsoft Works 7.0 (the one without Word). Depending on your perspective, that could also be a plus, since there are fewer programs taking up hard drive space. And HP does include several useful extras on a CD, which you can install if you need them. One that we recommend you install is Retrospect Express, a backup program that can be set to back up to the DVD/CD-RW combo drive automatically.

While the dx2000 may seem unusually Spartan to those who are used to more advanced components, its practically bare-bones setup ensures that what gets done is strictly business. And that's good for anyone's bottom line.

HP Compaq Business Desktop dx2000

With 3.0E-GHz Intel Pentium 4 with SSE3 (Prescott), 512MB DDR400 SDRAM, Intel Integrated Extreme Graphics 2, CD-RW/DVD-ROM drive, 40GB hard drive, 15-inch LCD monitor, six USB 2.0 ports, Microsoft Windows XP Professional, $1,298 direct. Hewlett-Packard Co., www.hp.com. ●●●○○

IBM THINKCENTRE A50P

PC MAGAZINE EDITORS' CHOICE

The features of the IBM ThinkCentre A50p makes it the most attractive desktop here. IBM chose to send us a 17-inch CRT monitor instead of an LCD. But this price does include Microsoft Office Standard edition—a fair trade to keep the price below $1,300.

The A50p's non-Hyper-Threading Pentium 4 and DDR333 memory led to lower scores on our tests, particularly Business Winstone 2004 Multitasking. But performance is more than adequate for 2D business chores. The A50p's integrated graphics can be bypassed in favor of a faster AGP solution should you need the graphics horsepower.

IBM's Enhanced Performance USB Keyboard has a built-in two-port USB hub—in addition to the eight USB 2.0 ports on the system. The keyboard also includes a blue Access IBM button, which launches IBM's proprietary utilities. These can help you troubleshoot problems or figure out how to perform a range of tasks (burning a CD, backing up, and more).

The Access IBM button also figures prominently in the Rapid Restore process: Should your computer become unusable (but still able to boot), the Rapid Restore program can help you return the ThinkCentre to its out-of-box state, without your having to search for recovery discs. Rapid Restore can also create a backup on your hard drive after you've set it up to your liking, with all your programs and documents. This option will take up some hard drive space, but with 120GB, you have plenty to work with.

The IBM ThinkCenter A50p may not be the fastest PC in this group, but it's not slow, either. And with its surprisingly rich feature set, we think it's a winner for small businesses.

IBM ThinkCentre A50p

With 2.8-GHz Intel Pentium 4, 512MB DDR333 SDRAM, 120GB hard drive, Integrated Intel Extreme Graphics 2 , CD-RW drive, DVD-ROM drive, 17-inch CRT monitor, Microsoft Windows XP Professional, $1,299 direct. IBM Corp., www.ibm.com. ●●●●○

IN SHORT

Polywell Qbox-NF2-3200

Pros: Compact chassis. Multiple input/output ports and a dual KVM (keyboard, video, mouse) setup means that two employees can share one system.

Cons: With one possible point of failure for two users, watch out for twice the support headaches. One user can temporarily hog all the resources.

Bottom line: An interesting take for businesses short on space, the Qbox lets two users share a PC simultaneously.

$1,950 direct. Polywell Computers Inc., www.polywell.com. ●●●◐○

Velocity Micro Voyager Pro MX

Pros: Fine machine for running business applications. Small chassis is good for tight spaces. Tech support that cares.

Cons: Limited expansion options.

Bottom line: The Voyager Pro MX is a solid business machine from a company usually known for bleeding-edge gaming boxes. If you prefer to deal with a smaller company, this is a viable alternative to a locally built white box system.

$1,315 direct. Velocity Micro Inc., www.velocitymicro.com. ●●●◐○

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Apple's iTunes Gets Incremental Improvements

BY TROY DREIER

Over the span of about a year, **Apple's iTunes Music Store** has gone from being a concept to being the dominant player in online music retailing: It has sold 70 million songs in its first year and now offers more than 700,000 tracks. And Apple has again updated its iTunes utility, letting buyers make better use of the store and the tracks they purchase there (as well as the ones they rip from their own CD collections). But while iTunes is still a top-tier player and store, the improvements in 4.5 turn out to be less interesting in practice than they are on paper.

WITH iTUNES 4.5, users can create playlists of songs on their computers and then let others see and rate their creations.

The feature likely to get the most attention is iMix, a way for you to create song playlists and then upload them to the iTunes store. Other users can then browse and even rate your playlists. While it may be fun after future improvements, iMix is less than thrilling so far. Looking at other people's song lists isn't all that fascinating, and there's no way to post comments on mixes.

Also missing the mark slightly is a new tool called Party Shuffle, which lets you generate a playlist of random songs. We love that it shows the last songs played and the songs upcoming, and that it's easy to add songs and reorder them. But the customization options need work. You can select only one library or playlist where songs should come from and can opt to have higher-rated songs play more often, but that's all. To be truly useful, Party Shuffle should offer more control over which artists, playlists, or genres should or shouldn't be included.

iTunes finally delivers jewel-case printing with this release. The feature is easy to use, but here again, customization is lacking. You can print a "mosaic" insert with small images of the cover artwork for your CDs or a plain text insert. The mosaic inserts looks extremely professional, but there's no way to adjust what you get. It's a one-size-fits-all option that's leaves no room for creativity.

New offerings in the iTunes Music Store include radio charts (which show what songs are hot on stations around the country) and a dedicated music-video section. Apple is also changing the digital rights on purchased songs with this release. Users who buy songs on the iTunes Music Store can now play them on five computers (up from three) but can only burn a playlist to CD seven times (down from ten).

Apple iTunes 4.5

Free download; 99 cents per song; most albums, $9.99 each. Apple Computer Inc., www.apple.com. ●●●●○

Wal-Mart Eyes Slice of Music Pie

BY TROY DREIER

Bricks-and-mortar behemoth **Wal-Mart** has debuted a no-frills music downloads store offering what the company is famous for: low prices. Songs are 88 cents apiece (as opposed to 99 cents on every other online store), and albums are typically $9.44 (versus $9.99 elsewhere).

Wal-Mart claims its catalog offers over 300,000 tracks from all five major labels and "a number" of independents. The big alternatives—iTunes Music Store, Musicmatch, and Napster 2.0—now offer at least twice that number. The store offers the familiar music genres, but the catalog is weighted toward country—and is scrubbed free any songs with explicit language.

Wal-Mart's store is browsable on any platform, but the songs are WMA files, which play only on Windows computers. The service doesn't have its own jukebox utility, instead relying on Windows Media Player 9. Songs can be played on one computer and backed up to two additional machines—although the clumsy process of backing up the license files will likely deter that from happening often. A song can be burned to CD a maximum of ten times. These limits are far more restrictive than with other stores, where songs can be burned indefinitely as long as the playlist is changed.

The store is easy to use, but basic. We were pleasantly surprised to see that it offers some

WAL-MART'S ONLINE music store is as clean and easy to navigate as an actual Wal-Mart.

new releases missing on Apple's iTunes, such as Radiohead's Hail to the Thief and Prince's Musicology. But browsing the store wasn't the same kind of enticing adventure that we get with iTunes or Napster 2.0, and the store offers nothing in the way of community features or videos.

We also experienced a few notable glitches using Wal-Mart. Song previews, which should play in Windows Media Player, wouldn't work on our test machine. And when we tried to burn one CD of purchased songs, we found our computer hadn't received the licenses for all the songs we purchased. (Downloading the tracks again fixed the problem.)

Wal-Mart's lower prices may attract some. But for the few pennies more, we would opt for the more full-featured sites with their larger catalogs and more liberal usage schemes.

Wal-Mart Music Downloads

88 cents per song; most albums, $9.44 each. Wal-Mart, http://musicdownloads.walmart.com. ●●◐○○

Peer-to-peer is a clear problem.

PC MAGAZINE EDITORS' CHOICE

March 16, 2004
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Some colorful remarks about HP printers.

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–*PC Magazine* Readers' Choice Award, August 5, 2003

"18th Annual Editors' Choice Award—Color LaserJet 2500L."
–*Macworld*, 2003

"'Pick of the Year' for Outstanding Color Inkjet Workgroup Printer—Business Inkjet 3000n."
–Buyers Laboratory Inc., 2003

"Top 10 Printers—Color LaserJet 5500n."
–*PC World*, August 2003

"Editors' Hot Pick for Hardware—Color LaserJet 9500."
–*The Seybold Report*, October 2003

The Digital SLR to Beat

BY SALLY WIENER GROTTA

PC MAGAZINE EDITORS' CHOICE

Last year, Canon created a stir with the Digital Rebel, the first digital SLR (D-SLR) for under $1,000 (including lens). Nikon's return of serve has tremendous heat on it. Instead of creating an amateur-oriented camera like the Rebel and competing directly on price, Nikon has produced a slightly more expensive D-SLR with the features, functions, versatility, and image quality to appeal to budget-minded professionals as well. In fact, not only is the 6.1-megapixel **Nikon D70** more camera than the Rebel, it even bests our previous Editors' Choice in the category, the Olympus E-1 ($2,000).

The D70 body is solid, well designed, and (like the Rebel) made of high-impact plastic. The D70, however, is heavier and feels more substantial than the Rebel. Also, the D70's fixed 2-inch LCD is brighter than the Rebel's.

Like the Rebel, the D70 sports both a built-in pop-up flash and an intelligent hot shoe; the Nikon, however, lacks a standard PC connector for studio strobe lights. The D70 offers flash compensation, and it's the fastest-syncing focal-plane shutter SLR available, with a top sync speed of 1/500 second (for crisp action shots and more flexibility when using fill flash). The D70 supports the faster USB 2.0 spec (though not FireWire).

The D70 incorporates a 6.24-megapixel Sony CCD, yielding a maximum resolution of 3,008 by 2,000 pixels. The E-1 was the first D-SLR to use Kodak's 5.5-megapixel 4/3 chip and has a top resolution of 2,560 by 1,920 pixels. The Rebel uses a 6.29MP CMOS, for a top resolution of 3,072 by 2,000 pixels. None has a movie mode. All three save images as RAW or JPEG files, though the E-1 can also save TIFFs.

The D70 offers almost all the features a professional might look for, including aperture and shutter priority, manual exposure, adjustable exposure bracketing, three metering and focusing modes, shutter speeds as high as 1/8,000 second, sRGB and Adobe RGB color modes, and sharpening and color saturation controls. There's also a fast, responsive playback mode with extensive metadata and histogram.

Nikon created a new series of digital lenses for the camera. Auto-focus with the D70's standard 18- to 70-mm, f/3.5 to f/4.5 zoom lens (35-mm equivalent: 27 to 105 mm) is very fast, and the lens is sharp and distortion-free.

Our tests show that the D70, with the bundle's 18- to 70-mm lens, has a horizontal resolution of 1,650 lines, a vertical resolution of 1,750 lines (higher numbers are better), and horizontal and vertical pixel transitions of 2.4 and 1.8 percent, respectively (lower numbers are better). The Rebel, with its 18- to 55-mm lens, scored 1,600 lines horizontal and vertical, with pixel transitions of 2.6 and 1.9 percent.

Using the D70's default settings on our tests, image quality was very good. Our simulated daylight shot exhibited excellent details, especially in the shadows, but was somewhat underexposed, with a slight blue color shift. Our test flash shot was very sharp and evenly illuminated, with excellent color, if slightly underexposed. By contrast, the E-1's simulated daylight test shot was perfect. Keep in mind, however, that professional and prosumer cameras work best not on default settings but by using white balance and exposure controls. The D70's image quality jumped to excellent when we took these routes.

The D70, with its 8-frame-per-second burst mode, handles and shoots as fast as any film SLR. It can click off JPEG images at a sustained 3 fps until you run out of memory. Better yet, it boots up in 0.4 seconds and has no shutter lag. For sustained shooting and throughput, the D70 is far and away the fastest D-SLR under $3,000. Given its stellar price/performance ratio, the Nikon D70 is our clear pick.

THE NIKON D70 is currently the D-SLR camera to beat, thanks to its excellent price/performance mix.

Nikon D70

Body and lens, $1,300 street; body only, $999 list. Nikon U.S.A. Inc., www.nikonusa.com. ●●●●●

IN SHORT

Panasonic Lumix DMC-LC70

Pros: Compact. Fast boot time, speedy zoom. Welcome options for beginners.
Cons: Some icons are confusing. No aperture or shutter priority modes and no manual mode.
Bottom line: The 4-megapixel Lumix DMC-LC70 offers decent image quality. With its beginner-targeted features and convenient controls (not to mention its lack of manual overrides), it is best suited to first-time buyers.
$299.99 direct. Matsushita Electric Corp. of America, www.panasonic.com. ●●●○○

Pentax Optio S4i

Pros: Extremely compact. Large LCD. Quick boot time and good battery life. Good feature set.
Cons: Nonstandard battery and long recharge time. Flimsy and unwieldy plastic plugs. Small control buttons.
Bottom line: The 4-megapixel Optio S41 packs a lot of features into a tiny package, but it's not particularly speedy. And while the images it produces are sharp, its flash shots are noisy.
$350 list. Pentax U.S.A. Inc., www.pentaxusa.com. ●●●○○

Pentax Optio S40

Pros: Compact. Good lens. Good help features.
Cons: Small LCD. Mediocre indoor photos. Slow boot and recycle times. Drains standard AA batteries very quickly.
Bottom line: Compact and reasonably priced for its feature set, the 4-megapixel Optio S40 suffers when it comes to image quality and above all, speed.
$299 list. Pentax U.S.A. Inc., www.pentaxusa.com. ●●◐○○

www.pcmag.com/cameras

Sony's Sleek PC/TV

BY JOEL SANTO DOMINGO

Convergence is one of those happy buzzwords in the technology industry these days, but which functions actually converge may vary. Not so with the **Sony VAIO PCV-V200G**. This all-in-one system looks like a sleek 15-inch LCD TV and works fine as one, too. But boot up and you'll be thrilled to see that it's a complete PC that also gives you DVR (digital video recorder) capability.

From the front, the PCV-V200G looks just like a Sony LCD TV, down to the clear, lit power/standby button. One nit: We feel the system needs channel and volume controls on the screen's bezel, not just on the remote. The set's TV output looks clear at normal viewing distances of 3 to 5 feet, though it can seem a little grainy closer up.

The PCV-V200G includes Sony's GigaPocket software, which lets you record TV programs. GigaPocket is a good DVR program; features like the "film strip" preview make it ideal for advanced users. And the built-in DVD burner means you can archive shows you've recorded. But for novice users, we recommend Microsoft Windows XP Media Center Edition or standalone products like SnapStream Media's Beyond TV, since their scheduled-recording features are easier to use.

Thanks to its 2.8-GHz Intel Pentium 4 processor and 512MB of memory, the PCV-V200G can handle Web surfing, e-mail, and basic computer functions adequately (it scored 17.3 on our Business Winstone benchmark test). The system returned decent multimedia performance numbers. But don't even think of playing advanced 3D games. The integrated SiS 651 graphics card is woefully underpowered for games that require DirectX 8 or later. While the PCV-V200G lacks PCI card slots, you can add on (say, a wireless adapter) via the single PC Card slot or USB 2.0.

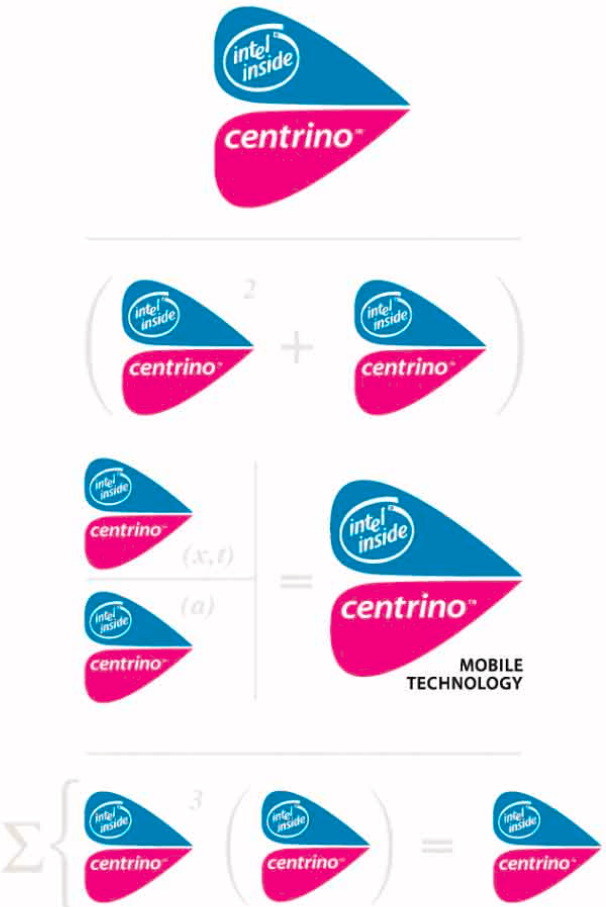
The PCV-V200G is best for viewing live TV, surfing the Web, and recording TV shows only occasionally. The relatively small 120GB hard drive means you need to erase your recorded programs sooner rather than later, since video recording can eat up around 2GB per hour of recorded TV.

Sony is the leader in capturing the look and feel of a consumer electronics product in a PC. The VAIO PCV-V200G is a good DVR PC and an even better TV/PC. It would fit perfectly in any tight space, like a kitchen or a dorm room, where you can use it to watch TV, surf the Net, and e-mail friends.

IT LOOKS LIKE AN LCD TV, but this Sony unit's wireless mouse and keyboard are the tip-off that it's also a full-function PC.

Sony VAIO PCV-V200G

With 2.8-GHz Intel P4, 512MB DDR-333 SDRAM, 120GB hard drive, integrated SiS 651 graphics, DVD-RW drive, 15-inch LCD monitor, Microsoft Windows XP Home Edition, $1,699 direct. Sony Electronics Inc., ww.vaio.net. OVERALL ●●●●○ Music: 75 (out of 100); Photo: 86; Video: 65; Gaming: 46.



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New Zires for Advanced and Entry-Level Needs

BY JONATHAN ROUBINI

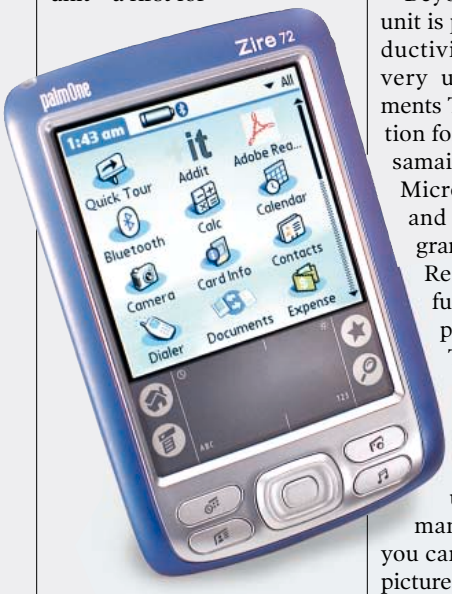
Two new PDAs from palmOne deliver a good set of basic features plus a few attractive extras. Whether you need a powerful PDA or a simpler device, one of these will fill the bill.

PALMONE ZIRE 72

PC MAGAZINE EDITORS' CHOICE

The new Zire 72 replaces the Zire 71 in the palmOne product lineup. It weighs just 4.8 ounces and offers several noticeable improvements over the outgoing model, such as use of the new Intel PXA27x processor, which provides better multimedia support. It comes with 32MB RAM and Bluetooth.

palmOne has also upgraded the camera component to a 1.2-megapixel (1,280-by-960) unit—a first for a PDA. Although it's no replacement for a dedicated digital camera, on evaluation the Zire 72 delivered acceptable images for e-mailing and even personal Web use. And the pictures are certainly a step up from those other handhelds produce. The lack of a flash is a drawback in dim surroundings, though the unit's handy low-light setting did brighten the pictures we took indoors.



A 1.2-MEGAPIXEL CAMERA and other standout features set the palmOne Zire 72 apart.

You can also record video at 320-by-240 at up to 15 frames per second. On our tests, the videos averaged 5 to 7 frames per second. That led to choppy video, and we noticed that the auto-focus and auto-exposure processes seemed slow to respond. Shooting can be continuous—the Zire 72 doesn't have the 15-second limit we see in most cell phones—but it does require the use of an SD card. The Zire 72 also lets you record voice memos with the simple click of a button located on the left side of the device. Recording quality was fairly clear on our tests.

Beyond the hardware, the unit is packed with office productivity tools. You get the very useful DataViz Documents To Go 6.0 Standard Edition for Word and Excel; Versamail for e-mail syncs with Microsoft Outlook, Eudora, and Lotus Notes mail programs; and Adobe Acrobat Reader for Palm OS. For fun, you have the RealOne player for MP3 playback. The user interface is easy to master, and it supports advanced music-player features such as playlists. The unit comes with photo-management software, so you can easily manage all the pictures you take.

The Sony Clié PEG-TJ37 ($300 street) is the Zire 72's main competitor. Both run Palm OS 5.2, offer a bundle of applications, and have the same screen resolution. The PEG-TJ37 does have 802.11b connectivity, but since it wasn't working well when we tested it, it's hardly a selling point. Also, the unit's camera is a mere 640-by-480 and doesn't allow video recording. Besides, the Zire 72 comes with the newest Intel processor. So in our book, the Zire 72 is a clear winner.

palmOne Zire 72

$300 street. OVERALL ●●●●○
Design ●●●●○ Usability ●●●●○
Wireless connectivity ●●◐○○
Entertainment ●●●●○
palmOne Inc., www.palmone.com.

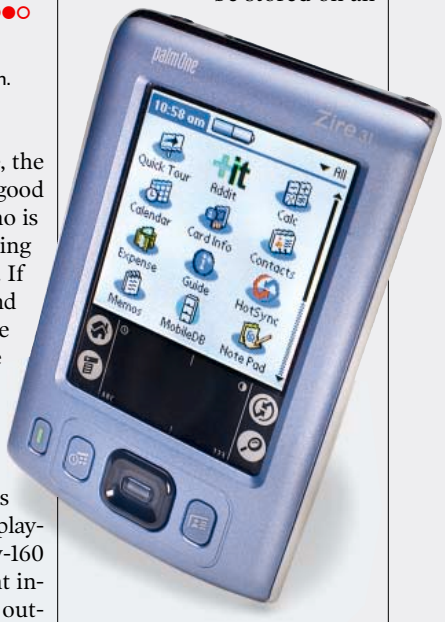
PALMONE ZIRE 31

At the low end of the line, the new palmOne Zire 31 is a good starter PDA for anyone who is on a budget and isn't looking for cutting-edge features. If the monochrome screen and lack of expandability of the Zire 21 ($100 street) leave you cold, the Zire 31 is a welcome step up.

In addition to the color screen and SD expansion slot, the Zire 31 delivers 16MB of memory and MP3 playback abilities. The 160-by-160 color STN display is bright indoors but difficult to use outdoors on a sunny day and does not deliver the higher resolution or color depth of the TFT units in more expensive PDAs. The Zire 31 also replaces the Zire 21's two-way navigation buttons with a much more useful five-direction pad. The stylus is light but comfortable to use.

Of course, the basic Palm OS applications, such as a calendar and to-do list, are all here, with a few minor updates. For example, in the calendar, entries can be color-coded to designate different categories. And a new quick look-up feature helps make searching in addresses easier. Other utilities include the photo-management applet that lets you sync pictures.

The RealOne Player is preinstalled on the Zire 31 to handle MP3 playback. You can play MP3s with the screen off (to save battery power) or in the background while using other apps. The built-in speaker works as well as can be expected, but you'll need to supply your own headphones to make this sound like a real music player. Also, the unit itself doesn't have enough memory to hold MP3s, so they must all be stored on an SD card (also not included).



THE ZIRE 31 is an affordable PDA that still delivers a color screen and SD expandability.

The Zire 31 compares favorably with other affordable PDAs. For example, while the Sony Clié PEG-TJ27 ($200 street) delivers a built-in camera, 32MB of memory, and a richer color screen, it doesn't support MP3 playback and relies on Memory Stick Pro (not the more universal SD format) for expansion.

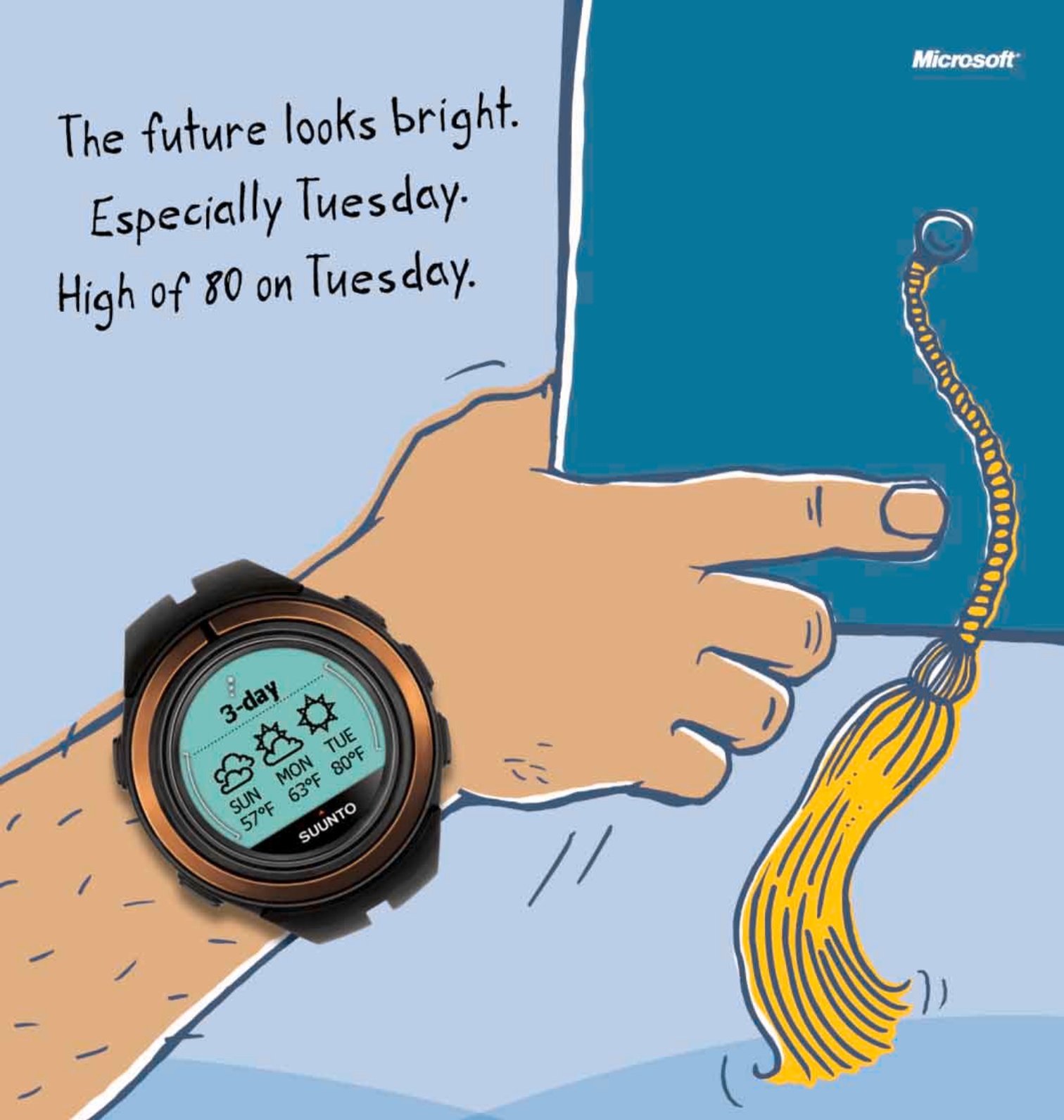
With its color screen, music-player features, and solid PIM apps, the Zire 31 is a good choice for anyone looking for an inexpensive PDA that goes beyond the basics.

palmOne Zire 31

$150 street. OVERALL ●●●○○
Design ●●●◐○ Usability ●●●○○
Wireless connectivity ●◐○○○
Entertainment ●●●○○
palmOne Inc., www.palmone.com.

Microsoft

The future looks bright. Especially Tuesday. High of 80 on Tuesday.



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A Better Way to Manage Web Research

BY ALFRED POOR

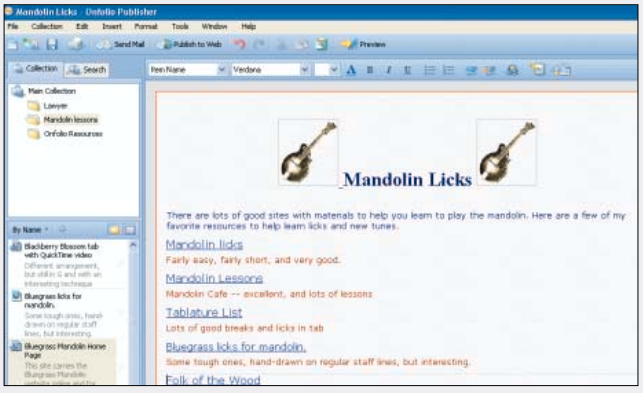
PC MAGAZINE EDITORS' CHOICE

If you do a lot of research online, keeping track of what you find can be challenging. Onfolio makes Web research more efficient, letting you easily gather and organize the data you find online. Two versions are available, each offering the same tools for collecting and organizing information. We tested **Onfolio Professional Edition** ($79.95 direct), which lets you create detailed reports that can be shared via e-mail, posted to a Web site, or even distributed as an RSS feed. The Standard Edition ($29.95) uses the same intelligent organizational approach but has only very basic sharing abilities.

The program works as an add-on to Microsoft Internet Explorer (5.5 or later required), adding a toolbar to IE's interface. When Onfolio is active, it displays an Explorer Bar to the left of the browser window, similar to IE's History and Favorites bars. Here you create collections, which are hierarchies of folders where you store data you gather from the Web.

To add items, you simply click the Capture button on the main Onfolio toolbar or—even better—use the F9 shortcut key. You can capture an entire page, or you can highlight and save only an important snippet of a page. The content (text and graphics) can be stored locally so you can access the data offline, or you can store just a link to the page. You can also annotate items and add priority flags. The end result is a very robust way to collect data.

These features alone make Onfolio a worthwhile application for individual research. However, if you want to share your data with others, the Professional Edition really shines. To create a report, just open the Publisher pane, drag in items from various folders, and arrange the content on a page. You can add your own text to the report and dress it up by formatting the text and inserting graphics. The only rough edge we encountered was that to alter the report style definitions, you have to edit a separate cascading style sheet file outside of the program. This, however, is a very small complaint for a product that can quickly become an indispensable tool.



ONFOLIO PROFESSIONAL'S REPORTING feature makes it easy to publish the results of your Web search.

Onfolio Professional Edition

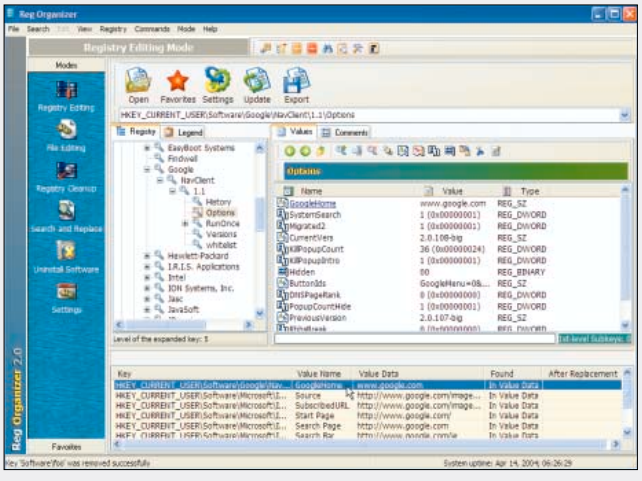
$79.95 direct. Onfolio Inc., www.onfolio.com. ●●●●○

An All-Purpose Registry Utility

BY NEIL J. RUBENKING

ChemTable Software's **Reg Organizer 2.0** handles virtually any Registry task. It has an editor that's more flexible and powerful than Regedit, allows fast search and replace, and contains an automatic Registry cleaner. Like *PC Magazine*'s InCtrl5 utility, Reg Organizer can take a snapshot of the system before and after program installation and report on exactly what has changed. It can edit INI files, apply specific Registry tweaks, and much more.

The utility's Registry Editing module displays Registry keys in familiar tree form, with the current key's values at right. You can add comments to keys; for example, to note when and why you changed a given value. Browser-style forward and back buttons aid navigation, as does the ability to add keys to a Favorites list for quick return. We did find that right-clicking a key doesn't select it, so the menu action affects the previously selected key.



REG ORGANIZER 2.0 gives you complete control over your OS Registry, including automatic cleanup and a roll-back feature.

Where Regedit's Find option tediously halts at every hit and can't perform an automatic replace, Reg Organizer can search all or part of the Registry and quickly list all matches, optionally replacing found data with a new value. The search results remain visible in Registry Editing mode. When Reg Organizer merges a REG file into the Registry, it can provide a preview of the file's effects. It can also unmerge a REG file, deleting all values added or changed by the file. But we don't recommend using this feature, since it cannot restore the previous data for changed values.

In addition to automatic cleanup of erroneous or useless Registry items, Reg Organizer offers detailed analysis and manipulation of nine specific Registry areas. For example, it lists all programs launched at startup and lets you enable or disable them, remove or launch them, or view their file properties. All in all, it's a fine Registry tool and the only one you're likely to need.

Reg Organizer 2.0

$29.95 direct. ChemTable Software, www.chemtable.com. ●●●●○

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Great Photos at Breakneck Speed

BY M. DAVID STONE

PC MAGAZINE EDITORS' CHOICE

For high-quality photos up to 13 by 19 inches without the wait, the **Canon i9900 Photo Printer** is our printer of choice. It can serve as an all-purpose printer, but that would be like using a Porsche 911T as your everyday car.

The i9900 uses eight ink colors, with a separate cartridge for each, adding red and green to the six colors photo printers typically have. As with the Epson R800, which leaves out light cyan and light magenta but adds red and blue, the additional colors yield a wider than usual color gamut.

These extra inks pay off in true photo quality. Text also rates as excellent; more than half of the fonts we tested were easily readable at 4 points with default settings. Graphics in default mode showed only minor flaws. Performance for photos was even more impressive, thanks to a printhead with 6,144 nozzles. The i9900, which we tested using QualityLogic's testing software and equipment (*www.qualitylogic.com*), was blazingly fast on our new photo suite, at 30 seconds for each 4-by-6 photo and 1 minute 5 seconds for each 8-by-10.

IF PHOTO OUTPUT MATTERS, then the Canon i9900 Photo Printer belongs on your short list.

We've learned to expect Canon printers with a high nozzle count to be far faster than all-purpose printers for photos but slower for other applications, and that's exactly what we saw. The $100 Lexmark Z816 (a standard ink jet), for example, took up to 4:24 for 4-by-6 photos, yet was faster than the i9900 on PowerPoint and three of the five Excel tests.

So you can get faster text and graphics for a lot less money, but if you need a printer that does it all and produces superb photos fast, the i9900's combination of speed and output quality is tough to beat at any price.

Canon i9900 Photo Printer

$499.99 direct. Canon U.S.A. Inc., www.usa.canon.com.
OVERALL ●●●●● Text ●●●●●
Graphics ●●●●○ Photo ●●●●●

A 2-Minute Photo Lab

BY M. DAVID STONE

If you're looking for a way to print digital photos that's as easy as dropping off film at a 1-hour photo lab, the **PictureMate by Epson** ($200 street) may have your name on it. The PictureMate is an ink jet–based dedicated photo printer that can compete head to head with thermal-dye photo printers like the Sony DPP-EX50 Picture Station (First Looks, June 8). The PictureMate is limited to a 4- by 6-inch maximum size, but prints true photo-quality output.

EFFICIENT AND PORTABLE, the PictureMate by Epson delivers 4-by-6 prints in about 2 minutes.

The PictureMate is designed for portability. At 5.8 by 10.1 by 5.8 inches (HWD) with the trays closed, the printer looks like a mini boom box, complete with a handle that folds down when you don't need it. Setup is easy: Just slide the single six-color ink cartridge (cyan, yellow, magenta, black, red, and blue) into a slot in the back, load the photo paper, and plug the unit in.

You can then slide a memory card into a slot or use the USB connector on the back to connect a PictBridge or USB-Direct Print camera, a CD or ZIP drive, or even a USB memory key. The built-in menus for direct printing guide you through each step. Unfortunately, there's no color LCD to preview the images; instead, you have to print an index sheet, with 20 images per sheet.

We timed the PictureMate at 2 minutes 15 seconds to 2:22 for each 4-by-6 photo, about 30 seconds slower than the Sony model. Image quality is a match for conventional film-based photos, and images are waterproof and smear-proof. Even better, each print costs only 29 cents. Cost per print for the Sony's output is 50 to 67 cents.

We'd like the PictureMate even better if it had a color LCD preview screen, but that's our only complaint.

PictureMate by Epson

$200 street. Epson America Inc., www.mypicturemate.com.
OVERALL ●●●●○ Text: N/A
Graphics: N/A Photo ●●●●●

IN SHORT

Lexmark Z816 Color Jetprinter

Pros: Optional six-color printing (with a photo cartridge) yields photo printer–like quality. Automatic paper sensing means one less setting to adjust.
Cons: Graphics in default mode show obvious banding. Some highly stylized fonts are hard to read in sizes smaller than 12 points.
Bottom line: The Lexmark Z816 Color Jetprinter is a worthy contender for the price, with quality ratings of good for text and graphics and very good for photos. Also welcome are features like automatic paper sensing, which helps make printing with expensive photo paper a little more foolproof.
$99.99 direct. Lexmark International Inc., www.lexmark.com
OVERALL ●●●○○ Text ●●●○○
Graphics ●●●○○ Photo ●●●◐○

Fujitsu ScanSnap fi-5110EOX

Pros: Document scanner images 15 sheets per minute—and both sides of the page at once. Automatically rotates page scans to correct orientation. Doubles as a business-card reader.
Cons: No Twain or WIA driver means you can't start a scan from most programs. Limited OCR. No scan-to-fax option.
$495 list. Fujitsu Computer Products of America, www.fcpa.com. ●●●●◐

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A Worthy Successor to Zip

BY BILL MACHRONE

PC MAGAZINE EDITORS' CHOICE

You could call the **Iomega Rev 35** a Zip Drive for the 21st century, but you'd be doing it an injustice. The Rev 35 holds 35GB of data on a removable 2.5-inch drive and is precisely the kind of backup medium you need for today's machines.

The Rev 35 employs removable hard drive technology, which confers the triple benefits of speed, random access, and off-site storage. It connects via USB 2.0, so it can be moved from machine to machine easily. (Iomega also makes a bay-mounted ATAPI-connected version, the same size as a standard floppy disk drive.)

WITH ITS HIGH-CAPACITY cartridges, the Rev 35 is the ideal companion for today's PCs.

Software and hardware installation were simple. In performance testing, we saw transfer rates of between 2.2 MBps (megabytes per second) and 12.2 MBps. That's right in line with the USB 2.0 Maxtor One Touch external hard drive we tested, which doesn't offer removable cartridges.

The Iomega Rev 35 ships with a version of Symantec Ghost in addition to Iomega Automatic Backup Pro, so you can easily create a Rev disk that will reboot your system and then perform a full restore from a Rev drive. The backup software also performs compression, which can boost capacity up to a data-dependent 90GB.

The Rev format is new and has some very interesting possibilities. Iomega predicts higher-density versions in the future, and the price of the cartridges (currently $59 each) will likely come down. The company also says that autoloader and multispindle drives are under development, which will be good news for servers with highly dynamic content. We foresee new applications like video production backup, in addition to faster, more flexible backup for small offices and ever-growing home machines. All in all, we think Iomega's got another winner on its hands.

Iomega Rev 35

$399 list (including one cartridge). Iomega Corp., www.iomega.com. ●●●●●

Multifunction Tool for Photographers

BY BILL MACHRONE

PC MAGAZINE EDITORS' CHOICE

For a serious digital photographer, the **Micro Solutions RoadStor** is about as close as you can get to an electronic Swiss Army knife. This slim device solves one big problem of traveling with a digital camera: downloading images without dragging a laptop along. The RoadStor accepts all popular memory card formats and burns their contents directly to CD-R or CD-RW discs—no need for a PC. Even better, the 1.6-pound RoadStor can run on battery power, so you can take it on a day's outing. And the padded carrying case even has room for your camera.

The RoadStor is also a CD and DVD player. You can use it to view photos or commercial DVDs on any TV set with video and audio input jacks. Its remote control includes DVD transport and navigation functions, plus zoom; a single button starts the backup process. And the RoadStor's USB 2.0 connection makes it a full-function external CD-RW drive and media reader for your laptop or desktop machine.

We tested the RoadStor by filling up some memory cards with images and repeatedly transferring the contents to disc. When a CD is full and you try to transfer additional images to it, the RoadStor displays NeedNewDisc in its LCD status window and continues the transfer when you load a fresh CD.

THE ROADSTOR is a CD burner, DVD player, card reader, and storage station.

The RoadStor's firmware is smart enough to know when you connect to a TV, and it will display the contents of a disc or memory card three ways: as an automatic slide show, a nine-pane preview window, or a folder-and-file display, also with preview. You can rotate images from the remote. In DVD playback mode, the battery lasted 2 hours 40 minutes—enough to make it through most movies or utterly anesthetize your audience with slides.

Micro Solutions RoadStor

$230 street. Micro Solutions Inc., www.micro-solutions.com. ●●●●◐

IN SHORT

Memorex True 8X External Dual Format DVD Recorder

PC MAGAZINE EDITORS' CHOICE

Pros: Comprehensive software bundle. Both USB and FireWire interfaces. Supports DivX and limited MP3 encoding.
Cons: Slow DVD ripping.
Bottom line: A great software bundle, dual interfaces, and a reasonable price combine to make this relatively bulky external drive a terrific choice for anyone who needs a transportable DVD rewriter that supports all the latest high-speed formats.

$230 street. Memorex Products Inc., www.memorex.com. ●●●●◐

Pioneer DVR-A07XLB

PC MAGAZINE EDITORS' CHOICE

Pros: Fast DVD±R recording. Superior software bundle, sophisticated hardware.
Cons: No DivX or MP3 support.
Bottom line: The DVR-A07XLB is a solid performer across the board. It combines superior application software with a raft of unique hardware features that help ensure high-quality output.

$190 street. Pioneer North America Inc., www.pioneerelectronics.com. ●●●●○

Toshiba SD-R5272

Pros: Low price. DivX and MP3 support. Nero software bundle.
Cons: Just 10X CD-RW speed. Slow MP3 encoding.
Bottom line: The SD-R5272 isn't the fastest or most flexible of the new DVD burners, but it holds its own against the competition, and does so at a bargain price.

$149 direct. Toshiba Storage Device Division, www.sdd.toshiba.com. ●●●●○

www.pcmag.com/guides

Slow PC?

New Version Release!

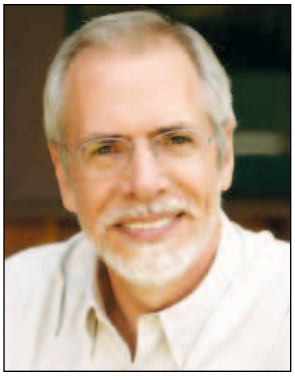
Try this easy and proven technique for making your computer fast again

By Craig Jensen, Chairman and CEO, Executive Software International

Why Computers Slow Down

Do you remember what it was like when your PC was brand new? Do you remember the feeling of exhilaration at its speed and responsiveness compared to your old PC? Chances are, your PC is much slower today than when it was brand new. Why?

The answer is simple: *fragmentation*. The solution is even simpler: Buy *Diskeeper*® and automatically eliminate it. But more on *Diskeeper* in a minute. Here's what I mean by "fragmentation": Imagine storing information in a paper file. You take a piece of paper, put in a file folder and put the folder in a file drawer in a file cabinet. Now, when you want to get that piece of paper back, you just go directly to the file cabinet, open the drawer, pull out the folder and there's your piece of paper. So far so good.



"One person told me her computer takes so long to start up she turns it on before her shower so it's ready by the time she's dressed."

Now add another piece of paper to the same folder, and then another and another. Eventually, the folder fills up and you need to make another folder to hold the overflow. That's fragmentation. Your one file of data is split into two fragments—the two folders. Now say you add another folder and another and eventually find that there is no more room in the drawer, so you move some of the folders to another drawer, possibly even to a different file cabinet. Now when you need to get a piece of paper out of that file, you have to rummage around in different folders, different drawers, even different file cabinets to find the exact piece of paper you need. It slows things down. *A lot.*

In true computer style, your disk can be fragmented rather quickly into hundreds of thousands, even *millions* of pieces. To retrieve information, your computer has to take the time to look in all those places. No wonder it slows down! And it continues to get worse at a rapid rate. But how can this make such a tremendous difference in the speed of your computer?

The Hidden, Built-In Bottleneck

In broad terms, the speed of your computer is determined by the speed of three components: CPU speed—a fraction of a billionth of a second (very fast), memory (or RAM) speed—one hundred-millionth of a second (also very fast) and Hard Disk speed—hundredths of a second (slooow). The hard disk is factually a *million times slower* than the next fastest component. If your CPU and memory speed were cut in half, your computer would still seem downright peppy so long as the hard disk is running at full speed. The disk is *the major bottleneck!* You can't afford to let fragmentation slow your hard disk down further. If the hard disk slows down, even a little, you notice it. If it slows down a lot, you really notice it. And when it continues to worsen, you start looking for a new PC. One person told me her computer takes so long to start up she turns it on before her shower so it's ready by the time she's dressed. She was amazed to see her computer boot-up in seconds after running *Diskeeper*.

The simplicity and wonder of *Diskeeper* is it finds all the pieces of *every* file and puts them back together neatly. Your PC is going to be fast once again, just like when it was brand new. What's it worth to have your PC like new again?

What's more, *Diskeeper* is designed to run automatically in the background. You don't even have to start it up each time, it is truly "Set It and Forget It"®.

BUY NOW

Get *Diskeeper*. Install it on your PC and within minutes your PC will be restored to full performance and it will stay that way indefinitely. *Diskeeper* is extremely affordable and unconditionally guaranteed or your money back. Buy *Diskeeper* from your favorite software retailer or go here:

www.Diskeeper.com/slowpc/pm3

Here's what our customers say:

"Diskeeper really works as advertised, and without any catch-22s, like hangs and blue screens."
—William Schenker

◆◆◆

"Diskeeper has more than lived up to my expectations. My computer is now ultra fast…"
— Randy Derwenko

◆◆◆

"As for the faster start time, it's the difference between having a chance to run down the stairs for a drink while the machine starts up, and now having to prepare the drink before switching on!"
—Matt Harris

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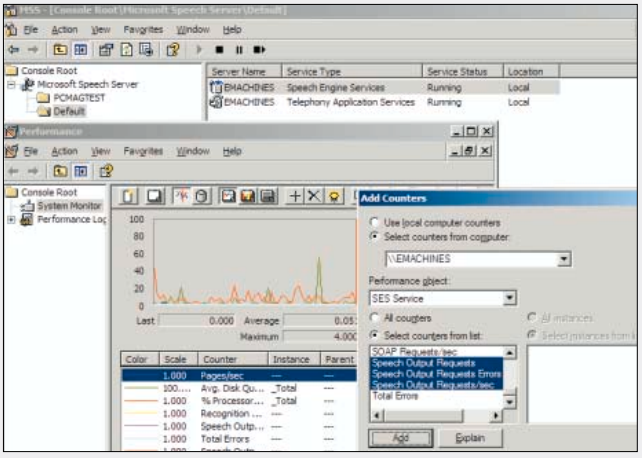
Speak to Your Server

BY RICHARD V. DRAGAN

Setting up interactive voice-response systems (like those used by large financial companies and movie directory hotlines) used to require a significant investment in proprietary software. But with the debut of **Microsoft Speech Server 2004 Standard Edition**, speech-based computing is now within reach of a much wider range of businesses.

With Speech Server, you can develop several kinds of speech applications: touch tone interfaces, voice-driven menus, and multimodal interfaces (where voice supplements a standard visual Web interface). Microsoft's multimodal application style is new and lets callers interact with Web pages via voice as never before. Speech Server piggybacks on ASP.NET, adding speech to standard Web applications via its Speech Application Language Tags (SALT). It offers voice input recognition as well as text-to-speech conversion, with technology licensed from ScanSoft. But it does not currently support VoiceXML.

We installed Speech Server under Windows Server 2003 Enterprise along with an Intel Dialogic D/4IJCT-LS telephony card with four phone ports. (Your hardware choices for telephony include Intel cards with up to 96 ports.) We used the third-party software from Intel to configure the telephony card and with the default options we were up-and-running in under an hour. If you want more than the default options, you'll likely need to dig in here. Configuration can involve setting jumpers on multiple boards. Any admin who faces this chore will probably wish for more integration with Speech Server itself.



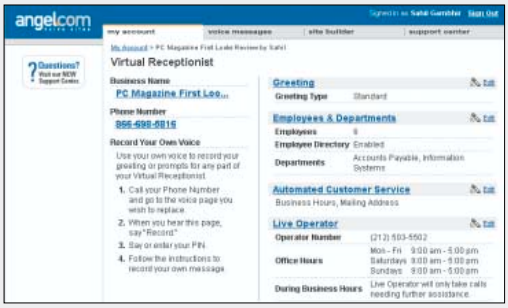
MICROSOFT SPEECH SERVER lets you track the performance of voice and telephony for your speech applications.

On the other hand, administration of Speech Server is simple. If you can handle standard ASP.NET Web applications, you'll be able to administer speech-enabled ones, too. Basic admin is handled with a bare-bones MMC snap-in.

Angel's Just a Phone Call Away

BY SAHIL GAMBHIR

Until now, interactive voice response systems (IVRs) have been viable only for large operations, but **Angel.com** enables smaller businesses to create, structure, and manage an IVR with ease. Even a one- or two-person operation can have a call center that sounds and acts just like that of a big company.



ANGEL LET US easily build and deploy a virtual receptionist to guide callers to the right department.

After you sign up for the hosted service, you get access to a Web-based SiteBuilder application, site management tools, and a toll-free ten-digit phone number that serves as the gateway for your IVR application. Because IVR design involves subtle complexities of context and meaning, Angel provides lucid documentation that overlays IVR concepts onto traditional Web development practices. The result is a WYSIWYG design environment familiar to anyone who's ever built a Web page.

The help system suggests using one of over a dozen included IVR templates. That's definitely the way to go. We used the Virtual Call Receptionist template. Within half an hour, we set up departments and added users to a company directory. Angel generated individual voice mailboxes automatically. The service also auto-generates voice keywords that help callers navigate the site. One nice touch is a privacy option that limits callers to certain sections of the system and password-protects others.

We found that phonetically challenging names do not translate well using the built-in text-to-speech engine, but Angel does provide professional voice services for a nominal fee. Dialing into the IVR system as an administrator and recording phrases is a snap. You can also use the template wizard to upload recordings in WAV format. But uploaded voice files sound a bit incongruous when played with Angel's digitized recordings, so you should choose one audio style for the entire voice site to present a consistent caller interface. In testing, we found the speech-recognition engine competent, although we did have to repeat commands when speaking in non-American accents.

Angel manages voice messages smoothly; workers get notifications with links to the message embedded in e-mail. Users scroll through their messages and save or delete them. We commend Angel for doing simple things right, like giving you the option to add hold music during wait periods. It does lack some of the power voice-mail features, like reply and forward, however.

Angel.com performed remarkably well and provides a very comprehensive solution at a very attractive price. Any operation that can benefit from the business and image boost provided by an IVR should consider it seriously.

Angel.com Voice Sites

$39.95 per month and up. Angel.com, www.angel.com. ●●●●◐

bones MMC snap-in for configuring speech-enabled applications. Additional counters are available in Performance Monitor for pinpointing processing bottlenecks. For debugging on the server, Speech Server offers a trace utility and the ability to view server events within Windows Event Viewer.

The real power behind speech processing is the freely downloadable Microsoft Speech Server SDK 1.0. We installed this add-on to Visual Studio .NET and were pleasantly surprised by its powerful suite of speech tools. By contrast, in the VoiceXML space, development often means using a text editor to write and tweak XML. Microsoft offers a component-based model for building speech apps, with some two dozen Visual Basic-style components for handling speech dialogs and managing phone calls—all without delving into the details of XML. In testing, we used these components to model several voice dialogs in C# and SALT from a legacy travel alert application built in VoiceXML.

Other standout tools make creating your first speech application relatively painless. A visual editor let us define and tweak speech recognition *grammars* (sets of phrases that are valid at particular points within a speech-enabled application). A handy prompt editor in the SDK let us manage a list of text prompts along with recorded WAV files. Speech Server SDK includes support for recording, playing back, and editing sampled speech.

A final noteworthy feature is a simulator for running speech applications on a desktop PC. After typing a starting URL, we were able to simulate a complete telephone session using a standard PC microphone, while viewing a detailed trace log of events. In testing, this feature proved effective, though we missed the color-coding available in VoiceXML solutions like Voxeo, which can make slogging through a trace of phone and speech activity a little easier.

Microsoft's opening gambit in IVR systems is promising, though it's not likely that businesses that have already invested in voice software will jump onboard with this first release. If you are new to voice development, however, and haven't already invested in VoiceXML, the component-based style of programming in Speech Server lets you tackle speech applications with ease.

Microsoft Speech Server 2004 Standard Edition

$7,999 (direct) per CPU. Microsoft Corp., www.microsoft.com. ●●●●○

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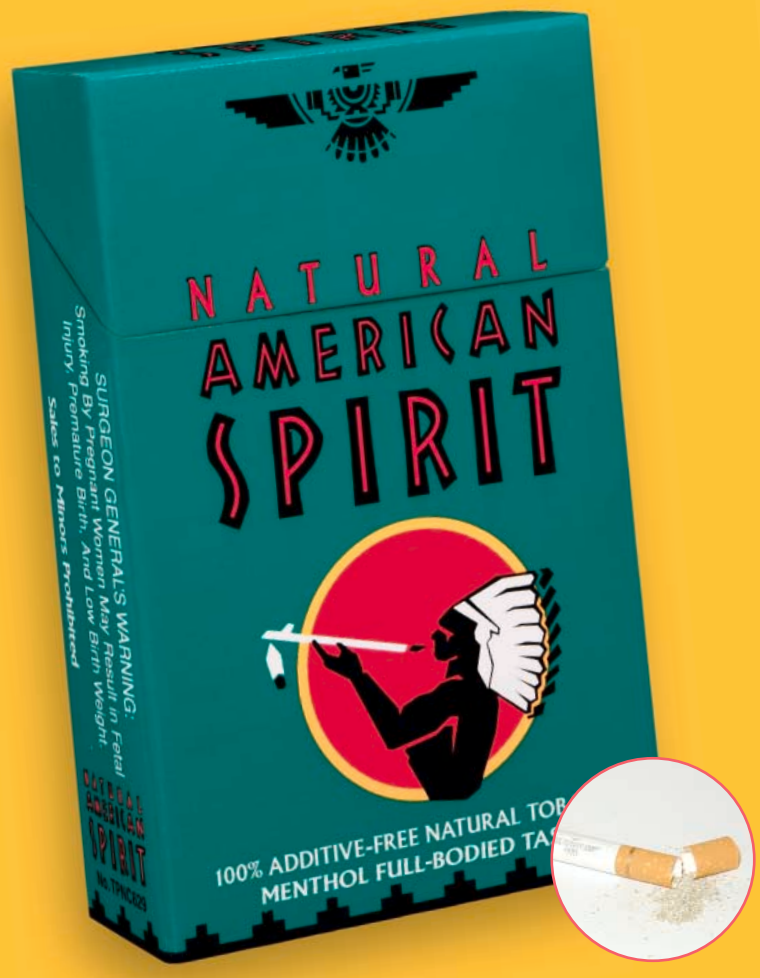

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FEEDBACK

"I defy Miller to prove that outsourcing is beneficial to anyone except the Bill Gateses of the world."

OFFSHORING: THE GOOD, THE BAD, AND THE UGLY

I HAVE ALWAYS THOUGHT JOHN DVORAK had brilliant insight when it comes to technology. However, he should stick to his core competence, rather than use his columns for political rants, as "the sinister nature of offshoring jobs has corrupted the highest levels of our nation" (May 18, page 61) and "the only good thing about the EU is the invention of the nifty Euro currency" (Inside Track, May 18, page 63) hardly qualify as technology commentary. While I believe in freedom of the press and Dvorak's right to rant (he's great when he does it about technology), *PC Magazine* is not named *Business Week* or *Foreign Policy*.

DARIO TABAKOVIC

JOHN C. DVORAK'S COLUMN is the best I've read on the dangers of offshoring. His column is a key reason I subscribe to *PC Magazine*. Please give him more money when his contract is renewed.

STEPHEN HEMMERICK

MR. DVORAK'S COLUMN bashes engineers and coders of Indian origin as not being creative and claims that they are good only for patching spaghetti code. He fails to see the hard work done by engineers of Indian origin in Microsoft, IBM, Oracle, and other companies throughout the world. They work long hours to produce awesome applications. Indian scientists contribute immensely to agencies like NASA with their analytical skills. Mr. Dvorak should think twice before blaming Indian engineers.

AVI VERMA

THE TITLE ALONE OF Michael J. Miller's tawdry little globalist screed, "The Benefits of Offshore Outsourcing" (Forward Thinking, May 18) induced an involuntary vomit reflex. He is ignorant of what he speaks, which is not surprising as he no doubt lives well on his salary. And he still has his job, which can't be said for some of us. I am a an IT professional who has slowly watched his career being destroyed by outsourcing and HI-B visa scams, and I am not the only person I know who has suffered in this way.

The only reason for outsourcing is to reduce labor costs, and the cash saved is pocketed by bloated plutocrats. I'll never accept the myth that foreign workers are as educated and capable as domestic workers. People who stand to gain make ridiculous claims in order to continue this harmful trend. I defy Miller or anyone else to prove that outsourcing benefits anyone except the Bill Gateses of the world, or that high-level, "professional" jobs that are outsourced return to the United States in multiples of the numbers that were lost.

I'd love to see Miller's job taken away through outsourcing. Perhaps *PC Magazine* will find foreign workers to write stupid, globalist, brainwashing articles such as this. They probably wouldn't write nearly as well as Miller, but they'd do it for a lot less. In the end, though, Miller would benefit and prosper in his happy and unemployed globalist world. Maybe he could work in Starbucks.

ANTHONY CHAPMAN

IT'S DISAPPOINTING THAT Michael J. Miller has taken the ITAA's propaganda at face value. The Global Insight study he refers to, paid for by the ITAA, claims that total U.S. employment will rise because of lowered IT costs, as the U.S. becomes more productive by dumping its high-tech expertise. Their rosy projections seem to assume that lowered costs always result in a growing economy, and they treat all jobs as equal, whether highly skilled and well-paying or mopping floors at a "big box" store.

The corporations that fund the ITAA can't see beyond the immediate savings of dumping their homegrown expertise. They don't care about the future of this country, or whether the U.S. retains the high-tech expertise that it needs to remain competitive.

KURT STRAHM

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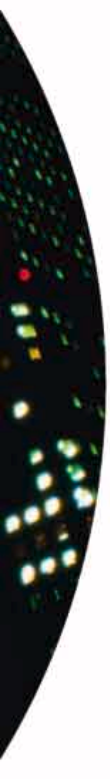
Corrections and Amplifications

- In our May 4 MP3 player roundup, we noted that iTunes is incapable of displaying file types. Actually, iTunes has this capability, via a check box in the *View options* dialog under the *Edit* menu.
- In "Wellness on the Web" (After Hours, May 4), we incorrectly stated that Weight Watchers Online does not have an option for generating a weekly shopping list. The shopping list can be found in the Points Tracker section of the site.
- In a May 4 After Hours review of Quicken WillMaker Plus 2004, we incorrectly stated that the program offers no password protection; it does, as a feature called Lock Documents. We also printed an incorrect name for the company that makes this product: It is Nolo, not H&R Block eSolutions.
- In our review of the Apple AirPort Extreme in our May 18 cover story, "Wi-Fi Networking: Rated 'G' for Everyone," we incorrectly stated that the AirPort lacks DHCP server and configurable NAT capability. In fact, the AirPort does have both features.
- Our May 18 First Looks review of the Lexmark C510n should have been marked with an Editors' Choice logo, as the C510n is now our favorite entry-level color laser printer.
- In "Playing in the Past" (After Hours, May 18), the screen shots were mislabeled. The shot labeled "Atari: The 80 Classic Games" is actually for MAME32plus, and the shot labeled "MAME32Plus" is for Jakks.

*Wireless connectivity and some features may require you to purchase additional software, services or external hardware. System performance, will vary depending on your specific hardware and software configurations. See http://www.intel.com/products/centrino/more_info for more Processor with HT Technology logo which your system vendor has verified utilize Hyper-Threading Technology. Performance will vary depending http://www.intel.com/info/hyperthreading for information. ©2004 Intel Corporation. Intel, Intel Inside, Centrino, Pentium, Xeon and Itanium are or its subsidiaries in the United States and other countries. All rights reserved.



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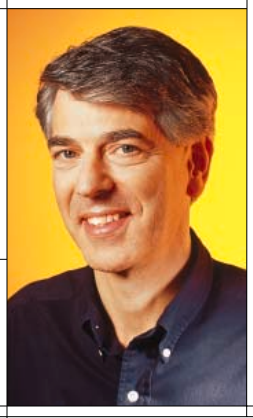
Bill Machrone



Your Next PC Survey: Early Results

Responses to my survey are rolling in, with nearly 2,000 recorded as I write this. The early results are dichotomous: fascinating surprises on the one hand and exactly what I'd expect from *PC Magazine* readers on the other. It's too early to analyze the results, but I'm really enjoying the reader responses in the Additional Comments area.

I get a kick out of the diametrically opposed ones. "I have no desire to have a media center," said one reader. "Multiple devices controlled by one device result in high system-failure rates." Another wrote, "I would like a seamless interface into my entertainment system to stream audio, video, or even pictures." That sounds much like a Windows Media Center PC (or a Mac, as that faction tirelessly reminds us). But then I read, "I still haven't seen anything interesting in terms of a media center. An article on what media centers can and cannot do would be great."

That, of course, raises the issue of Media Center PCs versus lowercase media centers—those confusing, no-two-alike add-on devices that can be anything from radio receivers to attached storage to network hubs with TV tuners. If anyone figures out how to make sense of this market, I'd like to hear about it. Perhaps we need to institute a scheme whereby a manufacturer can't call a product a media center unless it meets certain criteria. We'll have this overseen by the Product Names and Claims Administration, kind of like the Food and Drug Administration. Kidding, of course, but wouldn't you love to veto some product's dumb name or overblown features?

I gave respondents ample opportunity to fess up to a desire for a Media Center PC, but relatively few of you did (less than 10 percent so far). Roughly four times as many of you said you'll have a TV tuner or an HDTV tuner in your next PC; wouldn't you like some OS-level support for it? Or maybe Windows XP Media Center Edition doesn't confer enough benefits to be worth a journey into the unknown.

SURPRISING STATISTIC

With close to 2,000 responses so far, the most amazing result (to me) is the huge number of you who intend to build your next PC. You represent the single largest category of responses, currently 35 percent, 1 percentage point higher than those who said they would buy from "a large online reseller." I've been watching this first number since the responses started coming in, and it's declined steadily, having started at 40 percent.

That makes sense when you think about it: The most active, involved, and opinionated readers were most strongly impelled to answer the survey, and what's more conducive to building your own PC than being active, involved, and opinionated? As of this writing, my column had not yet been picked up by ExtremeTech, but its readers will likely push the number up again.

In the same vein, I'm somewhat but pleasantly surprised to see the number of respondents who care about such details as power supply wattage, front-side bus speed, and even the motherboard chipset manufacturer and model, whether they're buying or building. Among this group, at least, it takes more than a brand name and a high clock speed to sell a system. I like that.

HELPFUL SUGGESTIONS

I also got plenty of feedback on the structure and implementation of the survey. This is my first venture into such waters, so I appreciate your suggestions—and your forbearance. I briefly toyed with creating the HTML and hosting it myself, but why reinvent the wheel? I'd had experience with Zoomerang as a survey vendor before, for smaller surveys in a rather homogeneous group: *PC Magazine* editors. We tend to be a trusting lot, and some of you evidently are not. I quickly discovered that you can't take the survey if you have cookies disabled—unless you like answering the same question over and over. Some of you had trouble using the Opera browser. I didn't, but perhaps you had cookies disabled there too.

From your suggestions, it's clear that there's no way to structure a survey to please everyone. Some of you were highly complimentary, some highly critical. But I also got many useful suggestions for future surveys.

One clever reader suggested that I just set up a site that emulates a PC manufacturer's configuration page and let you "build" the machine of your dreams from a long list of options. Hey—then all I'd have to do is build the machines and take your credit card numbers, and everybody would be happy!

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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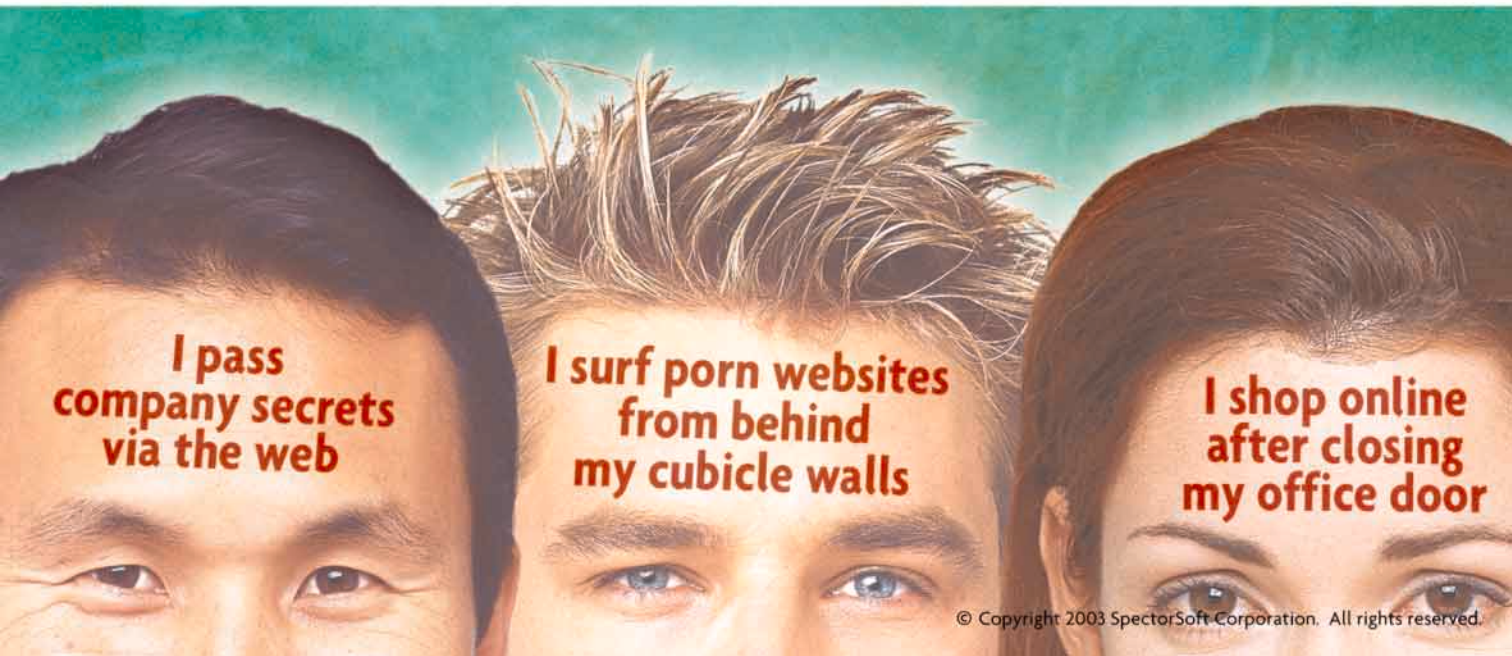

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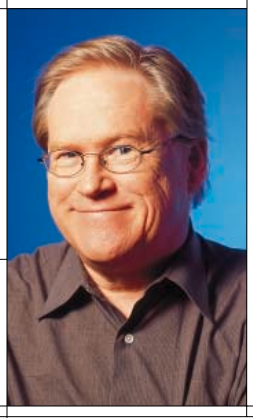
John C. Dvorak



Microsoft, Spend Your Money!

With billions and billions of dollars, why can't Microsoft fix its software?

Since the release of Windows 2000 and XP, Microsoft is no longer the frequent butt of jokes about system crashes, but its software's security vulnerabilities have only gotten worse over the years. This is despite Bill Gates's emphasis on fixing these problems.

I've been thinking about the Sasser worm, which sneaks into your system and at a minimum ruins the machine's performance—if you have any left by now, since the patch to stop the worm also ruins the performance. Such worms are the worst, since they literally "worm" around the Internet looking for open ports on any machine connected to the Net. Certain ports have weird vulnerabilities, for reasons only Microsoft can understand. A worm jumps into the port, then executes itself inside the OS, which seems eager to oblige. Next thing you know, your machine is screwed up.

This especially galls me since Microsoft and Bill Gates in particular promoted the idea of high-speed 24/7 connectivity. Once the company got a clue about the Internet and figured out how to make TCP/IP work, they were gung-ho about 24/7 broadband connectivity. What were they thinking? If they'd had a clue, they should have advocated a big red switch with a huge warning light that you turned on just before you went online. You'd get your mail, then slam the switch off, hoping nothing bad happened to your machine in those few moments that you were online. A company that develops an e-mail client that lets you casually pass around active executable code as attachments has no clue about security and never will.

As far as I'm concerned, the company has just one real job: to provide an operating system that works well for users. Nothing else counts. Microsoft has over $30 billion in the bank, and that figure is growing. The world's richest man, worth perhaps $50 billion, who calls himself Chief Software Architect, is in charge of the software. Gates has a private jet, a slew of cars, and a $100 million home. The company can afford to pay more than half a billion dollars in fines to the EU. It can pay settlements totaling hundreds of millions to companies it has wronged in some way or other.

With billions and billions of dollars, why can't Microsoft fix its software? This is not some suffering little Podunk company about to go broke selling faulty software. Microsoft has all the monetary resources in the world and over 20,000 programmers. And it's not as if the company is giving the software away. Windows XP, which Microsoft sells for $180, probably costs $5 or less per unit to manufacture. Even with all the overhead included, Microsoft has one of the highest profit margins in the world, yet with all these profits it chooses to add features to its software in an effort to sell more, rather than fixing the problems that already exist in each and every package it sells.

Microsoft began in the 1970s as a company making a BASIC compiler, modeled after a DEC BASIC. Designed to run on CP/M machines, it became very popular despite what many people viewed as flawed math. The company then made a good amount of money actually selling CP/M on a hardware card that you could plug into an Apple.

Unfortunately, two bad things happened then. Microsoft bought some code to sell to IBM as the first MS-DOS, but never developed that code, so it slowly became a patchwork. The company then decided to build an operating system from scratch, so it hired the famous David Cutler away from DEC (amazing how DEC is woven throughout Microsoft history) to develop the new OS (Windows NT) from scratch.

By all accounts, the job was rushed. It appears that compromises were made. And there was meddling. IBM was in on the act. The jealous coders from other projects would snipe. Bill Gates added his two cents to everything. Windows NT hit the market with a thud after years of hoopla. The old MS-DOS–centric Windows remained popular. Eventually the idea was to merge the code base to make Windows XP.

There are now so many millions of lines of code that I'm told nobody at Microsoft has a handle on it. It's what is called spaghetti code. It can't be fixed. But with $30 billion, couldn't a new architecture be designed that would break the OS into 10,000 parts, each of which could be coded in a few months, then put back together?

In fact, I expect more of the same: broken spaghetti code, never-ending bugs and patches. Soon Microsoft will have $60 billion in the bank, maybe $100 billion. And we'll have bupkes.

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.

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Inside Track

The Good News and the Bad News Dept.: The good news is that the semiconductor business has suddenly **picked up steam.** A huge flood of orders is resulting in many of the silicon foundries hitting **100 percent capacity** almost overnight. The bad news is that the so-called "fabless" semiconductor companies may have to wait as long as six months to get their products delivered from the foundries.

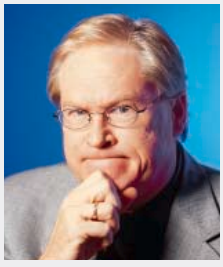
I've never been a big fan of the idea that you can be a semiconductor company without having a fabrication facility of your own. That's a good idea until things get tight and nobody can make your chips. The problem with an **extended slowdown** in the semiconductor business is that instead of building for their future needs, most companies ratchet back and fret.

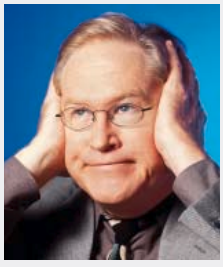
The longer a downturn goes on, the harder it is to pull out, because when things crank up again—as they appear to be doing—we end up with a lot of **shortages** and price hikes, which **stall recovery.** When higher demand and shortages cause a slower recovery, it makes these companies think there is a huge bonanza awaiting them if they can only ramp capacity as never before. Thus, during the next phase they all overbuild and create enormous capacity, resulting in a flood of product that has to be sold cheap, resulting in a huge buyers' market. Ah, it never ends.

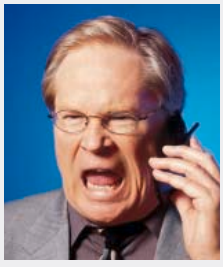
Smart Radio Coming to Your Home Soon Dept.: One of the new technologies to watch is something that is called cognitive radio. The **DARPA** folks are quite interested in this. It's essentially a smart radio beyond the scope of the seemingly moribund **software-defined radio** that was supposed to take the world by storm. To understand how cognitive radio works, imagine a **heroin junkie** who is out of drugs but knows he has stashed some in his house. He needs them badly and starts to **tear up the place** looking for them.

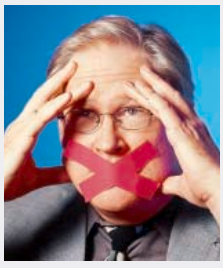
This is how cognitive radio works. Its heroin is bandwidth, and it scrambles all over the spectrum trying to find the most that it can for its immediate needs. If designed right, it can **poach legally** on licensed parts of the spectrum too. Two-way cognitive radio would mean two devices that shake hands, then agree on a mutually beneficial spectrum on which to communicate.

When all is said and done, though, I suspect that this technology, like ultrawideband (UWB), will end up as a **military-only technology.** Civilian UWB was given the green light only for **ludicrously low** power limits. This is the old pulse radio I've written about in the past. It's also used for ground-penetrating radar. Useless now.









I don't see the point of MP3 with Dolby Digital 5.1 surround sound. It's like HDTV on a cell phone—kind of pointless.

Cognitive radio is part of **another initiative** led both by Internet mavens who want to change everything and by the government. This initiative entails a basic change of the network topologies from "spoke and hub" to an **infinite peer-to-peer "connectionless" mesh** free of Ethernet and TCP/IP.

Cognitive networks? The best way to envision this is to imagine the national air transport system changing from a spoke-and-hub arrangement with air traffic controllers to a **wide-open free-for-all** where you go where you want, when you want. Equip the planes so that they avoid crashing into each other, and get rid of the infrastructure, except for the runways. Today, if I wanted to go from New York to Sacramento, I'd perhaps fly from NYC to Denver (hub) to San Francisco (hub) to Sacramento (destination), with long delays at each stop. Or maybe I'd go from NYC to SF to Sacramento, using one hub. It's a topology similar to what we have in the office with routers and hubs.

With a free-for-all mesh, I would jump onto any old plane that I could find, then fly from NYC to Cincinnati to Colorado to Salt Lake City, perhaps landing on the lake bed, then to Reno to Oakland to Sacramento. Assuming there is no propagation delay of consequence, the advantage to the mesh is that there is **no single point of failure.** Maybe comparing train transport to trucking is a better example; it's just not as funny.

Whither MP3? Hello, Ogg Vorbis Dept.: It will be interesting to see exactly how versatile the music swappers can be. According to John Quain, writing for PCMag.com, the owner of the major MP3 patents—the Fraunhofer Institute—intends to add a **backward-compatible 5.1 surround-sound** capacity to the MP3 file structure, as well as **digital rights management.** This should, of course, kill MP3 as a swapping medium and finally lead to the free Ogg Vorbis format at last!

Well, maybe not. While the new MP3 might have restrictions, the world is already populated by a few million ripping programs that work as usual. Any new devices that won't play the old stuff simply won't sell. Let's face it: Nobody who has accumulated a large MP3 inventory is about to start over. And personally, I don't see the point of MP3 with Dolby Digital 5.1 surround sound. It's like HDTV on a cell phone—kind of pointless. This should turn out to be **a fiasco.**

The copyright protection scheme is **a bit weird,** too. It's called Light Weight Digital Rights Management (LWDRM), and it allows people to copy MP3s only if they put their own digital signatures on each copy and register with some **central office.** Oh, brother.

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Bill Howard

LAN in a Can

With multiple PCs in a home setting, you may want a central repository for music, photos, and even videos.

Once you have two or more PCs in your small business or home office—and who doesn't? —odds are you need a third PC. A file server. It's always been possible to take any old PC, slap in a network card, and call the machine a server. But now we're seeing a rebirth of tiny servers that don't take up much more space than Dan Brown novels.

I've used personal servers for several years, always aware that the cost per gigabyte was high relative to the cost of a cheap PC with a big hard drive. But the reasons for having a server are changing. You always need backup; writing files out to another hard drive is a lot simpler than hunting up a writable CD or DVD, feeding discs, and so on. With multiple PCs in a home setting, you may want a central repository for music, photos, and even videos. (You can compress 50 1-hour digital videos onto 25GB with darn good quality.) And once you install a digital media hub next to your PC and stereo system, you'll need a back-end server for the media you're sharing among your PCs.

Such devices are commonly called *network-attached storage,* although *network hard drive* is sometimes used for smaller and simpler (sub-$500) units. *Server appliance* is an old term. Informally, these devices could be called "shoebox servers" or even "LAN in a can."

I recently searched for upgrades to my two existing servers, an ancient but still serviceable Snap Server and a Linksys EFG80. I found over half a dozen reasonable choices, but among them, more are suited to small business than to small-office or home users.

Three that fare better when price is not your sole concern are from LaCie, Linksys, and Snap Appliance. They run $600 to $900 street for 120GB or 160GB models. The LaCie Ethernet Disk is a low-rise rack-mountable device with USB and FireWire connectors for adding even more storage. The Linksys model has a bay for a second drive and a printer port. Snap's looks like a sculpted brick.

The Mirra Personal Server ($499 direct for 120GB) shines for people paranoid about data loss. It automatically makes eight sets of backups and lets you access them from anywhere on the Web.

For those who want a really low price, the Ximeta NetDisk checks in at $240 street for 120GB. Iomega sells the similar Network Hard Drive. Each has a USB jack, in this case for direct connection to your PC as an external hard drive. When Ethernet-connected, they require a small applet running on your PC, which Ximeta says is an advantage, because your PC more easily treats the device as a local drive (even if it's parked down the hall in a closet). But that means one more piece of software your PC has to juggle. As USB-connected hard drives, these compete somewhat with the Maxtor OneTouch, a USB/FireWire external drive ($200 street for 120GB) with excellent backup software.

The D-Link DSM-604H has everything you could want in a personal server except for disk space. With its 2.5-inch notebook drive, it's so small and light you can hang it on the wall with a pair of screws, but you're limited to 40GB ($380 street)—not enough for storing multimedia files. Too bad; setup took only 10 minutes.

The Buffalo LinkStation is the spoiler at $300 street for 120GB. It has decent backup software and two USB ports: one for adding an external drive, one for a printer. The only downside is that it can't be directly connected as an external hard drive the way the Ximeta and Iomega servers can. Also, there is no higher-capacity model; many of the others go to 250GB, which isn't a lot if you want to store DV tapes in native format.

My biggest disappointment in this search was from the digital-media-hub end. Almost every media hub shares the same shortcoming as the Ximeta and Iomega products: It requires client software on a PC. If the intermediary PC is off—or if it crashes—you're out of luck. (The Turtle Beach AudioTron is the one exception; this music-only player can find any independently functioning network hard drive.) If your media hub needs to talk through a PC, why not just install a bigger hard drive and have it talk directly to the PC?

Call this a split decision: For backup and shared storage, these network hard drives are fine, as prices come down to not much more than the cost of the drive, case, and Ethernet connection. But as the back end to a media hub, the PC can't be eliminated from the equation. If it were my money, as of mid-2004, my choice for a media hub and personal server would be a Roku or Turtle Beach hub plus a Buffalo Technology drive—total cost, $500 to $600.

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.**

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DVD Rot, or Not?

The lowdown on "DVD rot," and a look at delamination, hub cracks, and other problems that can render your discs unplayable. **BY DON LABRIOLA**

In early 2003, news of an insidious, disc-devouring "DVD rot" hit the mainstream press. Alarmed by reports that up to 10 percent of all mass-produced DVD-Video discs were slowly destroying themselves, the DVD industry spent months trying to figure out whether the problem was as catastrophic as it appeared. It turned out that most reported incidents had actually been caused by improper disc handling and storage. DVD rot appears to be a real—though exceedingly rare—phenomenon. Users themselves are the greatest threat to the longevity of their DVD collections.

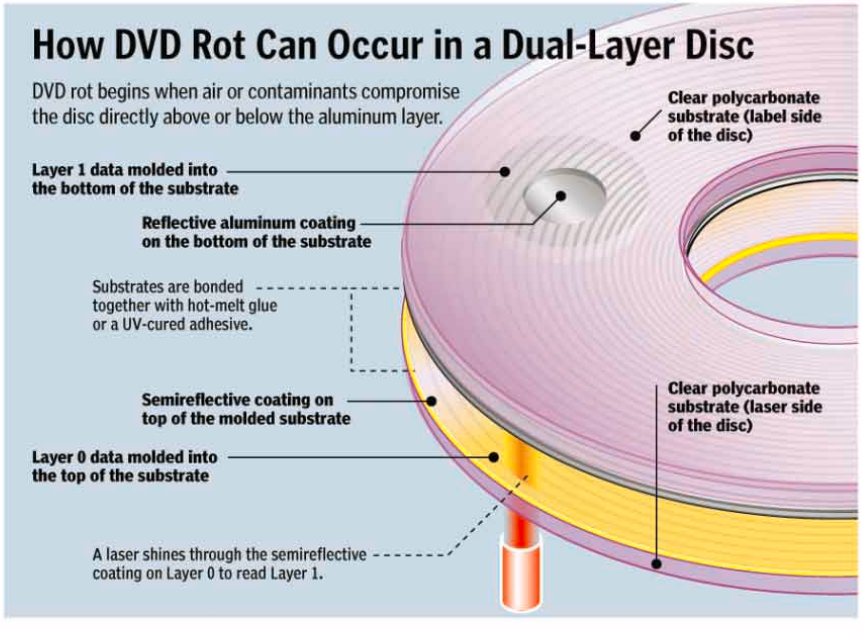
Most people think of DVDs as little more than high-capacity CDs, but though the two are very similar, DVDs have vulnerabilities that require particular care in their handling, storage, and cleaning. But with a bit of knowledge and effort, nearly all damage to DVDs can be prevented.

DISC ANATOMY

A CD consists of a piece of polycarbonate "substrate" into which up to 6 billion tiny pits that represent stored data have been molded. This pattern is coated with a reflective material like aluminum, which is covered by an ultrathin protective coating. When a CD player aims its laser through the clear substrate, the aluminum reflects the beam back. The drive reads data by detecting changes in the reflected beam as it passes across the molded pits.

Mass-produced DVDs employ similar technology, but with a few important differences. Most replicated DVD-Video discs store two layers of data and use a semireflective material like gold to coat the layer closest to the laser (see *http://www.pcmag.com/article2/0,1759,1573655,00.asp*). This allows DVD drives to select which layer to play by simply adjusting laser power and focusing distance. DVDs also boast greater data density and can store up to 4.7 billion bytes per layer, far more than the 650–800MB that can be squeezed onto a CD. This means that, despite a more robust error-checking and correction mechanism, each bit of DVD data is smaller and more easily obscured by tiny scratches and debris on the disc's surface.

Unlike a CD, which is a solid piece of plastic, a DVD is composed of two polycarbonate discs that are bonded together. This helps protect the coatings, as it sandwiches them between plastic layers. But it also makes DVDs more vulnerable to stresses caused by severe bending and flexing, especially at the disc's inner hub.



DVD CARE AND HANDLING

DVDs may be more delicate than they look, but it doesn't take much to prevent problems. It's a good idea to store them vertically in their original packaging whenever possible. Some DVD cases support a disc only at the hub, allowing it to sag at the edges when stored flat for long periods of time or at out-of-spec temperatures. Any resulting deformation will be slight, but it doesn't take much to unbalance a high-speed DVD drive.

Never store DVDs in CD jewel cases, which may apply too much hub stress. DVD-approved jewel cases, designed to reduce hub pressure, can be differentiated from CD versions by an embossed DVD logo on the tray insert.

Poorly conceived packaging can contribute to problems that make DVDs unplayable. Some off-brand cases require excessive force even when you use the correct procedure to remove a disc, while others release discs too easily, allowing mail-order DVDs to bang around the case for days while in transit.

Well-made cases, such as Amaray's DVD-Safe clamshell models (*www.amaray.com/dvds.htm*), grip a disc securely in a stress-free locking hub while allowing it to

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rotate freely. Attempting to pry a disc out of the case without unlocking the hub can result in over-flexing the disc, delamination, and even hub cracks. The rosette in the center of the case must be gently pressed until the disc pops free, letting you lift it effortlessly by its edges.

Even with better-quality jewel cases, it's not hard for a disc to pop off its hub and get scratched in the case. To prevent this, line your jewel cases with soft adhesive pads sold by companies such as Azuradisc (*www.azuradisc.com*). But don't panic if the surface of your disc does sustain some damage. Fine scratches can be removed with specialty formulations like Novus Plastic Polish (*www.novuspolish.com*) or by carefully polishing the surface with white toothpaste and a soft cloth. In extreme cases, a professional disc-polishing device like those made by Azuradisc can restore discs that would otherwise be impossible to salvage.

Avoid storing discs in paper or cardboard sleeves. Paper can leave tiny surface scratches when you insert or remove the disc. If you must use sleeves, choose those made of soft woven material like DuPont's Tyvek.

When you store discs in binders, don't load each volume with so many pages that the platters are under potentially deforming pressure. Use binder pages lined with a woven material, not with paper or cardboard. It's especially important when using binders to be sure that no debris is trapped against the data surface of a stored disc.

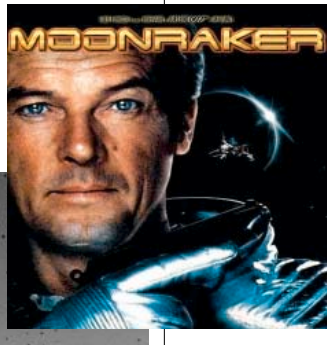
Adverse environmental conditions can greatly shorten the life of a disc. Avoid extremes and rapid changes in temperature or humidity, and never leave a disc in direct sunlight. Try to maintain an ambient temperature of between 55 and 75 degrees Fahrenheit, and keep the humidity within a 20 to 50 percent range.

Never apply adhesive labels to a DVD. Although paper labels are okay for CDs, it takes far more precision to read a DVD's much denser data. Even a slightly off-axis label can create unstable playback conditions. The best way to label a disc is to print directly onto it with a disc printer like the Primera Bravo II Disc Publisher or any of the Epson Stylus Photo R200/R300/R800 line ($99, $179, and $399 direct).

Recordable and rewritable DVD media have their own handling requirements. Their recordable surfaces should never be exposed to bright sunlight, and you should avoid breaking their shrink wrap before you're ready to use them.

CLEANING THE PLATTER

The best disc-cleaning solvent is deionized water, but even distilled or soft tap water can work in a pinch. Diluted dish detergent or rubbing alcohol can remove tougher contaminants. Never use any organic solvent, polish, antistatic solution, or cleanser that you suspect might attack or coat the plastic surface. In all cases, be sure to rinse the disc with water and dry with a cloth to avoid staining or residue; use a soft, lint-free cloth or photographic lens tissues.



A 50X photo of a *Moonraker* DVD, showing microscopic dots that had appeared in the unplayable areas of the disc. They form a ring along the disc's outer edge, visible at left. (©2000 Rohan Byrnes)

Always wipe discs in a radial motion, moving in straight lines between the hub and the outer edge. Almost any type of cleaning will leave microscopic scratches, but a DVD's error-correction mechanism can compensate for thin scratches that cross a data path at a right angle. Wiping discs in a circular motion can leave scratches that cover a longer span of data and may not be correctable.

IS SOMETHING ROTTEN?

Similar to the "laser rot" that cropped up in some early laserdiscs, DVD rot makes discs unplayable by impairing the ability of their aluminum layer to reflect light. Its most likely causes include oxidation caused by air coming into contact with the reflective layer, a galvanic reaction between a dual-layer disc's gold and aluminum coatings, and a chemical reaction triggered by impurities in either the disc's adhesive or in the aluminum itself. The good news is that although the aluminum coatings of a small percentage of discs manufactured before 2001 have slowly deteriorated spontaneously, the vast majority of reported cases of DVD rot have been shown to be due to user mishandling.

In a February 2003 study, Australian engineer Rohan Byrnes generated photographic evidence of aluminum deterioration in the unplayable areas of several affected discs (*www.andraste.org/discfault/discfault.htm*). The recent flap was triggered when a Sydney newspaper extrapolated his findings to conclude that the problem would eventually destroy a huge number of discs (*www.smh.com.au/articles/2003/01/31/1043804519345.html*).

Most observers agree that real cases of DVD rot do exist but are probably limited to discs from a few plants that had quality control problems in the late 1990s. Fortunately, there seem to be no new cases, and Byrnes hasn't found problems with new discs. Also, DVD rot doesn't affect recordable or rewritable DVD media, which use a radically different dye-based technology to store data.

A RELIABLE MEDIUM

The bottom line is that, in the absence of profound manufacturing defects, replicated DVD-Video discs remain a credible storage medium. Their longevity depends on how well you treat them. With proper handling and storage, they can provide reliable performance for decades.

MORE ON THE WEB

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Protect Your E-Mail Address

If you have to post your e-mail address online, here's how to keep spammers from finding it. **BY BRIAN LIVINGSTON**

Like most e-mail users, you probably get a ton of unsolicited messages, and you may be getting more and more every month. Filtering software can help you sort out the obvious spam, but it still takes time to examine all the e-mails a spam filter puts into the in-between category of "it may be spam, it may not be." (To view *PC Magazine*'s recent reviews of spam filters, go to *www.pcmag.com/article2/0,4149,1472754,00.asp*.) Wouldn't you rather avoid some of that spam in the first place?

In a series of experiments, the Center for Democracy and Technology, a nonprofit group based in Washington, D.C., created dozens of new e-mail addresses and then used them in various ways to see which addresses would receive the most spam.

After months of public exposure, the e-mail addresses that received almost all—a whopping 97 percent—of the thousands of pieces of spam that came in were those posted on Web pages. Addresses that had been used only to register at e-commerce sites, for example, received little or no spam. (To read the full report, go to *www.cdt.org/speech/spam/030319spamreport.shtml*.)

Professional spammers constantly scan the Web using high-speed programs known as *harvesters* to capture visible e-mail addresses. Harvesting addresses in this way is illegal in the U.S. under the CAN-SPAM Act, which became law on January 1. But that hasn't stopped the practice.

Does this mean you can never put your e-mail address on a Web page? Not at all. If you use the right methods, you can let people know how to get in touch with you—and still keep spammers from harvesting your address.

The easiest way is to spell out the "@" sign and the period, like this: *brian at example dot com*. In the Center's study, addresses that had been obscured in this simple way on Web pages did not receive a single piece of spam.

Unfortunately, though spammers' current harvesting software isn't smart enough to replace the spelled-out symbols, this won't be true for long, as the programs are continually improving. To ensure that harvesters can't read your address now or in the future, stronger steps are needed.

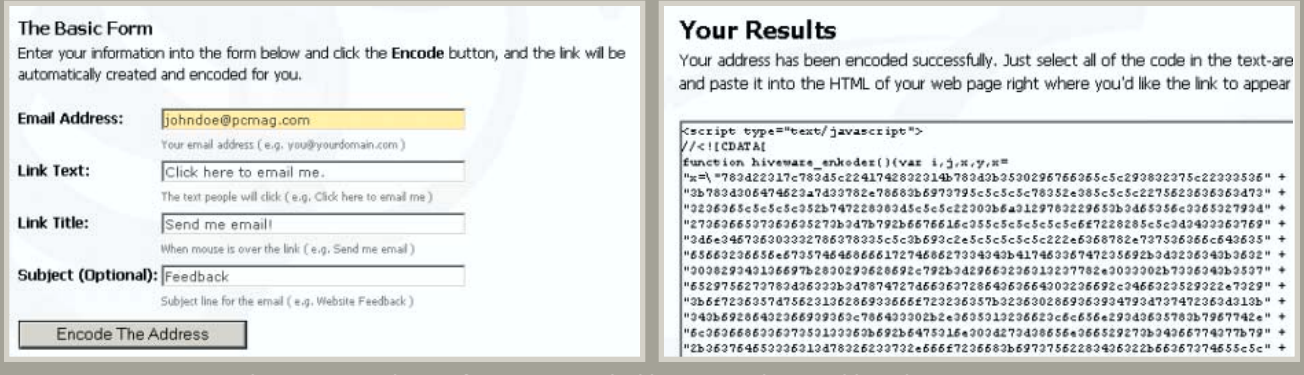
To make your address truly invisible to harvesters, display it only as a graphic. Open Microsoft Paint or a similar graphics application and select text mode. Type your address, switch to the Select tool, and select the area where your address appears, saving it as a GIF file. Post the graphic on your Web page, and you're done.

Although optical-character recognition (OCR) programs can read letters and numbers in image files, it's unlikely that a harvesting program will ever use OCR. Setting harvesting programs to scan every image on the Web would slow them down severely and wouldn't be cost effective.

If you have an e-mail link on your site, it's important that the HTML code behind it does not contain your e-mail address in plain text. Harvesting programs can easily read code, not just the characters visible in a browser.

To protect your clickable links from being harvested, try the free encoding service at *www.hiveware.com/enkoder_form.php*. Hiveware's Enkoder lets you enter the address you want to protect and the link text that will be visible on your Web page. When you click the service's Encode button, you get a block of JavaScript code. Simply paste the code onto your page and a clickable link will appear.

The fact that this JavaScript looks unreadable is exactly the point. It is unreadable to the human eye, and it is also unreadable to harvesting programs, which can't take the time to decode all of the JavaScript on Web pages. Browsers, however, have no trouble when it comes to interpreting the code. Some 10 percent of users have disabled JavaScript in their browsers and will not be able to see the link, so be sure to display your address both as a graphic and as a clickable JavaScript link.



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Brian Livingston is the editor of Brian's Buzz on Windows, *a free e-mail newsletter of Windows tips* (www.briansbuzz.com).

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SECURITY WATCH

Spyware or Slyware?

Software that sneaks onto your machine may not always be spyware, but it's not very welcome either. **BY BILL MACHRONE**

AOL caused a stir among users when it introduced AOL Instant Messenger's most recent update, version 5.5. This version installed WildTangent, which most security programs identify as spyware, yet companies such as Hewlett-Packard and Gateway deliver it preinstalled on many of their machines. The WildTangent site (*www.wildtangent.com*) says that its Web Driver platform is merely an enabling device for high-quality online games.

If you're an AIM user, you probably agree to upgrades fairly automatically, as insurance against bugs, hacks, and future incompatibilities. But the initial release of version 5.5 didn't tell users it was going to install WildTangent, which users deplored. In apparent response, subsequent revisions do make this clearer. But questions remain: Is WildTangent evil or is it innocent fun? Are we too quick to label as spyware any software that ends up on our machines without our knowledge? The answers depend on your level of paranoia and how protective you are of what software gets loaded onto your PC.

We tend toward the paranoid, and run Spy Sweeper, Spybot Search and Destroy, or Intermute SpySubtract weekly on our active machines. We regularly remove tracking cookies and the occasional browser helper object or registry entry. But even we were surprised when SpySubtract detected 122 WildTangent registry entries on one machine running AIM 5.5. We let SpySubtract delete them, and then reloaded AIM to see if it behaved any differently.

AIM loaded its games icon with the others on the bottom of the buddy list window, and when we clicked on it, it brought up a selection of games. We then reran SpySubtract to see if AIM had reloaded the software. It hadn't. You can choose games and invite other players, and the system doesn't attempt to redownload the WildTangent software until you actually get to the point of starting a game. Unlike the AIM 5.5 installation, however, WildTangent asks for your permission.

ARE ANTISPYWARE products sometimes overzealous when it comes to identifying spyware?

So how evil is WildTangent? Not very, in our estimation. Its most objectionable feature is that it uses global unique identifier (GUID) tracking when it logs into the game servers. According to WildTangent's privacy statement (*www.wildtangent.com/default.asp?pageID=privacy*), it may collect name, address, phone number, e-mail, and other contact information and, with your consent, may share this information with other parties. It also collects information such as your CPU speed, video card configuration, and DirectX version. The information is used for tuning WildTangent's games and product offerings, and if shared, will only be shared in an aggregated manner, without identification.

WildTangent is self-updating and it doesn't ask for permission. We prefer software that is up front about its updating, because the software's features and the privacy policy could change at any time, and we'd rather be aware of the changes. ZoneAlarm does not appear to stop WildTangent's conversations with its host; in this case, we assume that it operates under AIM's permission umbrella.

If you're not playing WildTangent games, there isn't much point in having it on your system. The easiest and most thorough way to disable it is with an application such as Spy Sweeper; it's kind of tedious to remove all of those registry entries manually. But you can do a quick and dirty removal using Windows' Add/Remove Programs. If that doesn't work, try this:

Start the Regedit and browse to HKEY_LOCAL_MACHINE \ SOFTWARE \ Microsoft \ Windows \ CurrentVersion \ Run. Look for the value "wcmdmgr" in the right pane and delete it. Then close Regedit and restart your machine. Remove the subfolder "WT" from your WINDOWS or WINNT folder. Note that the antispyware applications will probably not remove the \WT folder or its contents; you still have to do that manually.

The debate over products like WildTangent won't end any time soon. In the meantime, monitoring what's on your machine is the best defense against truly harmful programs. We recommend scanning once a week or, preferably, using your spyware tool's active scanner to catch spyware before it gets on your PC.

Bill Machrone is a contributing editor of PC Magazine.

THE LOOKOUT

MICROSOFT CONFIRMS BUG IN SSL PATCH

Microsoft has confirmed in a knowledge base article (*http://support.microsoft.com/default.aspx?scid=kb;EN-US;841382*) that its patch for a critical bug can cause some Windows 2000 systems to lock up and fail at boot time.

The patch is for a particularly critical vulnerability for which experts have begun to see exploits in the last few days (*http://www.eweek.com/article2/0,1759,1573825,00.asp*).

According to the article, the problem occurs because Windows tries repeatedly to load drivers that fail to load. Microsoft acknowledges that the problem is a bug in the patch, and says that the company is investigating solutions.

The article gives one specific example, where the Nortel Networks VPN client is installed and the IPsec Policy Agent is set to Manual or Automatic. In such cases, the article suggests disabling the IPsec Policy Agent. But the problem is a more general one, and these specific drivers need not be involved.—*Larry Seltzer*

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Location, Location, Location

uLocate's GPS-based service helps you keep track of family and friends. **BY ALAN COHEN**

Big Brother may not know your every move, but your boss, your coworkers, and your spouse soon may. And they won't have to do much to find you, either. They'll go to a Web page for a map showing everywhere you've been all day—bad news if you skipped work to go to the movies, good news if you're stranded on the side of a road. What gave you away? Your cell phone. Thanks to new location-based services, your phone is not just a communications device, it's a homing beacon.

One of the first companies to launch a phone-based tracking service is uLocate Communications, a year-old startup based in Newton, Massachusetts. It has integrated the location technology being built into new cell phones with the Internet, creating private Web pages where customers can track the comings, goings, and (sometimes) unauthorized escapades of employees and loved ones.

Although uLocate (*www.ulocate.com*) has launched on the Nextel network and is available to subscribers who have one of three Motorola handsets, the service is very much a work in progress. Some of the biggest wireless carriers, including Sprint PCS and Verizon, are still upgrading their networks to enable location-based services. You can expect them to be location-aware soon, however, as federal E911 legislation mandates that they incorporate the technology into their networks so emergency response systems can locate any cellular handset.

What makes services like uLocate possible is the Global Positioning System, a constellation of 24 satellites that circle the Earth in synchronous orbits and continuously transmit radio signals to terrestrial receivers. By picking up the signals of three or more satellites, a GPS receiver can calculate its own position on the ground. Today's receivers can be miniaturized enough to fit easily and economically into phone handsets. Indeed, most new phones have them—even if the networks they run on have yet to activate them.

A phone using uLocate links to the GPS satellites—at least three, but typically five or seven to get a fix within 100 feet of accurate—and calculates its location, speed, and direction of movement. A Java applet running on the phone sends this data over the cellular network, which, in turn, sends it to uLocate's server in Waltham, Massachusetts. The server—a Dell PowerEdge 1750 with dual 2.8 GHz Xeon processors running Linux—uses MapQuest Enterprise Server to turn longitude and latitude data into an address and plot it on a map, which can be viewed on a Web page or a phone.

To make the location data more useful to its customers, uLocate has developed some enhancements. For instance, users can set up "geofences" around specific locations; when a phone enters or leaves that area, an alert is triggered. This could be used to let parents know, by e-mail or SMS, when a child reaches school.

Location data is also stored—currently for 90 days—so users can check someone's route days or weeks later. "It comes in handy when a customer complains that something didn't arrive on time," says Frank Schroth, uLocate's vice president of marketing. Indeed, uLocate's business users tend to be companies with field personnel. "They use it to check on deliveries, but also to cut down on the unauthorized use of vehicles and to ensure the safety of drivers," says Schroth. Consumers, on the other hand, typically use the service to keep tabs on children or other family members.

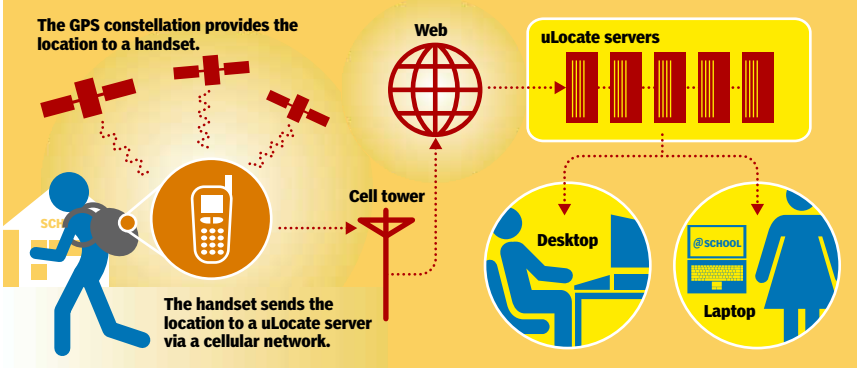
The system is not foolproof. For one thing, those being tracked can foil uLocate simply by turning off their phones. When a cell signal is dropped, ulocate is dropped with it. And since the GPS receiver in the handset needs a clear line of sight to at least three of the GPS satellites, the system won't work if the phone is indoors, underground, or in a covered vehicle. In that case, the map will display only the phone's last known location.

At press time, uLocate was available for free (users, however, must purchase a wireless data plan from their carrier), but Schroth expects it to go commercial this spring, with rates of approximately $8 to $9 per month for the first phone on the account and discounts for subsequent phones.

uLocate plans enhancements that will make the service a little more inviting for those being tracked. For example, after plotting your location, it could send you driving directions to the nearest ATM.

Your Personal Homing Beacon

uLocate has taken the location technology that's being built into new cell phones and integrated it with the Internet. After setting up a "geofence" around, say, your child's school, you get an alert whenever he arrives or leaves.



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Automate Your Image Processing

You don't have to spend a lot to find easier ways to handle your Web site images. **BY JOHN CLYMAN**

Those who have been publishing a Web site for a while know how time-consuming image preparation can be. Tools like Adobe Photoshop and Equilibrium's DeBabelizer can help automate these tasks, but they're not cheap. So let's look at some alternatives.

For those who want a painless, GUI-based approach, IrfanView (*www.irfanview.com*)—free for personal use—offers ways to automate file-format conversions, resizing, and image enhancements. It even lets you superimpose text, such as copyright notices, on all your images in a single step. (IrfanView was an Editors' Choice in our Utility Guide of June 8, 2004.)

FIGURE 1: ImageMagick makes it easy to add text and a white border.

For more sophisticated image manipulation, you can try the extremely powerful ImageMagick toolkit (*www.imagemagick.org*), which runs on a variety of platforms and is free for both personal and commercial use. ImageMagick exposes several programmatic interfaces you can use to script extremely sophisticated image manipulations and customizations.

The simplest way to use ImageMagick is from the command prompt. To resize an image and save it as a JPEG (regardless of its initial format), you can use this command:

```
convert photo.tif -resize 200x150
thumbnail.jpg
```

Convert is one of ImageMagick's handful of commandline programs. It takes the name of a source file (photo.tif), one or more directives (like `-resize 200x150`), and the name of an output file (thumbnail.jpg). In this case, `-resize 200x150` tells ImageMagick you want the result to be no more than 200 pixels wide and 150 pixels high. The `-resize` function supports variations like resizing to exact dimensions (even if this changes the aspect ratio), scaling by percentage, or resizing conditionally (if the image is larger or smaller than specified limits).

Using Convert, you can also perform image manipulations as varied as rotations, contrast and brightness adjustments, crops, blurs, and more. But ImageMagick's powerful compositing capabilities really expand the possibilities. For example, to add a colored border to an image and superimpose text annotation, you could use a command like this:

```
convert brugge.tif -resize 200x150 -
fill white -gravity southwest -font
arial -pointsize 15 -draw "text 2,20
'Brugge, Belgium - 2004'" -border 5x5
brugge_annotated.jpg
```

The effect of most of these directives should be clear. (`-gravity` defines the corner of the image that text falls into, in this case the lower left.) ImageMagick processes them one at a time to produce the resulting image (see Figure 1).

Another ImageMagick trick is superimposing a watermark on your images:

```
composite -watermark 30% -gravity
southeast pcmlogo.gif volcano.bmp vol-
cano_watermark.gif
```

Figure 2 shows the results. To multiply ImageMagick's power, you can apply operations like these to a whole set of images at once. If you're comfortable writing batch files or shell scripts, the commandline versions of the tools make it easy to perform manipulations within a script. But ImageMagick's APIs give you ways to access its facilities from your favorite programming environment.

In Windows, for example, you can instantiate an ImageMagick COM+ object and call methods like Convert with the same parameters you'd use on the command line. This VBScript snippet illustrates how you can generate thumbnails for all the images in the current directory:

```
set img = CreateObject("ImageMagick
Object.MagickImage.1")
set fso = CreateObject("Scripting
.FileSystemObject")
set files = fso.GetFolder(".").Files
for each file in files
img.Convert file.name, "-resize",
"200x150", "thumb-" & file.name
next
WScript.Quit(0)
```

FIGURE 2: Watermarking lets you overlay a professional-looking branding image on all of your site's elements.

If you have the Windows Script Host installed—all reasonably modern versions of Windows include it—just save the above file as Thumbnail.vbs and run `cscript thumbnail.vbs` from a command prompt or a shortcut.

John Clyman is a contributing editor of PC Magazine.

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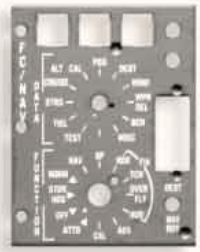

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USER TO USER

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Get the Last Nonblank Cell in an Excel Range

I have an Excel spreadsheet containing several instances of information for each month in a two-year period. In each case I need a formula to display the contents of the last nonblank cell in the two-year range. I tried using the IF function, but you can only nest seven IF functions. I tried other formulas without success. What formula can I use to display the most recent entry—that is, the last nonblank cell?

JEAN COOPER

First, let's work up a formula that will yield the row number of the last nonblank cell. We'll assume labels in cells A2:A25 and values in B2:B25, with the formula for the most recent entry in B26. In that cell, type

```
=MAX(IF(NOT(ISBLANK (B2:B25)),
ROW(B2:B25),0))
```

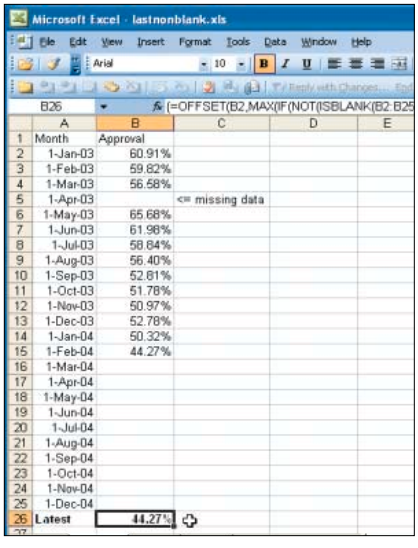

FIGURE 1: This formula lets you find the contents of the last nonblank cell.

Instead of pressing Enter, press Ctrl-Shift-Enter to create an array formula. Excel processes each element of the array B2:B25 in turn, returning the row number for nonblank elements and a zero for blank elements. The MAX() function returns the maximum of these results, which is the last nonblank row.

To get the contents of that cell, we'll use the OFFSET function. OFFSET returns the contents of a cell that's a specific number of rows and columns away from the starting cell. To convert the row number found with the first formula into an offset, simply subtract the row number of the starting cell. Don't delete the first formula; insert OFFSET(B2, at the beginning and add -ROW(B2),0) at the end. That yields this new formula, which you must again finish using Ctrl-Shift-Enter.

```
=OFFSET(B2, MAX(IF(NOT
(ISBLANK(B2:B25)),
ROW(B2:B25),0))-ROW(B2),0)
```

You can copy this formula to the cell just below each of your other two-year ranges. Note that the same technique works even if the data has some gaps.
—*Neil J. Rubenking*

Reboot into Safe Mode in Windows XP

After reading your article on rebooting into Safe mode (*www.pcmag.com/article2/0,1759,1492367,00.asp*), I was wondering how to do this in Microsoft Windows XP. I have a USB keyboard that is not operational until Windows is loaded, so I can't enter Safe mode using the keyboard. Is there another way?

CHRIS BACKUS

The technique for forcing Windows XP into Safe mode is, as you've noticed, not the same as for Windows 9*x*. From the Start menu's Run dialog, enter the command MSConfig. Click on the BOOT.INI tab and check the /SAFEBOOT box. Now when you boot, Windows will go into Safe mode. Naturally, when you no longer need Safe mode, you'll repeat the process and uncheck that box. One caveat: Don't experiment with the other settings on this tab. You could wind up unable to get back into MSConfig to undo your changes.—*NJR*

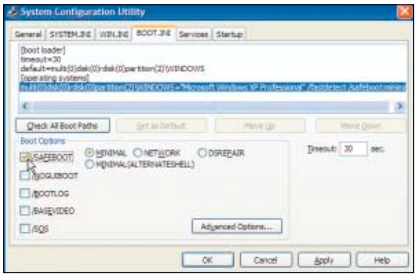

FIGURE 2: Use the MSConfig utility to boot Windows XP into Safe mode.

Control Where Outlook Saves Attachments

The answer to "Opening Attached Files" (*www.pcmag.com/article2/0,1759,1367938,00.asp*) could have included a Registry tweak that would allow you to change the location where Outlook attachments open. Here's how.

In the Registry, go to HKEY_CURRENT_USER\Software\Microsoft\Office*version*\Outlook\Security (the *version* section will vary with the version of Office installed). Add or edit the value OutlookSecureTempFolder, entering the preferred location for the attachments, such as C:\Attachments.

PAUL ELLNER

The earlier question involved changing the location that Outlook uses to store temporary copies of attachments when you choose to Open them. This tweak will definitely serve that need. However, as the name OutlookSecureTempFolder suggests, the real reason for this change is security. When temporary files are stored

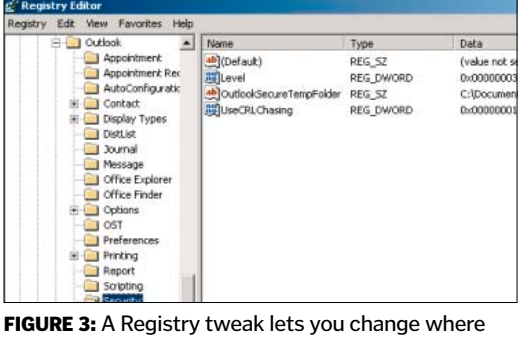

FIGURE 3: A Registry tweak lets you change where Outlook opens attachments.

The way to force Windows XP into Safe Mode is not the same as for Windows 9*x*.

Remapping drives when they're needed doesn't have to be time-consuming.

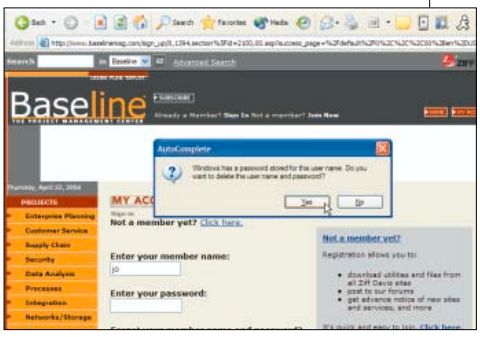

FIGURE 4: You can delete the user name and password from just one Web site.

in a known location, there's the possibility that a malicious program could launch programs without your permission.

To apply this tweak, launch REGEDIT from the Start menu's Run dialog. Navigate to the specified key; the version is 9.0 for Outlook 2000, 10.0 for Outlook 2002 or XP, and 11.0 for Outlook 2003. If the OutlookSecureTempFolder value is not present in the right-hand pane, right-click in that pane and choose New | String value, then name the new value OutlookSecureTempFolder. Double-click on the value and enter the desired path; be sure to end it with a trailing backslash. Finally, restart Outlook. From now on, Outlook will use this path to store temporary copies of attachments you open.—*NJR*

Remove User Name and Password from a Single Site

Is there any way to remove the saved user name and password from a single Web site? I need to remove this information only from one particular site; I want to keep all of my other saved password data. So far, all I can find in Internet Explorer is the option to clear all the passwords from all sites.

DANNY IBARRA

Removing a stored user name and password is pretty simple. Navigate to the site in question. When it prompts you for the user name and password, click in the user name box and press the Down Arrow. This will show all the user names stored for the particular site (usually just one). Press the Down Arrow until the name to be removed is highlighted, and then press the Del key. Windows will ask whether you want to delete the user name and password. Click on Yes and they're gone.—*NJR*

Avoid Startup Slowdown From Mapped Drives

I have defined several mapped network drives on my system, and if I'm connected to our intranet, either locally or through my VPN, everything is fine. But when I'm not connected to the intranet, there are huge delays whenever I'm browsing through the directory tree and during many other operations as well. Is there some way to tell Microsoft Windows XP not to search nonlocal resources when I'm not connected? I don't want to unmap the drives, as it is too time-consuming to remap them every time.

WARD BALVER

Remapping the drives when they're needed doesn't have to be time-consuming. The NET USE command will map a drive, for example: `NET USE G:\\computername\sharename\volume`. Create a batch file with a line like this for each of your mapped drives. Add this line at the end of the batch file:

```
NET USE /PERSISTENT:NO
```

That last line prevents the system from trying to reconnect at start-up, which it would do by default. When you are connected to the intranet, just launch the batch file to map all your network drives quickly.—*NJR*

Use the Current Date in a Windows XP Batch File

I need a way to capture just the *mmddyyyy* format of the current date in a Windows XP batch file to create a subfolder for each day of the year. I need to restrict the date to just these eight characters for organizational purposes. Can you help?

KEVIN HOLLIDAY

This example batch file will create and display an environment variable named `mydate` containing the current date in the *mmddyyyy* format:

```
@ECHO OFF
FOR /F "tokens=1-4 delims= / " %%I IN
 ('DATE /t') DO SET mydate =%%J%%K%%L
ECHO The value is "%mydate%"
```

This is strictly for Windows XP and 2000; it won't work on Windows 9*x* platforms. Note that the middle line is long and maybe word-wrapped in print. It begins with the word `FOR` and ends with `%%L`.

The `/F` switch causes the `FOR` command to parse lines of text into substrings called tokens, dividing each line at a specified set of delimiter characters. If the data set in parentheses uses no quotes, `FOR` treats it as a file specification and processes each line of the matching files. If it's in double quotes, `FOR` parses the literal string between the quotes. And if single quotes are used, `FOR` executes the string as a command and parses its output. We used the single quotes, so `FOR` parses the output of the command `DATE /t`.

FIGURE 5: Running the batch file on April 16, 2004, displays the date in the *mmddyyyy* format.

`DATE /t` returns the current date in a form like "Thu 03/25/2004". The `tokens=` and `delims=` entries determine how the string will be parsed. Here the delimiters are slash and space, and we have requested tokens 1 through 4. The defined `FOR` variable `%%I` gets the first token, which is the day of the week (not used here). The remaining tokens are automatically assigned to the next three letter variables, J, K, and L. By combining them, we get the date in the desired form, such as 03252004.

You can incorporate this command into any batch file—even change the order of the date elements or insert other characters. For example, by ending the line with `SET mydate =%%L-%%J-%%K` you'd get a sortable *yyyy-mm-dd* date.—*NJR*

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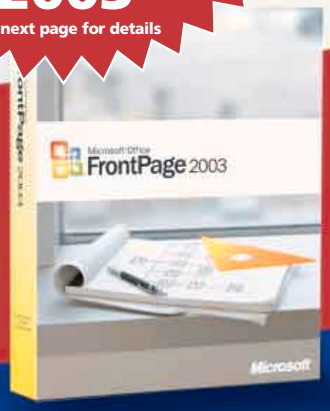

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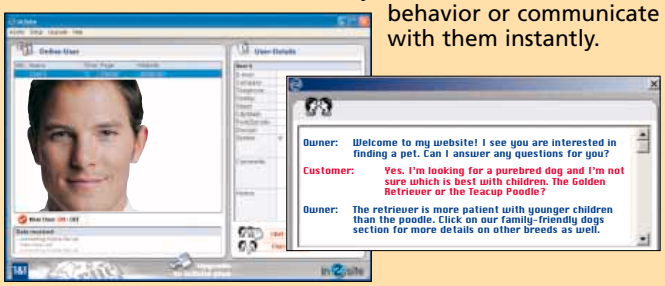

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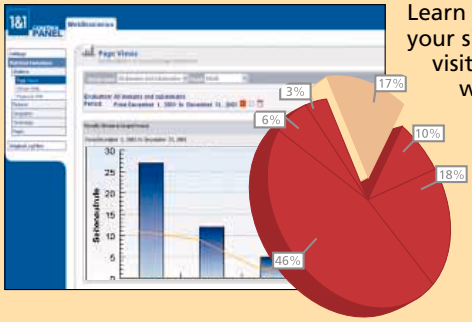

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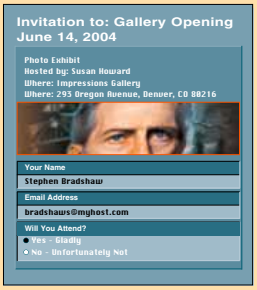

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FTP accounts, unlimited access	1	1
Included bandwidth/month	5 GB	5 GB
Protected by up-to-date firewall	✓	✓
Daily backups	✓	✓
APPLICATIONS		
1&1 Control Panel	✓	✓
WebsiteCreator	12 pgs	12 pgs
Full version software worth $550	✓	✓
Frontpage 2003	–	✓
E-MAIL		
POP3 e-mail accounts	50	50
Aliases, auto-responders, forwarding	✓	✓
1&1 WebMail	✓	✓
Included virus scanner	1 POP3	1 POP3
WEBSITE FEATURES		
Logfiles	✓	✓
CGI library (counter, guestbook, etc...)	✓	✓
FrontPage 2002 extensions	✓	✓
Password protected directories	✓	✓
CRM/E-COMMERCE		
1&1 WebStatistics	✓	✓
1&1 Chat channel	1	–
EXPRESS SUPPORT		
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Included domains at no additional cost	3	3
Manage unlimited domains with one account	✓	✓
Point external domains to 1&1	100	100
Subdomains	50	50
WEBSITE/CONNECTIVITY		
Web space	1000 MB	1000 MB
FTP accounts, unlimited access	5	5
Included bandwidth/month	15 GB	15 GB
Protected by up-to-date firewall	✓	✓
Daily backups	✓	✓
APPLICATIONS		
1&1 Control Panel	✓	✓
WebsiteCreator	18 pgs	18 pgs
Full version software worth $550	✓	✓
Frontpage 2003	–	✓
E-MAIL		
POP3 e-mail accounts	150	150
Aliases, auto-responders, forwarding	✓	✓
1&1 WebMail	✓	✓
Included virus scanner	3 POP3	3 POP3
WEBSITE FEATURES		
Logfiles	✓	✓
CGI library (counter, guestbook, etc...)	✓	✓
FrontPage 2002 extensions	✓	✓
Password protected directories	✓	✓
Perl, PHP3 and PHP4	✓	–
Database	1 MySQL	MS Access
SSH shell access	✓	–
SSI (Server side includes)	✓	✓
Cron Jobs / Scheduled Tasks	✓	✓
Directory Protection	✓	✓
Shared SSL	✓	✓
Active Server Pages	–	✓
CRM/E-COMMERCE		
1&1 WebStatistics	✓	✓
1&1 Chat channels	5	–
in2site Live Dialogue	✓	✓
Newsletter Tool	✓	✓
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	Linux	Windows
DOMAIN NAMES		
Included domains at no additional cost	5	5
Manage unlimited domains with one account	✓	✓
Point external domains to 1&1	200	200
Subdomains	200	200
WEBSITE/CONNECTIVITY		
Web space	2000 MB	2000 MB
FTP accounts, unlimited access	25	25
Included bandwidth/month	30 GB	30 GB
Protected by up-to-date firewall	✓	✓
Daily backups	✓	✓
APPLICATIONS		
1&1 Control Panel	✓	✓
WebsiteCreator	25 pgs	25 pgs
Full version software worth $550	✓	✓
Frontpage 2003	–	✓
E-MAIL		
POP3 e-mail accounts	300	300
Aliases, auto-responders, forwarding	✓	✓
1&1 WebMail	✓	✓
Included virus scanner	6 POP3	6 POP3
WEBSITE FEATURES		
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CGI library (counter, guestbook, etc...)	✓	✓
FrontPage 2002 extensions	✓	✓
Password protected directories	✓	✓
Perl, PHP3 and PHP4	✓	–
Database	3 MySQL	MS Access
MS SQL	–	✓
SSH shell access	✓	–
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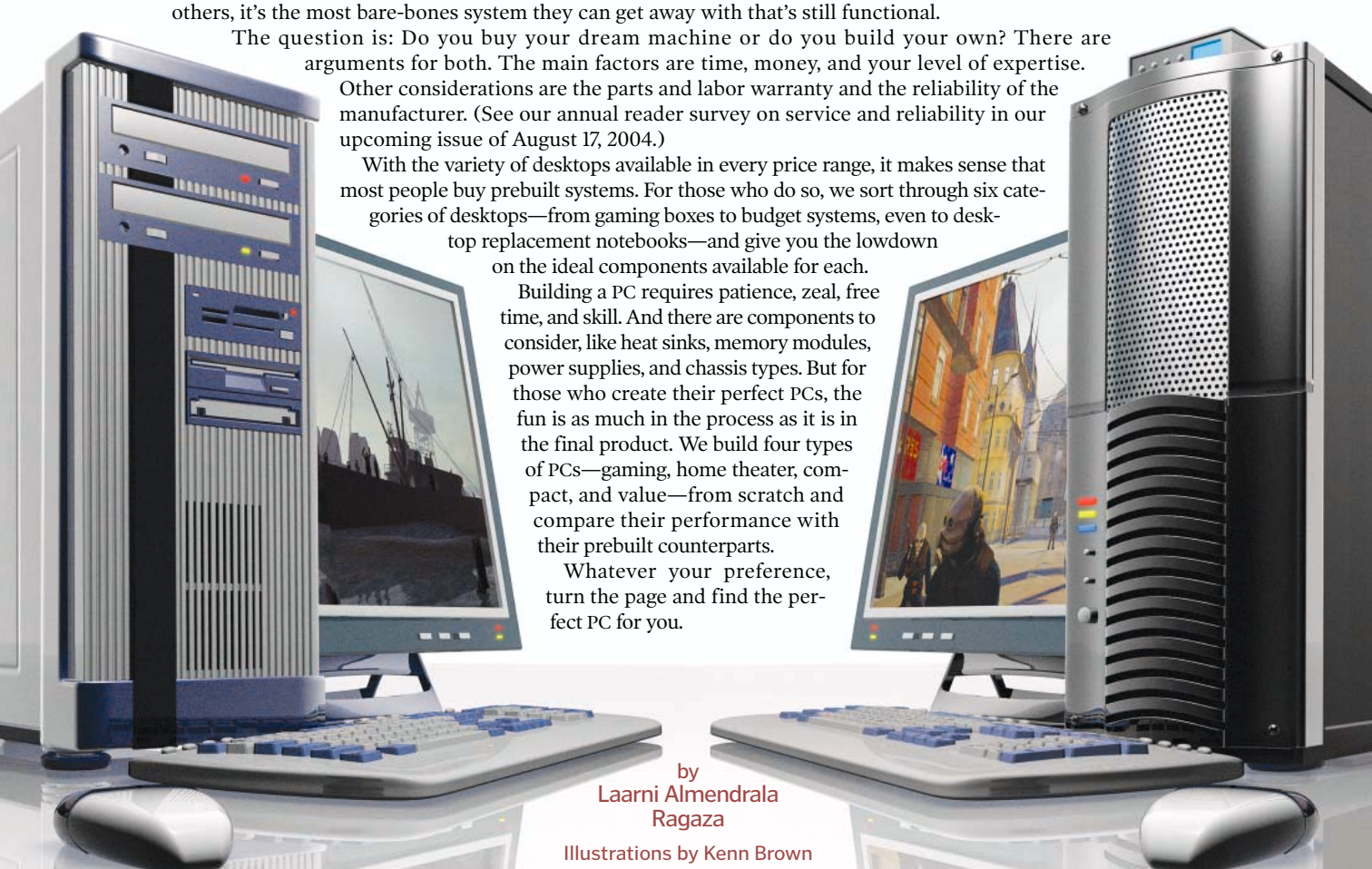
JUST AS BEAUTY IS RELATIVE, SO IS EACH PERSON'S IDEA OF THE PERFECT PC. FOR SOME, IT'S A no-holds-barred system with a bleeding-edge processor and graphics card, and scads of storage space. For others, it's the most bare-bones system they can get away with that's still functional.

The question is: Do you buy your dream machine or do you build your own? There are arguments for both. The main factors are time, money, and your level of expertise. Other considerations are the parts and labor warranty and the reliability of the manufacturer. (See our annual reader survey on service and reliability in our upcoming issue of August 17, 2004.)

With the variety of desktops available in every price range, it makes sense that most people buy prebuilt systems. For those who do so, we sort through six categories of desktops—from gaming boxes to budget systems, even to desktop replacement notebooks—and give you the lowdown on the ideal components available for each.

Building a PC requires patience, zeal, free time, and skill. And there are components to consider, like heat sinks, memory modules, power supplies, and chassis types. But for those who create their perfect PCs, the fun is as much in the process as it is in the final product. We build four types of PCs—gaming, home theater, compact, and value—from scratch and compare their performance with their prebuilt counterparts.

Whatever your preference, turn the page and find the perfect PC for you.



by
Laarni Almendrala Ragaza

Illustrations by Kenn Brown

Buy Your Perfect PC

INSIDE

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Multimedia PC

WHEN IAN PRESENT WENT OFF TO COLLEGE, he splurged on a Sony VAIO. Yes, he needed a machine that could help with the occasional term paper, but he also needed a system with multimedia hardware and software—for all those late-night extracurricular college activities. "I download music," says the 20-year-old junior at the State University of New York at Purchase. "I burn music onto CDs. I burn movies. I talk with friends on AOL Instant Messenger. I even use Photoshop to edit my digital pictures."

Present's desktop does just fine with a 2.0-GHz Pentium 4 processor, 512MB of RAM, a 60GB hard drive, and a 17-inch flat-screen display. But if you really want to be on the cutting edge, we recommend something with more *oomph:* a 3.4- to 3.6-GHz or equivalent system with 2GB of memory, 300GB of hard drive storage, and a 21-inch display. And make sure you've got FireWire and USB 2.0 ports, CD and DVD burners, and a decent pair of speakers. Your multimedia experience will be the better for it.—*Cade Metz*

Windows XP Pro or **Apple OS X 10.3** (for Mac users). Because of its enhanced features and networking capability, we recommend Win XP Pro over Win XP Home Edition. Win XP Pro provides password-protected local file-access control, Remote Desktop, Encrypting File System, Roaming Profiles, SNMP, and Network Monitor. For Mac users, Apple OS X 10.3 is the only choice. If you plan to record a lot of TV, Windows XP Media Center is a good alternative, but you can't upgrade to it.

A **1GB of DDR400 SDRAM** or better. You'll need 1GB or more for working with large media files, and DDR400 is the fastest memory currently available.

B The **Intel 875P chipset.** This chipset has a fast 800-MHz front-side bus, dual-channel DDR400 RAM, integrated SATA RAID (which doubles hard drive throughput), and 8X AGP. Coming soon is the Intel Grantsdale/Alderwood chipset, which will support PCI Express and DDR-II. PCI Express offers much wider throughput than AGP and PCI. Likewise, DDR-II will support faster processors and their memory data rate requirements.

C The **Creative Labs Sound Blaster Audigy 2 ZS sound card.** Besides an abundance of input/output ports, the Audigy 2 ZS also supports up to 7.1 surround sound (seven channels plus a subwoofer).

D Two **Western Digital Raptor 74GB, 10,000-rpm SATA hard drives** in a **RAID 0 array.** A RAID 0 array doubles hard drive throughput and provides faster load and save times for apps and large files, such as video. The 10,000-rpm drives come in handy for editing and saving graphics. An extra 250GB, 7,200-rpm SATA hard drive is a must for deep storage.

E A **DVD±RW drive** and a **DVD/CD-RW combo drive** (for copying directly from disc to disc). A DVD±RW drive offers the flexibility of writing to both DVD format types, and it lets you create DVDs that are playable in consumer DVD players. Look for dual-layer DVD writers in the near future, which will allow you to burn twice as much data, video, or music on a single disc.

Real-World Systems ($2,800 to $4,700): ABS Awesome 5500, Alienware Area-51 Extreme, Apple Power Mac G5, Dell

More On The Web

Want to see the real-world systems that come as close as possible to our Perfect PCs? Check out the summary of features for each category to see our component-by-component breakdown. Just point your browser to www.pcmag.com.

| **102** Business PC | **104** Mobile System: Desktop Replacement Notebook | **100** Form Fitting

J A **21-inch or larger CRT.** This component is vital, and an additional 15-inch XGA (1,024-by-768) LCD for toolbars and palettes is useful for true multimedia/graphics enthusiasts. A wide-screen 16:10 monitor is an option for video-editing pros.

K A **3.4-GHz Intel Pentium 4 with SSE3 or Athlon 64 3400+,** or a **2-GHz PowerPC G5** (for Mac users) **processor** or better. For multitaskers, the P4's Hyper-Threading and SSE3 technology can be beneficial. Now that SSE2 is built into the Athlon64 core, it is a worthy multimedia performer—at a lower price than the FX-53.

F The **ATI Radeon 9600, nVidia GeForce FX 5700,** or **Matrox Parhelia graphics card,** all with at least 128MB of graphics memory. For many multimedia users, 2D functions such as photo and video editing are more important than 3D performance. Going with one of these cards will take care of your graphics needs and save you money.

G Digital photography buffs will also want a **flash memory card reader** on the front panel that supports CompactFlash, Memory Stick, Secure Digital, SmartMedia, and xD-Picture Card formats.

H **Integrated 10/100/1,000 Ethernet.** Choose LAN or broadband for wired connectivity.

I For video and surround sound, the **Creative GigaWorks S750 7.1 speakers** mesh perfectly with the Audigy 2 ZS sound card. For music, the **Cambridge SoundWorks MegaWorks 215** is a superb set of 2.1 surround sound speakers, but it is pricey at about $400.

An **802.11g PCI** or **USB wireless solution.**

L At least six **USB 2.0** and two **FireWire ports** (four USB and one FireWire on the front panel for convenience), plus an **NTSC output.** FireWire is still the interface of choice for DV camcorders.

M A **wired or wireless keyboard** and **mouse.** Either setup will work, though wireless components cost a bit extra.

Dimension 8300 Gateway 710XL, HP Pavilion a550e, MPC Millennia 920i Creative Studio, Polywell Poly 875P, Velocity Micro ProMagix

Home Theater PC

IN DAVE DONOHUE'S BASEMENT HOME OFFICE, there's a Dell Dimension desktop PC set up as a second home theater—for those times he wants to watch something that only interests him. "My fiancée can take *Star Wars* only so many times," says the 31-year-old.

Equipped with a cable-ready WinTV card, a DVD burner, a 17-inch flat-panel display, and a six-piece Cambridge SoundWorks speaker set, Donohue's system is a television, DVD player, and stereo all rolled into one. The system cost less than $1,300, but its core components—a 2.66-GHz P4 processor, an 80GB hard drive, and a standard LCD—aren't as beefy as we'd recommend. We'd opt for a 3.2-GHz chip, a 250GB drive, and a wide-screen display.

Donohue can do without the extra hard drive space, shuttling large music and video files to his DVR upstairs. But he should consider upgrading to a 17-inch LCD for the full *Star Wars* experience.—*CM*

Windows XP Pro or **Media Center Edition.** Win XP MCE lets you watch TV and movies easily and edit media files, but it can be installed only by a vendor when the PC is built.

[A] An **AMD Athlon 64 3200+** or a **3.2-GHz Intel Pentium 4 with SSE3.** These processors offer high performance and are cheaper than bleeding-edge chips.

[B] The **Intel 865PE chipset** or the **nVidia nForce2 Digital Media Platform** (for AMD chips). The Intel 865PE has 800-MHz FSB and supports DDR400—more than enough for multimedia tasks.

[C] **512MB of DDR400 SDRAM.** Windows XP runs better with at least 512MB; you definitely won't want less.

[D] At least one **250GB, 7,200-rpm ATA hard drive.** An additional 250GB drive doubles storage for large video files that PVR programs will surely acquire.

[E] A **DVD±RW drive** and a **DVD/CD-RW combo drive** (for copying directly from disc to disc). A DVD±RW drive lets you use both types of writable DVD media.

[F] The **ATI All-In-Wonder 9800 Pro** with 128MB or more of graphics memory, or the ATI **All-In-Wonder 9600 series** with 128MB (a lower-price option). If you choose a PC with Win XP Media Center Edition, go with the TV and graphics card the manufacturer includes.

[G] The **Creative Labs Sound Blaster Audigy 2 ZS sound card.** The Audigy 2 has an abundance of I/O ports.

[H] **Creative GigaWorks S750 7.1 speaker system.** The seven surround-sound speakers support new standards, such as Dolby Digital EX and DTS-ES. To hook up your PC to a TV or stereo, you'll also need an external AV receiver.

[I] An **HDTV-compatible TV set** or **wide-screen monitor.** For viewing media in your living room, you can hook up your PC to either an HDTV-compatible TV set or a 17-inch or larger wide-screen monitor.

[J] At least six **USB 2.0** and two **FireWire ports,** plus **S/PDIF** and **NTSC S-Video outputs.** The ATI All-In-Wonder 9800 Pro or 9600 series can use a component video adapter to connect an external HDTV-compatible TV, or use the TV's DVI port if so equipped.

[K] A **wireless keyboard** with an integrated pointing device—a must for navigating your system from your couch.

[L] **Integrated 10/100/1,000 Ethernet** for LAN or broadband connectivity.

[M] A **remote control.** All Windows XP MCE-equipped PCs come with a standardized IR (Infrared) remote control for music playback, TV channel changing, and navigating the MCE interface.

Real-World Systems

($2,300 to $7,800) ABS Harmony 3000, Alienware DHS Series, Dell Dimension 4600C, Gateway FMC-901X, HP Media Center PC m, MPC Millennia 920i Xtreme, Polywell QBox-NF3, Velocity Micro CineMagix

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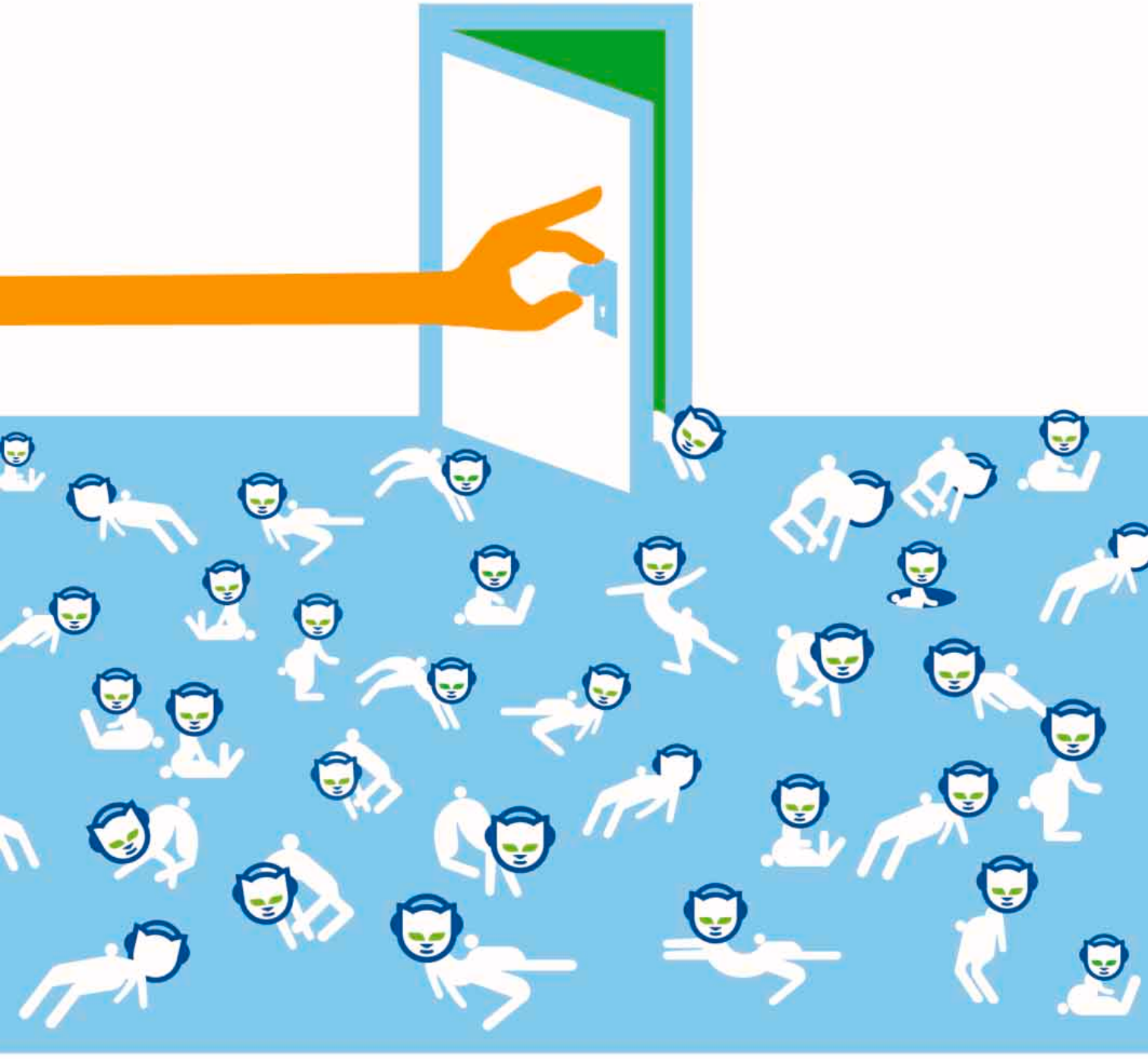

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Gaming PC

WHEN 16-YEAR-OLD WILLIAM SCHINDLER received an unexpected inheritance from a long-lost uncle, he knew exactly where the money was going. "I wanted the ultimate gaming computer, something so fast I wouldn't have to worry about speed for years," says the high-school student from Yorktown, Virginia. This February, he spent $8,700 on a Falcon Northwest gaming box, with a 3.2-GHz Pentium 4 processor, 1GB of memory, a 256MB ATI Radeon 9800 XT graphics card, and a pair of 250GB, 7,200-rpm hard drives.

Now, 500GB of hard drive space is a tad excessive; a 160GB hard drive is adequate. And the price raises eyebrows: You can get a killer gaming system for $2,400 to $5,000. Otherwise, serious gamers should follow William's lead. His mega-desktop also includes a Creative Labs Sound Blaster Audigy 2 ZS sound card, six-piece speaker set, and 21-inch monitor, providing room-rattling surround sound and jaw-dropping graphics. He even shelled out for an exotic case design. "Mine," he says, "has a picture of the grim reaper on it."—*CM*

A **Creative GigaWorks S750 7.1 speakers.** The S750 speakers provide surround sound for gaming and DVDs. The set includes four speakers, one center channel, two additional rear channels, and one subwoofer. With 7.1 surround sound, gaming is truly immersive. And opponents will have a hard time sneaking up behind you with all those surround channels.

B The **Creative Labs Sound Blaster Audigy 2 ZS sound card.** You can take advantage of the Audigy 2's abundance of input/output ports by connecting external speakers, an MP3 player, microphones, a MiniDisc player, or other audio devices. It also supports up to 7.1 surround sound (seven channels plus a subwoofer).

C A **wired keyboard.** Make sure your keyboard has customizable keys for playing first-person shooters or real-time strategy games. And slight lag time occurs with a wireless keyboard—which could mean the difference between life and death.

D For gaming fanatics, look to **game pads, joysticks,** and **force-feedback wheels** as alternative game tools.

E A **21-inch or larger CRT** or a **19-inch or larger UXGA (1,600-by-1,200) fast LCD** (less than 16-ms pixel response time). Although only CRTs will suffice for most gamers, today's fast LCDs are improving. And though CRTs are faster, LCDs are lighter. With a 15- or 17-inch LCD monitor, gamers can take both their tower and monitor to LAN parties.

F At least an **ATI Radeon 9800XT** or **nVidia GeForce 5950 Ultra** with 256MB or more of graphics memory. Gamers want the fastest 3-D gaming card, and these graphics cards fill the bill. But this may change before the ink is dry on these pages. Look for PCI Express graphics cards soon, which will supplant AGP 8X shortly. (By the time you read this, the GeForce 6800 Ultra series graphics cards will likely be available, as will the ATI Radeon X800 XT.)

G The **Intel 875P chipset** or the **nVidia nForce3 250Gb platform** (for AMD processors). The 875P has an 800-MHz FSB, dual-channel DDR400 RAM, integrated SATA RAID, and 8X AGP. Dual-channel DDR doubles the memory bandwidth, and SATA RAID doubles hard drive throughput. The nForce3 250Gb platform also features dual DDR400 memory, 8X AGP, and on-board 5.1-channel surround sound, as well as Gigabit Ethernet with security and integrated IDE/SATA RAID.

H An **AMD Athlon 64 FX-53** or **Intel Pentium 4 Extreme Edition.** Gamers who overclock their chipsets to improve performance should choose the AMD chip. But for those who don't want to open their boxes, the 3.4-GHz P4 EE will work.

I A **DVD±RW drive** and a **DVD/CD-RW combo drive** (for copying from disc to disc). A DVD±RW drive lets you burn discs in both formats to play on your DVD player.

Real-World Systems ($2,400 to $5,000): ABS Ultimate M6, Alienware Aurora Extreme, Apple Power Mac G5, Compaq X09,

J At least six **USB 2.0 ports** and two **FireWire ports,** plus an **NTSC output.** An abundance of USB ports (and a couple of FireWire ports) are essential for hooking up game controllers, external hard drives, and the like. (Four USB ports and one FireWire port should be on the front.)

K **1GB of DDR400 SDRAM.** The fastest memory available, DDR400 is ideal for current and future games.

L A **wired or fast wireless optical mouse.** An optical mouse has a faster response time and won't get slowed down by dirt and grit (as a mouse ball can).

M At least one **160GB, 7,200-rpm SATA hard drive.** A SATA hard drive is slightly faster than standard IDE, and the thinner cabling increases airflow. If you have the budget, you should go with dual SATA hard drives in a RAID 0 array.

N A **cool chassis.** Nothing's stopping you from getting a customized paint job, if your wallet permits. But if money's tight, there's always basic black with a see-through panel and fluorescent tubing.

O An **802.11g PCI** or **USB wireless solution.** Wireless connectivity is a plus for those who want to play online games throughout the house but don't want to string Category 5 cable.

P **Integrated 10/100/1,000 Ethernet** for wired connectivity.

Windows XP Pro. We recommend Win XP Pro over Win XP Home because of such features as password-protected local file-access control, Remote Desktop, Encrypting File System, Roaming Profiles, SNMP, and Network Monitor. XP Pro also has advanced network and network-sharing options, which are useful for LAN parties.

Dell Dimension XPS, Gateway 710G, Polywell Poly 900NF3, Velocity Micro Vision 64, WinBook PowerSpec 9361

Budget PC

TODD DOBBS, 55, doesn't edit videos or play 3D games—or even use a word processor. The Louisville native does little more than surf the Web on his PC. "Mainly he visits his favorite horse-racing sites," says his wife, Jeri. So when it came time to buy a new PC this past fall, the Dobbs purchased a $450 eMachines desktop. Although most people require more oomph for their daily computer tasks, you'd be surprised at what $450 gets you. The Dobbs's machine includes an Athlon XP 2400+ processor, 256MB of memory, an 80GB hard drive, a CD-RW drive, *and* a DVD drive.

Though we recommend that budget buyers go for something a bit beefier—a slightly faster processor, a larger hard drive, and twice as much memory doesn't cost very much more—this low-end system does everything the Dobbs require. Todd can surf horse-racing sites, and Jeri can occasionally burn a few music CDs. No need to buy more PC than you can use.—*CM*

Windows XP Home. Users on a budget probably won't need more than Win XP Home, which is offered in most systems costing $1,000 or less. An upgrade to Win XP Pro costs about $50 to $75 extra.

A An **AMD Athlon XP 3000+** or a **2.8-GHz Intel Celeron.** A system with either chip should cost about $1,000, and both offer solid performance.

B **The chipset that comes with your PC.** Since most budget-system users won't upgrade or tweak their systems, you really don't need to concern yourself with the chipset choice. And even systems at about $1,000 support DDR SDRAM.

C **Integrated 10/100 Ethernet** for connectivity (probably broadband).

D **512MB of DDR266 SDRAM** or faster. Some value systems come with only 256MB, but we recommend a minimum of 512MB for Win XP PCs. Memory upgrades are cheap and worth the performance boost.

E A **60GB to 80GB, 5,400-rpm or faster ATA hard drive.** An ATA hard drive should fit most basic needs.

F Separate **DVD** and **CD-RW drives.** Having two drives makes burning CDs easier. Consider upgrading to a single DVD±RW drive, which can burn and play CDs and DVDs of various formats, if you can spare the extra $50 to $100.

G Two **speakers** and a **subwoofer.** Go with whatever comes with your PC, which is sometimes small stereo speakers.

Form-Fitting

Back in the ancient times of personal computing—the mid-1980s—one size fit all. For that matter, one color fit all. But thankfully, the computer industry has shaken things up a bit, allowing people to choose their perfect PCs' sizes, shapes, processor speeds, and memory types.

Many PC manufacturers have moved beyond the traditional tower and desktop sizes. Towers typically come in full, midsize, and mini, but micro and compact towers are out there, too.

Although the various styles appear to change only case sizes, motherboards also come in different sizes to fit in smaller cases. As the space gets tighter, airflow and cooling become more important, necessitating such changes as moving add-in card slots away from the CPU or installing motherboards that allow unobstructed air flow across the CPU.

➤LET'S GET SMALL

Rarely seen in consumer models, the **full-tower** is typically used for servers or workstations, in which there is a need for many drives and slots. At 21 to 26 inches tall and positioned vertically, it's the largest tower available and accommodates up to four 5.25-inch and ten 3.5-inch drives, with extra room for sound card panels, front-bay port adapters, and more. An AT motherboard typically powers these towers, letting you add as many as five PCI slots and even some old ISA slots.

The **midtower** is smaller than a full tower but still has enough room for expansion. At 17 inches tall or so, it fits about four 5.25-inch bays and four or five 3.5-inch bays. This chassis usually houses an ATX.

The **mini-tower**—15 to 19 inches tall (or wide)—is a common form factor for business and consumer desktops. It's large enough to allow expansion but will still fit on or under most desks. A typical mini-tower fits about two 5.25-inch and four 3.5-inch bays, which is enough room for most drive needs. The motherboard here is typically a Baby AT or the newer ATX.

Smaller still are **micro-towers.** At 13 to 15 inches tall, this form factor limits expansion greatly, but if all you need are two hard drives and two optical drives, this is a very practical size. Its small footprint lets it fit in small spaces and on top of desks. As expected, smaller cases need smaller motherboards. A Mini ATX or Flex ATX are usually found here.

Slimline desktops, or **small form factor** (SFF) desktops, are popular sizes for business use. They are horizontal units about 3 to 5 inches high. Components are typically packed in with little, if any, expansion room left. This makes sense for businesses, as many do not upgrade or expand their systems. The NLX is the motherboard of choice in these cases, since it has a small footprint and uses a riser card for slot expansion.

Real-World Systems

($650 to $1,000): ABS Awesome 2300, Apple eMac, eMachines T3085, Gateway 510S, HP Pavilion a500y, IBM ThinkCentre A30, Polywell Poly 880NF2-MX, Velocity Micro Vector, WinBook PowerSpec 8342

H An **integrated graphics card** or a low-cost add-on card like the 128MB **nVidia GeForce FX 5200.** Cheaper integrated graphics solutions don't perform as well as discrete graphics cards. Low-cost add-on cards should be fine for day-to-day computing tasks and non-3D-intensive games.

I **Integrated AC '97 sound** on the motherboard. Although integrated sound cards can't offer the same sound quality as separate cards, they cost less and are sufficient for most users.

J Six **USB 2.0 ports.** At least two of the USB ports should be in the front of the chassis.

K A **wired or wireless keyboard** and **mouse.** Either type will work fine, with wireless equipment costing a bit more.

L A **17-inch CRT** or **15-inch LCD** is more than enough screen.

➤ NEW SHAPES AND SIZES

A new and growing form factor is the **compact** case. Like other small, square boxes built specifically for multimedia PC that sit next to TVs, compact cases are generally single-purpose. They are typically smaller than a toaster and can even fit in your hand.

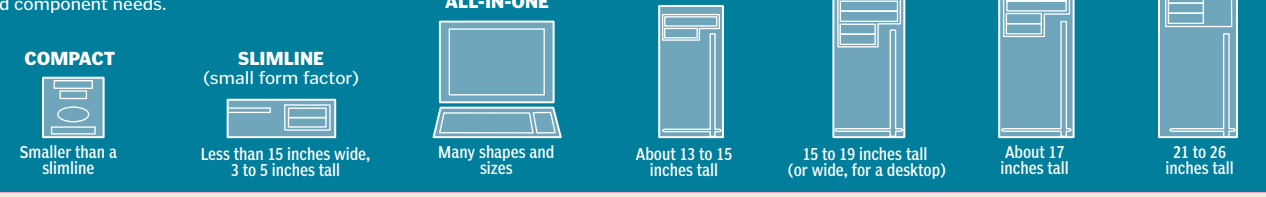
Some are meant for gamers, since they are easy to carry to LAN parties and can use the newest, fastest graphics card. Others are intended for corporate use as a single system shared by two employees. This lightweight form factor offers just enough space for large-capacity drives and the fastest graphics cards, as well as good air flow. A Baby ATX or a Micro ATX are the motherboards commonly found in these systems.

There's more to form factors than just case size. The **all-in-one** form factor—part of Apple's lineup since the first Macintosh systems—has long been popular with Mac users and is gaining popularity among PC users. An all-in-one is generally a feature-rich PC with the monitor (CRT or LCD), motherboard, CPU, and usually the drives rolled into one unit. PC manufacturers such as Gateway, MPC, and Sony offer all-in-one models.

For those who build their own systems, components are more important than chassis size. But for the rest of us, space can often be a deciding factor when choosing a desktop PC.—*Richard Fisco*

A Form for Every Function

The seven desktop form factors shown here are designed to meet both space and component needs.



Business PC

AS A SENIOR IT MANAGER in the Jersey City, New Jersey offices of electronics manufacturer Bel Fuse, Jonathan Klempner needs a desktop that handles everything from e-mail to high-end database apps. "I test software and do a lot of programming and network administration," he says. "I have to have a pretty beefy system."

When it came time to upgrade this spring, the 51-year-old Klempner chose a 3-GHz Dell Dimension with 2GB of RAM, a 128MB nVidia graphics card, a 250GB hard drive, and a DVD/CD-RW combo drive. You probably won't need as much memory or hard drive space, but you'll want Win XP Pro. And don't be overly concerned with the speakers or monitor. Klempner attached a 19-inch monitor and a pair of speakers he had lying around the office.—*CM*

Windows XP Pro. The only OS choice for business users, Win XP Pro has enhanced features and networking capability. The Remote Desktop feature alone is worth the upgrade price, as it allows IT techs to control your system remotely, a boon for simple troubleshooting calls. Win XP Pro is also required for network environments that use NT Domains for user and group management.

A An **AMD Athlon 64 3200+** or **3.2-GHz Intel Pentium 4 with SSE3 (Prescott).** Business users don't need a top-of-the-line processor, and a slower CPU will not have a noticeable effect on performance—and will save you at least $200.

B The **Intel 845G/845E, 865G/865GV** or **VIA chipset** (for AMD chips). Most business PCs use motherboards with mainstream chipsets such as these.

C A **120GB, 7,200-rpm ATA hard drive.** This hard drive should be more than enough for employees' storage and speed needs.

D A single **DVD±RW drive.** With their 4.7GB capacity, writable DVD drives are quickly supplanting tape and CD-R backup methods. DVD multiformat drives can also burn CD-R and CD-RW formats. If you don't need backup capability, go with a standard DVD drive or no optical drive at all.

E **Integrated graphics** or a **basic AGP card.** Most business PCs ship with integrated graphics, which is cost effective and performs well in a business environment.

F **Integrated 10/100/1,000 Ethernet** for connectivity (LAN or broadband).

G **Integrated AC '97 sound** on the motherboard. An integrated card has lower sound quality than a separate card but should be sufficient for most business users.

H **512MB of DDR266 or faster SDRAM.** 512RAM is becoming standard on desktops, especially Win XP PCs.

I Two **speakers** and a **subwoofer.** Unless your business is a recording studio, business users probably don't need a subwoofer, but most vendors toss one in for free or a nominal fee as part of a lower-end speaker package. Speakers built into the LCD panel work fine for the office, too.

J A **19-inch CRT** or **17-inch SXGA (1,280-by-1,024) LCD.** A 19-inch CRT is worth the extra expense, though some major vendors ship PCs with 17-inch LCDs for reasonable prices. If space is limited, go for a 15-inch LCD over a 15- or 17-inch CRT.

K An **802.11g PCI** or **USB wireless solution.** A wireless solution is an option for businesses that don't want to wire the office with costly Category 5 cable.

L Perfect add-on: A **multifunction printer.** A single system to print, fax, scan, and copy, such as the HP OfficeJet d135, is ideal for home or small-office setups.

M Six **USB 2.0 ports** and one **FireWire port.** Ports are important for connecting devices like printers and scanners.

N A **wired or wireless keyboard** and **mouse.** Either setup will do. A wireless setup adds spatial flexibility, but it is an added expense and probably not necessary for most business users.

Management software. Businesses of sufficient size (between 50 and 100 employees) may want to install **network management tools,** like Dell's OpenManage or IBM's Director. These packages can help IT departments deploy software easily and troubleshoot problems before they become catastrophic. Management software can come pre-installed on desktops, depending on your arrangement with the manufacturer. (For more information, see "Better Corporate PCs," *PC Magazine,* April 6, 2004.)

Real-World Systems ($1,300 to $2,300): ABS Explorer 1500, Apple iMac (17-inch), Dell Dimension 4600, Gateway 710S, Compaq Presario SR1000Z, IBM ThinkCentre S50, MPC ClientPro 345, Polywell Poly 865PE, Velocity Micro Voyager Pro, WinBook PowerSpec 9261

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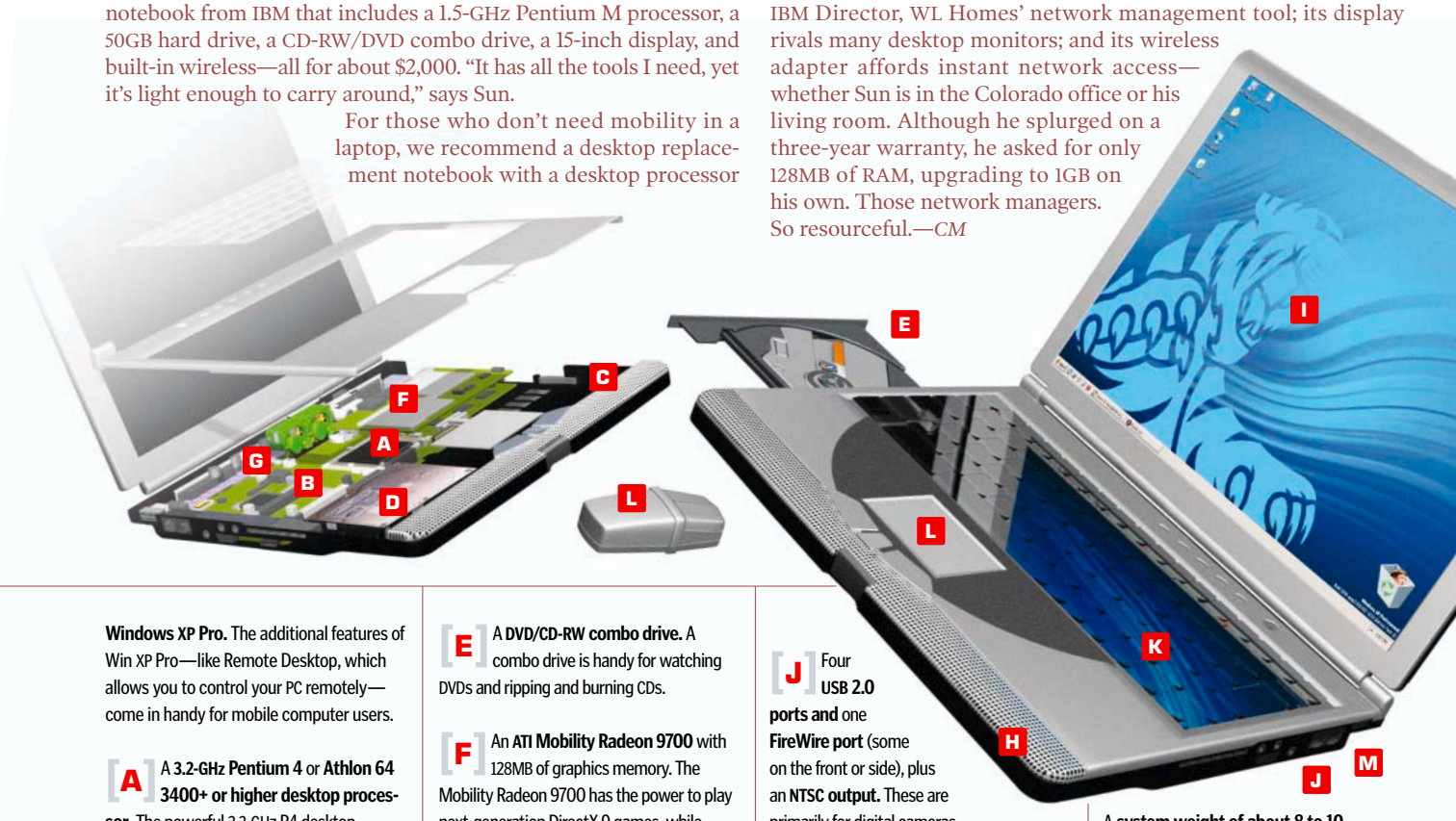
Desktop Replacement

MIKE SUN NEEDS A LOT OF POWER—and he needs it to go. Sun, 35, is the network manager at WL Homes, which has multiple offices out West. Sun recently upgraded to a top-of-the-line sub-7-pound notebook from IBM that includes a 1.5-GHz Pentium M processor, a 50GB hard drive, a CD-RW/DVD combo drive, a 15-inch display, and built-in wireless—all for about $2,000. "It has all the tools I need, yet it's light enough to carry around," says Sun.

For those who don't need mobility in a laptop, we recommend a desktop replacement notebook with a desktop processor (since most desktop replacement notebooks rarely leave the desk) and a larger hard drive. But overall, Sun has a more than competent notebook. It's powerful enough to run demanding apps, including IBM Director, WL Homes' network management tool; its display rivals many desktop monitors; and its wireless adapter affords instant network access—whether Sun is in the Colorado office or his living room. Although he splurged on a three-year warranty, he asked for only 128MB of RAM, upgrading to 1GB on his own. Those network managers. So resourceful.—*CM*



Windows XP Pro. The additional features of Win XP Pro—like Remote Desktop, which allows you to control your PC remotely—come in handy for mobile computer users.

A A **3.2-GHz Pentium 4** or **Athlon 64 3400+ or higher desktop processor.** The powerful 3.2-GHz P4 desktop processor offers very good performance but reduces battery life and adds weight.

B The **Intel 855 chipset** (currently the only chipset that supports the Pentium M) or the included chipset: the SiS 650 (Pentium 4), for example, or Via K8N800 (Mobile Athlon 64) chipset.

C **512MB of DDR266 SDRAM.** We recommend 512MB, especially for Win XP PCs or memory-hungry applications.

D An **80GB, 5,400-rpm ATA hard drive.** This hard drive has more than enough speed and storage for MP3s, family photos, and household bookkeeping.

E A **DVD/CD-RW combo drive.** A combo drive is handy for watching DVDs and ripping and burning CDs.

F An **ATI Mobility Radeon 9700** with 128MB of graphics memory. The Mobility Radeon 9700 has the power to play next-generation DirectX 9 games, while power management eases drain on the battery. If you won't be playing 3D games, integrated graphics should be sufficient.

G **Integrated AC '97 sound** on the motherboard. An integrated sound card is an economical solution that is sufficient for most users.

H **Built-in speakers.** These should be unobtrusive, yet still include hardware volume and mute buttons.

I A **15-inch or larger XGA (1,024-by-768) LCD.** Since a desktop replacement will rarely leave your desk, opt for a larger screen.

J Four **USB 2.0 ports and** one **FireWire port** (some on the front or side), plus an **NTSC output.** These are primarily for digital cameras, mice, MiniDV camcorders, and the like.

K A **19-mm–pitch keyboard.** This is also known as a full-size keyboard. Anything smaller is awkward for typing.

L **Dual pointing devices.** You should opt for a **touch pad** and a **pointing stick.** And adding a mouse to the notebook gives you even more navigation choices.

M **Integrated 10/100/1,000 Ethernet** for connectivity (LAN/broadband).

A **built-in 802.11g wireless solution** is handy for those who have or plan to set up a wireless network.

A **system weight of about 8 to 10 pounds.** You can certainly buy notebooks that weigh less, but desktop replacements focus more on performance than mobility.

For greater mobility but the same feature set as a DTR notebook, look to a **mainstream notebook** with the following components: Win XP Pro; 1.8-GHz or higher Pentium M (Dothan) or AMD Mobile Athlon XP-M 2800+ or higher processor; 60GB or larger; 7,200-rpm hard drive; 512MB or more of memory; 128MB ATI Radeon 9700 graphics card; DVD±RW drive; built-in 802.11a/g wireless solution or dual-band 802.11g (for the Centrino platform); three or more USB 2.0 ports; one FireWire port; SD slot; 14-inch or larger UXGA screen; dual pointing devices.

Real-World Systems ($1,700 to $4,000): ABS Mayhem G2, Apple PowerBook G4 (17-inch), eMachines M6809, Gateway M675XL, IBM ThinkPad T42P, MPC TransPort X3000, Polywell PolyNote 2500X, Velocity Micro NoteMagix B50, WinBook W360

Our contributors: **Cade Metz** is a senior writer at *PC Magazine*. **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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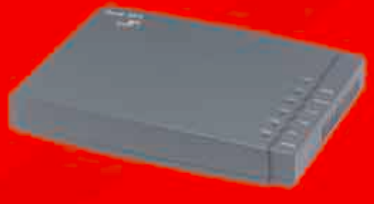

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Build Your Perfect PC

INSIDE

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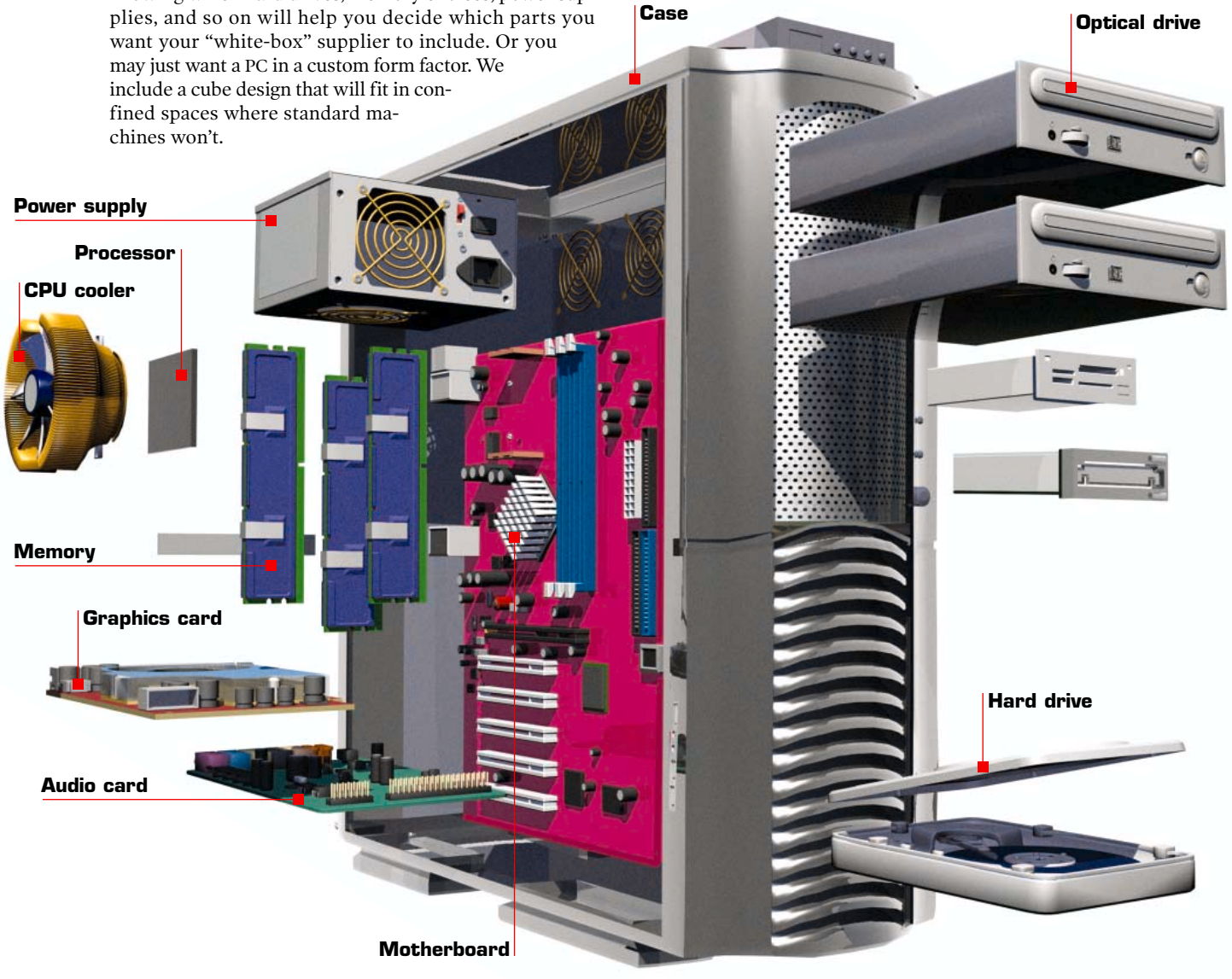
With retail, direct, and online prices so low, why would anyone want to build his own PC? There are plenty of good reasons to engage in this seemingly irrational behavior. First, you may want a fully loaded machine for gaming and want to handpick optimum components for your performance needs. Second, if you're an IT person at a small to medium-size company, knowing which hard drives, memory choices, power supplies, and so on will help you decide which parts you want your "white-box" supplier to include. Or you may just want a PC in a custom form factor. We include a cube design that will fit in confined spaces where standard machines won't.

But the biggest reason? *PC Magazine* readers are technology enthusiasts, who enjoy the challenge and sense of accomplishment that comes from building a PC. Once you've built one yourself, you'll have a greater understanding of what goes on under the hood, and you'll know how and what to fix if things go wrong.

When you choose your own parts, don't cut corners with slightly cheaper components—something low-cost



PC vendors do to increase profit margins. And when you build for yourself, you know that your PC isn't crammed with software and services that you have no use for, such as online services when you already have broadband.

Here we focus on choosing the best parts for your creation. For a step-by-step assembly tutorial, you can go to our Web site at *www.pcmag.com/buildorbuy* or see "Build or Buy" in our issue of September 16, 2003. You can also visit *www.extremetech.com*, which regularly covers the art of putting together various kinds of computers. Instead, we take you through the most important part considerations when building four types of machine, ranging from a fire-breathing gaming PC to a modest budget PC, and visiting home theater and compact computers in between.

We compared the performance results of our home-brew machines with the Editors' Choice machines most closely resembling them. As you'll see, you don't have to give up performance when you build your own. Our gaming machine actually outperformed prebuilt PCs that cost more.

Yes, it may take more of your time than simply picking up a box at your local computer store. And it may cost about the same, but the bragging rights you'll earn are priceless.—*Michael W. Muchmore*

Gaming PC

The big advantage of building your own system is that you can choose whichever parts you desire. For our absolute screamer of a gaming system, we began with the fastest CPU we've seen for PC games to date—the AMD Athlon 64 FX-53, costing about $770 (street). As an alternative for multimedia applications and gaming, do-it-yourselfers may want to consider a 3.4-GHz Intel Pentium 4 Extreme Edition, which features 2MB of level 3 cache and costs a cool $1,000. The P4 offers speedy performance for lots of applications and excellent multitasking, but it lags slightly behind the FX-53 in gaming.

A fast processor deserves a fast motherboard, so we slipped the FX-53 into an Asus SK8V socket 940 motherboard, which uses the Via K8T800 chipset. For the Intel processor, we've found the Asus P4C800-E Deluxe to be the most robust motherboard for the P4 processor line.

We wrapped the motherboard into a Koolance PC2-650BK chassis, which features a liquid-cooling system. This let us overclock the processor from 2.4 GHz to 2.53 GHz, and it ran quietly to boot. The cooling system is built into a steel chassis that houses the heat exchanger, control circuitry, and coolant reservoir. A polished copper heat sink sits on top of the CPU, with attached coolant tubes. The blue coolant circulates over the hot CPU and back through the heat exchanger. Even during intensive gaming, it remained quiet and well chilled.

If you don't like the idea of fooling around with a liquid-cooled system, the Antec P160 is a great case choice, but you'll need to buy a Coolermaster KK8-7152A CPU cooler (if you're running the FX-53) or a Vantec Aeroflow for the P4 CPU.

A fast gaming system needs both fast graphics hardware and speedy memory. The graphics processor is none other than the spiffy, new nVidia GeForce FX 6800 Ultra. The 6800 Ultra offers astounding 3D game performance, plus support for Microsoft's emerging DirectX Shader Model 3 API standard. The nifty new ATI Radeon X800, with comparable performance, is a worthy alternative. The latter lacks support for Shader 3.0, but you won't find many games that use this yet.

For system memory, because the Athlon 64 FX-53 uses registered (buffered) DDR memory, we chose the Corsair TwinX, which packages a pair of 512MB, low-latency, registered memory modules. For an Intel P4

Gaming PC Part Choices

		Street price
PROCESSOR	**AMD Athlon 64 FX-53** *www.amd.com*	**$770**
	Intel P4 Extreme Edition (3.4 GHz) *www.intel.com*	$1,150
	AMD Athlon 64 3400+	$400
MOTHERBOARD	**Asus SK8V** *www.asus.com*	**$190**
	Asus P4C800-E Deluxe	$180
	Asus K8V	$110
GRAPHICS CARD	**nVidia GeForce 6800 FX Ultra** *www.nvidia.com*	**$500**
	ATI Radeon 9800 XT *www.ati.com*	$410
	nVidia GeForce FX 5950 Ultra	$390
CASE	**Koolance PC2-650BK** *www.koolance.com*	**$240**
	Antec P160 *www.antec-inc.com*	$120
	Antec Sonata	$90
POWER SUPPLY	**Antec TrueControl 550**	**$120**
	Antec TruePower 480	$100
	Vantec Stealth 470A *www.vantecusa.com*	$85
CPU COOLER	**Koolance CPU-300-H06 with Athlon64 Kit**	**$50**
	Cooler Master KK8-7152A *www.coolermaster.com*	$18
	Vantec Aeroflow (for P4)	$25
HARD DRIVE	**Western Digital WD740 (2 in RAID 0)** *www.wdc.com*	**$430**
	Hitachi Deskstar 7K250 *www.hitachigst.com*	$300
OPTICAL DRIVE	**Sony DRU-530A DVD+RW/-RW Drive** *www.sonystyle.com*	**$180**
	Plextor PX-708A *www.plextor.com*	$180
AUDIO CARD	**Creative Labs Audigy 2 ZS Platinum** *www.creativelabs.com*	**$160**
	Creative Labs Audigy 2 ZS Gamer	$130
	Creative Labs Audigy 2 OEM	$70
MEMORY	**512MB Corsair XMS3200 (2)** *www.corsairmicro.com*	**$290**
	Kingston HyperX DualPack *www.kingston.com*	$270
OPERATING SYSTEM	**Windows XP Professional** *www.microsoft.com*	**$140**
	Windows XP Home	$85
TOTAL COST		**$3,220**

Bold type denotes parts we used.

At about $3,000 for parts, our home-built gaming PC outperforms the reigning *PC Magazine* Editors' Choice, the Voodoo PC Rage d:100. This is due largely to our inclusion of the state-of-the-art nVidia GeForce FX 6800 Ultra graphics processor. We also spared no expense in choosing a Koolance enclosure, which, with its water-cooling system for the CPU, allowed us to overclock our AMD Athlon 64 FX-53 processor—also state-of-the-art.

processor, we suggest the Kingston HyperX DualPack, which is not registered.

Storage chores are handled by a pair of Western Digital WD740 Raptor hard drives arranged in a RAID 0 (striped) configuration for fastest disk performance. The optical drive of choice is the Sony DRU-530A, a multiformat DVD rewriter that now supports both 8X DVD+R and -R media.

Rounding out the system is a Creative Labs Sound Blaster Audigy 2 ZS Platinum card. You could save some money by dropping down to the same company's Audigy 2 ZS Gamer or even more with the Audigy 2. The Gamer throws in a tempting bundle of game software, but you lose the front I/O panel. On the plain Audigy 2 you get 6.1-channel sound, instead of the 8.1 channels on the other two cards.

These components deliver just about the speediest gaming rig you can build. And all told we spent only a little over $3,000—considerably less than *PC Magazine*'s Editors' Choice gaming PC. The machine aced our gaming tests. We also ran numerous additional games, all yielding smooth frame rates at high resolutions. And we could run most games with 4X anti-aliasing enabled. Standard applications perform on a par with other similarly configured systems, so it's no slouch there either.—*Loyd Case*

Home Theater PC

The PC and consumer electronics (CE) industries have been converging—some would say colliding—for several years now. Nowhere is this more apparent than in home theater PCs (HTPCs). An HTPC system plays and records TV shows, stores media of every type, and can even play some 3D games. It also has several stiff requirements: It needs to be fast yet quiet, versatile yet stable, and powerful yet affordable. Ours cost under $1,700 for parts and still satisfies those criteria.

We started out with Intel core components, for their performance and reliability. The 2.8-GHz Intel Pentium 4 is a solid workhorse CPU that can ably handle media encoding and decoding. The Intel D865Perl motherboard we chose includes on-board FireWire for quickly connecting your digital camcorder.

Disk capacity is key for storing and delivering huge media files. Here, we went with the Western Digital Caviar SE, a 250GB Serial ATA drive, which offers room for plenty of recorded TV programs and home videos. The Maxtor DiamondMax Plus 9 250GB Serial ATA is another drive choice that could serve our purposes. For reading and writing movies and music, we chose the Plextor PX-708A optical drive, which can record at 8X speeds to DVD+R media rated for only 4X burning. The Sony DRU-530A DVD burner is another worthy option that handles most DVD flavors.

Television and PVR duties fall to the Hauppauge WinTV-PVR-250MCE, which delivers very good standard-definition TV picture quality. The ATI All-in-Wonder Radeon 9600 XT would be a good choice here too, but we found that Hauppauge produces better TV image quality. It also has an FM radio tuner, so you can play and record incoming radio broadcasts. Note that our choice doesn't deliver HDTV signals: There are several over-the-air (OTA) HDTV cards available, such as the MIT MyHD MDP-120 card. These let you watch

Our contributers: **Loyd Case** is a technical director, **Dave Salvator** is a senior technology analyst, and **Jason Cross** is a technology analyst for ExtremeTech. Associate editor **Michael W. Muchmore** was in charge of this story.

A home theater PC's success hinges on its ability to store and transfer huge amounts of data, an interface that works from the couch, a good TV tuner card, and a size that allows it to fit into your component rack.

HDTV programming on your PC, but the interface and PVR software we need does not support HDTV, and the PVR applications bundled with these HDTV cards are still rough around the edges.

For the graphics subsystem, we went with the midrange ATI Radeon 9600 XT, which offers a great combination of price and performance. It's not ATI's top-of-the-line card, but it still makes most game play enjoyable. For audio chores, we selected the Creative Labs Sound Blaster Audigy 2 ZS—the only THX-certified sound card available today. It supports most popular multichannel audio formats, including 6.1 formats such as Dolby Digital EX and DTS-ES. The card also includes a DVD Audio player application that uses the system's DVD drive to deliver audiophile-quality sound.

The most likely OS choice for a media PC of course would be Microsoft's Windows XP Media Center Edition, but that's only available in prebuilt systems. Our system demands a user interface that you can read on a TV screen across the room. We considered Home Media Networks' ShowShifter, ATI's Multimedia Center, and Frey Technologies' SageTV, but decided to use SnapStream Media's Beyond TV 3. It not only provides a "10-foot user interface" but ably handles all personal video recorder (PVR) chores. As a TiVo-like PVR, Beyond TV offers commercial skip and a free electronic program guide (EPG). Its streaming video server lets you watch recorded programs on any PC on your home network. Beyond TV even supports remote programming using a WAP-enabled phone, so you can set up a recording while you're out and about.

A living-room–based PC requires cordless controls, and a TV-like remote control greatly simplifies matters. We chose the Gyration Ultra Cordless mouse, which has a 3D gyroscopic sensor that allows you to move the cursor by moving the mouse through the air. Unlike past attempts at this technology, the Gyration works wonderfully and takes only a few minutes to master. As a TV-like remote control, the ATI Remote Wonder can send commands to the PC from just about any room in the house. Having both the Gyration keyboard/mouse and the ATI Remote gives you full control of your home theater system.

Housing the whole affair is the Antec Overture case, which fits nicely into your A/V component rack. Compact cases like those made by Shuttle are an interesting alternative, but they won't fit into the rack. The Overture's fans run quietly, and front-mounted USB and FireWire ports offer easy access.

Our homemade home theater PC puts extensive audio and video content at your fingertips, and it can act as a media furnace, serving content up to other machines on your home network. Taking control of your media collection requires the right tools for the job, and this sysem is a great place to start.—*Dave Salvator*

Home Theater PC Part Choices

		Street price
PROCESSOR	**Intel Pentium 4 (2.8 GHz)** *www.intel.com*	**$190**
	AMD Athlon XP 2800 *www.amd.com*	$130
MOTHERBOARD	**Intel D865Perl**	**$90**
	ASUS A7N8X-E Deluxe *www.asus.com*	$110
GRAPHICS CARD	**ATI Radeon 9600 XT** *www.ati.com*	**$170**
	ATI All-in-Wonder Radeon 9600 XT	$270
CASE	**Antec Overture** *www.antec-inc.com*	**$110**
TV TUNER CARD	**Hauppauge WinTV-PVR-250MCE** *www.hauppauge.com*	**$130**
	ATI TV Wonder Pro	$60
	MyHD MDP-120 *www.digitalconnection.com*	$280
HARD DRIVE	**Western Digital Caviar SE (250GB)** *www.wdc.com*	**$210**
	Maxtor SATA Ultra L01M250 *www.maxtor.com*	$200
OPTICAL DRIVE	**Plextor PX-708A** *www.plextor.com*	**$180**
	Sony DRU-530A *www.sonystyle.com*	$180
KEYBOARD/MOUSE	**Gyration Ultra Cordless GP170-007** *www.gyration.com*	**$130**
	Belkin F8E815-BNDL Wireless *www.belkin.com*	$35
REMOTE CONTROL	**ATI Remote Wonder**	**$50**
	StreamZap PC Remote *www.streamzap.com*	$35
PVR SOFTWARE	**Snapstream BeyondTV 3** *www.snapstream.com*	**$60**
	ShowShifter *www.showshifter.com*	$60
DVD SOFTWARE	**Cyberlink PowerDVD 5** *www.gocyberlink.com*	**$40**
	Intervideo WinDVD 5 *www.intervideo.com*	$40
AUDIO CARD	**Creative Labs Audigy 2ZS** *www.creativelabs.com*	**$85**
MEMORY	**Corsair PC3200 (512MB)** *www.corsairmicro.com*	**$180**
	Mushkin Basic Green PC3200 (512MB) *www.mushkin.com*	$100
OPERATING SYSTEM	**Windows XP Home Edition** *www.microsoft.com*	**$85**
TOTAL COST		**$1,710**

Bold type denotes parts we used.

Compact PC

One of the hottest trends among computer enthusiasts these days is the compact computer, also known as the "small-form-factor PC." While diminutive computers have been around for quite some time, only in the last year or two have these small, cube-shaped PCs really taken off.

The company most responsible for this trend is Shuttle Computer whose XPC line of small cube-shaped PCs caught on with PC hobbyists and gamers. These are on-your-desk rather than under-your-desk PCs; with footprints of less than 1 foot by 8 inches, they're smaller than breadboxes. Their size makes them easy to transport to LAN gaming parties and ideal as second

home PCs. Best of all, you don't have to sacrifice performance.

Although some boutique PC manufacturers like Falcon Northwest and Voodoo PC have begun selling complete systems based on the small-cube chassis, they are mostly sold as bare-bones systems, including only the case, power supply, motherboard, and CPU cooler.

We took the latest bare-bones box from Shuttle, the SB75S Limited Edition, and built a fairly powerful system based on it to show just how much computer you can easily fit into a such a small space. The SB75S includes a custom motherboard built around the Intel 875P chipset and ICH5 south bridge. It offers top performance for P4 CPUs, two Serial ATA ports (in addition to a standard parallel ATA), and gigabit Ethernet. The box itself is quite handsome, with a nice metallic pearl-white finish, elegant lines, and a simple row of buttons and lights in the front. Even Apple would be proud of its looks. It also includes a 250W power supply, which may seem underpowered, but these small systems use far less power than their full-size ATX brethren. And we had no problem running fairly high-end hardware.

An Intel 3.0-GHz Pentium 4 forms the core of our system, providing plenty of CPU power for demanding applications. We didn't have to buy a CPU cooler to go with the box: Shuttle's PC cases include a custom heat pipe that transfers heat to a large, rear fan that cools the entire system. To this we added a 128MB ATI Radeon 9800 video card, perhaps the best bang for the buck in graphics cards available these days. At well under $200, it may not be as fast as the latest $500 card, but it certainly has more than enough juice to run all the latest games without any major compromises.

Compact PC Part Choices

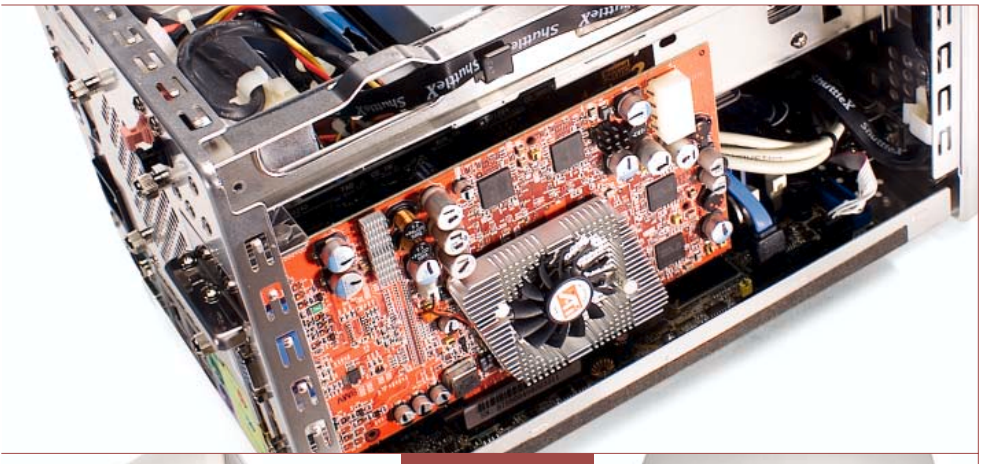
		Street price
PROCESSOR	**Intel P4 (3 GHz)** *www.intel.com*	**$230**
	AMD Athlon 64 3200+ *www.amd.com*	$280
	AMD Athlon XP 3000+	$140
MOTHERBOARD	**Shuttle FB75 (integrated)** *www.shuttle.com*	**N/A**
	Shuttle nForce3 150 (integrated)	N/A
	Chaintech 7NIL1-Summit *www.chaintech.com.tw*	$60
GRAPHICS CARD	**ATI Radeon 9800 (128MB)** *www.ati.com*	**$160**
	Gigabyte GeForce FX 5900 (128MB) *www.gigabyte.com*	$190
	Sapphire Radeon 9800 (256MB) *www.sapphiretech.com*	$290
CASE	**Shuttle SB75S** *www.shuttle.com*	**$360**
	Shuttle SN85G4	$310
	Antec Aria *www.antec-inc.com*	$110
CPU COOLER	**Shuttle (integrated)** *www.shuttle.com*	**N/A**
	Cooler Master DI4-7H53D Cooler *www.coolermaster.com*	$8
HARD DRIVE	**Seagate Barracuda (160GB)** *www.seagate.com*	**$120**
	Maxtor DiamondMax Plus 9 (250GB) *www.maxtor.com*	$200
	Western Digital Caviar 1200JB (120GB) *www.wdc.com*	$90
AUDIO CARD	**Creative Labs Audigy 2** *www.creativelabs.com*	**$70**
OPTICAL DRIVE	**Plextor Plexwriter Premium** *www.plextor.com*	**$90**
	Lite-On LDW-811S DVD+RW *www.liteon.com*	$100
MEMORY	**256MB Kingston DDR400 (2)** *www.kingston.com*	**$110**
	512MB Crucial DDR400 (2) (1GB total) *www.crucial.com*	$220
OPERATING SYSTEM	**Microsoft Windows XP Home Edition** *www.microsoft.com*	**$85**
	Microsoft Windows XP Professional Edition	$140
TOTAL COST		**$1,225**

Bold type denotes parts we used. N/A—Not applicable: The component is not sold separately.

The Shuttle XPC systems, and most compact PCs like them, have only two slots—one AGP and one PCI. Though we certainly could have used the integrated audio, we decided to improve sound quality and compatibility greatly by installing a Creative Labs Sound Blaster Audigy 2 card in the PCI slot.

You've got plenty of choices when it comes to drives; we chose a nice 160GB Seagate Barracuda Serial ATA hard drive and one of the best CD-RW drives we could find, the Plextor Plexwriter Premium. Certainly you could opt for different hard drive capacity; the box has room for two 3.5-inch internal hard drives, and even supports Serial ATA RAID configurations. Likewise, almost any 5.25-inch optical drive would be appropriate, from basic CD-ROMs to top-of-the-line 8X DVD+RWs. We took a middle-of-the-road option on both fronts.

All that hardware gets a bit cramped in such a little box, but the 250W power supply has no trouble providing enough juice for it, and the built-in cooling system doesn't let it overheat. The total bill? Without monitor, putting together this little gem should cost you about $1,200. Performance is quite good, not only in business and content creation applications but also in 3D games. See? You can have it all—and put it in an 11- by 8- by 7-inch box.—*Jason Cross*



More and more people are discovering that you don't have to give up computing power when you choose a small alternative like our compact PC using Shuttle's XPC case.

Budget PC

Our goal for this machine was simple: Spend the least money necessary to build a PC with decent performance for the home or office. We wanted the result to have enough power that we wouldn't need to upgrade it anytime soon. The main challenge we faced was finding cheap parts to meet our criteria.

To stay within our budget of $700 or less and get the most power for our money, we chose an Athlon XP 3000+ CPU with a 400-MHz bus speed. We installed the processor in a motherboard based on the excellent nVidia nForce2-400 Ultra chipset. This combination delivers enough CPU horsepower to rip through the most demanding

You'll usually get a better budget system when you build it yourself, because you won't skimp on parts—like the graphics card—the way budget PC makers usually do.

Budget PC Part Choices

		Street price
PROCESSOR	**AMD Athlon XP 3000+ (400 MHz)** *www.amd.com*	**$150**
	Intel P4 2.6C *www.intel.com*	$150
MOTHERBOARD	**Shuttle AN35N** *www.shuttle.com*	**$60**
	MSI PT880 Neo *www.msi.com.tw*	$60
GRAPHICS CARD	**Sapphire Radeon 9600 (128MB)** *www.sapphiretech.com*	**$130**
	Chaintech GeForce FX 5700 *www.chaintech.com.tw*	$130
CASE	**Antec 3700 AMB** *www.antec-inc.com*	**$45**
	Enlight Corp. En-72500AZB *www.twe.enlightcorp.com*	$40
CPU COOLER	**Cooler Master CP5-6J31C Cooler** *www.coolermaster.com*	**$7**
HARD DRIVE	**Western Digital WD800JB** *www.wdc.com*	**$65**
	Maxtor DiamondMax 9 (120GB) www.maxtor.com	$70
OPTICAL DRIVE	**Lite-On 16X CD-RW/DVD-ROM** *www.liteon.com*	**$45**
	Lite-On LDW-411S DVD+RW Writer	$80
	Sony CRX230E *www.sony.com*	$32
AUDIO CARD	**Integrated**	**N/A**
	Creative Labs Sound Blaster Live! 5.1 *www.creativelabs.com*	$30
	Creative Labs Audigy	$60
MEMORY	**Kingston 256MB DDR400 (2)** *www.kingston.com*	**$110**
	PNY 256MB DDR333 (2) *www.pny.com*	$100
	Kingston 128MB DDR333 (2)	$60
OPERATING SYSTEM	**Windows XP Home Edition** *www.microsoft.com*	**$85**
TOTAL COST		**$697**

Bold type denotes parts we used. N/A—Not applicable: The component is not sold separately.

Top Tips for Buying PC Parts

Shopping for just the right gear you need to build your own PC takes time and care. The trick is to figure out the best sources for parts—whether local or mail-order. You also have to decide whether to buy all equipment from the same dealer. Here are a few pointers on this important phase of the project.

- **Use the Web.** You can almost always find lower prices through careful Web shopping.
- **Develop a relationship** with the "white-box" computer shops in your area. Sometimes you can get a discount that comes close to the better prices you find on the Web, and it's much more convenient.
- **Use price-searching Web sites.** Note that some prices are artificially low, but you should still get a good idea as to the best prices. Sites like PriceGrabber (*www.pricegrabber.com*) and PriceWatch (*www.pricewatch.com*) let you sort by price, reseller, or product.
- **Check the satisfaction ratings** of the Web outlets through services like ResellerRatings (*www.resellerratings.com*) before you place your order. Cheapest isn't always best if the service isn't up to par.
- **Try to aggregate your buying** to minimize total shipping costs. Some sites will even offer free shipping for large orders.
- **Take advantage of software discounts.** Part vendors will often sell you discounted copies of Windows and other key software when you buy a major part such as a CPU.
- **Understand shipping and handling costs.** Some lowball resellers use high shipping costs to recoup profits.
- **Buy OEM versions** of hardware. These are the same as the retail version—usually without the accessories or software—but they can save you money. Beware: OEM processors often have substantially reduced warranties, and they often don't ship with CPU coolers.
- **Watch out for restocking fees!** If you have to return a defective part, the shipping charges will usually be your responsibility. Some stores charge as much as 15 percent to restock a returned item that's not defective. Unscrupulous outlets even charge a restocking fee for exchanging a defective unit.—*LC*

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BENCHMARK TESTS

Build vs. Buy

To benchmark-test our creations, we pitted the gamer and budget PCs against our Editors' Choice–winning machines in those categories. We don't include results for the home theater PC, because the standard benchmark tests don't measure the tasks this kind of machine is designed for. And because we don't have a compact PC comparable to the one we assembled, we just present its scores alone.

Our high-end gaming demon fared favorably on gaming tests compared with the top-performing Editors' Choice gaming machine, the Voodoo PC Rage d:100. We tested the games at 1,024-by-768 resolution with 2X anti-aliasing and 2X anisotropic filtering enabled.

Though the Voodoo bested our system slightly on the Winstone tests, in game performance our machine took the laurels. We attribute this primarily to our use of the new nVidia GeForce FX 6800 Ultra graphics processor. The Voodoo's overclocked 3.4-GHz P4 Extreme Edition CPU helped it on business tests, but our AMD Athlon 64 FX-53 pumped up gaming performance.

Our budget PC performed a little better than the eMachines T2865. Chalk that up to a slightly faster processor, faster memory, and a superior graphics processor. The eMachines system has an edge over our system, with twice the hard drive space and a DVD+RW drive. But performance and graphics makes ours a better long-term solution.

High scores are best. Bold type denotes first place within each category.	Business Winstone 2004	Multimedia Content Creation Winstone 2004	PCMark04 Pro (CPU)	3DMark03 Pro	Serious Sam: The Second Encounter (fps)	Tom Clancy's Splinter Cell (fps)
GAME PCs						
PC Magazine Labs–built gaming PC	24.2	33.5	4,320	**12,616**	**172**	**83**
Voodoo PC Rage d:100	**25.8**	**35.1**	**5,556**	5,431	152	56
COMPACT PC						
PC Magazine Labs–built compact PC	22.5	28.7	N/A	N/A	N/A	N/A
BUDGET PC						
PC Magazine Labs–built budget PC	**21.3**	**25.7**	N/A	N/A	N/A	N/A
eMachines T2865	20.1	24.1	N/A	N/A	N/A	N/A

We did not test home theater PCs. N/A—Not applicable: We did not run the test on this machine.

applications out there today. A P4 is a better choice if you need to do a lot of video encoding, but for most other applications, a similarly priced Athlon is faster.

We paired our processor with 512MB of DDR400 memory—perhaps a bit much for a cheap business PC, but the performance boost is noticeable and welcome. If you want to shave another 50 bucks off your system price, you can trim this down to 256MB of DDR memory rated at 333 MHz.

To house it all, we chose a charcoal-gray Antec 3700AMB—one of our favorite inexpensive PC cases. It's rugged, easy to work on, and looks much better than a generic beige tower. The box uses a large, slow-turning 120-mm exhaust fan and has rubber grommets on the hard drive mounts, both of which help keep noise down. At under $50, including 350-watt power supply, it's a steal.

Speaking of hard drives, the 80GB Western Digital 800JB may not be the newest model around, but it has the 8MB cache and 7200-rpm rotational speed to perform well, and the price is right. The same could be said of our choice of optical drive, the Lite-On LTC-48161H. This is a combination DVD-ROM reader and CD-RW burner that costs less than a video game yet performs competently. The ability to burn DVDs would be a nice plus, but that's too expensive for our budget system. Why not just go with a plain CD-RW drive? Because it doesn't save you that much money.

We could have saved a few dollars on the video card by choosing an nVidia GeForce 4 MX or by sticking with integrated graphics, but we chose the ATI Radeon 9600 Pro for good reasons. It supports the Pixel and Vertex Shader 2.0 standards in DirectX 9. That's important now for playing games at home, but it also means this PC will be able run the 3D graphics and animation in Microsoft's Aero Glass interface, slated for future versions of Windows. Cheaper video cards can do this, but their performance leaves much to be desired. The 9600 Pro, at around $125, won't require you to upgrade again this fall just to play the latest games.

Instead of shaving off a few more dollars with substandard graphics—a common practice in almost all store-bought machines in this price range—we decided to make up the difference by sticking with integrated audio. The Shuttle AN35N motherboard we used includes the AC'97 audio codec provided by a Realtek ALC650 chip. Although it offers 5.1 channels, the sound from integrated audio tends not to be quite as clear as that from a dedicated sound card, so 3D sound-effects in games will suffer. In the end, high-end sound is a luxury we can do without.

So there you have it: a PC that doesn't cut corners and is both a solid home and future-proofed business machine for just over $600 in parts (plus shipping). Round out the system with a decent keyboard, mouse, monitor, and speakers and you should still be well under $1,000.—*JC*

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1x
2x
3x
4x
6x
8x
10x
12x

SUPER ZOOMS

Get closer to the action with these powerful yet affordable cameras.

By Daniel Grotta and Sally Wiener Grotta
Photography by Thom O'Connor

Everyone wants close-ups of their kids sliding home, eagles soaring overhead, or performers' faces from 35 rows away. Unfortunately, the short optical zooms (typically 3X or 4X) on most point-and-shoot digital cameras don't get very up close and personal. That's where superzooms come in. Defined here as cameras with 10X or greater optical zoom, these popular—and surprisingly small—shooters can give you telephoto abilities that only pros can afford in film photography.

THE DIGITAL ADVANTAGE

Superzooms use digital sensors smaller than 35-mm film; the lenses required to cover this smaller sensor real estate are smaller than comparable film lenses. Consider the Panasonic Lumix DMC-FZ10, which has a native focal length of 6 to 72 mm, equivalent to a 35- to 420-mm lens on a 35-mm film camera—an impressive 12X optical zoom. It's also amazingly fast: f/2.8 at 420 mm (faster lenses require less light).

While independent manufacturers sell 10.7X (35-mm equivalent: 28 to 300 mm) zoom lenses for film and digital SLR (single lens reflex) cameras for about $300, these have maximum apertures of f/6.3 at telephoto—far slower than the lenses on the cameras reviewed here. Canon and Nikon sell 400-mm f/2.8 telephoto (nonzoom) lenses for their SLRs for over $6,000; these weigh about 10 pounds. By contrast, none of the cameras reviewed here weighs over 20 ounces (lens, body, batteries, and all), and all cost less than $600.

SPEED MATTERS

Why does lens speed matter? Because the more light a lens gathers, the less time it needs to keep the shutter open for proper image exposure. This is especially important at maximum telephoto, because the closer you zoom, the harder it is to hold the camera steady for sharp pictures. The slowest shutter speed at which most people can shoot without a tripod is 1/focal length (35-mm equivalent) of the lens. With the Panasonic DMC-FZ10 at full telephoto (420 mm), for example, it's generally acknowledged that you won't get steady shots at less than 1/420 second without image stabilization technology.

The solution is to allow enough light into the lens to shoot fast enough to ignore shake—a challenge when you're shooting baseball games in the rain or animals in the bush. This is where superzooms shine. Even the slowest we reviewed has a maximum aperture at telephoto of f/3.7.

Two of the cameras we reviewed, the Canon PowerShot S1 IS and the Panasonic, add image stabilization. Typically found in camcorders, image stabilization uses gyrosensors to detect shake and compensate, letting you shoot at slower shutter speeds (1/50 second in our example).

THE LATEST MODELS

We looked at six 3- to 4-megapixel superzooms. Like prosumer big-lens models, they're sophisticated, but they're also fairly simple to operate, with prices and feature sets targeted at sports moms, nature lovers, and budding candid snapshooters. Given the plethora of 5MP to 8MP cameras available, you might surprised at the low resolution of these superzooms, but they're fine for 8-by-10 prints. Given their powerful zooms, you'll rarely need to crop images, losing the associated pixels.

The Olympus resembles a typical compact consumer model, and the Konica Minolta's appearance is unique, but most of the cameras look like miniature, muscular

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MORE ON THE WEB

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SLRs with extended battery grips and large-diameter lens mounts. All have eye-level, through-the-lens electronic viewfinders. All can operate as simple point-and-shooters but come with an array of easy-to-use manual features and program modes.

Superzooms are handy, but they're not for everyone. Most are bulky, and most people can manage with 3X to 4X optical zoom lenses for snapshots. (And remember: No zoom replaces walking closer to your subject—as a pro would—when possible.) Also, we prefer lenses that start from a wider angle: You can always crop images, but you can't add data that was outside the frame.

These superzooms aren't quick enough to be ideal action shooters, either. You need to prefocus on all of them (pressing the shutter button halfway) for any hope of capturing action. This makes them better suited to sports like baseball, where the action is predictable, than soccer, where it isn't.

If size and price aren't issues, check out the 8MP prosumer cameras we recently reviewed (First Looks, May 18), all of which cost about $1,000. While we've never been big fans of digital zooms, consider that you can digitally double the 5X to 8X zoom ranges of higher-end models and still end up with 4MP images. But for those of us without a grand to spend, it's clear that superzooms are a lot of camera for the price—and a lot of fun.

Canon PowerShot S1 IS

ALL REVIEWS BY GLENN MENIN

Canon PowerShot S1 IS

3.2 megapixels, 10X optical and 3.2X digital zoom, $500 street. Canon U.S.A. Inc., www.powershot.com. ●●●○○

Boot time, 5.6 seconds; recycle time, 2.1 seconds; resolution, 1,000 by 1,050 lines; transition pixels, 2.1% by 3.2%.

The Canon PowerShot S1 IS is ergonomic, and comfortable to handle. It and the Panasonic Lumix DMC-FZ10 are the only models in this roundup with image stabilization. But at $500, the PowerShot S1 is one of the most expensive superzooms, and its 3.2MP sensor can't compete with the 4MP sensors on our labs-based sharpness and pixel transition tests.

On the plus side, the PowerShot S1 is packed with features and has intelligently located and distributed controls. The silver-colored plastic body feels solid and stable. The smooth and speedy zoom controller is conveniently located above the right-hand grip, allowing for easy one-handed operation whether you're using the somewhat fuzzy electronic viewfinder or the 114,000-pixel LCD panel.

The PowerShot S1 has the only LCD in this roundup that can be positioned at any angle, but it's just 1.5 inches (compared with the Kodak's, at 2.2 inches) and easily washed out in bright sunlight. The camera provides image stabilization for its 10X zoom lens (f/2.8 to f/3.1; 35-mm equivalent: 38 to 380 mm) and can also compensate for shake on two optional interchangeable lenses—one telephoto and one wide-angle.

We like the PowerShot S1's dedicated buttons—the most of any unit here. Once you're familiar with them, they allow for smooth operation and often eliminate the need to wade through menu options. Along with full auto mode, the camera's top-mounted mode dial includes scene-specific settings (Portrait, Landscape, Night Scene, Fast Shutter, and Slow Shutter), as well as aperture or shutter priority. The PowerShot S1 also has a manual mode, as well as six white-balance options and a custom setting.

The PowerShot S1 shoots in four resolutions, ranging from 640-by-480 to 2,048-by-1,536, and three levels of JPEG compression, though it doesn't support uncompressed formats. We applaud the camera's video capabilities: 640-by-480 QuickTime files at 30 fps, limited only by memory capacity—about an hour on a 1GB high-speed CompactFlash card. You can even zoom while recording, and the playback mode offers several editing options.

Although our test images exhibited good exposure and color, they were relatively soft. Flash illumination was good. On our resolution tests, the PowerShot S1 garnered lower scores than the other cameras here, as you'd expect given its 3.2MP sensor. Its scores, however, were on a par with those of most 3MP sensors, at 1,025 lines (average).

The PowerShot S1's pixel transition results were higher (worse) than those of the others but certainly acceptable (higher than 5 percent can cause image quality problems). Boot time was mediocre, at 5.6 seconds, but recycle time, at 2.1 seconds shot-to-shot, was the second fastest in the roundup.

IMAGE STABILIZATION

A rule of thumb is that you shouldn't take handheld shots at a shutter speed slower than 1/focal length of the lens (35-mm equivalent) without image stabilization. We took these pictures, for example, at a focal length of 420 mm at 1/50 second (using the Panasonic Lumix DMC-FZ10).

Fujifilm FinePix S5000

Fujifilm FinePix S5000

3.1 megapixels, 10X optical and 2.2X digital zoom, $399.95 list. Fuji Photo Film U.S.A. Inc., www.fujifilm.com. ●●●○○

Boot time, 4.2 seconds; recycle time, 1.4 seconds; resolution, 1,050 by 1,050 lines; transition pixels, 2.1% by 2.0%.

At $399.95 (we've seen it online for under $300), the Fujifilm FinePix S5000 is a bargain—with some caveats. Though responsive in testing, the camera proved less than ideal for action shooting. Additionally, the images produced by its 3.1MP SuperCCD sensor were only marginally sharper than those of the 3.2MP Canon, but less sharp than those produced by the 4MP cameras—with noise and graininess to boot.

SUPERZOOM ON THE HORIZON

While there are only six superzooms available at the moment, more are sure to follow. One intriguing model due out soon is the raygun-shaped 3.2-megapixel Pentax Optio MX, which will have an f/2.9 to f/3.5 10X zoom lens for under $400.

Olympus Camedia C-765 Ultra Zoom

PC MAGAZINE EDITORS' CHOICE

While none of the superzooms scored a home run, we were most impressed with the Olympus Camedia C-765 Ultra Zoom. Compact (nearly pocketable) and easy to shoot with, the C-765 led the pack in image quality: It tied the Panasonic for first place on our resolution tests and edged out the Fujifilm FinePix S5000 for the top score on our pixel transition tests. The camera's daylight and flash shots were crystal clear and well exposed. That said, the C-765 isn't perfect. Its boot-up is slow, and it's less responsive than we'd like for action photography. Still, this all-around camera is well worth the money.

Honorable mention goes to the chunky Panasonic Lumix DMC-FZ10 for its fantastic f/2.8 12X Leica zoom lens; it tied the Olympus for resolution, wasn't far behind in pixel transition, and beat the Olympus model on boot and recycle times. It suffered a bit in the exposure department, though we love its image stabilization feature. For photographers who are likely to require maximum telephoto shooting, this camera may be the best choice. It's worth noting that while it weighs under 20 ounces, the DMC-FZ10 is a sizable camera—definitely not a shirt-pocket shooter.

The Kodak EasyShare DX6490 also gets an honorable mention for its dead-simple operation and beautifully illuminated flash shots. If ease of use is the key factor for you (at the cost of some image sharpness), consider this aptly named camera.

The S5000 is easy to hold and handle, though some operations are awkward, and we found the menu structure busy (thankfully, the documentation is excellent). The all-black plastic body is ergonomically designed, with a rubberized hand grip and rear panel. The Fujinon 10X zoom lens (f/2.8 to f/3.2; 35-mm equivalent: 37 to 370 mm) operates smoothly, but the zoom control is too close to the 110,000-pixel EVF, making viewing awkward, particularly for the left eye. Zooming is further complicated in manual focus mode, as the MF button—located on the top right, behind the shutter—must remain depressed to focus. In addition, the camera exhibited an irritating amount of stutter, freezing the image several times in the course of shooting a single picture—during prefocus and while writing to the storage card.

The mode dial located on top is simple and straightforward, though the four scene-selection icons are black on a gray field, making them hard to distinguish. The S5000 supports JPEG or RAW format and can shoot 340-by-240 QuickTime video at 30 fps until the xD-Picture Card is full.

The S5000's Fujifilm Super CCD HR technology can interpolate 3.1 effective megapixels into 6. We used this mode for our testing. Our daylight results were a bit dark, with some noise. The flash images were well illuminated but showed some graininess. The visual resolution was somewhat more telling, as our result, 1,050 lines, was more akin to that of a 3MP camera than a 6MP model. On the other hand, the S5000's pixel transition score was very good. The S5000 was the fastest performer, posting a 4.2-second boot time and a speedy 1.4-second recycle time.

Kodak EasyShare DX6490

4.0 megapixels, 10X optical and 3X digital zoom, $499 list. Eastman Kodak Co., www.kodak.com. ●●●◐○

Boot time, 4.6 seconds; recycle time, 2.6 seconds; resolution, 1,100 by 1,150 lines; transition pixels, 2.4% by 2.6%.

For those who want the power of a superzoom and the ease of use of a basic point-and-shoot camera, the Kodak EasyShare DX6490 is worth consideration. This camera is a pleasure to shoot and straightforward to operate in automatic mode,

Kodak EasyShare DX6490

while still offering more precise controls to those so inclined. Yet for all its simplicity, the DX6490 takes well-exposed pictures (including the best flash shots in this roundup) that are reasonably sharp.

Along with auto and scene settings

(Sport, Portrait, Night, and Landscape) the DX6490 has priority modes for aperture and shutter speed, as well as a full manual mode. In manual mode, it has five ISO speeds ranging from 80 to 800.

The compact black body and silver controls are plastic but feel extremely solid. The squat shape of the DX6490 makes the already generous 2.2-inch 180,000-pixel LCD look even larger. The electronic viewfinder (with adjustable diopter) is bright, and info icons are informative and intuitive—the best in this roundup.

The camera's clever EVF shuts off if it's idle for 15 seconds but senses when your eye moves back into position and turns on again. The right-hand grip allows easy access to controls and one-handed shooting, although those with beefier fingers might find the grip too close to the lens for comfortable handling. The 10X zoom (f/2.8 to f/3.7; 35-mm equivalent: 38 to 380 mm) operates smoothly, with reasonable speed.

Image transfer and printing are easy, with a dedicated One Touch button and the included cradle.

Kodak uses fairly high JPEG compression, which keeps file sizes down; even at 2,304-by-1,728, images were under a megabyte, and we didn't note any adverse

SUMMARY OF FEATURES

Superzoom Cameras

Download this table at **www.pcmag.com**

■ YES □ NO	Canon PowerShot S1 IS	Fujifilm FinePix S5000	Kodak EasyShare DX6490	Konica Minolta DiMage Z2	Olympus Camedia C-765 Ultra Zoom	Panasonic Lumix DMC-FZ10
Price	$500 street	$399.95 list	$499 list	$450 street	$450 street	$599.95 list
Dimensions (HWD, in inches)	3.1 x 4.4 x 2.6	3.2 x 4.4 x 3.1	3.1 x 3.9 x 3.2	3.1 x 4.3 x 3.2	2.4 x 4.1 x 2.7	3.4 x 5.5 x 4.2
Weight with batteries and media (ounces)	17.0	15.8	13.3	13.9	10.9	19.4
Effective/total megapixels	3.2 / 3.3	3.1 / 3.2	4 / 4.2	4 / 4.2	4 / 4.28	4 / 4.23
CCD size (inches)	1/2.7	1/2.7	1/2.5	1/2.5	1/2.7	1/2.5
ISO equivalencies	50, 100, 200, 400	160, 200, 400, 800	80, 100, 200, 400, 800	50, 100, 200, 400	64, 100, 200, 400	50, 100, 200, 400
Still-image formats	JPEG	JPEG, RAW	JPEG	JPEG	JPEG, TIFF	JPEG
Maximum still-image resolution in pixels (with aspect ratio)	2,048 x 1,536 (4:3)	2,816 x 2,120 (4:3)	2,304 x 1,728 (4:3), 2,304 x 1,536 (3:2)	2,272 x 1,704 (4:3)	3,200 x 2,400 interpolated (4:3)	2,304 x 1,728 (4:3)
Native/35-mm–equivalent focal lengths (mm)	5.8–58 / 38–380	5.7–57 / 37–370	6.3–63 / 38–380	6.3–63 / 38–380	6.3–63 / 38–380	6–72 / 35–420
Optical/digital zoom	10X / 3.2X	10X / 2.2X	10X / 3X	10X / 4X	10X / 4X	12X / 3X
Maximum aperture: wide angle/telephoto	f/2.8 / f/3.1	f/2.8 / f/3.2	f/2.8 / f/3.7	f/2.8 / f/3.7	f/2.8 / f/3.7	f/2.8 / f/2.8
Image stabilization	■ (optical)	□	□	□	□	■ (optical)
Closest distance in macro mode (inches)	3.9	4.0	4.7	2.6	0.5	1.9
Filter thread	■* (52 mm)	■ (55 mm)	■* (44.2–55 mm)	■ (52 mm)	■* (55 mm)	■ (72 mm)
Shutter speeds (seconds)	15–1/2,000	52–1/2,000	16–1/1,700	15–1/1,000	15–1/1,000	8–1/2,000
Burst-mode speed at maximum resolution (fps)	1.7	5	3	2.5	1.5	4
Number of shots per burst	24	5	6	5	8	5
Auto-exposure bracketing	■	■	□	■	■	■
Flash range: wide-angle (feet)	3.3–14 (ISO 100)	1.0–19.7 (ISO 200)	2.0–16.1 (ISO 140)	0.8–20 (ISO auto)	11.8–14.8 (ISO 100)	1.31–13.12 (ISO auto)
Flash range: telephoto (feet)	3.3–12 (ISO 100)	2.6–18.0 (ISO 200)	3.9–13.8 (ISO 200)	4.1–15 (ISO auto)	3.9–11.5 (ISO 100)	6.56–13.12 (ISO auto)
Scene modes	4	4	7	5	7	9
Panorama framing/Time-lapse mode	■ ■	□ □	□ ■	□ □	■** □	■ ■
Video file format	AVI	AVI	QuickTime	Motion-JPEG	QuickTime	QuickTime
Maximum video resolution (pixels)	640 x 480	320 x 240	320 x 240	800 x 600	640 x 480	320 x 240
Maximum video frame rate (fps)	30	30	20	30	15	30
Audio support	Movies	Movies	Movies	Movies	Movies, still images	Movies, still images
LCD size (inches)/resolution (pixels)	1.5 / 114,000	1.5 / 110,000	2.2 / 153,000	1.5 / 113,000	1.8 / 118,000	2.0 / 130,000
Electronic-viewfinder resolution (pixels)	114,000	110,000	180,000	113,000	240,000	114,000
Adjustable diopter	■	■	■	■	■	■
Included memory card†	32MB CF	16MB xD	16MB internal	16MB SD	16MB xD	16MB SD
Included batteries	4 AA alkaline	4 AA alkaline	1 lithium ion	4 AA alkaline	1 lithium ion	1 lithium ion
AC adapter or charger included	□	□	■	□	■	■
Slide show mode	■	■	■	■	■	■
Dock or cradle included	□	□	■	□	□	■
USB Mass Storage Class	□	■	■	■	■	■
Audio/video output	■ ■	■ ■	■ ■	■ ■	□ ■	■ ■
Print Image Matching/PictBridge	□ ■	□ □	□ □	■ ■	■ ■	■ ■
Remote control	Optional	□	□	□	□	□
Bundled software	ArcSoft Camera Suite, Canon Digital Camera Solution	FinePix Viewer, ImageMixer VCD for FinePix	Kodak EasyShare Software	ArcSoft Video-Impression 2, DiMage Viewer	Camedia Master Image Editing Software	ArcSoft Panorama Maker, PhotoBase, PhotoImpression, PhotoPrinter; SD Viewer
Toll-free technical-support hours (eastern time)	9:00–8:00 M–F	9:00–8:00 M–F	9:00–8:00 M–F	9:00–8:00 M–F	8:00a–10:00p M–F	24/7

RED denotes Editors' Choice. * With adapter. ** Only with an Olympus xD-Picture Card. † CF—Compact Flash, SD—Secure Digital, xD—xD-Picture Card.

Konica Minolta DiMage Z2

effects on quality. On the contrary: On our tests, the DX6490 produced sharp, well-exposed images with good color saturation and just a hint of posterization at times. Our daylight test shot tended toward the warm end of the spectrum, but the flash shot had the best illumination in this roundup, without a hint of noise.

Lines of resolution and pixel transition results were average for this roundup, as was boot time (4.6 seconds). Recycle time was mediocre, at 2.6 seconds. The camera's burst mode maxes out at six images. Its QuickTime video capabilities are limited to 320-by-240 at 20 fps, though movie length is limited only by memory card capacity.

Konica Minolta DiMage Z2

4.0 megapixels, 10X optical and 4X digital zoom, $450 street. Konica Minolta Photo Imaging U.S.A. Inc., www.konicaminolta.com. ●●●○○

Boot time, 4.4 seconds; recycle time, 2.2 seconds; resolution, 1,100 by 1,100 lines; transition pixels, 2.5% by 2.6%.

The Konica Minolta DiMage Z2 has a unique look and is easy to shoot. A decent performer in terms of speed, with many features, it had exposure problems in daylight and flash shots and produced images of only average sharpness.

The Z2 stands out because of its design, but it felt toylike to us. The body is barrel-shaped, with a smooth, wedgelike grip. Its well-placed rear-panel buttons are large and arranged in an arc; icons and labels are clearly marked.

Thanks to clever design, the Z2's 113,000-pixel LCD screen seems larger than its 1.5 inches, and it's bright. The Z2 has only one display screen, but its Switch Finder system uses mirrors to move the LCD image between the rear panel and the viewfinder. This makes the image identical no matter how you choose to view the subject. The system *feels* clunky, however.

You can control the 10X zoom (f/2.8 to f/3.7; 35-mm equivalent: 38 to 380 mm) with your thumb on the back grip for one-handed shooting, but it's a stretch; the camera is better suited to two-handed operation. At the telephoto end, it's slightly slower than some others in this roundup.

Handy features include a real-time histogram, an intelligent hot shoe for an external flash, and an optional converter lens (wide-angle, 28-mm equivalent). You get five scene options, four flash modes, EV compensation, white-balance options, ISO choices, bracketing and metering settings, two auto-focus modes (passive and active, or lamp-assisted) and manual mode.

Menus are easy to read and navigate. Resolutions range from 640-by-480 to 2,272-by-1,704, and there are three levels of JPEG compression, but the Z2 doesn't support RAW or TIFF formats. It takes 640-by-480 QuickTime video at 30 fps, with duration limited by the SD card's capacity. SVGA video (800-by-600) is only at 15 fps.

Konica Minolta claims its Rapid AF will focus in as little as 0.2 seconds, but we did not find the camera any speedier than its competitors in shooting. Our tests showed the Z2 to have quick boot (4.4 seconds) and recycle (2.2 seconds) times—in both cases the second-best here. Visual resolution and pixel transition results were average. The camera suffered in studio still-life tests: Auto settings resulted in a dark and noisy daylight shot, while the whites were oversaturated in flash images.

FIVE TIPS FOR STEADY SHOOTING

1. Keep an eye on the camera shake warning. Don't try to handhold the camera at shutter speeds slower than 1/focal length of the camera (35-mm equivalent) unless the camera is using some sort of image stabilization.
2. To shoot at faster shutter speeds, bump up the ISO equivalent to let in more light, though you'll pay for this with a noisier image.
3. When possible, take an extra second to check your stance before shooting. Bring your elbows in close to your body and exhale slowly while shooting.
4. Don't expect the built-in flash to freeze max telephoto shots; beyond 10 to 15 feet away, most of these flashes are useless.
5. Use a tripod, or rest the camera on a steady object, like a tree, a chair, or a wall.

Olympus Camedia C-765 Ultra Zoom

4.0 megapixels, 10X optical and 4X digital zoom, $450 street. Olympus America Inc., www.olympusamerica.com. ●●●●○

Boot time, 6.8 seconds; recycle time, 2.5 seconds; resolution, 1,200 by 1,200 lines; transition pixels, 1.9% by 2.1%.

PC MAGAZINE EDITORS' CHOICE

The Olympus Camedia C-765 Ultra Zoom's size and deisgn belie its power. The smallest superzoom here, the C-765 is just about pocketable—if you have big pockets—but the boxy, plastic body feels cheap. Appearances aren't everything,

Olympus Camedia C-765 Ultra Zoom

however. This camera is comfortable to hold, a breeze to shoot, and produced the sharpest images in this roundup.

The 10X zoom retractable ED glass lens (f/2.8 to f/3.7; 35-mm equivalent: 38 to 380 mm) has a surprising amount of play. Olympus says this reduces drag without sacrificing durability.

Olympus's new TruePic Turbo image processor claims quicker start-up and less shutter delay. While the C-765 had the slowest boot and the second-slowest recycle times in this roundup, it seemed quick to focus and performed well in the field. Along with the Panasonic, it was the best for shooting action up close.

The C-765 offers aperture and shutter priority modes, full manual and auto modes, and various scene settings, all easily accessible via the dial behind the shutter button. All other controls are found on the camera back, and all—including our favorite, a clearly marked red power but-

ton—are responsive and easy to access.

The C-765's 1.8-inch 180,00-pixel LCD and 240,000 pixel EVF display a bevy of info, and the LCD especially stood out as extremely bright and crisp—the best performer in this roundup in bright sunlight.

You can preadjust noise and contrast levels on the camera and set a white balance choice. You can set two custom macro modes. The C-765 offers seven resolutions, from 640-by-480 to 2,288-by-1,712, as well as TIFF support and four levels of JPEG compression. It captures 640-by-480 QuickTime video with audio, but at only 15 fps.

The C-765's test images led the pack in crispness and clarity. Our daylight still-life shot showed realistic colors and even exposure, and the camera maintained focus over the entire subject matter (about 3 feet wide by 2 feet deep). Our flash image was well illuminated, and colors remained accurate with a hint of noise in the shadows. Boot time was slow, at 6.8 seconds, as was recycle time, at 2.5 seconds.

Olympus released another superzoom, the C-770, after our testing was completed. The C-770 has a more powerful flash, a hot shoe for external flashes, and MPEG-4 movie capture for an additional $100. We'll have a First Look of the C-770 shortly.

Panasonic Lumix DMC-FZ10

4.0 megapixels, 12X optical and 3X digital zoom, $599.95 list. Matsushita Electric Corp. of America, www.panasonic.com. ●●●◐○

Boot time, 5.5 seconds; recycle time, 2.2 seconds; resolution, 1,200 by 1,200 lines; transition pixels, 2.9% by 2.6%.

Geared towards more serious enthusiasts, the Panasonic Lumix DMC-FZ10 is neither compact nor light. But it's manageable and

Panasonic Lumix DMC-FZ10

relatively easy to use, and the images it captures are crisp if somewhat overexposed.

Just shy of 19.5 ounces, the FZ10's heft comes from its formidable Leica DC Vario-Elmarit 12X zoom lens (35-mm equivalent: 35 to 420 mm, the longest in this roundup), with Panasonic's Mega Optical Image Stabilizer. Maximum aperture is an impressive f/2.8 across its entire zoom range, allowing the fastest shooting in this roundup at max telephoto.

The FZ10 has two image stabilization settings: One is continuous, with dynamic compensation throughout the framing and composing process; the other initiates stabilization only when the shutter button is pressed. When shooting close-up action in the field, the Panasonic exhibited the least stutter of our shooters. We were able to prefocus without freezing the image on the LCD, which made it easier to track moving subjects.

The silver plastic body feels sturdy, but the hand grip, which curves to an angular rubberized edge at the fingertips, may be awkward for some users. The zoom lever surrounding the shutter button operates smoothly, and the mode dial is nearby. Buttons for toggling between the ample 2.2-inch, 130,000-pixel LCD and the 114,000-pixel EVF, display (for on-screen info), and exposure controls are on the back panel, along with a four-way selector. All the controls—and notably the power switch—are clearly labeled.

The EVF is sharp, and the menus and on-screen info icons are intuitive. We applaud Panasonic for including a real-time histogram, which turns yellow when it detects exposure problems. The FZ10's manual focus ring operates smoothly on the well-machined lens, and the electronic focus assist on-screen window functions very well, which helped when the auto focus was sometimes slow to respond.

The FZ10's images were sharp and crisp. Our daylight test shot was slightly overexposed. Our flash shot also seemed unbalanced, with the foreground too bright. The FZ10 has a hot shoe for auxiliary flash. Boot time was slow (5.5 seconds). Recycle time was good, at 2.2 seconds.

Our contributors: **Sally Wiener Grotta** is a contributing editor of *PC Magazine.* **Daniel Grotta** is president of DigitalBenchmarks and a frequent contributor to *PC Magazine.* Associate editor **Sean Carroll** and PC Magazine Labs lead analyst **Glenn Menin** were in charge of this story.

PERFORMANCE TESTS

VISUAL RESOLUTION

Visual resolution refers not to the megapixel count but to the eye's perception. In general, 3MP cameras should produce 950 to 1,100 lines of resolution; 4MP cameras, 1,100 to 1,300. We shot an ISO target resolution chart for digital cameras; a photographic copy stand ensured the target and camera were perpendicular. We used auto-focus and automatic exposure settings (under conditions that didn't require flash) and a self-timer to avoid vibration.

PIXEL TRANSITION

By analyzing other ISO target elements, we determined the pixel transition ratio, which defines image sharpness. We determined the number of gray, or *transition,* pixels between white and black elements, expressing this score as a percentage of the total number of pixels. The higher the percentage, the fuzzier the edges. Typically, 5 percent is the largest acceptable pixel transition ratio.

PERFORMANCE TESTS

We assessed camera speed by recording the time needed to boot up, capture, and process an image. We invoked the flash, turned on the LCD, and set the cameras to maximum resolution and minimum compression. *Recycle time* is the time required to take a shot, process the image, and take another shot.

SUBJECTIVE ANALYSIS

To gauge clarity, dynamic range, and color fidelity, we shot a still life designed to stress a camera's ability to render colors, shadow details, whites, fine lines, and edges. We looked for correct exposure, illumination, and noise. We shot under daylight conditions (tungsten lights, color-corrected for daylight) of 16,400 lux, typical of an overcast sky. Then we dropped to 1,780 lux to invoke the auto flash. We observed the images in a darkened environment on Sony GDM-C520 21-inch CRT monitors.

We used high-speed Lexar media cards exclusively and charts from Gretag-Macbeth.—*Glenn Menin*

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CAN LINUX DELIVER LOWER TCO?
ASK THE PEOPLE EVALUATING IT.

Microsoft

"We conducted a major TCO study to explore Microsoft and Linux solutions for our needs. In the end, we found that the TCO for the Windows Server System™ approach was about 20 percent less expensive than Linux."

—Keith Morrow, CIO, 7-Eleven, Inc., U.S.

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Business Se

By Robert P. Lipschutz
Illustrations by Campbell Laird

READ ON TO LEARN:

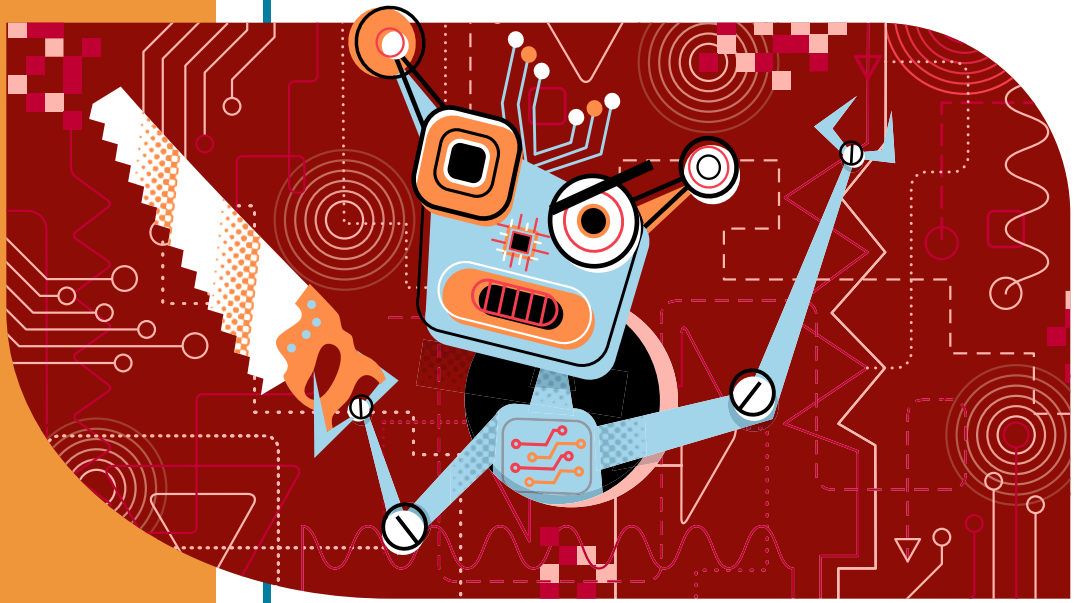
- Why you need to build a solid security infrastructure.
- What the major threats are and how to protect yourself.
- Which features to insist on when shopping for security solutions.
- Which junctions in your network are vulnerable.
- How to pick the products that best fit your business size.

When you're running a business, security breaches hurt in many ways. On an emotional level, you feel sick that you and your company have been violated. On a business level, you have to cope with material damage, stolen proprietary information, denial of service, and lost productivity.

Implementing a security strategy can be daunting for small and medium-size businesses (SMBs). You need cost-effective solutions, yet you must choose products in the no-man's-land between personal security offerings, like desktop firewalls and antivirus software, and high-end enterprise solutions, like identity management and expensive intrusion detection systems.

You might be tempted to think that SMBs are less likely targets for directed attacks, but hackers and viruses do not discriminate. Run a threat assessment software program on your network and you'll probably find several vulnerabilities. But with the right products, smart policy planning, and perhaps some outside expertise, your business can protect itself without breaking the bank.

The advice we offer here will help you make the right purchases for your company. We organized the guide into seven threat categories. Protecting your business against the first four—network intrusion, virus attacks, spam overload, and operating-system and application vulnerabilities—is essential.



Businesses large and small must be active about security, and intelligent shopping now can save you from heavy losses in the future.

curity

Protection in the other three areas—wireless LAN breaches, remote-access trespasses, and lawsuits and noncompliance—is optional, depending on the kind of business you run. For example, law firms and medical companies need to be concerned with compliance issues; businesses mobile or remote workers have to consider remote-access security, and wireless protection is necessary if you use Wi-Fi networking. We discuss these last three threats in an exclusive online section of our buying guide (*www.pcmag.com/securitybg*).

For the four crucial security categories, we explain each threat and answer common questions, outline the kinds of products available, specify appropriate ones for your business size, and offer shopping advice. We also consider price, integration, and ease of use. As a rule, we recommend integrated security appliances for most businesses. For a list of links to *PC Magazine*'s in-depth security product reviews online, see "More on the Web" on page 142. Security is a major concern for businesses of all sizes, and intelligent shopping now can save you from losses in the future.

Network Intrusion

The most likely sources of attack continue to be hackers and disgruntled employees, according to the 2003 Community Security Institute/FBI Computer Crime and Security Survey. The former are typically outside the company, and the latter have physical access to the network, so the means to combat them are very different. At risk are customer information, intellectual property, and passwords.

Your network's routers have built-in but rudimentary address and port-level filters that scan the headers of incoming data packets. But these filters don't block complex protocols such as those used for instant messaging or online meetings. In addition, routers are hard to configure, and mistakes can lead to gaping holes in your perimeter.

PRODUCT CATEGORIES

Appliance-based perimeter firewall. A *stateful inspection* firewall examines connections dynamically and determines whether to allow or deny traffic. A hardware-based firewall appliance is simple: no installation and no worrying about operating-system security. Appliances that cost around $1,000 can handle the basics. Spend between $3,000 and $5,000 and you'll get perimeter antivirus and antispam features as well. You'll still want to run desktop antivirus software, though. If you need centralized management for multiple firewalls, you should plan on spending up to $10,000.

Desktop firewall. Desktop firewalls add another layer of protection. We'll discuss them in the section "OS and App Vulnerabilities."

Network intrusion software. This kind of product sits passively on the net-

NETWORK INTRUSION:
ARE YOU AT RISK?

- Are you keeping track of all the users on your local and wireless networks?
- Do remote users access your networks?
- Do your employees use instant messaging and peer-to-peer connections?

Deploying SMB Security

Small and medium-size companies have scarce resources and significantly less IT infrastructure than large enterprises. And they don't have the time to manage and configure every desktop. The best choice for them is an integrated solution with easy management. Check for the following features when creating your security system.

Integrated appliances. A security appliance, with its hardened operating system, easy installation and configuration, and wide set of features (firewall, antivirus, antispam, and remote access is one popular combination) is the option we recommend for SMB perimeter security.

Centralized control of desktop software. In addition to the perimeter measures, a strong, layered security defense requires desktop software such as antivirus and firewalls. For SMBs, centralized control of this desktop software is a necessity. Centralized control tools put command in the hands of a knowledgeable network administrator or consultant, instead of passing the configuration options to end users who may not have the know-how to configure complex rules.

True perimeter, desktop, and server security integration. Ideally, an SMB administrator or consultant should manage and monitor perimeter security (firewall, antivirus, antispam) and desktop/server security (antivirus, personal firewall, intrusion detection) holistically. That means you should work with consistent management interfaces, consistent reporting interfaces, and integration where appropriate. Don't be fooled by vendors that cobble together a bunch of unrelated products with disparate admin consoles. Visit *www.pcmag.com/infrastructure* to read reviews of the latest security software and appliances, and make sure the solution you choose is easy to deploy and manage.—*RPL*

work and identifies potential attacks by looking at known signatures or protocol anomalies on the network. It may be too expensive for small businesses (well into five figures), but medium-size operations should consider it.

SHOPPING TIPS

If you have workers accessing the network from the road, look for firewall products—either software or appliances—that include VPN (virtual private network) capabilities, so you can connect other small offices, remote employees, or partners. Consider getting advice from an outside consultant to help with firewall rules, as they're tricky to manage. You may also want to investigate managed services, where a third party handles your security needs.

When considering an intrusion detection product, research its false-positive rate, and make sure you can decipher the information in its logs to determine where attacks may originate.

Virus Attacks

Viruses are most often unleashed when an unsuspecting victim clicks on an e-mail attachment, loads a Web page, or opens a file brought in on a CD or downloaded from the Web. Antivirus software makers have responded with products that protect all points of entry—e-mail gateways, Web browsers, servers, and desktops.

PRODUCT CATEGORIES

Desktop and server antivirus software. Every business should have an antivirus package installed at the server and desktop levels, with the program managed centrally by a knowledgeable administrator. It stops known viruses from attacking a computer and often protects the whole network. Automatic updates, which now occur every few days, keep antivirus software current. Note that most desktop antivirus products do not work on server operating systems like Microsoft Windows Server 2003.

Desktop intrusion detection software. Antivirus programs maintain lists of virus characteristics and compare each incoming e-mail against the lists. But new viruses can wreak havoc before a definition is available, so you should also consider desktop intrusion detection software (see our section "OS and App Vulnerabilities").

E-mail firewall and e-mail server plug-in. For companies that can afford the extra few thousand dollars, specialized e-mail firewalls or e-mail server plug-ins provide another layer of protection that can keep e-mail–borne viruses away from a network completely, by scanning incoming e-mail messages. These perimeter solutions look for known virus signatures and telltale behaviors. In some cases, they can protect a network from inappropriate content and denial-of-service attacks as well.

Perimeter appliance. As we mentioned earlier, perimeter appliances often handle antispam and filtering tasks, and many include third-party antivirus solutions. You may have heard talk about the advantages of having one vendor's antivirus solution on the perimeter and another's on the desktop, providing added protection. We don't like this approach, as it invites fingerpointing and increases the complexity and headaches for your business. An SMB should select one antivirus vendor. Keep this in mind, and choose perimeter e-mail firewall and antivirus solutions that are compatible with each other and with your desktop solution.

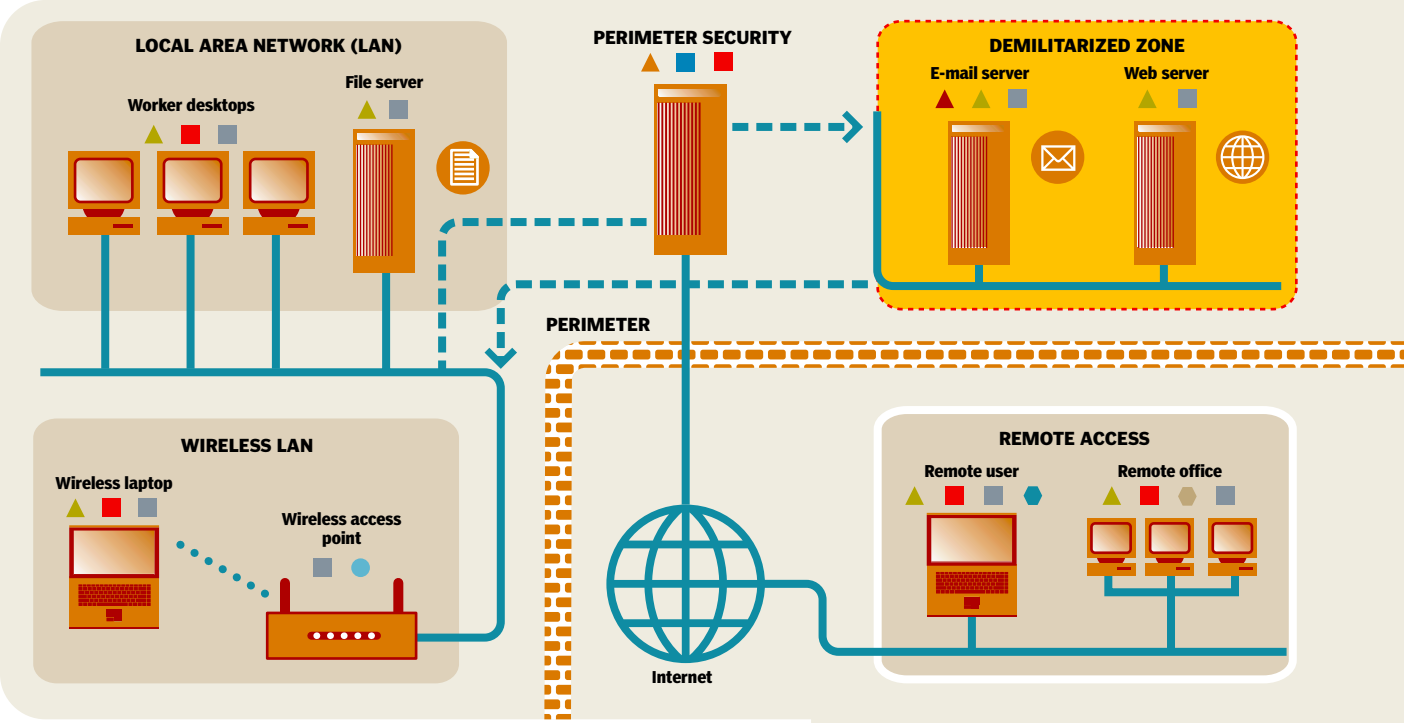
VIRUS ATTACKS: ARE YOU AT RISK?

- Does your e-mail ever contain executable file attachments?
- Are your employees allowed to download and install software on work machines?
- Do your remote users have antivirus software on their machines?

Security Strategies For Your Business

	SMALL BUSINESS	MEDIUM-SIZE BUSINESS
Number of employees	1 to 99	100 to 999
General considerations	Outsourcing and all-in-one solutions to security threats	In-house expertise and layered solutions to security threats
Network intrusion	Perimeter firewall	Perimeter firewall and network intrusion protection
Virus attacks	Managed desktop antivirus software	Managed desktop antivirus software and e-mail perimeter protection
Spam overload	Outsourced or desktop antispam software	Perimeter antispam software
Operating-system and application vulnerabilities	OS and application updates	OS and application updates, secure applications, and desktop firewalls or desktop intrusion protection
Remote-access trespasses	Windows Remote Desktop, remote-control software, or an all-in-one integrated device	SSL VPNs for single-user remote access; site-to-site IPsec VPNs
Wireless LAN breaches	WEP	WPA
Lawsuits and noncompliance	Web content filtering	Web, e-mail, and IM filtering and compliance reporting

Our contributors: **Robert P. Lipschutz** is president of Thing 7 (*www.thing7.com*), a technology consulting firm. Associate editor **Michael J. Steinhart** and PC Magazine Labs lead analyst **Sahil Gambhir** were in charge of this story.



Securing Your Network

No matter the size or complexity of your network, there are several vulnerable junctions in its infrastructure. The main gateway you must protect is where the Internet meets your network or demilitarized zone (the servers that act as a bridge between the Net and your LAN machines). Next to each threat point is a suggested list of security measures to put in place. Actual deployment schemes will vary according to your budget and company structure.

- Antispam software
- Antivirus software
- Content filter
- Firewall
- Intrusion detection system
- IP Security VPN
- OS updates and patches
- Secure Sockets Layer VPN
- Wireless Protected Access (or Wired Equivalent Privacy)

SHOPPING TIPS

The key for SMBs is centralized control and automation. Your antivirus products should offer reports that consolidate information from multiple desktops and summarize any incidents related to compliance, virus infection, and alerts. The reports should also communicate clearly all activity surrounding recent virus definition updates, scans, and viruses found. The products should conduct updates and scans automatically.

Some antivirus tools include antispyware functions as well. If your tool doesn't, consider a separate product to handle this threat, or use a more general desktop intrusion protection product.

Spam Overload

Internet e-mail was designed in a more innocent age, when electronic doors could remain unlocked. SMTP, the protocol used for sending e-mail, is not designed to guarantee the identity of the sending party, and encryption techniques to ensure authenticity (such as S/MIME and PGP) and disposable e-mail addresses are not widespread. Add that sending e-mail is very inexpensive and you have the current spam problem. The challenge is to block all the spam you can without blocking legitimate e-mail messages.

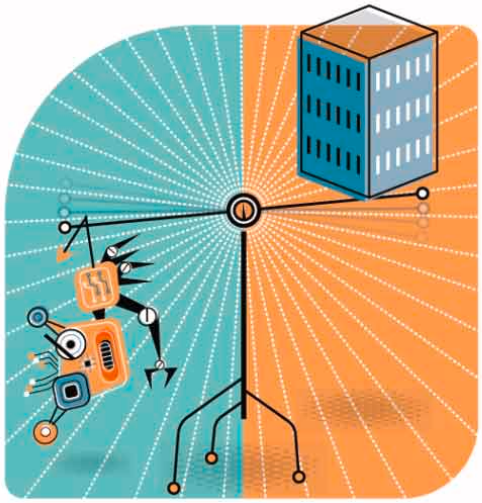
PRODUCT CATEGORIES

Current products use several approaches to thwart spam. If you outsource your e-mail, make sure your service provider filters for spam. Large ISPs like AOL, EarthLink, MSN, and Yahoo! use some of the best techniques. If you handle your own e-mail server, you can block spam by using a hosted service, installing software or an appliance either at the perimeter of your network or in your mail server, or running software within each client.

Antispam products use several techniques, including blacklists, whitelists, pattern filters, challenge/response messages, and mail relay blockers. The techniques fall into two general categories: content-based and identity-based.

SPAM OVERLOAD: ARE YOU AT RISK?

- Is a significant portion of your incoming mail unwanted and not business-related?
- Is your e-mail server capacity suffering because of spam overload?



Justifying the Costs For Security

With enterprises under pressure to do more with less, justifying purchases for security infrastructure takes finesse, because the return on investment isn't as quick as it is for other IT projects. Compared with a CRM application that increases sales or an application server that improves an e-commerce store's uptime, security products offer a return that is more difficult to measure. Even when security is effective, its benefits aren't necessarily seen or felt directly.

To justify your security expenditures, consider financial calculations such as net present value, which takes into account an investment's worth over time. Suggest or conduct a thorough audit and analysis of your current security infrastructure, and use it to show how modifications and additional products can be used to mitigate risk, such as spillover costs incurred by your partners and the indirect costs if your critical customer information is compromised. Also run a risk assessment. This is critical in helping prioritize expenditures, based on the likelihood of attacks on particular core business components and the impact these would have on your bottom line.

For an in-depth look at how to assess threats and prioritize security purchases, read "Managing Risk" at *www.pcmag.com/managerisk.*

—Sahil Gambhir

Content-based approaches look at patterns within the subject header or body of each e-mail message. These products attempt to keep up with the content patterns used by spammers, while spammers modify their messages to trick the filters, much the way real-world cold viruses evolve to protect themselves. Many products combine multiple content-based approaches into heuristic filters (learning over time) or Bayesian filters (analyzing message characteristics), mostly because no one approach seems to work perfectly.

Identity-based approaches look at the sender's name or the originating mail server. The problem with this is that almost all spam messages have spoofed the senders' identity. Although identity-based blockers can get some traction by monitoring and blocking bad mail servers, open relays (mail servers that forward any mail message) and new mail servers pop up daily to support the spammers.

Desktop software. Microsoft Outlook includes junk mail filters, but it still lets a fair amount of spam through. You can install antispam software on each computer on your network, but we don't recommend that tactic, because most users cannot make educated decisions about all the options and settings in the spam filters. If you plan on an individual desktop solution, avoid products with many user-configurable filters and options. The only exceptions to this rule are personal whitelists and blacklists, which individual users can maintain on their own, but these are best implemented as an optimization for a perimeter solution.

Perimeter appliance. Perimeter or centrally managed desktop approaches are more effective than individual desktop filters, but they're more expensive. Even so, if spam is pummeling your business, you should invest the money. Plan to spend around $3,000 to $5,000, plus yearly update fees, for a perimeter appliance with antispam, antivirus, and firewall protection. The advantage of this approach is that a knowledgeable network administrator can make judgment calls, create policies, monitor effectiveness, and rework policies as new spam techniques emerge.

Outsourced antispam service. Go this route if you just don't have the expertise in-house to figure out how to handle spam. Prices vary depending on the number of e-mails received, but services start at a few hundred dollars per month.

SHOPPING TIPS

Be sure your antispam product supports your particular mail server and access method. For example, not all desktop products work with IMAP or Exchange. Before buying an antispam solution, consider the claimed percentage of spam blocked and the rate of false positives (legitimate messages classified as spam) returned. Also evaluate the speed at which the vendor adds new content or identity rules. Companies that monitor Internet spam in real time and on a global basis yield the best results.

Today, the multitactic approach most vendors offer catches the most spam. In the future, when e-mail sender information is more secure and harder to fake, identity-based solutions will be more effective.

OS & App Vulnerabilities

Operating systems and applications are both the primary targets of and conduits for attacks. Security holes in Windows get a lot of press, but other OSs and programs are also at risk from enterprising hackers. Hackers exploit known vulnerabilities—even those that vendors have already "fixed" by posting downloadable patches—because patches work only if you use the latest ones. Another way viruses attack is by installing a rogue application that begins collecting information on your network. Typically, such attacks let hackers take over a system and compromise the security of your network.

SMBs can fight back in three ways. First, keep up with the OS and application vendor updates. To close up Windows holes in your small business, set

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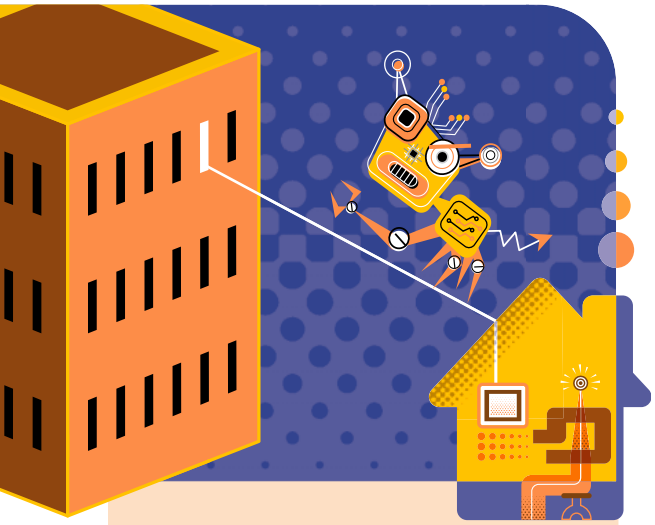

each desktop to perform automated updates using Microsoft's Windows Update service (*http://windowsupdate.microsoft.com*). You should also check periodically for application updates (Microsoft SQL Server and Outlook are well-known targets).

Medium-size companies with additional resources may choose to centralize the testing of these updates before distributing them to every desktop and server, to make sure that patches do not break important infrastructure applications.

PRODUCT CATEGORIES

Secure software. To keep out unwanted eavesdroppers and protect against security breaches, use secure instant-messaging and e-mail services. Such services add encryption and authentication to ensure that each message sender is known and that the contents are secure in transit from the sender to the recipient. Secure IM costs between $20 and $50 per user, and digital IDs to authenticate e-mail correspondents can be had for between $10 and $20 per user per year.

Desktop firewall. In addition to secure applications, SMBs should use desktop firewall or intrusion protection software to protect both the host computer and other network machines. These applications enforce policies around acceptable and expected application behavior. Personal firewalls and desktop intrusion protection systems cost around $50 per desktop (server products cost more) and prevent unauthorized application usage on individual machines.

For example, a personal firewall might allow only Outlook to send e-mail, allow port 80 access only from Internet Explorer, and lock down other inbound and outbound traffic altogether. These precautions will prevent new viruses, spyware, and attempted hacks from causing any significant damage.

Such applications work together with antivirus solutions, and many security companies offer both products as a single bundle. Be aware that these products also reduce the flexibility available to end users and require administrators to set policies that allow legitimate work to proceed unhindered.

Antispyware software. Spyware is finally getting the attention it deserves, and if you haven't taken steps against it, it's already on your machines. The question is, do you have the annoying kind that pops up its own search engine page, or is it looking to steal information? Buy antispyware software if your antivirus solution does not protect against spyware. Such packages look for applications like spyware, adware, and Trojan horse programs—malicious software that can send your keystrokes, passwords, or sensitive files to a remote location. Instead of waiting for the activity, these utilities find and remove known malware before it can do any damage.

SHOPPING TIPS

For all but the smallest business, a good rule is to look for centralized management of desktop firewalls or intrusion detection software. Monitoring and reporting should paint an easy-to-understand picture of the filtering activity. Finally, consider outside help for setting up the initial configuration.

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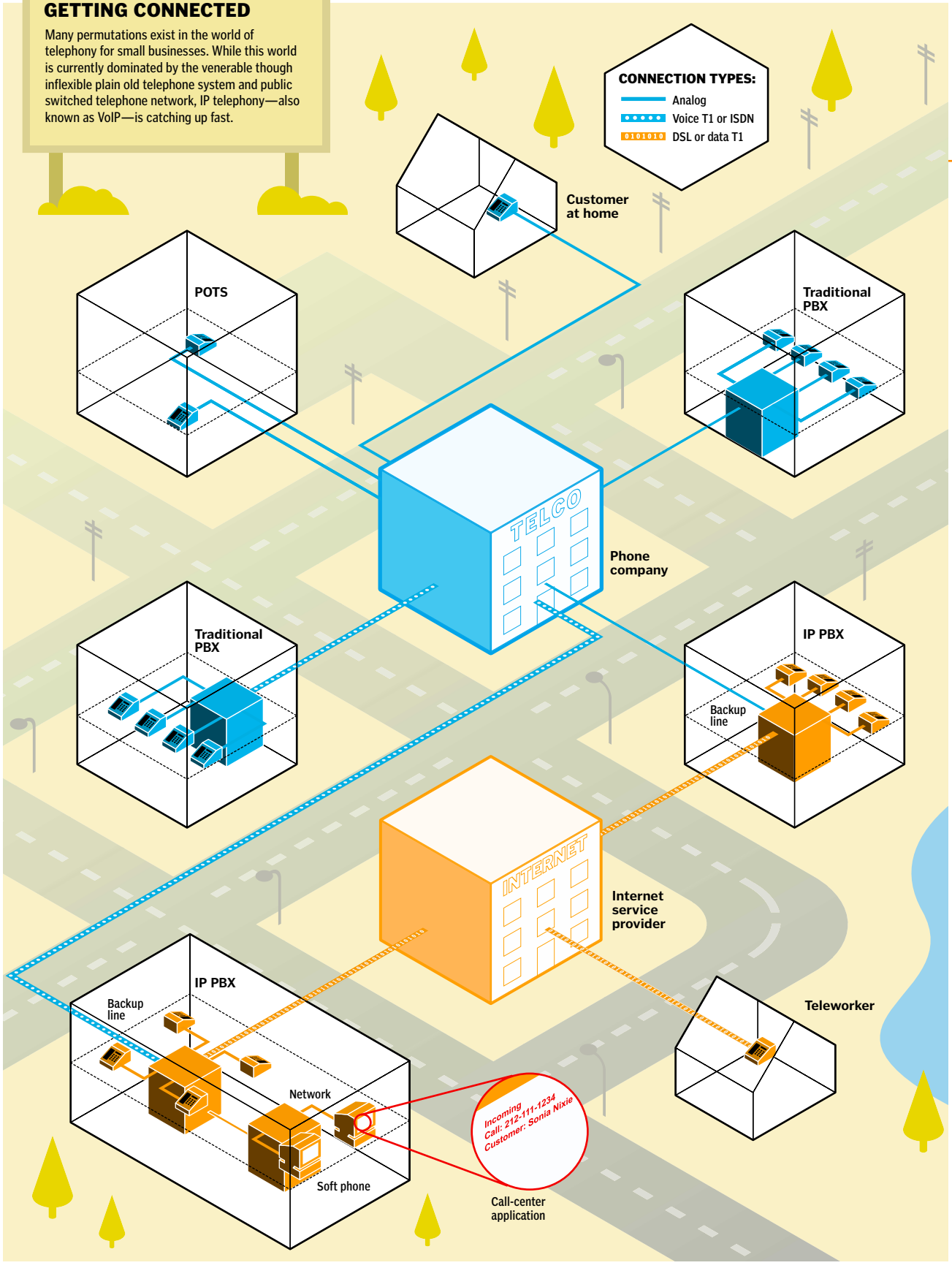
GETTING CONNECTED

Many permutations exist in the world of telephony for small businesses. While this world is currently dominated by the venerable though inflexible plain old telephone system and public switched telephone network, IP telephony—also known as VoIP—is catching up fast.



VoIP: THE RIGHT CALL

Finally, VoIP is ready for small and medium-size businesses that have a firm grasp of their needs.

By Charlotte Wolter Illustration by David Foster

After years of hype and unfulfilled promises, IP telephony—also known as Voice over IP (VoIP)—has finally evolved as a true option for small and medium-size businesses. The technology of sending voice packets over data pipes has been refined and has matured, offering a number of benefits over traditional phone networks.

Not only do today's VoIP systems match the voice quality of regular phone systems—based on the TDM (time division multiplexing) system—they're adding features that businesses never would have imagined. For example, with VoIP, callers can reach you no matter where you are by dialing your office number. And with a Web browser, you can retrieve your voice mail.

The main benefit, of course, is cost savings. Though initial equipment costs can be considerable, with most implementations of VoIP the distinctions between local and long-distance calls go away almost completely. And when signing up with a hosted service, such as an IP Centrex provider, you can keep up-front costs to a minimum.

VoIP calls made over a private network—for example, from a main office to a branch office—are free. And even if you're calling someone who is not on the network and doesn't have VoIP, you can still realize significant savings. Through deals with broadband service providers or other hosted services your calls are still carried either free via the Internet or at highly discounted flat rates—about 2 to 3 cents a minute.

Today, there is much more to VoIP than the early consumer applications, which involved cumbersome Web interfaces and using PCs with headphones instead of handsets. In the early days of VoIP, there was also a lack of widespread broadband, a problem augmented by poor voice quality and the difficulty in finding people to connect with at the other end. Only over the past five years, since the introduction of the first IP gateways, has the technology been adapted for standard business phone use.

Enterprise customers have firmly grabbed hold of this new technology, and now manufacturers old and new are eyeing small and medium-size business markets. (We define *small* as having fewer than 100 employees and *medium-size* as 100 to 500.) The industry is heating up to the point where these businesses can choose from a dozen or more IP PBX (IP private branch exchange) systems and nearly as many service providers offering hosted VoIP solutions.

With so many choices available, business owners need to understand their own requirements, the pros and cons of IP telephony in general, and the distinctions among the various solutions before deciding how to implement VoIP, if at all.

COST SAVINGS AND OTHER BENEFITS

VoIP can save small businesses significant amounts of money, averaging about 30 percent on phone costs. This varies tremendously and depends greatly on the type of system a company uses, but some amount of savings is just about guaranteed.

While larger companies have the most to gain by connecting their branch offices via VoIP, small businesses too can save on calls to and from teleworkers or partners—even if they're located in another country—when those calls are placed over the Internet. IP phones can talk over any IP network, including the Internet or a company's data network. The quality may not be perfect if you are depending on the Internet, but companies may be willing to accept that in exchange for free calls around the world.

Most of the time, poor voice quality is caused by Internet congestion, which today is much more of a problem in developing nations. Such nations often have very little bandwidth going in or out, compared with the more advanced networks of Asia and Europe.

As an IP telephony switching system, the IP PBX controls all of the phones in its system via an IP network (which could be the Internet). Thus, just one PBX can control phones at multiple locations, even in other countries. That eliminates the need for multiple PBXs, which many companies have now with traditional PBX systems.

Enterprises can use this capability to provide extended office coverage. For example, calls placed to an East Coast office that has closed for the day can be routed free to a West Coast office. Likewise, IP telephony comes in handy in times of disaster; if an office becomes damaged and unusable for whatever reason, calls can often be forwarded to workers at home over broadband connections.

In the same way that it enables calls from any location, IP telephony can be a godsend for the frequent traveler. A VoIP phone—or for more convenience a VoIP soft phone installed on a laptop—can be used to make and receive calls from any location in the world, as long as there is access to the Internet. In many cases broadband access is not even necessary, though it usually helps considerably with voice quality.

Finally, a VoIP system can mean signifi-

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Telephony Glossary

Attendant console The larger, specialized phone an operator or attendant uses to answer incoming calls and route them to the appropriate extension. In an IP PBX, this may be replaced by software running on a PC.
Centrex A traditional business telephone service that a local telephone company offers from a local central office. This is essentially a normal single-line telephone service with advanced business features.
CSU/DSU (channel service unit/data service unit) A device that terminates a digital channel. In this context, the device sits between the voice T1 line and the IP PBX.
Find-me/follow-me A feature that allows calls to find you wherever you are, ringing multiple phones (such as your cell phone, home phone, and work phone) all at once. Such *presence features* are found in IP PBXs and offered by some hosted services. You activate them by pressing a soft key.
Gateway In VoIP systems, a network device that converts voice and fax calls in real time from a public switched telephone network (PSTN) to an IP network. A gateway can also convert calls between branch offices to VoIP so they can travel over the Internet.
High-availability Refers to devices or deployment strategies designed to provide access to fully functioning systems at all times. One HA strategy is to cluster devices so that the primary device can fail over to the secondary one if necessary.
IP Centrex or **hosted voice** An IP voice service delivered by an IP service provider or a phone company. On the surface it is like old-fashioned Centrex, but the features are much richer and the price is usually much lower.
IP PBX (Internet Protocol private branch exchange) A private telephone switching system that performs the same basic functions as a traditional PBX but operates using IP, making it easier to add features.
KTS (key telephone system) A system in which the telephones have multiple buttons representing separate phone lines. Users select external phone and intercom lines directly through these buttons. KTS solutions are less expensive and less flexible than PBX solutions.
PBX (private branch exchange) A private telephone switching system that connects outside phone lines from a telecommunications provider to extensions within a building or office, as well as providing such features as call forwarding and paging. Where older proprietary systems used handsets designed specifically for separate systems, new PBX devices are interoperable.
PoE (Power over Ethernet) A solution in which networking hardware transmits electrical power over Category 5 Ethernet cable or better. This eliminates the need for AC power cords, minimizing cabling and outlet requirements.
POTS (plain old telephone service) The typical, familiar single-phone-line-and-single-phone-number model.
PSTN (public switched telephone network) The combination of local, long-distance, and international carriers that make up the worldwide telephone network.
QoS (quality of service) The ability of a network (including applications, hosts, and infrastructure devices) to deliver traffic with minimum delay and maximum availability.
SIP (Session Initiation Protocol) An Internet Engineering Task Force (IETF) standard for initiating, maintaining, and terminating an interactive user session involving video, voice, chat, gaming, virtual reality, and more.
Soft keys Buttons on a telephone handset that can be programmed to perform various functions—such as speed dialing or conferencing—depending on the interface on the handset's screen.
Soft phone IP telephony software that lets users send and receive calls from nondedicated hardware such as a PC or Pocket PC device. It is typically used with a headset and microphone.
VoIP (Voice over IP) The process of making and receiving voice transmissions over any IP network. IP networks include the Internet, office LANs, and private data networks between corporate offices. The main advantage of VoIP is that users can connect from anywhere and make phone calls without incurring typical analog telephone charges, as for long distance.

cant savings in maintenance costs, especially when moving phones. There is no need to call in a technician and spend $200 every time an employee changes offices, since an IP phone will carry its configuration over to any LAN port it is plugged into. But adding phones or changing a phone's configuration requires logging on to the PBX management console and likely requires an administrator or consultant.

RICH WITH FEATURES

While the potential cost savings are what usually sells IP telephony, the cool features and the ease with which they can be managed are what keeps users happy.

Voice over IP systems offer features traditional PBXs and key telephone systems either don't offer or offer with a high level of complexity. Such features include *unified messaging,* in which all voice mail messages are stored as audio files and delivered as attachments to e-mail. This way, traveling employees don't need to make expensive phone calls back to the office to retrieve their messages.

Another feature that is proving to be hot with business is *find me/follow me.* This is a feature that knows whether a user can be reached and how (desk phone, e-mail, instant message, mobile phone). And though the browser-based interfaces are evolving and differ from one manufacturer to another, you can control what the caller is told. For instance, if a salesperson wants only the boss to know that she is reachable on her cell phone, that can be easily set up.

Surveys have shown that most employees of a company never use the majority of features a traditional PBX affords, because they're not easy to use. With IP systems, many advanced features are more accessible and easier to use.

Many automated applications are also available to run on or in tandem with an IP PBX, such as *call-center* applications, which assist with routing calls to appropriate employees or physical locations. In addition,

OUR CONTRIBUTORS: Charlotte Wolter is a freelance writer and the editor-in-chief of the online newsletter New Telephony. **Matthew D. Sarrel** is a technical director at PC Magazine Labs. *PC Magazine* associate editor **Davis D. Janowski** and PC Magazine Labs lead analyst **Oliver Kaven** were in charge of this story.

LEADING SMALL-BUSINESS IP PBX SOLUTIONS

Most IP PBX solutions for small businesses come standard with handsets, messaging, voice mail, video or voice conferencing, and soft-phone capabilities. Handsets with advanced features are usually available at an additional cost. Here is a sampling of some of the most popular IP PBX packages and what differentiates them.

	List price	Extensions	Lines	In a nutshell
AltiGen AltiServ1	$7,445	30	8	Includes eight phones, telephony software, hybrid IP/TDM capability, local 911 routing, Zoomerang auto call return, Microsoft CRM integration, live call screening.
Avaya IP Office	$9,907 $78,000	15 100	Varies	A standard IP PBX solution with remote-user licenses and hybrid IP/TDM capability. The 15-extension plan includes built-in wireless. The high-end plan includes call-center licenses.
Cisco Call Manager Express	$16,160 $36,130 $68,620	24 50 100	6 24 32	Prices include phones, routers, and feature licenses. No hybrid IP/TDM capability. The basic plan does not include voice mail.
Comdial ConverSip MP1000 Media Platform	$4,068 $10,500	10 25	4 8	A SIP-based solution. The prices include phones, appliances, and soft-phone features. The high-end MP5000 platform is also available, with hybrid IP/TDM and call-center capabilities.
Mitel SX-200	$14,560 $46,533	25 100	8 24	A feature-rich solution including phones, an e-mail client, a wireless kit, Your Assistant software, and hybrid IP/TDM capability. (The Mitel 3300 ICP, discussed elsewhere, supports additional applications.)
ShoreTel5	$52,200	100	24	A standard IP PBX solution including phones, an e-mail client, and call-center and hybrid IP/TDM capabilities.
Siemens HiPath 3500	$27,126	192	Varies	A standard IP PBX solution with hybrid IP/TDM capability. The price does not include phones.

auto-attendants—basically automated software-driven replacements for live operators—are becoming common.

If the many features that come with an IP PBX or IP Centrex system are not exactly what a company is looking for, they can be customized much more easily than with traditional telephony. A programmer who knows Java or XML can create custom applications that will run on an IP PBX or IP Centrex system. And some manufacturers are now supplying software development kits for this purpose as well.

CONSIDERATIONS

VoIP for the small office isn't perfect—yet. Most systems and services on the market have had a couple of years to work out the bugs, but there are still occasional performance issues, particularly with networks that are saturated with both voice and data traffic.

One of the often-cited advantages of Voice over IP is that the office telephone system moves onto the local area network (LAN), and you then have just one network to maintain, not two. Whether this is good news depends on how a company feels about its LAN. Local area networks are generally far superior to what they were even a few years ago, but a LAN may need a tune-up—upgrading its switches and making sure its WAN connection can support the bandwidth requirements to carry both its data and voice communications. Most businesses contemplating such a move should contact a consultant or VAR (value-added reseller) to assess their networks and carry out preliminary planning.

Another issue to keep in mind is power. Every VoIP phone has to have a power source, which means one more thing to plug in at each desktop. If the power goes out, so do your IP phones, unless you have power backup for the LAN. The new Power over Ethernet standard is simplifying these issues, but to get that capability a company has to install new LAN equipment, something most businesses are willing to do only when they move to new offices.

Finally, there's the issue of up-front costs. All these nifty new IP phones don't come cheap; they average about $300 each, with the highest-end models selling for more than $600. New models, as from snom technology (*www.snom.com*), can be had for under $200, but they remain the exception.

IP phones do provide many extras for their hefty price tags, such as *soft keys,* which can be programmed for almost any function the user chooses. For instance, a soft key can be set to open your Outlook address book at the touch of a button and then dial a selected number. These advanced features can be managed through the system's Web interface, which can be reached from anywhere in the world. Keep in mind that setting up these features still requires a telephony-savvy administrator.

STANDARDS AND STICKING POINTS

IP and the Internet represent the model for open systems, but the same is not always true for IP phones. Some vendors—notably the big ones, such as Avaya and Nortel—still lock customers into using their brand-name IP phones by relying on proprietary signaling between the PBX and the phones. Although another manufacturer's phones can sometimes be used, you'll be left without any of the fancy proprietary features designed into the end-to-end solution.

Now the acceptance of a new international standard called SIP (Session Initiation Protocol) is putting pressure on manufacturers to be more open. SIP is still developing and has not yet implemented some of the more obscure PBX features. But SIP has a lot of industry momentum, and once it is widely adopted it will undoubtedly help bring down phone prices.

HOSTED VoIP SERVICES FOR SMALL BUSINESSES

An increasing number of small-business VoIP service providers offer calling plans that are competitive with many local and long-distance carriers. Most of the plans detailed below include standard services such as caller ID, call waiting, call forwarding, and voice mail. Every service provides a terminal adapter that plugs into a standard phone, and they all include Web access to control features and monitoring. Existing phone numbers can migrate to all services.

	Monthly fee per seat	In a nutshell
Packet8 Business Basic/Virtual Office	Basic, $59.95 direct	Offers 4,000 local or long-distance minutes in Canada and the U.S. (additional minutes, 4 cents each). Rings multiple phones with a single DID.
	Elite, $79.95 direct	Offers advanced features such as auto-attendant, on-hold music, voice or e-mail message retrieval, and multiple DID numbers. Works with a Virtual Office phone ($99), which has a large LCD and programmed soft keys. Other packages are available.
VoicePulse Business Unlimited	$45.99 direct	Offers unlimited local and long-distance calls in Canada and the U.S. for 2.9 cents per minute. Enhanced voice mail, call filters, call blocking, call hunting, and soft-phone capability.
Vonage Small Business Plan	$49.99 direct	Offers unlimited local and long-distance calls in Canada and the U.S. Free fax line, virtual phone numbers using any area code for $5 each, repeat dialing, and caller ID blocking.

IP CENTREX SOLUTIONS

Another flavor of hosted IP telephony solution is IP Centrex, a vastly improved IP descendant of Centrex. This type of solution emulates an IP PBX in features including voice mail, messaging, long-distance calling plans, and auto-attendant. All providers listed here require an inventory of your company's LAN and WAN before deployment.

	Monthly fee per seat	Minimum number of seats	In a nutshell
GoBeam vPBX	$32 direct and up	10	Standard PBX features plus click-to-call, instant messaging, an attendant console, and optional auto call distribution. Long distance, 3 to 5 cents a minute.
ICG VoicePipe	$58 direct and up	10	Standard PBX features, six-way calling, priority ring tones, a toll-free number, e-mail messaging, a call center, and remote-user access. Phones included.
SBC PremierServ Regional	$29 direct	10	Standard PBX features plus enhanced voice mail and find-me/follow-me capability. The 10-seat National plan is $39.

Beyond the battles over protocol adoption, IP telephony has other issues to be resolved. One worth mentioning is the current inability for 911 services to pinpoint the location of VoIP users and dispatch help. Unlike traditional phones, IP phones are not necessarily associated with specific addresses. Many IP phones can be plugged into the Internet anywhere. This is particularly true when a company has several branches, all controlled by one IP PBX. Some of the phones will be in the physical office where the PBX is, and some will be elsewhere, but the PBX will see them all as local.

An organization working to find a solution to this problem by the end of 2004 is the National Emergency Number Association (*www.nena.org*), which has members from both government and the manufacturer community. Many possible solutions have been discussed, like tying GPS systems to phone locations or requiring hosted services and those with IP PBXs to maintain databases of physical locations tied to IP addresses.

THE FLAVORS OF VoIP

If you believe your business is a good candidate for VoIP, you need to ask yourself how far you want to go with it. Much of your answer depends on how much you're willing to spend on new equipment, and how much responsibility you want your business to take on with the deployment and upkeep of the system. There are three ways you can implement VoIP: a hybrid system (which combines old equipment with new technology), an entirely new IP PBX system, or a hosted VoIP service.

Hybrid systems. A hybrid system allows you to stick a toe in the water without getting completely wet. This is best for businesses that are satisfied with their current, traditional PBXs or don't have the budget to buy whole new VoIP systems. Several IP

The Mitel Example

Like many leading VoIP hardware manufacturers, Mitel offers a full line of IP phones, including an 802.11b wireless IP phone running Mitel's firmware and built by Symbol Technologies.

Beyond all the theoretical explanations, we at PC Magazine Labs knew that a real-world evaluation would help demonstrate how VoIP really works, so we set up and test-drove a leading hardware manufacturer's IP telephony solution.

For our testing, we installed and maintained an IP-based PBX in a hypothetical small-business setting to evaluate the system's features, management, and ease of use. Market leaders in this space include Avaya, Cisco Systems, Inter-Tel, Mitel, NEC, Nortel, and Siemens. We chose a Mitel solution, because the company has been a strong player in this market space for a number of years and is a recognized leader in IP telephony.

No two manufacturers provide parallel systems; each varies in hardware and software offerings. Also, none of the systems available from major manufacturers is a do-it-yourself project; each requires a VAR or consultant for initial installation and configuration of features. An IT administrator or power user can be trained to perform day-to-day maintenance, but major issues should be handled by a VAR.

THE PROJECT

We began by outlining parameters and needs for our hypothetical business, which consisted of 50 employees in a central office, 25 in a branch office, and 2 full-time mobile employees. We gave all employees access to voice mail, and the solution included a speech-enabled auto-attendant. We required high availability, a variety of IP-based phones (some wired, some not), and soft phone licenses. Mitel provided us with two Mitel 3300 ICP (Integrated Communications Platform) telephony servers, a variety of application servers, and an abundance of phones. The total cost, not including installation, was $62,621.

THE CENTRAL UNITS

The 3300 ICP is a full-featured IP-based telecommunications solution that uses a Web-based GUI for configuration and management. Besides the administrator GUI, there is also a user GUI (Desktop Administrator Tool), which individual employees can use to configure their own phones and soft-function keys.

Physical installation of the 3300 ICP was fairly straightforward and took less than an hour. But configuring the auto-attendant, company-wide speed dials, and voice mail options took several hours. Configuring a second 3300 ICP for the branch office and the Mitel 6010 Teleworker Solution added another half a day.

Several features of the 3300 ICP highlight the value an IP telephony solution adds, relative to a traditional PBX. The

PBXs are designed to begin life as a kind of helper system to the main PBX, enabling low-cost calls between offices and adding some more features.

The big manufacturers, such as Avaya (*www.avaya.com*), Mitel Networks Corp. (*www.mitel.com*), and Nortel Networks (*www.nortelnetworks.com*), offer a number of upgrade scenarios that ease into the new technology. These solutions vary in cost, depending on the original equipment and the number of extensions served, but they start at an average of $800 per worker.

A small company called Citel Technologies (*www.citel.com*) makes software that enables some of the most popular analog phones, such as the Nortel Meridian, to talk to an IP PBX from another manufacturer like 3Com (*www.3com.com*). This can cut the costs associated with buying new IP phones, or at least allow you to purchase and roll them out slowly.

For the kind of business with a few locations that make most of their calls to each other, another strategy is to install gateways at each company location. The gateways then convert only calls within the company to VoIP so they can travel over the Internet. Such small gateways, from companies like Mediatrix Telecom (*www.mediatrix.com*) or Quintum Technologies (*www.quintum.com*), can cost less than $2,000.

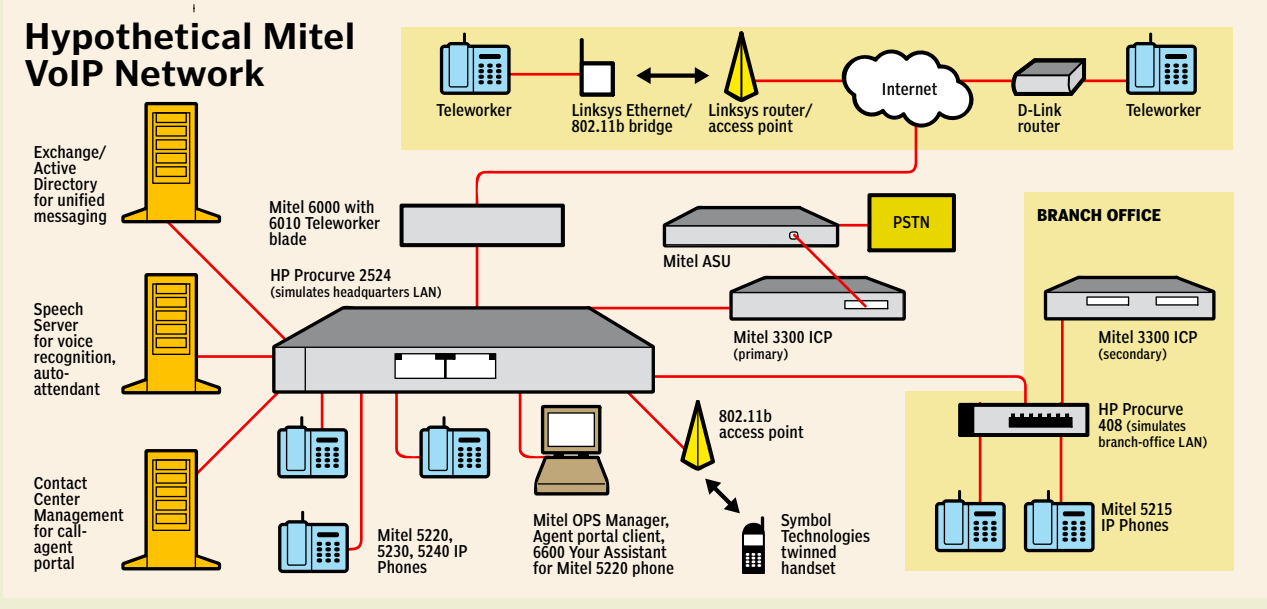
Finally, businesses with just a few employees who make the bulk of long-distance calls should consider buying a couple of phones from a consumer Voice over IP service, such as VoicePulse (*www.voicepulse.com*) or Vonage (*www.vonage.com*). These services bill at a flat rate, and using one of them can result in significant savings.

Complete IP PBX systems. Companies that are setting up new offices from scratch or expanding significantly are ideal candidates for a full hardware- and software-based, on-site VoIP system. The key advantages here are that a company owns and has full control over its voice system. In many cases this provides a great deal of flexibility to customize communications applications to meet specific needs. The one potential drawback is handling the complexity of an IP PBX. Either a knowledgeable IT staffer or a VAR or consultant must deploy and manage it.

The initial costs may be 10 to 20 percent higher than for a traditional PBX, but those costs are usually recouped within months if the purchaser can take advantage of the savings on long-distance calls. Those starting from scratch can also save when it comes to wiring their new space. Going with VoIP means installing one set of cables instead of one for voice and another for data.

Choosing a VoIP manufacturer is much like choosing a traditional PBX or key system manufacturer, especially now that most of the traditional players have IP products.

The traditional manufacturers, such as Alcatel (*www.alcatel.com*), Avaya, Nortel, and Siemens (*www.siemensenterprise.com*), all now have IP PBXs. And the company that pioneered the idea, Cisco Systems (*www.cisco.com*), now has some scaled-down models, though it is not yet aiming at very small companies, such as those with fewer than 20 employees. (See



unit runs a flavor of Unix that allows for simplified control via a Web browser, as well as the ability to transfer configurations via TFTP to other 3300 ICPs for backup. Support for fail-over resiliency is a strong selling point: Once configured, copies of configuration files are automatically exchanged with other 3300 ICPs, which can then serve as warm spares. In our testing, fail-over was not immediate, but within several minutes the branch-office IP phones found the central-office 3300 ICP, obtained its configurations, and were able to send and receive calls.

Also available is the Mitel SX-200 ICP, a less expensive alternative ($6,500 each) for either new installations or organizations looking to make the transition from a traditional phone system to an IP-based one. While the SX-200 ICP costs less and is easier to install and maintain, the 3300 ICP offers the additional software integration we required for our test business.

THE PHONES

The Mitel 5200 IP Desktop product line includes many ▶

the table at the top of page 147 for details on these offerings.)

Among small-system providers, one of the leaders is AltiGen Communications (*www.altigen.com*), a longtime player in systems for small businesses. Among its several IP PBX offerings is the AltiGen AltiServ1, which is designed for 8 to 50 users and includes voice mail, an auto-attendant, unified messaging, an administration system, call-detail reporting, workgroup support, and analog extensions ($7,445 list).

Also widely deployed is the ShoreTel solution (*www.shoretel.com*), from a company that was known until very recently as Shoreline—another organization with a long history in traditional PBXs. One of its offerings is the ShoreTel Single-Site Enterprise Solution (for 100 phone users or fewer), which includes ShoreGear switches in 24-port and 12-port sizes, as well as a T1 interface for trunking. The products include a user Web interface, ShoreWare Personal Call Manager. A system for ten users is available for less than $10,000.

Other manufacturers offering products in this arena are: Anta Systems (*www.antasystems.com*), Artisoft (*www.artisoft.com*), Bizfon (*www.bizfon.com*), Comdial (*www.comdial.com*), EADS Telecom (*www.eadstelecom-na.com*), FacetCorp (*www.facetcorp.com*), Interactive Intelligence (*www.inin.com*), Swyx Solutions (*www.swyx.com*), Toshiba (whose strategy has been to IP-enable existing lines; *www.toshiba.com/taistsd/pages/prd_voip_ipctxdk.html*), Vertical Networks (*www.vertical.com*), and Zultys Technologies (*www.zultys.com*).

Hosted services: IP Centrex solutions. Service providers large and small are offering hosted VoIP services for businesses. Some have a national footprint, while others are regional. Some offer complete PBX replacements, while others offer simply cheap long distance and standard phone features (call hold, caller ID, call waiting), plus a few extras for business (simultaneous ring, call transfer, and fax). The key advantage of a hosted service is that it relieves you of the responsibility of setting up and maintaining the system.

If you choose an IP Centrex provider, your phone system basically consists of software running at your provider's network operations center. It functions just like an on-site PBX, and you probably won't even know the difference; there just won't be any voice equipment in your own wiring closet. Such services are relatively new, having been offered only for the past five years, and failure to get the word out about their availability has been the primary inhibitor to their adoption.

The big national providers of hosted services in the U.S. and Canada include Covad/GoBeam (*www.covad.com, www.gobeam.com*), International Computer Graphics (*www.icg.com*), SBC (*www.sbc.com*), and Telus (*www.telus.com*). AT&T Wireless (*www.att.com*) plans to join this group by the end of 2004, as does Verizon

Administrators and users can easily customize their phones by adding speed dials and features to soft buttons using the Desktop application. The context-sensitive help is also excellent.

different models, each of which contains a second switched Ethernet port, so a single cable can connect a user's phone and PC, although we recommend isolating voice and data traffic onto separate VLANs and applying QoS rules. Each 5200-series phone comes with an external AC adapter but can be configured to use Power over Ethernet. From the model 5215 up, a soft key works in conjunction with the 3300 ICP to provide access to administrator -configured options such as a company-wide directory, voice mail, and call forwarding with the touch of a single button.

The most popular unit is the Mitel 5220 IP Phone ($350), a fairly typical desktop handset with support for up to 24 programmable keys. It is well suited for a teleworker and can be enhanced with a programmable module that adds 12 or 48 programmable keys.

The most interesting unit is the Symbol MiNET Wireless Phone ($818), a wireless handset that combines Symbol Technologies hardware with Mitel firmware to provide a cost-effective option for in-office roaming. The handset can be installed as a separate extension or twinned with an existing one. Reception on the MiNET phone was clear as long as we stayed within range of our 802.11b access point.

An intriguing option is the Mitel 5230 IP Appliance ($350), which integrates an HP iPAQ PDA (not included) into an IP-based desktop phone. This lets users take advantage of features that go far beyond a traditional PBX. All telephone settings, including phone book and speed dials, automatically populate any 5230 base station once an iPAQ is docked. Other features include the ability to dial from your Outlook Contacts list, and Visual Voice Mail lets you select a specific message to hear rather than going through all your messages in chronological order.

Mitel 6600 Your Assistant, a soft-phone application ($95 per user), is extremely powerful and easy to use. A single screen lets users obtain presence information for other users, set up granular call-routing rules, send text messages, share applications, and videoconference (with an added PC camera).

Shown here are the core components of our Mitel test system, the 3300 ICP (Integrated Communications Platform) controller and a Mitel 3050 Controller with the 6010 Teleworker Solution on-board.

THE 6010 TELEWORKER SOLUTION

The Mitel 6010 Teleworker Solution is easily the coolest feature Mitel has to offer. The 6010 lets remote users harness all the features of the 3300 ICP without being in the office. An administrator must enable a user for telework in OPS Manager and then config-

Wireless (*www.verizon.com*).

The new service that Covad/GoBeam offers is typical of these packages. Covad provides T1 and DSL connections nationwide. It just acquired GoBeam, which has been offering a full-featured IP Centrex service. Together they have national sales and support reach—and a highly developed PBX replacement package.

A typical service package from Covad is a full seat license for $26 to $32 a month, depending on volume. That license includes all PBX functions. Long distance is from 3 to 5 cents a minute. Factor in the cost of the broadband connection and the typical Covad customer spends about $61 per user per month. Auto-attendant and automatic call distribution are extra services, billed monthly.

Hosted options for very small businesses. Small companies with fewer than five employees can turn to "consumer" Voice over IP services. For instance, one consumer service provider, Packet8 (*www.packet8.com*) has just added a new service for small groups, called Virtual Office. It includes features such as auto-attendant, voice mail, call forwarding, call waiting, three-way conferencing, on-hold music, and call park and pickup. The package also includes unlimited local and long-distance calling. The price ranges from $39.99 to $79.95 a month with a minimum of three lines. Equipment, including a speakerphone, is a $99 one-time charge.

VoicePulse, a consumer service that offers flat-rate long distance in the U.S. and Canada, has features such as hunt groups, which will ring several phones simultaneously or in sequence, and distinctive ring, which will change the ring tone based on caller ID information. Whichever phone is answered first gets the call, but calls can also be transferred to other lines in the same group. These features are included in the cost ($45.99 per month), which also includes unlimited long distance.

A well-known consumer service, Vonage, offers a small-business package that includes a separate fax line, plus unlimited calling and a broad feature package, for $49.99 a month.

Covad/GoBeam will also be launching a small-office/home-office product this summer with a reduced feature set and, one assumes, lower pricing. Details were still in development at press time.

For small and medium-size businesses, the VoIP options are growing, and that's good news. As competition in this field increases in the coming months, prices will drop even further, making this a viable alternative for even more companies. And who knows, perhaps in another five years we will all be chatting via VoIP.

MORE ON THE WEB

VISIT ***WWW.PCMAG.COM*** FOR MORE INFORMATION ON VoIP AND A REVIEW OF AN OPEN-SOURCE IP TELEPHONY SOLUTION.

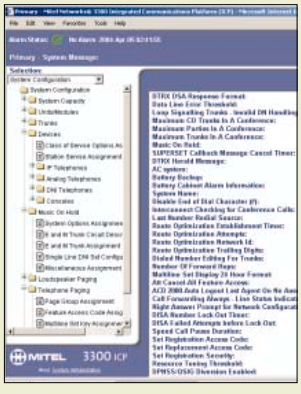
ure a 5220 with the external IP address of the 3300 ICP. Wherever that 5220 is plugged into a network, it attempts to establish contact with its 3300 ICP master, prompts the user for a PIN, establishes an IPsec VPN connection, and downloads firmware updates in addition to the user's profile.

At that point, a teleworker can send and receive calls (just as if directly attached to the 3300 ICP) and be available for automated call distribution (ACD), which is especially helpful in a customer-support scenario. We connected our 5220 to a Linksys Ethernet 802.11b bridge from the home of one of our PC Magazine Labs staffers, and it immediately found its host. And we were up and running with our full user profile.

WHAT WE LEARNED

In using the Mitel solution, we reached a couple of conclusions. First, purchasing your own system is expensive. Our fictitious small business spent $813.26 per user. We could have subtracted a few thousand dollars from the total by choosing simpler, lower-end phones rather than the mix of feature-rich and middle-of-the-road models we chose for our testing scenario.

Mitel's Web-based management GUI, Mitel OPS Manager, allows administrators to change a multitude of settings, the most common maneuvers being adds, moves, and changes to phone extensions. A traditional PBX requires a console connection and knowledge of a proprietary command line interface for any such tasks. This procedure is typically daunting enough to cause IT personnel to call back the VAR who installed the system and pay another $200 an hour.



Mitel OPS Manager provides system administrators with a browser-based interface for managing the Mitel 3300 ICP. It can be confusing without proper training, however, and is not for neophytes.

Even though OPS Manager is a good start, it fails to tame the complexity of the 3300 ICP for the uninitiated. Some of its options are buried in three nondescript menus, and the help system is extremely limited and overly complex. That means you'll need to pay for training at the time of installation or plan on regular maintenance.—*Matthew D. Sarrel*

MITEL 3300 ICP PRICING

This hypothetical installation is based on a 50-employee central office and 25-employee branch office. All prices are list, and discounts can be negotiated with your VAR. You could also reduce costs by selecting less advanced phones and removing the wireless-phone component.

Component	Quantity	Unit price	Cost
3300 ICP	2	$10,500	$21,000
ICP add-ons:			
Superconsole 1000	1	$1,531	$1,531
Network services unit	2	$2,500	$5,000
E-mail (SMTP) client	2	$1,250	$2,500
Voice mailbox licenses	77	$20	$1,540
6010 Teleworker Solution with eight client access licenses	1	$550	$550
IP phones and software:			
5207 IP Phone	15	$199	$2,985
5215 IP Phone	15	$275	$4,125
5220 IP Phone	31	$350	$10,850
IP phone licenses	77	$90	$6,930
Symbol MiNET Wireless Phone Kit	5	$818	$4,090
6600 Your Assistant soft phones	16	$95	$1,520
		Total cost:	**$62,621**

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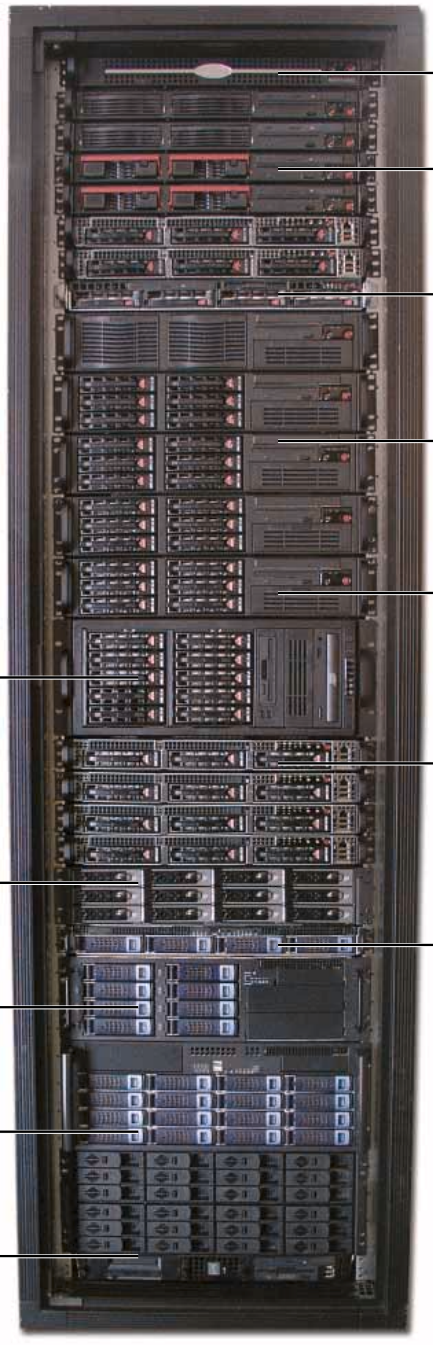

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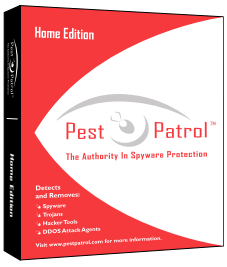

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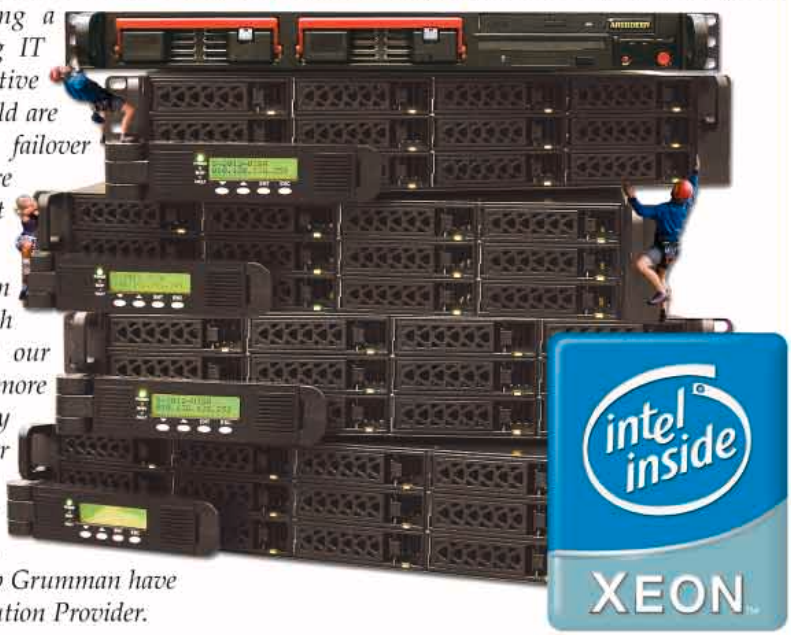

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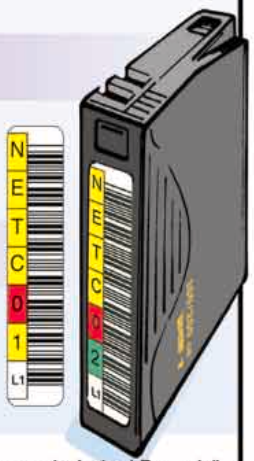

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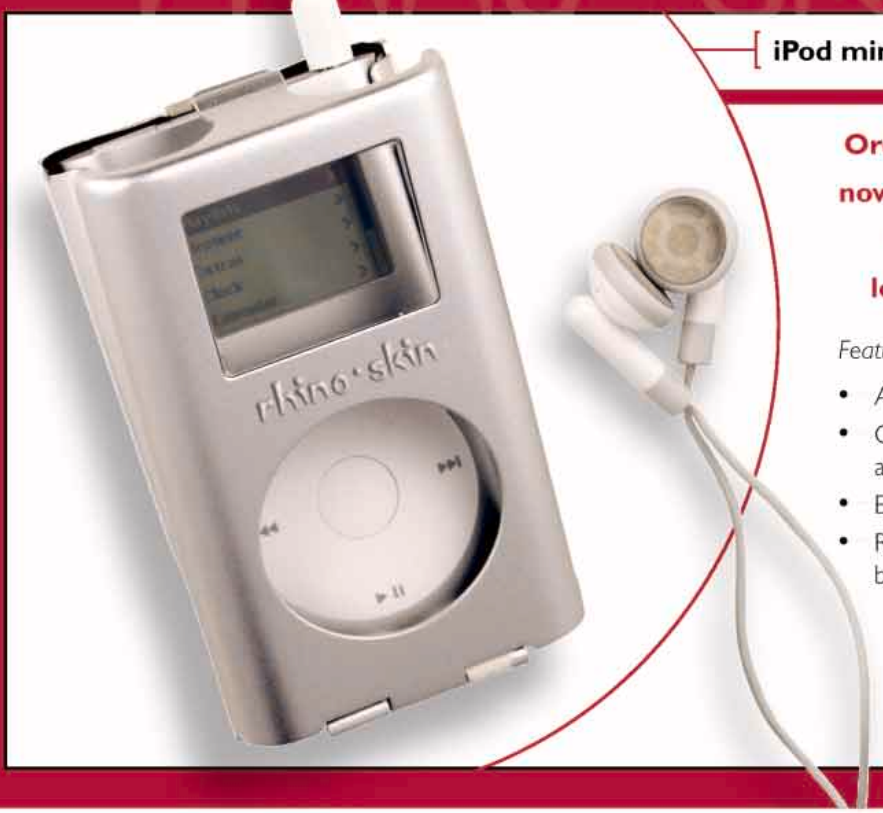

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Car Tech

BY BILL HOWARD

Credit the microprocessor for cleaner skies, fewer traffic fatalities, and more ways to entertain yourself in traffic jams. You'll find 50 to 70 microprocessors in today's high-end car; they monitor fuel efficiency and emissions, keep you from skidding around rain-slicked curves, control the timing and force of airbag deployment, track your location, and provide satellite music and backseat DVD entertainment. Even some of the software is familiar: A version of Microsoft Windows controls the dashboard in more than a dozen car models. (Insert your own "does it crash much?" joke here.)

FOLLOW ME Mercedes-Benz radar maintains safe following distances.

To be sure, the rich get new technology first. Burying a $2,500 radar cruise-control system in a $75,000 Mercedes sticker price is easier than in a $25,000 Dodge's. And luxury car buyers carry development costs in the decade it takes to make important technologies like antilock brakes and airbags affordable and standard.

In this story, we look at some of the most fascinating new technologies for your car.

WHAT THE RATINGS MEAN

- ●●●●● EXCELLENT
- ●●●●○ VERY GOOD
- ●●●○○ GOOD
- ●●○○○ FAIR
- ●○○○○ POOR

Navigation

Nav systems have been available for more than a decade, and the friendliest ones now allow technophobes to key in destinations with just a few finger taps. The best, from Alpine, Denso, and Xanavi, are found mostly on Japanese cars, plus some Cadillacs, Lincolns, and Jaguars, and use touch screens for input rather than control wheels. **Price:** $1,500 to $2,000. **What's next:** Acura and Cadillac will offer real-time traffic updates overlaid onto nav maps this fall, via XM Satellite feeds. Later on, prices should fall to $1,000, driven by efficiencies of scale (500,000 out of 17 million vehicles sold in the U.S. in 2003 had navigation systems).

NAVIGATION PLUS The Infiniti LCD shows a backup camera too.

Joysticks/LCDs

Rather than adding another switch every time a car gains a function, a handful of automakers—Audi, BMW, and soon Acura—are using an in-dash LCD and a joystick like controller to replace nonprimary switches. BMW's iDrive knob actually provides force feedback, and its first dash panel ran Windows CE. Most users, though, have found the "simplicity" confusing—several shoves, twirls, and clicks versus flipping one switch. Audi's MMI (multimedia interface) provides a more user-friendly approach, with eight buttons to preselect navigation, CD, radio, phone, and such. **Price:** Included. **What's next:** Acura will adopt an Audi-like solution this fall, and more BMWs will go to a simpler second-generation iDrive. Watch for this kind of controller on more cars soon.

IDRIVE The BMW control knob replaces dozens of dashboard switches.

Active Cruise Control

Cruise control works well only when the highway is empty. Active (sometimes called adaptive) cruise control (ACC) adds laser or look-ahead radar in the 76- to 77-GHz frequency range to back off the gas or lightly apply the brakes if a car cuts in front of you or if you come up quickly on a left-lane bandit. ACC is a vital safety asset on long, stuporous trips. By the way, ACC uses a different frequency than police radar, so it won't interfere with your radar detector **Price:** $2,000 to $3,000. **What's next:** $1,000 ACC, with cheaper (though bulkier) 24-GHz radar units in the U.S.; ACC mated to navigation systems and used to track the cars ahead as they go around curves.

Entertainment

Not the most advanced technology but perhaps the most desirable, backseat DVD keeps kids quieter on trips than anything short of pharmaceuticals. Sirius or XM Satellite Radio ($10 to $13 a month) provides 100 ad-free channels. True 5.1 surround sound is available in a few cars via DVD Audio. **Price:** Up to $2,500 for DVD video and premium sound. **What's next:** More cars that play MP3s, not just burned CDs; line-in jacks to connect digital music players; satellite video.

Steerable Xenon Headlights

Turn your steering wheel to the right and your headlights will turn also, lighting the way around corners. This technology is usually paired with xenon headlights, a great option in any case if you do a lot of night driving. **Price:** $500 to $1,000 for both. **What's next:** Super-accurate, next-generation nav systems that turn the lights before the road curves.

Bluetooth

Bluetooth in a car turns any Bluetooth-equipped mobile phone into a hands-free device. Only a few cars (from Acura,

ON-BOARD PACIFIER Backseat DVD on the Cadillac SRX entertains kids on long trips.

BMW, DaimlerChrysler, Lexus, Lincoln, and Toyota) have it, and you need a GSM phone (from AT&T or T-Mobile)—not a CDMA phone. **Price:** Around $500. **What's next:** CDMA (Verizon) phones with Bluetooth, $100 in-car Bluetooth, and in-car Wi-Fi for PC-to-car communications (also helpful at the dealership for uploading diagnostic info).

Head-up Display

Automakers that are worried about *glance time*—how long your eyes take to move to your instruments or LCD info panel back to the road—are projecting crucial info into the driver's line of sight using a head-up display. This technology, which GM originally marketed as a safety feature for older drivers in the late 1980s, is making a comeback at BMW and GM with color images using LEDs (rather than monochrome images from a hot projection bulb). The images appear to float at the end of the hood, so your eyes don't have to refocus. **Price:** $1,000 (or included). **What's next:** Lower prices, smaller packaging.

Lane Departure Warning

With this forthcoming feature, a windshield-mounted camera will capture lane markers, and powerful but cheap microprocessors will figure out what they mean. If you veer into another lane, the steering wheel will vibrate and an alarm will sound. **Price:** To be determined. **What's next:** Infiniti will incorporate this technology into vehicles this fall.

Precrash Safety

Front, side, rear, head, and knee airbags protect you after a crash, and seatbelt tensioners remove slack at the moment of impact. Now comes a software algorithm that senses the events leading up to a crash—sudden hard braking, skidding, heavy body lean—and prepares for the impact by raising reclined seats, closing the sunroof, and lightly increasing seatbelt snugness. Currently only high-end Mercedes-Benz cars use this. technology. **Price:** Included. **What's next:** Wider adoption.

PRESS HERE The best nav systems, like the Lexus LS430, use touch screens, not dials.

Automatic Manual Transmission

Purists say manual transmissions are faster, give better gas mileage, and are more fun to drive with than automatics. Manual gearboxes with electronic clutch control give you the best of both worlds. Audi's Direct Shift Gearbox on the TT 3.2, with dual clutches (even gears on one clutch and odd gears on the other), reduces the jerky shifts that happen with some other manumatic transmissions. **Price:** $1,000 to $2,500. **What's next:** Smoother shifting for all and the introduction of continuously variable transmissions (CVTs) in heavier cars.

MORE ON THE WEB

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See After Hours online for more Quick Clips and Gear & Games reviews.

SEE IN THE DARK Heat-sensing GM option shows night life on head-up display.

Hybrid Engines

Although trucks (including SUVs and minivans) make up the majority of the auto market, highly efficient power-plant engines thrive too. Most popular is the *hybrid,* a small gasoline engine and a big battery driving an electric motor for extra acceleration. **Price:** Up to $3,000 more than a comparable car (if one exists). **What's next:** Return of the diesel engine (now quiet), unused-cylinder shutdown (from DaimlerChrysler), and perhaps hydrogen-based fuel in the longer term.

Night Vision

The infrared heat sensor in GM's NightVision projects a video image onto a head-up display independent of the car's headlights. It's uncanny in its ability to see dark-clothed joggers, animals, and even parked cars that are still warm. **Price:** $2,250. **What's next:** Adoption beyond the current handful of GM cars.

Top Ten High-Tech Cars

- **Acura TL.** Integrated Bluetooth and five-channel DVD/CD Audio in every car. Superb nav system (as with all Acuras). $33,000 base price.
- **Audi A8 L.** Best yet cockpit controller. Almost as many gadgets as the Lexus LS430 and even more fun to drive. $69,000.
- **Audi TT Coupe.** The best automatic-manual gearbox, with Formula One-style paddles for manual shifting. $40,000.
- **BMW 5 Series.** Head-up display, active cruise control, and *variable steering* (the car turns more at slow speeds). Improved but still frustrating iDrive cockpit controller. $40,000.
- **Cadillac SRX.** Halfway between a wagon and an SUV, the SRX offers every imaginable entertainment option. $39,000.
- **Chrysler 300C Hemi.** Bluetooth, navigation, and satellite radio options. The Hemi engine shuts down half of its cylinders on the highway, increasing economy up to 20 percent. $33,000.
- **Infiniti FX45.** This aggressively styled SUV's Technology Package has active cruise control, a backup camera, and navigation. DVD entertainment quiets the backseat crowd. $44,000.
- **Lexus LS430.** One of the best nav systems, backup video, and—unlike some competitors—impeccable reliability. $55,000.
- **Mercedes S-Class.** Sensational active cruise control, a body that leans into turns, and crash-sensing wizardry makes you forget the so-so nav system and complex audio. $74,000.
- **Toyota Prius.** A hybrid car that's actually big enough to carry people and their luggage. Feels and drives like a real car. $20,000.

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GEAR & GAMES

Sony Micro Vault with Fingerprint Access

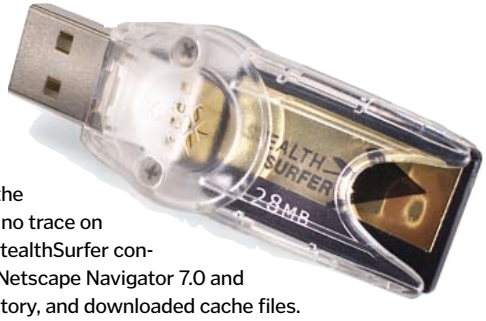
The Sony Micro Vault with Fingerprint Access is an excellent device for managing passwords, encrypting files and directories, and providing authenticated access to sensitive files. Tight integration with Windows Explorer and Internet Explorer makes it especially easy and intuitive to use. *—Craig Ellison*

$140 street. Sony Electronics Inc., www.mediabysony.com. ●●●○○

Soyo Aerielink Wireless Flash Combo

Talk about convergence devices: The Soyo Aerielink Wireless Flash Combo (model AWUA1211) is an 802.11b wireless network adapter combined with a 128MB flash drive. We saw good performance throughout the 160-foot length of our wireless test range. The drive uses the older and slower USB 1.1 interface, though. Unless you need both storage and wireless networking in one device, you're better off buying separate devices based on USB 2.0 and 802.11g technologies.*—CE*

$109.99 direct. Soyo Group Inc., www.soyousa.com. ●●●○○



StealthSurfer

Want to browse the Web and leave no trace on your PC? The StealthSurfer contains a custom version of Netscape Navigator 7.0 and stores all your cookies, history, and downloaded cache files. Secure Web surfing is handy, although this is secure only for home and not business use: Your corporate IT department can easily watch which sites you visit regardless of which browser you use. But some peace of mind is better than none, and the drive's small size is sure neat.*—Jeremy A. Kaplan*

128MB, $100 street; 256MB, $160; 512MB, $200. Stealth Ideas Inc., www.stealthsurfer.biz. ●●●○○

Forward Solutions Migo

A USB 1.1 flash drive bundled with tightly integrated software, the Forward Solutions Migo captures your desktop, including shortcuts and wallpaper, your Internet favorites, your Outlook e-mail, and your choice of files. When you plug your Migo into another computer, you can log on to the computer profile you've created (providing the applications you use also reside on that computer). When you unplug the Migo from the guest computer and plug it back into the original, you can synchronize any changes made.*—CE*

128MB, $149.99 list; 256MB, $199.99. Forward Solutions Inc., www.4migo.com. ●●●○○

MMORPGs: The Next Wave

BY JOHN BLAZEVIC

A slew of *MMORPGs* (massively multiplayer online role-playing games) are due out in the coming year. In case you don't already know, these games let you create a virtual character and interact with people all over the world. Players can band together to go on missions and fight monsters or, in some games, each other.

One of the biggest names in MMORPGs is Everquest; if EQ1 is any indication, EQ2 (not yet available for testing) will be hugely popular. Meanwhile, we were able to test prerelease versions of three other highly anticipated games. Each will require a monthly fee to play; these were still to be determined at press time.

CITY OF HEROES

City of Heroes

City of Heroes ranks among the most original MMORPGs we've seen. To begin, players create their very own superheroes to play as, and the creation process is almost as much fun as playing the game.

You can choose what makes your character super. For example, are you a mutation, or did you attain your powers from a science experiment gone awry? You then move on to archetypes and decide whether you're a superstrong, up-close–and–personal melee fighter or a fire-shooting-from-your-hands type. After all that, you venture into the various neighborhoods of Paragon City and take on missions, beating up thugs and muggers and defeating supervillains.

NCsoft Corp., www.cityofheroes.com. ●●●●◐

Lineage II

LINEAGE II

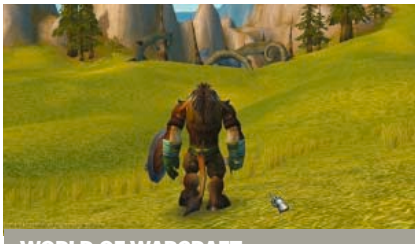
Lineage II is graphically stunning, with a nearly photo-realistic world and anime like characters. The character creation process can take a while in other games, but in Lineage II the process has been simplified. After choosing one of the five races—human, elf, dark elf, dwarf, or orc—each player decides whether to be a fighter or a magic user.

As you advance in the game, you can then make more specific career choices: For example, a human fighter can eventually wind up as a Paladin or Rogue. Some of the races are limited in what they can become, as far as careers go, but they all offer enough variety to keep things interesting. Lineage II features player-versus-player encounters, so having close friends play with you could give you the edge.

NCsoft Corp., www.lineage2.com. ●●●●○

World of Warcraft

Even in its early prerelease form, World of Warcraft (WoW) is very polished and feels complete. The play mechanics are similar to those of most other MMORPGs:



WORLD OF WARCRAFT

You level up, equip your character with new items, and so on. But the game is very well balanced, with a rich story line to keep things interesting.

You play as a character from one of eight races—four "good" races, consisting of humans, night elves, dwarfs, and gnomes, and the "evil" bunch, which includes orcs, tauren, trolls, and undead. There are many missions for players to complete, either with other players or solo, but you can also just run into the wild and hack away at the various beasts that roam the land. The game world is beautifully detailed in a cartoonish style that works really well.

Blizzard Entertainment, www.blizzard.com/wow. ●●●●○

QUICK CLIPS

Söldner: Secret Wars

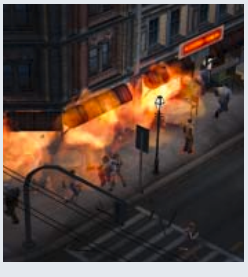
Set in the year 2010, this first-person shooter serves up constant combat with futuristic weapons and vehicles. Private mercenary armies fight in an ever-changing political climate; the robust single-player campaign also includes a mission generator for quick one-off games. The online multiplayer environment provides a variety of team-based missions, with dedicated support for 32 players as well as special servers for up to 128.—*Peter Suciu*

$49.99 list. JoWood, www.jowood.com. ●●●●○

CSI: Dark Motives

The crime is murder, and you and the Crime Scene Investigation team must solve it. Based on the hit CBS drama, this game takes you to the seamy side of Las Vegas, where you'll have to use detailed forensic equipment to analyze evidence in five cases. Fans of the show can expect the series' visual style and music along with the likenesses and voice talents of the cast, making for an immersive experience.—*PS*

$29.99 list. Ubisoft Entertainment, www.ubisoft.com. ●●●●○



Gangland

In Gangland, a real-time 3D simulation that brings the mean streets to life, you start out as a low-level wise guy and gradually work your way up the underworld food chain through an open-ended campaign. There are lots of possible paths for the aspiring gangster, but a poor camera system hampers game play.

Reminiscent of the Grand Theft Auto series, Gangland is rougher and tougher. Even Tony Soprano might find it offensive at times.—*PS*

$49.99 list. Whiptail Interactive, www.whiptailinteractive.com. ●●●◐○

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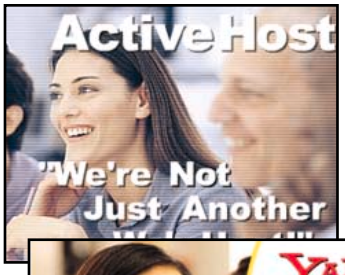
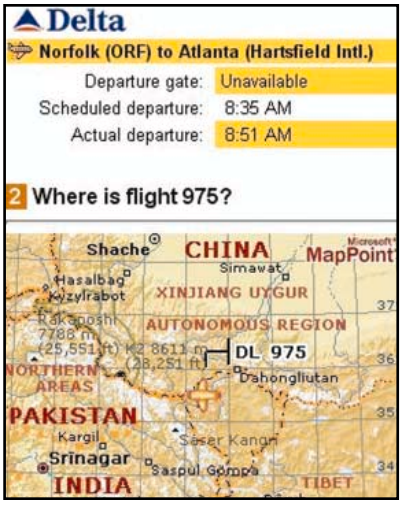
Edited by Don Willmott



She works at ActiveHost, but she must not like it, because she's also job-hunting at Yahoo! HotJobs.



From Norfolk, Va. to Atlanta by way of Tibet?
(Delta Airlines site)

What's wrong with this picture?
(DVD X Show ad)

Hmm. Maybe they meant "furniture." Then again, maybe not.
(Allentown Business School)

Not a bad way to refer to it, actually.
(Unidentified source)

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(Fox News)

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- Productivity Pack including WordPerfect® and Money®
- 6 Months of America Online® Membership Included[7]
- 1-Yr Limited Warranty[2]; 1-Yr At-Home Service[3]

$599 Ask about No Payments for 90 Days for well-qualified customers[11]
E-VALUE Code: 00045-D50505

DIMENSION™ 4600 DESKTOP

Exceptional Performance

- Intel® Pentium® 4 Processor at 2.80GHz with 533MHz Front Side Bus
- Microsoft® Windows® XP Home Edition
- 256MB Shared[4] Dual Channel DDR SDRAM
- 40GB Hard Drive (7200 RPM)
- 17" (16.0 v.i.s., .27dp) E773 Monitor
- Integrated Intel® Extreme Graphics 2
- 16x DVD-ROM Drive
- Integrated 5.1 Channel Audio
- Speakers Not Included
- Productivity Pack including WordPerfect® and Money®
- 6 Months of America Online® Membership Included[7]
- 1-Yr Limited Warranty[2]; 1-Yr At-Home Service[3]

$749 Ask about No Payments for 90 Days for well-qualified customers[11]
E-VALUE Code: 00045-D50507

DIMENSION™ 8300 DESKTOP

Cutting-Edge Technology

- Intel® Pentium® 4 Processor with HT Technology at 3GHz with 800MHz Front Side Bus
- Microsoft® Windows® XP Home Edition
- 512GB Dual Channel DDR SDRAM
- 80GB Hard Drive
- 19" (18.0 v.i.s., .24dp) M992 Monitor
- 128MB DDR ATI's RADEON™ 9800 PRO Graphics Card
- 16x DVD-ROM Drive
- Sound Blaster® Audigy™ 2 (D) Sound Card
- Dell 5650 5.1 Surround Sound Speaker System with Subwoofer
- Productivity Pack including WordPerfect® and Money®
- 6 Months of America Online® Membership Included[7]
- 1-Yr Limited Warranty[2]; 1-Yr At-Home Service[3]

$1599 Ask about No Payments for 90 Days for well-qualified customers[11]
E-VALUE Code: 00045-D50515

NEW INSPIRON™ 1150 NOTEBOOK

Notebook Essentials – Budget Friendly

- Intel® Celeron® Processor at 2.40GHz[1]
- Microsoft® Windows® XP Home Edition
- 14.1" XGA TFT Display
- 256MB Shared[4] DDR SDRAM
- 20GB Hard Drive
- 8x DVD-ROM Drive
- Integrated Intel® Extreme Graphics
- 8 Cell Li-Ion Battery (65Whr)
- Productivity Pack including WordPerfect® and Money®
- 1-Yr Limited Warranty[2]; 1-Yr Mail-In Service

$799 Ask about No Payments for 90 Days for well-qualified customers[11]
E-VALUE Code: 00045-D80507m

Recommended Upgrades:

- 24X CD Burner/DVD Combo Drive, add $59
- 3-Yr Limited Warranty[2]; 3-Yr At-Home Service[3], add $179

INSPIRON™ 5150 NOTEBOOK
Dell Outrageous Deal!

Perfect Balance of Price and Performance

- Mobile Intel® Pentium® 4 Processor at 2.66GHz[1]
- Microsoft® Windows® XP Home Edition
- 15" XGA TFT Display
- 512MB DDR SDRAM
- 40GB Hard Drive
- 24x CD Burner/DVD Combo Drive
- 32MB DDR NVIDIA® GeForceFX™ Go5200 AGP 4X Graphics
- 8 Cell Li-Ion Battery (65Whr)
- Productivity Pack including WordPerfect® and Money®
- 1-Yr Limited Warranty[2]; 1-Yr Mail-In Service

Pre-Rebate ~~$1199~~ **After $200 Mail-In Rebate[10]** **$999** Ask about No Payments for 90 Days for well-qualified customers[11]
E-VALUE Code: 00045-D80511m

Make this your perfect PC:

- 12 Cell Li-Ion Battery (96Whr), add $29
- 3-Yr Limited Warranty[2]; 3-Yr At-Home Service[3], add $269

NEW INSPIRON™ 9100 NOTEBOOK

Multimedia Powerhouse

- Intel® Pentium® 4 Processor with HT Technology at 2.80GHz
- Microsoft® Windows® XP Home Edition
- 15.4" UltraSharp™ Wide Screen XGA TFT Display
- 256MB DDR SDRAM at 400MHz
- 40GB Hard Drive
- 24x CD Burner/DVD Combo Drive
- 64MB DDR ATI's MOBILITY™ RADEON™ 9700 AGP 8X Graphics
- 12 Cell Li-Ion Battery (96Whr)
- Productivity Pack including WordPerfect® and Money®
- 1-Yr Limited Warranty[2]; 1-Yr Mail-In Service

$1499 Ask about No Payments for 90 Days for well-qualified customers[11]
E-VALUE Code: 00045-D80514m

Make this your perfect PC:

- 512MB DDR SDRAM at 400MHz, add $100
- 3-Yr Limited Warranty[2]; 3-Yr At-Home Service[3], add $269

Small Business Desktops

DIMENSION™ 2400 DESKTOP

Economical, Essential Technology Desktop

- Intel® Celeron® Processor at 2.40GHz
- Microsoft® Windows® XP Home Edition
- Productivity Pack including Corel™ WordPerfect® and Money®
- 128MB Shared* DDR SDRAM
- 40GB Hard Drive (7200 RPM)
- Integrated Intel® 3D Extreme Graphics
- 48x CD-ROM; Integrated Audio
- Integrated 10/100 Ethernet
- 1-Yr Limited Warranty; 1-Yr On-Site Service[1]
- Monitor Not Included

Our lowest Windows-based desktop price ever!

$339 **E-VALUE Code: 00045-S50503y**

Recommended Upgrades:

- WordPerfect® Office 11, add $49
- 17" (16.0" v.i.s.) E773 Monitor, add $100

NEW OPTIPLEX™ 170L DESKTOP

Network-Optimized, Value Business Desktop

- Intel® Pentium® 4 Processor at 2.80GHz with 533MHz Front Side Bus
- Microsoft® Windows® XP Professional
- 128MB Shared* DDR SDRAM
- 40GB Hard Drive (7200 RPM)
- Integrated Intel® Extreme Graphics 2
- 48x CD-ROM
- Integrated 10/100 Ethernet
- 3-Yr Next Business Day On-Site Service[2]
- Monitor Not Included

$649 Lease as low as **$18**/mo., (48 pmts:[3]) **E-VALUE Code: 00045-S30506y**

Recommended Upgrades:

- 48x CD Burner/DVD Combo Drive, add $60
- Microsoft® Office Basic Edition 2003, add $139
- 17" Dell™ UltraSharp™ 1703FP Digital Flat Panel, add $479

DIMENSION™ 4600 DESKTOP

Exceptional Performance Desktop

- Intel® Pentium® 4 Processor with HT Technolgy at 2.80GHz with 800MHz Front Side Bus
- Microsoft® Windows® XP Home Edition
- Productivity Pack including Corel™ WordPerfect® and Money®
- 256MB Dual-Channel Shared* DDR SDRAM
- 80GB Hard Drive (7200 RPM)
- 128MB DDR NVIDIA® GeForce FX 5200 Graphics Card with TV-Out
- 48x CD Burner; Integrated Audio
- Integrated Intel® PRO 10/100 Ethernet
- 1-Yr Limited Warranty; 1-Yr On-Site Service[1]
- Monitor Not Included

$799 Lease as low as **$22**/mo., (48 pmts:[3]) **E-VALUE Code: 00045-S50507y**

Recommended Upgrades:

- WordPerfect® Office 11, add $49
- Dell™ All-In-One Printer A960, add $179

Small Business Notebooks

NEW LATITUDE™ D505 NOTEBOOK

Balance of Price and Performance – Starting at 5.1 lbs:[4]

- Intel® Celeron® M Processor at 1.20GHz
- Microsoft® Windows® XP Home Edition
- 14.1" XGA TFT Display
- 128MB Shared* DDR SDRAM
- 20GB Hard Drive
- Modular 24x CD-ROM Drive
- Dell Wireless 1350 802.11b/g 54Mbps* Mini-PCI Wireless Card
- Integrated Intel® Extreme Graphics
- 1-Yr Mail-In Service; Serial and Parallel Ports Included

$1049 Lease as low as **$28**/mo., (48 pmts:[3]) **E-VALUE Code: 00045-S70510m**

Recommended Upgrades:

- Microsoft® Windows® XP Professional, add $60
- 3-Yr Next Business Day On-Site Service[1] add $99

INSPIRON™ 600m NOTEBOOK

Great Performance, Compact Design – Starting at 4.98 lbs:[4]

- Featuring Intel® Centrino™ mobile technology
  - Intel® Pentium® M Processor at 1.40GHz
  - Intel® PROWireless 2100 802.11b 11Mbps* Mini-PCI Wireless Card
- Microsoft® Windows® XP Home Edition
- Productivity Pack including Corel™ WordPerfect® and Money®
- 14.1" XGA TFT Display
- 256MB DDR SDRAM
- 30GB Hard Drive
- Modular 8x DVD-ROM Drive
- 32MB DDR ATI's MOBILITY™ RADEON™ 9000 AGP 4X Graphics
- 1-Yr Mail-In Service; Serial and Parallel Ports Included

$1299 Lease as low as **$35**/mo.,(48 pmts:[3]) **E-VALUE Code: 00045-S80512m**

Recommended Upgrades:

- 512MB DDR SDRAM, add $125
- Dell™ Laser Printer P1500, add $249

INSPIRON™ 8600 NOTEBOOK

Power on the Go – Starting at 6.9 lbs:[4]

- Featuring Intel® Centrino™ mobile technology
  - Intel® Pentium® M Processor at 1.40GHz
  - Intel® PROWireless 2100 802.11b 11Mbps* Mini-PCI Wireless Card
- Microsoft® Windows® XP Home Edition
- Productivity Pack including Corel™ WordPerfect® and Money®
- 15.4" UltraSharp™ Wide Screen XGA TFT Screen
- 512MB DDR SDRAM
- 30GB Hard Drive
- Modular 8x DVD-ROM Drive
- 32MB DDR NVIDIA GeForce FX Go5200 AGP 4X Graphics
- 1-Yr Mail-In Service; Serial and Parallel Ports Not Included

$1399 Lease as low as **$38**/mo.,(48 pmts:[3]) **E-VALUE Code: 00045-S80513m**

Recommended Upgrades:

- Microsoft® Office Basic Edition 2003, add $139
- Advanced Port Replicator, add $169

Small Business Servers&Workstations

POWEREDGE™ 400SC SERVER

Small Business Value Server

- Intel® Celeron® Processor at 2.40GHz
- Upgradable to Intel® Pentium® 4 Processor at 3.20GHz with 800MHz Front Side Bus
- 128MB ECC DDR SDRAM (Up to 4GB)
- 40GB (7200 RPM) IDE Hard Drive
- Upgradable to 500GB of Internal Hard Drive Storage
- Embedded Intel® PRO Gigabit* NIC
- RAID 1 Optional
- 1-Yr Next Business Day On-Site Service[1]
- Small Business Pricing

$499 Lease as low as **$14**/mo., (48 pmts:[3]) **E-VALUE Code: 00045-S20504h**

Recommended Upgrades:

- PowerConnect™ 2608 8-Port All-Gigabit Ethernet Switch;[5] add $159
- System Including Microsoft® Windows® Small Business Server 2003 (256MB SDRAM Min. Required);[6] now $1099

POWEREDGE™ 1600SC SERVER

High-Speed Small Business Server

- Intel® Xeon™ Processor at 2.40GHz
- Dual Intel® Xeon™ Processor Capable (Up to 3.20GHz)
- 256MB DDR SDRAM (Up to 4GB)
- 36GB (10K RPM) Ultra320 SCSI Hard Drive
- Upgradable to 876GB of Internal SCSI Hard Drive Storage
- Embedded Intel® PRO Gigabit* NIC
- Six PCI Slots (2-64/100MHz, 2-64/66MHz, 2-32/33MHz)
- RAID 1 or RAID 5 Optional
- 1-Yr Next Business Day On-Site Service[1]
- Small Business Pricing

$899 Lease as low as **$24**/mo., (48 pmts:[3]) **E-VALUE Code: 00045-S20508h**

Recommended Upgrades:

- PowerConnect™ 2616 16-Port All-Gigabit Switch;[5] add $329
- System Including Microsoft® Windows® Small Business Server 2003 (256MB SDRAM Min. Required);[6] now $1399

DELL PRECISION™ 360 WORKSTATION

Maximum Performance, Single Processor Workstation

- Intel® Pentium® 4 Processor at 2.80GHz with 800MHz Front Side Bus (Up to 3.40 GHz with HT Technology)
- Microsoft® Windows® XP Professional
- Mini-Tower Chassis
- 256MB Dual-Channel DDR SDRAM
- 40GB (7200 RPM) IDE Hard Drive; 48x CD-ROM
- 64MB NVIDIA® Quadro NVS 280 AGP 8X Graphics
- Integrated Intel® PRO 1000MT Gigabit* NIC
- Lifetime 24x7 Dell Precision™ Dedicated Tech Support
- 3-Yr Next Business Day On-Site Service[1]
- Monitor Not Included

$999 Lease as low as **$27**/mo., (48 pmts:[3]) **E-VALUE Code: 00045-S40509y**

Recommended Upgrades:

- 3-Yr Same-Day 4-Hour (5x10) On-Site Service;[1] add $199
- 19" Dell™ UltraSharp™ 1901FP Digital Flat Panel, add $699

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